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2018
7th BALTIC CONGRESS
OF RADIOLOGY

BCR

4-6 October 2018
Kaunas, Lithuania

ONLINE ABSTRACT BOOK

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## PROGRAMME AT A GLANCE

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PLENARY SESSION

Imaging as a turning point in acute stroke patient management
Maija Radzina
Riga Stradins University, Paula Stradina Clinical University Hospital, Riga, Latvia

Introduction. Imaging the brain and the vasculature is a vital first step before treating patients with acute ischemic stroke.

Aim and Learning Objectives. The presentation aim is to give an insight into possibilities of the various multimodal imaging paradigms use into an existing clinical practice for acute stroke patients. It will include step by step diagnostic algorithm of acute stroke with detailed explanations and imaging examples of various clinical and imaging scenarios. The importance of standardization will be addressed in order to improve the value of reporting before and after treatment. The presentation will be based on the most current medical imaging evidence and clinical guidelines.

Main characteristic signs of stroke will be demonstrated, difficulties of interpretation will be discussed with clinical imaging examples. Efficient imaging protocols for patient selection will be shown, as well as common concerns about the use of imaging, including time spent, contrast, radiation, and other advantages and disadvantages, thereby potential influence on patient’s outcome will be highlighted.

CT perfusion (CTP) provides an objective quantitative assessment of irreversibly injured brain and tissue at risk, unlike the Alberta stroke programme early CT score (ASPECTS) on non-enhanced computed tomography. Dynamic angiography (CTA) generated can be used to grade collaterals with excellent temporal resolution to differentiate complete occlusion because of thrombi from high-grade stenosis or no occlusive thrombus;

For any imaging to be effective, it has to be of sufficient quality to allow visualization of the finding that has implications in predicting the likelihood of early recanalization. Quality in CT (non-enhanced CT, CTA, or CTP) acquisition and interpretation can be affected by multiple factors – technical, software, technician and physician based. As endovascular therapy is established in standard practice and further efficiencies develop, it is possible that the extent of imaging acquired will be adjusted based on the clinician’s level of confidence in making a treatment decision in the individual patient.

Conclusions. In summary the efforts should be made to increase the role of individually tailored multimodal imaging in acute stroke patients. Ultimately, the objective is to prioritize patients at high risk and optimize medical outcomes by standardized imaging, reporting results and precise risk stratification in acute stroke patients, with responsibility to avoid any delays in possible active recanalization treatment, supporting the importance of the long term outcomes and reduction of unnecessary complications.
PARALLEL SESSIONS

1st PARALLEL SESSION | NOVELTIES IN RADIOLOGY

Post-mortem virtual dissection
Sunne Remmer
Estonian Forensic Science Institute, North Estonia Medical Centre

Introduction. Post-mortem computed tomography (PMCT) and magnet resonance imaging (PMMRI) complement traditional autopsy in determining the cause of death and the presence of injuries. At the Estonian Forensic Science Institute, we have been using PMCT and PMMRI since 2010. PMCT has proved to be indispensable in detecting certain types of fractures and the presence of gas or air embolism. Some soft tissue injuries can be demonstrated by PMMRI, although conventional autopsy remains the key method for detecting external injuries and organ pathology. 3D reconstructions are useful for presenting injuries in the court of law.

Diagnostic errors in radiology and how to avoid them
Evaldas Laurencikas

Quality of radiological diagnostic methods and techniques has dramatically improved during recent decades but the diagnostic ability of the ‘human eye and brain’ and the rate of diagnostic errors did not. Medical errors including radiological mistakes are considered to be one of the major death causes in modern developed countries. Radiology has become a central part in the patient care. Demand for radiological diagnostic procedures and impact of radiologists on patient-care process are steadily increasing. There is a variety of diagnostic errors, almost two thirds of them, according to recent studies, being not directly associated with image interpretation process. Many diagnostic errors could be avoided. Understanding the reasons why and when in the diagnostic process different types of errors occurs is crucial for reduction of error rate and improvement of health care delivery.

LIRADS CEUS
Maija Radzina
Riga Stradins university, Paula Stradina Clinical University Hospital, Riga, Latvia

Introduction. Contrast-enhanced ultrasound (CEUS) is an established imaging modality for focal and diffuse liver diseases, performed with an intravenous injection of microbubble contrast agents. The American College of Radiology (ACR) group of international experts developed CEUS Liver Imaging Reporting and Data System (CEUS LI-RADS) since 2014. Although the CEUS LI-RADS principles for liver lesion characterization, using dynamic contrast enhancement features, are similar to those for CT or MRI, there are significant differences between these classifications of LI-RADS.

Aim and Learning Objectives. CEUS LI-RADS has different diagnostic features and a unique characterization algorithm. The size of a lesion, the type and degree of arterial phase enhancement, the presence of washout, and the timing and degree of washout are the major features used for the categorization.

This presentation will include key differences in hepatocellular carcinoma (HCC) high risk patients and will include step by step diagnostic algorithm of CEUS LI-RADS with detailed explanations and imaging examples of CEUS LI-RADS categories. Additional features – such as ancillary features, other focal liver lesion categorization will be discussed in a comprehensive way.

Aim of this presentation is to inform the audience about possible scenarios of CEUS LIRADS use, highlight the importance of this method necessity in the daily routine, performed by skilled radiologists and sonography specialists to facilitate it’s use in order to reduce unnecessary radiation exposure, especially in the HCC high risk patients.

Conclusions. In summary contrast enhanced ultrasound may be defined as a useful diagnostic imaging technique for focal liver lesion characterization. The advantages of CEUS LIRADS should be considered to be included in clinical practice, as it offers often cost-, time- and radiation exposure-saving; as well as one should remember it’s limitations that should never be forgotten for a correct use of this technique.
Abnormal placental attachment (placenta accrete) is becoming more prevalent, because rates of caesarean delivery are increasing. Ultrasonography is the primary screening modality for the identification of abnormal placentation, but magnetic resonance (MR) imaging is a complementary imaging modality that is useful when ultrasonography is inconclusive. Antenatal exams are critical giving important information to reduce life-threatening complications. I will share my experience of Placental MRI exams completed in East Tallinn Central Hospital.

1st PARALLEL SESSION | RADIOGRAPHERS SESSION

The EFRS: representing Europe’s Radiographers
Jonathan McNulty
European Federation of Radiographer Societies

The European Federation of Radiographer Societies (EFRS) represents over 100,000 Radiographers and over 8,000 students through 39 national societies and 60 institutions involved in radiography education. This representation spans the three recognised branches of the profession, namely, medical imaging, radiotherapy and nuclear medicine. All of the Baltic countries are currently represented within the membership of the EFRS through Societies and educational institutions. The EFRS engages on a regular basis with other European representative bodies and with the European Commission. Areas of current activity include: the promotion and advancement of the profession; the promotion and advancement of all levels of radiography education; the facilitation and development of evidence-based practice and radiographer-led research; and patient safety. The EFRS represents the interests of the Radiographer at the European level and is our voice in Europe.

Nuclear Medicine Technologists Role in Patient Dosimetry
Toms Kusins
Oncology Center of Latvia, Riga East University Hospital

Introduction. The presentation includes an introduction to basic principles of patient dosimetry in nuclear medicine, an overview of the equipment and techniques used. The main focus of the presentation is to show the role of the radiologic technologists in dosimetry and the collaboration of nuclear medicine specialists in order to ensure the quality and credibility of data acquisition for dosimetry.

Aims and Objectives. The main aim is to show the importance of a radiologic technologist in patient dosimetry. The objectives are to introduce the basic principles of dosimetry, equipment and techniques, as well as to show the importance of a radiologic technologist in patient dosimetry measurements.

Materials and methods. The work includes author's practical experience and overview of materials from established journals (The Journal of Nuclear Medicine, European Journal of Nuclear Medicine and Molecular Imaging, EJNMMI Physics) and major nuclear medicine events, such as EANM congresses (2016 and 2017).

Results. Dosimetry is important nuclear medicine procedure, to ensure patient safety and quality of therapy, it is a collaboration between nuclear medicine specialists.

Conclusions. The radiologic technologists play significant role in data acquisition and are key link between physicists and physicians.

Practical Experience with Ra-223
Ginta Lace
Oncology Center of Latvia, Riga East University Hospital

Introduction. Recent years have shown the development of various treatment options for prostate cancer patients. One of these is a targeted alpha therapy with Radium-223 (Ra-223). Ra-223 acts as a bone-seeking calcium mimetic. After the intravenous injection it accumulates in hydroxyapatite areas surrounding tumour lesions and selectively binds to the areas of increased bone turnover. Its activity concentrates in the bone with very limited...
penetration into the surrounding soft tissues. This new agent is not easy to use in daily clinical practice and it depends on patient comorbidities and the characteristics of patient's disease. The use of Ra-223 also depends on each clinic's therapeutic accessibility, clinical judgment of therapeutic team, and experience.

Aims and Objectives. The main aim of the presentation is to demonstrate advantages and disadvantages of Ra-223 therapy from the radiologic technologist's viewpoint. The main objectives are to describe the therapeutic indications for Xofigo (Ra-223) and to describe the characteristics of the Ra-223 alpha radiation. The presentation focuses on the practical experience in working with Ra-223 and also includes such topics as the selection of patients, handling of Ra-223, calculation and preparation of dose for administration, the delivery of the selected dose, and radiation safety working with Ra-223 during the treatment.

Materials and methods. This presentation provides practical guidelines of using Ra-223 in treating patients with prostate cancer based on the analysis of the available literature and on our clinical experience.

Results. The clinical experience working with Ra-223 shows that it is indicated for the treatment of patients with metastatic castration-resistant prostate cancer (mCRPC) and patients with symptomatic bone metastases. The use of Ra-223 requires specific knowledge and a coordination of care among multidisciplinary team members. Even though Ra-223 can be administered on an outpatient basis, adherence to the guidelines regarding safety in order to protect both patients and staff from unnecessary contamination risks are essential. Communication with patients and their caregivers, as well as other members of the treatment team is essential for optimizing the safe and effective treatment with Ra-223.

Conclusions. Ra-223 therapy is effective in prostate cancer patients with symptomatic metastases in bones. The main purpose of treatment with Ra-223 is to improve patient's survival and not only to relieve them of existing symptoms. Therefore, the appropriate patient selection is essential taking into consideration patient's overall health, type of disease, as well as weighing the possibility of concomitant use of Radium-223 with other therapies such as external beam radiation therapy or hormonal therapy. The personnel working with Xofigo (Ra-223) must comply with all radiation safety requirements.

Access Points for Common Carotid Artery Endovascular Treatment

Davis Feldbergs, Karlis Kupcs
Paula Stradina Clinical University Hospital, Institute of Diagnostic Radiology

Introduction. The most commonly used puncture site for the treatment of carotid artery diseases is transfemoral artery - transfemoral approach (TFA), however this overview demonstrates the feasibility of the transradial approach (TRA). The TRA has long been used to address practically all coronary artery lesions. It has shown significant benefits when compared to transfemoral approach, particularly in a reduction of puncture-site related bleeding complications.

Aims and Objectives. The main aim of this presentation is to discuss in detail the utility of TRA for treating carotid artery lesions using different techniques. The objectives are to highlight the advantages and limitations of the TRA, and to discuss the results of different studies using TRA for carotid artery interventions. The pros and cons of TRA versus TFA for peripheral procedures are also demonstrated.

Materials and methods. Various studies on using TRA for carotid artery interventional procedures were analyzed.

Results. TRA can be utilized effectively to address peripheral vascular lesions, including the renal, iliac, subclavian, carotid, vertebrobasilar, and superficial femoral systems.

Conclusions. Although there is a need for the development of radial-specific hardware to track bulky devices, the TRA is an effective alternative for TFA to treat carotid artery and peripheral vascular lesions.
Methods of Patient Position Verification Used for Radiotherapy in Latvia
Laura Ekhare, Evita Bladiko
Riga East Clinical University Hospital, Oncology Center of Latvia

Introduction. Nowadays, due to the advancements made in the radiation therapy technologies, we have access to radiation methods that minimally affect normal body tissues. In order to properly use these available methods, additional systems are necessary such as patient body position verification systems - EPID, OBI, CBCT, ExacTrac. The accurate positioning of the patient is an essential part of the radiation therapy procedure because it can affect the quality and outcome of the treatment. It is crucial to deliver the precise dose to the intended target volume throughout the whole course of the treatment. For this reason, it is important to check each patient's position before irradiation and, if necessary, make appropriate corrections.

Aims and Objectives. The aim of the presentation is to introduce patient body position verification methods that are currently used in radiation therapy in Latvia. The main objective is to provide an overview about the following verification systems - EPID, OBI, CBCT, ExacTrac, and their potential in the cancer treatment of various anatomical structures.

Materials and methods. Available literature was collected and analysed on the body positioning verification systems used in the radiation therapy in general. Furthermore, body positioning verification systems used in Latvia were selected and in-depth review was compiled.

Results. The body position verification systems used in radiation therapy in Latvia allow for accurate treatment delivery.

Conclusions. Radiation therapy technologies are rapidly developing nowadays. The newest technologies are developed in such a way that they cause minimal damage to the normal, healthy tissues. In order to use these methods, additional systems are required - patient body positioning verification systems, that assist in performing precise radiation therapy procedures. Patient positioning is an important part of the daily work of the radiation therapy department, because it affects the quality and outcome of the treatment. During the radiation therapy it is very important that the treatment dose is delivered to the intended target volume the entire course of patient's therapy. Therefore, it is very important for the radiologic technologist and/or radiographer to check if the patient is correctly positioned before each irradiation and if necessary to adjust the position.

Comparison of the Accuracy of Positioning Devices for Radiation Therapy of Breast Cancer Patients
Anete Rozmane, Lelde Jurkane
Riga East Clinical University Hospital, Oncology Center of Latvia
P. Stradins Clinical University Hospital, Oncology clinic

Introduction. The presentation is a part of the Bachelor Thesis in Radiography from the University of Latvia. The novelty of the topic is determined by the fact that there is an increase in the number of breast cancer patients and the availability of precise treatment options.

Aims and Objectives. The aim of the presentation is to report on the accuracy of positioning devices for radiation therapy of breast cancer patients using three positioning devices - vacuum bag, breast board and armrest (Wing board). The main objectives of the research paper were: 1) to collect and analyze the available literature about radiation therapy used in the treatment of breast cancer patients, 2) to create a research protocol, 3) to record any deviations of positioning devices in lateral, longitudinal and vertical directions, 4) to compare the collected data, and 5) to draw conclusions on which one of three positioning devices is the most precise in the radiation therapy treatment of breast cancer patients.

Materials and methods. When trying to determine the most appropriate positioning device for the patient, the patient's stage of illness, patient's anatomical characteristics such as body circumference, breast size, anatomical deformities of the body and movement restrictions where taken into account. Ten breast cancer patients were positioned using a vacuum bag, ten - using breast board and ten - using armrest (Wing board). During the research period (from January to April, 2017), each day before the commencement of radiation therapy procedure, patient positioning data was read and any deviations were recorded from the electronic portal imaging system.
Results. The research found that the most accurate positioning device for the radiation therapy of the breast cancer patients was an armrest (Wing board), because the mean deviation in the lateral direction was only 0.13 cm, longitudinal and vertical deviation - 0.12 cm. The vacuum bag did not have a large deviation, but the largest mean deviation was found in using the breast board.

Conclusions. The research provides important information for the daily work in the radiation therapy treating patients with breast cancer. It is crucial to have the knowledge of and to use the most appropriate positioning device selected individually for each patient.

The Radiology works of Arts
Philippe Gerson

The first X-RAY of works of art was achieved in France during the first world war on battle fields in the east part of France by PR LEDOUX LEBARD;

It is in 1920 that was opened the laboratory of the LOUVRE museum and it is in 1937 that it was known at the international stage. Today, it is located in the pavilion de FLORE and it is installed on 5000 m2 including a radiology department with 3 x-ray rooms. These missions are to authenticate works of art of the different public museums of France and as a role of education for French and foreign students. We will see a certain number of examples of paints and sculpture X rayed (e.g. Rembrandt, Poussin, Corot, Picasso) and notably the famous MONA LISA – la jocund from Leonardo da Vinci.

1st PARALLEL SESSION | NEURORADIOLOGY

Changes in resting state functional MRI and cognitive function in children with perinatal stroke compared to healthy controls
Nigul Ilves1,2, Pilvi Ilves1,2, Rael Laugesaar3,4, Julius Juuramaa1, Mairi Männamaa4,5,6, Silva Loo7,8, Dagmar Loorits2, Tiitu Tomberg2, Anneli Kolk3,9, Inga Talvik10, Tiiu Tomberg2, Anneli Kolk3,9, Inga Talvik10
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4. Children’s Clinic of Tartu University Hospital, Tartu, Estonia
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6. Institute of Psychology, University of Tallinn, Tallinn, Estonia
7. Department of Paediatric Neurology; University of Helsinki
8. Helsinki University Hospital, Helsinki, Finland
9. Department of Neurology and Neurorehabilitation, Children’s Clinic of Tartu University Hospital, Tartu, Estonia
10. Tallinn Children’s Hospital, Tallinn, Estonia

Introduction. Perinatal stroke causes lifelong motor and neurocognitive deficits, language impairment, behavioral disorders and epilepsy and carries a substantial health, economic, and personal costs. Resting-state fMRI (rs-fMRI) enables to explore the functional connectivity across the brain. Networks supporting the motor and sensory functions in healthy children have a functional organization similar to that in adults, however, networks involved in the higher cognitive functions have immature characteristics even in teenagers. Dysfunctions in the large-scale resting-state functional networks may underlie cognitive and behavioral disability in these children.

Aims and Objectives. The aim of the study was to identify resting-state networks and cognitive development in children with perinatal arterial ischemic stroke (AIS), periventricular venous infarction (PVI) and healthy controls and to find correlations between resting state network changes and cognitive function.

Materials and methods. We studied resting-state functional networks (RSFN) in patients with perinatal stroke collected from the Estonian Pediatric Stroke Database using a Philips 3T magnetic resonance scanner and FMRIB Software Library (FSL) MELODIC tool (www.fmrib.ox.ac.uk/fsl). The study included 45 children (age range 7.6-17.9 years): 11 with leftside PVI, 12 with leftside AIS, and 22 age and sex matched healthy controls. Neurodevelopment of children was assessed using the Pediatric Stroke Outcome Measurement (PSOM) by
Results. The children with AIS had significantly higher total PSOM scores compared to the children with PVI (p<0.05). According to the Kaufman Assessment Battery for Children, the children with AIS received significantly lower scores (p<0.05) in all three general cognitive ability indexes than the children of the PVI group. The overall cognitive development of the children with PVI in our study remained roughly within a normal range. Thirteen functionally relevant RSN were found as have been described in previous studies using a similar methodology for adults as well as for children. According to the present study, the networks were stable across the participants of the AIS, PVI and control groups. No correlations were found between RSFN and general cognitive indices. Correlations were only found in specific cognition process indices and RSFN. AIS group had more correlations than PVI group and controls.

Conclusions. Our findings demonstrate correlations in some specific networks and cognitive functions in children. Changes in the resting-state networks found in children with stroke could serve as the underlying derangements of cognitive brain functions of these children.

Imaging findings of CNS diseases in immunocompromised patients: from toxoplasmosis to lymphoma
Givi Lengvenis1,2, Renata Baltagalviene1,2, Asta Bajorinaite1,2, Jurate Dementaviciene1,2
1. Centre of Radiology and Nuclear medicine, Vilnius University Hospital Santaros Klinikos, Vilnius, Lithuania
2. Department of Radiology, Nuclear Medicine and Medical Physics, Institute of Biomedical Sciences, Faculty of Medicine, Vilnius University, Lithuania

Introduction. Immunocompromised patients belong to a high-risk group, prone to severe neurological complications, including infectious-inflammatory diseases and tumours. The numbers of susceptible patients are rising because of increasing rates of solid organ and bone marrow transplantations, chemotherapy, treated autoimmune diseases, as well as growing numbers of people living with HIV infection. The type of opportunistic infection partly depends on the host's immune status and immunity type being most affected. The most common CNS opportunistic infectious agents are toxoplasma, fungi, mycobacteria, while the most common immune suppression related neoplasms are primary CNS lymphoma and post-transplant lymphoma.

Aims and objectives. The aim of this presentation is to highlight the importance of imaging patterns recognition of CNS abnormalities in immune suppressed patients.

Materials and methods. We present 3 cases of immune suppression related complications - CNS toxoplasmosis in a 43-year-old HIV infected man, fungal brain abscess in an 18-year-old woman with hematologic malignancy, and post-transplant CNS lymphoma in a 53-year-old woman after kidney transplantation. A brief review of the literature, imaging findings and differential diagnosis is provided.

Conclusions. Patients with immune suppression related CNS complications often present with nonspecific imaging findings. Patient's history and experience of the radiologist is very important for early and correct diagnosis.

Development of periventricular venous infarction in foetuses and in pretermly born infant
Norman Ilves1, Pili Ilves1, Dagmar Loorits2, Rael Laugesaar3
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2. Radiology Clinic of Tartu University Hospital,
3. Department of Paediatrics, University of Tartu; Children’s Clinic of Tartu University Hospital

Introduction. Stroke can occur during the entire lifetime. Fatal stroke is an under recognized condition, and little is known about its causes and the timing of the stroke. Perinatal stroke affects survivors with lifelong motor and cognitive disabilities and epilepsy.

Perinatal stroke occurs between the 20th week of fetal life and the 28th postnatal day. The stroke is classified as fatal stroke – diagnosed before birth; neonatal stroke – diagnosed during the neonatal period and presumed perinatal stroke (PPS) – diagnosed after the neonatal period. In case of PPS vascular event is presumed to have
been developed during the fatal period and diagnosed after the neonatal period. Arterial ischemic stroke (AIS) and periventricular venous infarction (PVI) are the most frequent vascular syndromes; arterial haemorrhagic stroke and cerebral sinovenous thrombosis are rare in perinatal stroke.

A haemorrhage of the germinal matrix in early fatal life after 24 weeks of gestation can cause PVI, interrupt neuronal migration and cause porencephaly. During the last trimester of pregnancy arterial thrombosis can occur in fetuses. If a fetus with stroke survives, the child will be born at term without acute symptoms and presumed perinatal stroke will be diagnosed later after development of hemiparesis and/or seizures.

In preterm infants, germinal matrix haemorrhage can cause obstruction of the medullary veins draining the periventricular white matter and PVI develops after a few hours or days, followed by porencephaly. However, in some preterm infants PVI is visible on the first day of life.

Our aim was to identify children with fatal development of PVI among pretermly born infants and in children with presumed perinatal stroke.

Methods and patients. Fatal and presumed perinatal stroke patients were identified from the Estonian Paediatric Stroke Database and preterm infants with PVI were identified from the hospital archives or digital information systems from 1994.

All radiological images were re-evaluated from the picture archive of the Tartu University Hospital from 1994 and from the All-Estonian Picture Archive from 2004.

Results. In the Estonian Paediatric Stroke Database 59 children with presumed perinatal stroke were identified. Only 26/59 (27%) of patients with presumed perinatal stroke had arterial ischemic stroke that probably occurred during the last trimester of pregnancy. In two third of the patients with presumed perinatal stroke (73%) had PVI probably developed during the early fatal life after the 24 weeks of gestation. During the neonatal period boys are usually more affected of stroke. In the presumed perinatal stroke group, only 44% of children are boys without differences between AIS (19 of 43 children were boys) and PVI group (7 of 16 were boys).

In the hospital archive 140 preterm infants with PVI were identified, 80 of them survived. In 17% of them PVI or the periventricular cysts were visible on the first 24h after birth and it was considered fatal.

Conclusions. In children with presumed perinatal stroke the vascular damage develops long before birth after the 24th week of gestation. In preterm children, the PVI is a complex disorder not associated only with obstetric and/or early neonatal complications but in some infants, the stroke develops fatally.

Volumetric changes in basal ganglia in children with perinatal stroke
Jaan Katus1,2, Silva Loõo3,4, Rael Laugesaar4,5, Dagmar Loorits1, Pille Kool2, Pilvi Ilves1,2
1. Radiology Clinic of Tartu University Hospital
2. Department of Radiology, University of Tartu
3. Children’s Hospital, Paediatric Research Center, University of Helsinki and Helsinki University Hospital, Helsinki, Finland
4. Department of Paediatrics, University of Tartu, Tartu, Estonia; 5Children’s Clinic of Tartu University Hospital

Background and Purpose. Perinatal arterial ischemic stroke (AIS) and periventricular venous infarction (PVI) are relatively uncommon, but an important cause of severe neurological disability in children. Several papers have shown that the lobar localization, the size and the laterality of the stroke lesions are prognostic imaging findings. Less is known about the prognostic importance of volume changes in basal ganglia and thalamus in perinatal stroke patients.

The aim of this study was to compare the volumetric changes in basal ganglia and thalamus in children with arterial ischemic stroke and periventricular venous infarction and to find out the correlations between volumetric changes and motor outcome.

Methods. Perinatal stroke patients (20 girls and 18 boys, 20 children with AIS and 18 children with PVI) from Estonian Perinatal Stroke Database were investigated with 3T magnetic resonance imaging (MRI). Isometric 3D T1-weighted MRI images were evaluated with tools from FMRIB Software Library (https://fsl.fmrib.ox.ac.uk/fsl/fslwiki/FSL). The outcome of the children was evaluated with the Paediatric Stroke Outcome Measure (PSOM) by child neurologist and motor outcome with Assisting Hand Assessment (AHA) test by physiotherapist.
Using semiautomatic volumetric analysis, we correlated changes in thalamic and basal ganglia volumes with motor outcomes in children.

Results. Mean AHA score was significantly lower (p < 0.04) in AIS group (55 (95% CI 48 – 63)) compared to PVI group (65 (95% CI 60 – 70)). The global grey and white matter volume adjusted by age was lower in AIS group compared to PVI group (p = 0.01). No significant differences were found in the size of thalamus or basal ganglia between PVI and AIS groups. However, the volume of thalamus, globus pallidus and caudate nucleus on the ipsilateral side of the infarction was significantly correlated with AHA score, respectively r = 0.62 (p = 0.0001), r = 0.65 (p < 0.0001) and r = 0.73 (p < 0.0001).

Conclusions. Volume of the basal ganglia and thalamus is correlated with hand function evaluated with AHA test. This can be the early biomarker of hand motor outcome in children with perinatal arterial ischemic stroke and periventricular venous infarction.

The evaluation of Modic changes in the lumbar spine and their association with lower back pain
Greta Jurkeviciute, Saulius Lukosevicius, Algimantas Krisciukaitis, Robertas Petrolis, Kestutis Petrikonis

Introduction. Non-specific lower back pain affects people of all ages. There are many ideas, what can cause non-specific lower back pain. In recent years, the complexity of the problem was highly explored. The radiologic side of non-specific lower back pain might be Modic changes that were first described in 1988. Modic changes are MRI signal intensity changes in adjacent vertebral endplates. There are three different types of Modic changes separated by different pathologic changes and different appearance on MRI. Through the years the associations between Modic changes and lower back pain have been investigated widely but without finding one clear answer. There was no research carried out regarding the evaluation of Modic changes volume and their connection to characteristics of pain in the lower back.

Aims and objectives. The aim of the study was to find out the associations between the evaluated volume of Modic changes and clinical pain characteristics in patients with lower back pain. The objectives were to collect set of images registered using different MRI sequences for elaboration of image merging methodology, to develop and test the methodology for merging of images according to anatomical structures, to analyze the the demographics, characteristics of pain and to find the connection between them for the group of patients with lower back pain.

Methods. The research was started by finding the patients with lower back pain that had a lumbar MRI performed in 2015 in LUHS hospital Kauno Klinikos with confirmed Modic changes in the lumbar spine. We used the standard MRI images DICOM sets collected from 65 patients. The images were registered using Siemens Magnetom Aera (MRI 1.5T) scanner. The image sets were obtained in T1 and T2 sequences. Some images were also scanned in T2-TIRM. We then used the mathematical computing software MATLAB™ for merging multimodal images also producing optimal representation of the lesion zone. Then the evaluated volumes of the Modic lesions were used in statistical analysis. All the statistical analysis was performed using SPSS 23.0 program. Data were presented as mean ± standard deviation. The Student’s t test was used for testing equality of the mean hypotheses. When t-test assumptions were not met, for comparing two samples we used the Mann-Whitney U. The correlations between parameters were evaluated using Spearman’s correlation coefficient (R). Differences between data are statistically significant when p<0.05.

Results. The average age of patients with lower back pain and Modic changes in lumbar spine was 57.6±12.5y. Type I Modic changes were found in 14 (21.5 percent), Type II Modic changes - 51 (78.5 percent). Our volumetric analysis method was suitable to determine the volume of the Modic lesion for the 64 (98.5 percent) of the cases in T1, 35 (53.8 percent) in T2 and 34 (48.6 percent) of the cases in T2 TIRM. Although, no significant difference was found between the average volumes of Modic lesions in different sequences, we state that MRI images obtained using different sequences supplement each other reflecting different features of the same pathological process. There was no association found between average volume in different MRI sequences and demographic or clinical characteristics and other MRI findings (p> 0.05). The strong negative correlation between the average volume in T2 and the duration of pain (R=-0.81) (p<0.05) was found.

Conclusions. We elaborated the method for merging MRI images from different sequences based of structural analysis and identification of anatomical structures to use in volumetric Modic lesions analysis. We analysed the
group of patients with lower back pain and the Type 2 Modic changes were discovered most frequently. The analysis of MRI imaging of the Modic changes suggested a need of usage of multiple imaging modalities. Images from T1, T2, T2 TIRM sequences are suitable for volumetric analysis and might provide different information about the lesion. This is a new, additional diagnostic tool, which value must be estimated in future research.

1st PARALLEL SESSION | GASTROINTESTINAL RADIOLOGY

Bowel ultrasound
Klaus Schlottmann

Ultrasound is one imaging method for the investigation of the intestine. Thoroughly performed, we can visualise all intestinal and, as important, all para-intestinal structures such as mesentery, omentum, retroperitoneal fat, lymph nodes, fluid collections, vessels. Also, with Doppler techniques, perfusion of the intestine can be analysed and CEUS introduced a plenitude of additional applications.

Ultrasound does detect morphological changes which can be quite similar between distinct diseases but also quite different. We also investigate the intestine for functional changes under real time conditions. Therefore, ultrasound allows for morphological and functional assessment at the same time.

While intestinal ultrasound seems peculiar to the beginner, in experienced hands it can allow for diagnoses which are impossible to obtain by CT or MRI. A systematic approach for the examination of the stomach, small and large bowel and the pitfalls of ultrasound bowel examination will be presented. Intestinal ultrasound parameters which have to be kept in mind are: bowel wall thickness, (layers), the lumen, the content, the peristalsis, the perfusion, the anatomical site.

All possible diseases which lead to morphological and/or functional changes or altered anatomical position can be investigated, such as inflammatory bowel diseases and their complications, infectious diseases, appendicitis, abscesses, fistula, infarction, neoplasia, celiac disease, hernia etc. However, diseases not leading to morphological or functional changes, such as lactose intolerance etc. will usually not be detected.

MRI differential diagnosis of inflammatory bowel disease
Vestina Straksyte (LT), Irina Gineikiene (LT), Dalia Tuskaite (LT)

Learning objective: Describe Etiology, pathogenesis, clinical manifestation, classification of IBD. Imaging modality, Activity grading, Differential diagnosis and Structural report.

Abstract details: Inflammatory bowel diseases (IBD), consisting of ulcerative colitis (UC) and Crohn's disease (CD), have become more common in different regions of the world over the past decades. Its incidence and prevalence in developing countries is steadily rising and has been attributed to the rapid modernization and Westernization of the population. Magnetic resonance enterocolonography (MREC) has become the modality of choice in the diagnosis and follow-up of inflammatory bowel disease (IBD), and could potentially play a similar role in a variety of other small bowel disorders. Cross-sectional imaging offers the opportunity to detect and stage inflammatory, obstructive and fistulizing CD (ECCO 2H; ECCO–ESGAR 3C). Is fundamental at: First diagnosis to stage disease (ECCO–ESGAR 2A; ACG guidelines). Understand the location, severity and length of CD inflammation (ACG guidelines) To monitor follow-up, for therapeutic monitoring in colonic CD (ECCO–ESGAR 4E) MRI alone is not a tool for IBD differential diagnosis. Clinical features are helpful for differential diagnosis: patient history, physical examination, laboratory testing, stool test, colonoscopy with histology.

Keywords: IBD, Activity grading, Differential diagnosis
Resectability criteria of the pancreatic ductal adenocarcinoma
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Pancreatic ductal adenocarcinoma (PDAC) remains a highly fatal disease with increasing incidence. PDAC can be classified according to resectability status with 3 groups: resectable, borderline resectable and locally advanced. Surgery followed by adjuvant chemotherapy is the only treatment option for PDAC with the chance of long term survival. If a radical tumor resection is possible, 5 year survival rates of 20-25% can be achieved. Pancreatic surgery has significantly changed during the past years and resection approaches have been extended beyond standard procedures, including vascular and multivisceral resections. Borderline resectable PDAC has recently been defined by the International Study Group for Pancreatic Surgery, has become a controversial issue with regard to its management in terms of upfront resection versus neoadjuvant therapy and sequential surgical resection. Preoperative diagnostic imaging accuracy is a keypoint to define resectability of the PDAC. Purpose of the presentation is to summarize the current state of definition, management and outcome of PDAC surgery with focus on the borderline resectable PDAC.

Multimodal Imaging importance in Pancreatic Neuroendocrine Tumours
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Introduction. Pancreatic neuroendocrine tumours are rare neoplasms with prevalence of 1-2% [4], diverse clinical appearances and characteristic imaging features whether correctly located [1] [2]. These tumours can be both benign and malignant and clinical behaviour can range from no symptoms to severe clinical syndromes [3]. Therefore, diagnostics of this heterogeneous group can be difficult and delayed.

Aims and Objectives. To determine pancreatic neuroendocrine tumour characteristic imaging features and the most appropriate detection methods.

Materials and methods. This was retrospective descriptive study of 29 patients with histologically confirmed neuroendocrine tumours, carried out at two medical institutions from 2013 to 2017. We analysed characteristic features in various detection methods – both radiological imaging and endoscopic, and in two cases also by intraoperative ultrasound.

Results. The mean age of patients was 61.41±12.18 (range 37 to 78 years) with tumour mean size 3.92±2.9 cm (range from 1 to 13cm) in computed tomography (CT) and magnetic resonance imaging (MRI) examination. Among 29 patients 27.6% (8/29) conventional transabdominal ultrasonography was performed and confirmed neoplasm in 6 patients (75%). Endoscopic ultrasound was performed in 9 patients (31%), 4 of those confirmed as neuroendocrine tumour after biopsy. 24.1% (7/29) patients had Octreoscan and for 57.1% of patient’s it was positive. Although 25 patients (86.2%) underwent abdominal CT examination, in 2 patients (8%) of cases pathology was not found. For remaining 92% of CT positive patients 68.4% had intensive enhancement in arterial phase and radiologist suspected neuroendocrine tumour in 48% of cases (12/25). 8% (2/25) of these tumours had calcifications, 24% (6/25) had infiltrative growing pattern. Only 7 patients underwent MRI examination and in 5 cases tumour was actively vascularized. 41.4% (12/29) of the patients had metastatic process in the liver and 24.1% (7/29) had pathological retroperitoneal lymphadenopathy. The sensitivity, specificity, positive and negative predictive value for CT was 52.12%, 100%, 100% and 15.38%, respectively, and for MRI examination 60, 100, 100 and 50%, respectively. Accuracy for CT and MRI was 56% and 71.43%, respectively, without statistical significance. In two cases of inconclusive imaging findings, but distinctive symptom, the surgery became last diagnostic approach. The intraoperative ultrasound (US) (one during laparoscopy and one during laparotomy) was applied and in both cases US showed hypo echogenic tumour with smooth margins, confirming the diagnosis.

Conclusions. Multimodality examination is mandatory in all cases of clinical suspicion for neuroendocrine tumour and one negative imaging modality cannot exclude the pathology. Intraoperative ultrasound may be suggested as a final diagnostic approach in the inconclusive cases by other modalities.

References:

Retrospective comparison of CT findings in diverticulitis patients undergoing operative vs conservative treatment
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Purpose. The aim of the study was to compare the findings of computed tomography (CT) imaging in diverticulitis patients who were operated on with the findings in those who were managed conservatively.

Methods and Materials: Data from the health records of a single regional hospital was retrieved by ICD 10 codes for diverticular disease of intestine (K57) between 1/1/2009 and 31/12/2013. Among these cases only patients who had abdominal pain, febrile or subfebrile temperature, leukocytosis >8.8 x109/L, C-reactive protein >50 mg/L or description of diverticulitis in the imaging reports were selected. Of the 166 identified cases, 122 had available CT studies. The CT images were reviewed.

Results. Operative treatment was performed in 28.9% (35 of 122) of the patients. The mean age of the operated patients was higher than that of the nonoperated patients (68.8 (95% CI 64.6-72.9) and 63 (95% 59,9-66,1) respectively). Distant free gas has a positive predictive value of 85% for operative treatment and a negative predictive value of 82% against operative treatment, diffuse mesenteric fat infiltration 83% and 77 %, abscess >4cm 53% and 75%, free fluid 47% and 85%, respectively. No statistical significance was found for diverticulum location, bowel wall thickening, localized increased density of pericolic fat, localized pericolic extraluminal air or local peritoneal thickening between the operated and nonoperated groups.

Conclusion. Patients with distant free air, diffuse mesenteric fat infiltration, free fluid or abscess larger than 4cm were more likely to be operated.

The Role of Contrast-enhanced Esophagography in Diagnosing Esophageal Perforation
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Introduction. Esophageal perforation is a rare and potentially life-threatening condition. The most common causes of esophageal perforations are iatrogenic injuries (due to endoscopic procedures, surgical interventions etc.), accounting for more than half of all perforations. Spontaneous perforation (also called Boerhaave’s syndrome) is the most common cause of a noniatrogenic esophageal rupture. Esophageal perforation requires immediate suspicion and diagnosis to achieve a good outcome. The clinical signs are nonspecific and not always present so clinicians mostly rely on radiologists to diagnose a perforation. The contrast-enhanced esophagography is a noninvasive real-time imaging tool that helps diagnose a perforation. It also may help specify the location and extent of an esophageal injury.

Aims and Objectives. To present 6 cases of an esophageal perforation of different etiology and to overview their radiologic evaluation with special emphasis on the use of contrast-enhanced esophagography.

Materials and methods. 6 patients with an esophageal perforation of different etiology were selected. All of these patients were treated in the years of 2015-2017 in Vilnius University Hospital Santaros Klinikos. The medical records of these patients were reviewed evaluating demographic data, etiology of perforation, imaging methods
with special emphasis on contrast enhanced esophagography, fluoroscopic findings, the level and extent of perforation. All cases of esophageal perforation were also confirmed intraoperatively or with other diagnostic tools. Results. All 6 patients were male and their age varied from 47 to 73 years. 5 cases represent noniatrogenic perforations (Boerhaave syndrome and esophageal carcinoma) and 1 case represent iatrogenic perforation (due to removal of esophageal stent). Esophageal perforation was diagnosed with contrast-enhanced esophagography in all 6 cases. Esophagography was also used in follow-up imaging of all cases.

Conclusions. Contrast-enhanced esophagography remains an important imaging tool in diagnosing esophageal injuries and their localization. In some cases, it might even surpass more advanced imaging tools.

1st PARALLEL SESSION | BREAST RADIOLOGY

Evaluation of missed breast cancers
Marja Berg

Missed cancers in clinical patient population differ from those in screening. In clinic breast cancer diagnostics is based on palpation, inspection, imaging and biopsy. Palpation is very important investigation method for radiologists. A lump in the patients breast must always considered as a sign of breast cancer although a normal finding in mammography. Biopsy of suspicious lesions in imaging and palpable lumps is well tolerated and a valuable method for the proper diagnostics.

Breast cancers detected by screening are mostly non-palpable breast tumours being often indifferent in mammography. On that account comparison to the previous mammography images is essential for early detection. Education and monitoring of own results are very important to reduce the number of missed breast cancers in screening.

Breast imaging is based on equipment technology and good quality of images can not be too much emphasized. Mammography tests must be performed regularly.

This presentation shows some examples of missed breast cancers in clinic and in screening.

Diagnostic follow-up after treatment of primary breast cancer
Ilze Engele

Women who had breast cancer are at risk of recurrence and of developing a new breast cancer. Breast Conservation Therapy (BCT) is now seen as the treatment of choice for early-stage breast cancer, leading to a rising demand for post-operative surveillance.

Annual mammography is the imaging examination that should be performed to detect a localized breast recurrence in asymptomatic patients; more imaging may be needed if the patient has locoregional symptoms (eg, palpable abnormality).

Mammographic appearance of the normal breast is altered in the post-operative setting. It is essential to be aware of the normal findings as well as to identify features of recurrent disease with particular emphasis on radiological pathological concordance.

Breast cancer: the accuracy of ultrasound in axillary lymph node status evaluation
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Introduction. Axillary lymph node (ALN) status is one of the most important prognostic factors in patients with primary breast cancer and has an important role in guiding treatment for breast cancer. Roughly two-thirds of early breast cancer cases are associated with negative axillary nodes and do not benefit from axillary surgery at all. Accordingly, there is an ongoing search for non-surgical staging procedures to avoid axillary lymph node
dissection (ALND) or sentinel lymph node biopsy (SLNB). Patients with normal axillary physical exam and ultrasound rarely harbor a large nodal disease burden.

Aims and Objectives. The purpose of this study was to determine the accuracy of preoperative axillary ultrasound (PAUS) and to examine the reliability of PAUS to exclude heavy nodal disease burden, which was defined as >3 axillary lymph nodes containing metastasis. An additional objective was to examine patient and tumor characteristics associated with true-negative and false-negative PAUS.

Materials and methods. The present study is a retrospective analysis of all newly diagnosed breast cancer patients between 1 January 2011 and 31 December 2012 in the Hospital of Lithuanian University of Health Sciences Kauno klinikos. All patients received an ultrasound evaluation of the axilla as part of their staging. Patients received neoadjuvant chemotherapy or an immediate ALND when abnormal (pathological) lymph nodes were visualized. Patients with normal-appearing or with suspicious lymph nodes on PAUS underwent SLNB. The nodal status assessed by PAUS was compared with final histological findings. Radiological and pathological indices were compared between PAUS true-negative and false-negative patients.

Results. From 667 patients with primary breast cancer, 230 patients (34,5%) had lymph node metastases. 581 patients with normal-appearing or suspicious lymph nodes on PAUS underwent SLNB, 434 of them (74,7 %) were node negative. 68 patients (11,7 %) had three metastatic involved lymph nodes and additional ALND was performed, but only 24 patients (4,1 %) had metastases in additionally removed lymph nodes (N2). PAUS was not very sensitive (45,7 %), but had a high specificity (93,8 %), positive predictive value (79,5 %), negative predictive value (76,6 %) and an accuracy (77,2 %). Of the 535 patients with a normal PAUS, 125 (18,7 %) were ultimately found to be node-positive on pathologic assessment after axillary surgery. Primary tumor size (T), lymphovascular invasion (LV1), tumor grade (G) and patient age were found to be significantly different between true- and false-negative PAUS. In the false-negative group were found bigger tumor size (T2 versus T1), the presence of LV1, higher tumor grade (G3 versus G1) and younger patients age (<40 years versus older patients).

Conclusions. PAUS is a valuable tool that accurately predicted absence of axillary disease in 76,6 % of patients with PAUS node-negative breast cancer. Heavy nodal disease burden, which was defined as >3 axillary lymph nodes containing metastasis (N2) were found in 4,1 % of SLNB group patients. PAUS findings may be less accurate in young age (<40 years) and in patients with bigger tumor size (>2 cm), higher tumor grade (G3) and the presence of LV1, these patients with PAUS node-negative should be interpreted cautiously.

Breast MRI: Prognostic Role of Morphologic, Kinetic and Neoangiogenetic Features in Patients with Breast Cancer
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Key words: breast cancer, magnetic resonance imaging, neoangiogenesis, prognostic factors.

Objective: To evaluate the association of breast cancer neoangiogenic, morphologic and kinetic magnetic resonance imaging (MRI) features with prognostic factors in patients with unilateral tumor.

Materials and methods: Data of women diagnosed with breast cancer by biopsy and underwent MRI in 2008-2016 was retrospectively analysed. Morphologic, kinetic and neoangiogenic features were evaluated. Histopathologic features were also recorded. The relationship between MRI features and prognostic factors was measured.

Results: Data of 319 women whose age ranged from 26 to 79 years (mean age - 51.39 years) were analysed. Tumor size varied from 6 to 131 mm, the mean tumor diameter was 28.40 mm. Metastasis in LN had 129 patients (40.4%), in other organs 46 (14.4%). All neoangiogenic factors were significantly associated with tumor size, LN metastasis and metastasis in other organs (p<0.05). Similar correlations were seen between breast oedema, perifocal tumor oedema and skin thickening. Solid tumor hyperintensity in T2 sequences strongly correlated with metastasis (p<0.01). Neoangiogenic features were less expressed in tumors with positive ER and PR receptors (p<0.05).
Conclusions: Neoangiogenetic factors breast, oedema, perifocal tumor oedema and skin thickening could be used as reliable prognostic factor in breast cancer diagnostics. Solid tumor hyperintensity in T2 sequences is rarely seen, but strongly correlates with poor outcomes.

Breast MRI as a sensitive tool to assess treatment response and residual disease in neoadjuvant chemotherapy settings for breast cancer patients, NHS Kettering Hospital experience 2014-2018
Maret Talk
Kettering General Hospital NHS

Introduction. Neoadjuvant chemotherapy (NAC) is highly used treatment and mostly offered to women with large and locally invasive breast tumours. The aim is to downstage the tumour and enable breast conserving surgery. There is a tendency noted it is being offered also to women with smaller cancers and with the stage IIb or IIa to facilitate the optimal (cosmetic) surgical outcome. NAC regimen standard involves 8 cycles of treatment: 4 cycles of anthracycline- based epirubicin and cyclophosphamide followed by 4 cycles of a taxane-based therapy with paclitaxel (total 20 weeks). There exist variations in used therapy regimens. Majority of patients will achieve some positive response. Part of patients will achieve a pathological complete response (pCR) at surgery. pCR is associated with improved overall and improved disease-free survival. Breast cancers respond to chemotherapy differently: some reduce circumferentially while others can fragment or cluster forming some smaller foci. To evaluate the therapy response to NAC conventional radiologic methods have shown difficulties: mammographic accuracy can suffer from the masking effect of high breast density and malignant microcalcifications representing ductal carcinoma in situ (DCIS) usually do not disappear in response to chemotherapy. Ultrasound is highly user dependent and has also its limitations in monitoring response to NAC. This makes assessment of the true extent of disease with mammography and ultrasound more difficult and gives challenges for optimal surgical management of the patient. MRI gives better correlation with pathological size at surgery following the completion of NAC. A British poll (2014) suggested that approximately one third of radiologists were evaluating response using MRI alone, a third were using ultrasound alone and a third were using both. In Kettering Hospital majority of patients from 2014 to 2018 during NAC were followed by MRI. Only if MRI could not be performed US was used instead. MRI scans can be performed at several time points. Baseline scans are essential to assess the extent of disease. Follow-up studies during NAC are used to predict a patient’s eventual response at early point and would enable to define who would be more likely to undergo successful breast conserving surgery and a subset of patients with a better prognosis who would not benefit from additional systemic chemotherapy. Identification of early response (after two cycles of NAC) enables also management to be planned appropriately: NAC regimes will be changed if the therapy response shown by MRI is not favourable and alternative loco-regional or systemic therapies to be used. In poor responders continued ineffective therapy may be harmful, decrease the patient’s quality of life due to the toxic side effects of NAC and increase costs to the healthcare system. The final scan following therapy is needed to plan the surgery. MRI prediction of pCR on a final scan after NAC shows variations in sensitivity and specificity. This can be due to the under- and overestimation of residual disease, but it can also be related to differences of treatment response of different breast cancer subtypes. Recent studies have shown that MRI is more accurate when evaluating response in triple negative breast cancers, HER2 positive cancers and high-grade tumours but less accurate in luminal subtype breast cancers and low-grade tumours.

Aims and Objectives To analyse MRI accuracy to evaluate the therapy response to NAC in breast cancer patients and if this is related to tumour molecular subgroups.

Materials and methods A retrospective study for invasive breast carcinoma patients at Kettering Hospital from 2014 to 2018. MRI studies for NAC patients were evaluated considering the following parameters: tumour size, tumour grade, tumour molecular subtype, axillar lymph node engagement, presence of in situ carcinoma. The correlation between preoperative MRI results for NAC patients and final pathological report was analysed by size and molecular subtypes of breast carcinoma.

Results The imaging performance of MRI to evaluate the response to NAC seems to depend of tumour molecular subtype (by ER and HER2 status). The molecular subtypes of BC also can be considered prognostic biomarkers of NAC efficiency.

Conclusions To improve the diagnostic and prognostic accuracy of MRI, we should consider additional factors including: tumor size, grade and molecular subtype. Monitoring therapeutic response to neoadjuvant chemotherapy
(NAC) is likely to improve NAC effectiveness in breast cancer. Imaging performance seems to vary per tumor molecular subtype (by ER and HER2 status).

**Breast Cancer Screening in Latvia**

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Introduction. Breast cancer is the second most common cancer in the world, and by far, the most frequent cancer among women with an estimated 1.67 million new cancer cases diagnosed in 2012 (25% of all cancers) [1]. Incidence rate in Latvia is one of the lowest in European Union – 69.8 cases per 100 000 (2012 year’s data) [1,2]. 1177 new breast cancer cases were diagnosed in 2016, which is 60.1 cases per 100 000 [2]. However mortality rate is one of highest in EU. In 2016, 452 women died of breast cancer in Latvia (42.7 women per 100 000 population) [2].

Aims and Objectives. Upon randomized controlled trials, the reduction in breast cancer mortality due to screening mammography is 40% for women between 50 and 69 years of age [3]. There has been organized population based breast cancer screening for past 9 years in Latvia for every 2 years for women from age 50 to 69 years. During the period of 9 years since breast screening has been introduced in Latvia, the mortality rates caused by breast cancer should be decreased.

Materials and methods. Since introduction of breast cancer screening in Latvia, the collected data from National Health Service and The Centre for Disease Prevention and Control of Latvia have been gathered and analysed. For breast cancer screening statistics in Latvia is used “5-point standardized breast reporting system”.

Results. In 2016 and 2017 participation rate was 35.7%. Recall rate in 2017 was 13.78 % and in 2016 - 15.78%. The proportion of cases of breast cancer being at 1. and 2. stage detected in 2016 was 67% (only 60,5% in 2010). In 2016 first time breast cancer cases were detected for 1169 women, of whom 540 or 46.19% were within the screening age group (age 50-69). Only 226 or 19% of them had attended the cancer screening mammography. For 184 patients, cancer screening mammography test results were in category R3, R4, R5, which is to be considered as confirmed breast cancer case detected during screening. 42 patients had their screening results matching R1 or R2. Breast cancer cases detected in women younger than screening age (within age of 25-49) equals to 239 women, of which 190 were within the 40-49 age group. There are 390 women that have been diagnosed with breast cancer and are above the age of 70.

Conclusions. After European commission guidelines - acceptable level of participation rate in population is >70% and desirable level is >75%, for breast cancer screening to be qualitative (effective), and recommended recall rate should be below 5% [4]. Nine years since breast cancer screening was introduced in Latvia, the mortality rate continues to increase, which proves the current screening is fairly ineffective [2]. It is vital to decrease recall rate, and increase participation rate.

2. Breast cancer screening data from 2009 till 2017 from National Health Service and The Centre for Disease Prevention and Control of Latvia  
Introduction 295 breast MRI examinations with contrast media have been performed from 2011 to 2016. 103 first examination (that were made from 2012 to 2016) were qualified in the sample.

Aims and Objectives. To evaluate a new radiological examination method – breast magnetic resonance imaging (MRI) with a contrast media – for accuracy and correlation with final histological evidence in women with operated breast cancer.

Materials and methods. We selected women patients who had MRI with contrast media with known breast cancer or suspected breast cancer. We excluded patients who had:
1. neoadjuvant chemotherapy and histological finding has changed, the woman
2. not been operated on and so here were no histology results
3. repeated follow-up and control examinations.
4. examination performed in the wrong cycle phase: contrasting could not be evaluated adequately.

To evaluate correlation of the MRI with the histological finding (tumour bulbs and involvement of lymph nodes) patients were divided into four groups: Group 1 – MRI finding matches the histology finding exactly; Group 2 – Hyperdiagnostics in MRI (cancer was not diagnosed, the tumour was histologically smaller, fewer tumour bulbs); Group 3 – Cancer was not diagnosed during MRI; Group 4 – MRI finding was mostly accurate, but details included hyper- or hypodiagnostics (for lymph nodes or tumour bulbs).

Results. Group 1 - 44 examinations (43%) exactly matched with histology; Group 2 – 32 examinations (31%); in 22 cases (71%), there was no cancer present during the final examination, in 9 cases (29%), there were fewer tumour bulbs (or some bulbs were benign), or the actual size of the tumour or the involvement of the breast was smaller than suspected during the MRI; Group 3 – 1 examination (1%) borderline phyllodes tumour; Group 4 – 26 examinations (25%) in 8 cases, metastases in the lymph nodes were not diagnosed (micrometastases were present in 4 cases), in 5 cases, the metastases in lymph nodes suspected during the MRI were not confirmed in the final examination, in 13 cases, the suspected cancer mass was benign or there were more or fewer metastases in the lymph nodes than described during the MRI.

Conclusions The reference value was the histology result. MRI is the most sensitive diagnostic method. It also has a relatively high proportion of hyperdiagnostics: benign changes simulate malignant signal changes (contrasting). No breast cancer bulb was left undiagnosed. The precision of the diagnosis of metastases in the lymph nodes is more variable (both hyper- and hypodiagnostics).

1st PARALLEL SESSION | INTERVENTION RADIOLOGY

Theranostics – interventional tumour imaging and treatment
Vladislav Malikov

Theranostics is a new and continuously growing field of precision medicine which combines specific targeted treatment methods based on specific targeted diagnostic procedures. With a key focus on personalized patient care, theranostics provides a transition from conventional medicine to a contemporary personalized and precision medicine approach.

Nowadays new diagnostic methods allow accurate assessment of the oncological disease in early stages creating an opportunity to treat tumors locally, without surgery. Radiological intervention in cancer care has grown worldwide during the last few decades. Microwave and ultrasound ablation methods are now used in addition to classical thermal ablation methods such as radiofrequency-, cryo-, and laser ablation.

It is possible to treat tumor tissue also through a vascular approach with microparticles, perform a Transcatheter Arterial Chemoembolization (TACE) or perform a Selective Internal Radiation Therapy (SIRT). During the lecture precision medicine examples from our practice using different diagnostic and treatment methods will be provided and discussed.
Prostatic artery embolization: easy for patient, hard for radiologist

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Introduction. Benign prostatic hyperplasia (BPH), being on the most common non-malignant diseases of the aging men, causes a variety of symptoms, most of which are related to reduced quality of life. To this day, there are numerous available techniques to reduce these symptoms, including medical, surgical and minimal invasive therapy. Over the last few years more and more publications appear showing promising results of prostatic artery embolization (PAE), as new, minimal invasive and effective treatment options for men with BPH.

Aims and Objectives. The aim of this study is to present the most recent data available about PAE and evaluate the outcomes, including periprocedural complications, results of the procedure and the changes in quality of life.

Materials and methods. The most recent literature regarding prostatic artery embolization to treat benign prostatic hyperplasia was reviewed. The outcomes of the available studies were analysed. The most important parameters of the BPH (including prostatic volume, maximum urinary flow, international prostate symptoms score and quality of life) were compared between the studies and the mean values were calculated.

Results. The parameters characterising the severity of the symptoms of lower urinary tract due to BPH pre and post PAE, along with the success and patient rejection rates were compared with our ongoing PAE study short term results.

Conclusions. PAE is a new minimal invasive and promising technique to treat BPH, which could be used for BPH patients when medical therapy is not sufficient, but the strict criteria for patient selection should be advised.

Complications in endovascular ischemic stroke treatment

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During last 5 years endovascular treatment of acute ischemic stroke has become widespread therapy for patients with large vessel occlusion.

Endovascular treatment is highly efficient, but still carries a risk of potentially severe complications. This can lead not only to not improvement of patient's neurological status, but also possibly worse outcome then natural course of disease.

During our 10 year’s experience of endovascular stroke treatment we have evaluated our complications, possibilities to solve them and tried to assess potential risks and how to avoid them. Having this knowledge is essential to provide best care for patients, especially for those interventional radiologists at the early stage of endovascular stroke treatment experience.

The objective of lecture is to share our experience and to discuss possible complications and endovascular rescue treatment options.

Endovascular treatment for acute ischaemia of the superior mesenteric artery – the experience of a single centre

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2. LSMU Medical Academy, Faculty of Medicine

Introduction. Acute mesenteric ischaemia (AMI) is an acute critical disease caused by loss of the mesenteric circulation. Owing to the insidious onset and rapid development of AMI and because there have been no breakthroughs in the clinical diagnosis or treatment, the prognosis of AMI is very poor. The overall mortality rate can reach 60-80%. The main pathogenesis of AMI is superior mesenteric artery (SMA) embolism, accounting for approximately 40-50% of cases. The early diagnosis and treatment of AMI is crucial to its prognosis. Delayed
treatment might lead to intestinal ischaemia and necrosis. Traditional treatment has mainly been confined to open or laparoscopic thrombectomy. With the development of endovascular thrombectomy have been gradually adopted.

Aims and Objectives. To evaluate the possibilities provided by endovascular treatment used by the Department of Radiology of LSMU Kaunas Clinics in 2016–2017, its results and reliability in the treatment of acute ischemia of the SMA.

Objectives:
1. To evaluate mechanical thrombectomy options offered at the Department of Radiology of LSMU Kauno Klinikos in the treatment of acute ischemia of the SMA.
2. To evaluate the clinical course of acute ischemia of the SMA; to determine the needed frequency of surgical interventions following mechanical thrombectomy.
3. To evaluate treatment options for acute ischemia of SMA, combining endovascular and surgical methods of treatment.

Materials and methods:
1. Planned research sample — all patients treated at the Department of Radiology of LSMU Kauno Klinikos in 2016–2017 for acute ischemia of the SMA.
2. A CTA was used to diagnose the patients with acute ischemia of the SMA.
3. Mechanical thrombectomy was used to treat the patients.
4. Following the thrombectomy according to the standardized protocol, the treatment outcome, the clinical course, and the need for surgical treatment will be assessed.

Results. Percutaneous mechanical thrombectomy showed good results in our research with dramatic improvement of symptoms present immediately in all patients. No post procedural complications were present in our patients.

Conclusions. No permanent complications were observed and good results suggests that mechanical thrombectomy is a good alternative to established surgical treatment in selected cases. Still, by avoiding surgery, the bowel ischemia or necrosis may progress, during the time between CTA and percutaneous procedure, and if the patient’s condition does not improve, laparotomy may follow.

Challenges in vertebrobasilar aneurysms
Helmuts Kidikas, Karlis Kupcs
Pauls Stradins Clinical University Hospital, Institute of Radiology, Riga, Latvia

Dolichoectatic and fusiform aneurysms represent a small subset of cerebral aneurysms and are among the most difficult to treat endovascularly or surgically. The natural history of vertebrobasilar fusiform aneurysm continues to present a moribund pathology. Despite technological advancements in surgical and endovascular technique, treatment options do not improve upon the natural history. The treatment of fusiform aneurysms of the vertebrobasilar area is challenging for several reasons - the presence of perforating vessels, the proximity to the brain stem. Also access to the basilar artery could be challenging. The objective of lecture is to discuss the difficulties in the management of this disease, potential treatment options and complications.

1st PARALLEL SESSION | NUCLEAR MEDICINE PROSTATE

Nuclear medicine. Prostate cancer
Feliksas Jankevicius
Vilnius University. National Cancer Institute

The therapeutic landscape of advanced prostate cancer is rapidly evolving. However, despite advances in therapy options, the diagnostic scenery has remained relatively static, with only few innovations addressing optimal modality for detecting regional or distant metastatic disease. This presentation reflects some of unmet needs in the imaging and management of men with advanced prostate cancer that oncologists and radiologists face in daily practice. The sentinel node concept in prostate cancer may facilitate more precise nodal staging, however several hurdles still remain to be cleared in clinical reality. Historically, the standard imaging of bones has been 99mTc-polyphosphonate bone scintigraphy. Improved specificity and sensitivity in accord with early detection advantages, suggest that MRI as a first-line detection modality already may have a place in standard practice for patients at high risk of metastases. The high rate of biochemical recurrences (20-40%) after treatment with curative intent indicates
that at the time of primary diagnosis substantial proportion of prostate cancer patients thought to be nonmetastatic (M0) are in fact metastatic (M1). Newer imaging technologies including PSMA PET/CT changing the way metastases are detected, provide clear opportunity for improvement in detection practices. However, whether increased diagnostic accuracy of new technologies translates into improvement of clinical outcome needs to be confirmed in upcoming clinical trials.

**Nuclear Medicine Tools for Prostate: changing paradigms**

Sergei Nazarenko  
*North Estonia Medical Centre*

**Introduction.** Prostate cancer has the highest incidence rate of all cancers detected in male population in Estonia. Annually in Estonia, more than one thousand primary cases of prostate cancer are detected, which makes more than a quarter of all primary cancers cases in men. Due to its enormous social and medical footprint, prostate cancer deserves continuous attention from diagnostic and therapeutic medicine. Nuclear Medicine has offered tools for diagnosis and treatment of prostate cancer since many years. Commonly known are detection of bone lesion with 99mTc-labelled phosphonate bone scintigraphy and 18F-labelled sodium fluoride positron emission tomography (PET), evaluation of metastatic processes with PET using 11C- or 18F- labelled choline, as well as 18F-fluordeoxyglucose. A variety of therapeutic radiopharmaceuticals is available to treat the bone metastases: 153Sm-EDTMP, 89Sr-chloride, 223Ra-dichloride. Recently, clinical use of prostate specific membrane antigen (PSMA) targeting ligands for visualization, therapy and radioguided surgery of prostate cancer has become a paradigm changing and booming technology.

**Aims and Objectives.** Our work presents the paradigm shift in clinical use of nuclear medicine tools for the management of prostate cancer that occurred after introduction of PSMA targeting ligands at North Estonia Medical Centre (NEMC).

**Materials and methods.** Our team performed first PET/CT with 18F-PSMA-ligand on 18 January 2018. PET/CT scans were acquired on a standard scanner (Discovery VCT, GE, USA). In our first patients a single fixed activity of 250 MBq was administered intravenously to every patient, and acquisition was started 60 minutes after administration, and repeated 180 minutes after administration. Before the study relevant clinical information was reviewed from health record, as well as data of all previous imaging studies stored at National PACS were recalled. If indicated, one out of two CT-components of our study was performed with full diagnostic exposure with or without administration of intravenous contrast; the CT-component of the other acquisition was always low-dose for attenuation correction only. Based on initial experience, and after installation of a new scanner (Discovery MI, BE, USA), the study protocol was amended. Since then, administered activity of the 18F-PSMA-ligand was calculated individually: activity = 2 x BodyWeight; a single acquisition was commenced at 120 minutes after administration, and the CT-component was always tailored to actual clinical needs. Image interpretation was carried out visually, accompanied by SUV measurements. At the time of preparation of current abstract preparations to introduce radioguided surgery with 99mTc-labelled-PSMA-ligand, as well as therapy with 177Lu-PSMA-ligand were started.

**Results.** Our first results demonstrate high sensitivity and specificity of 18F-PSMA-ligands for the detection of prostate cancer tissue. Based on this experience, which is very much in line with published data, 18F-PSMA-ligand-PET/CT has become in our department the mostly used nuclear medicine tool for the detection of prostate cancer.

**Conclusions.** Our experience encourages further clinical use of PSMA-ligands for management of prostate cancer. We are looking forward to being able to use in our practice in addition to 18F-PSMA-ligands also 99mTc- and 177Lu-PSMA-ligands for intraoperative detection, and radionuclide therapy, respectively.
**Ga68-PSMA PET/CT. First experience in Latvia**
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1. Riga Stradins University Radiology Research Laboratory, Riga, Latvia
2. Riga Stradins University Nuclear Medicine Clinic, Riga, Latvia

Introduction. 68Ga-Labeled Prostate-specific Membrane Antigen Ligand Positron Emission Tomography/Computed Tomography (68Ga-PSMA PET/CT) is a new non-invasive diagnostic technique that is used to image prostate cancer with increased prostate-specific membrane antigen expression. PSMA is overexpressed in most prostate cancer (PCa) cells, therefore it can reveal the tumour tissue of PCa. Since November 2016, this diagnostic modality is available in Baltic countries and we present our first experience with 68Ga-PSMA PET/CT examination.

Aims and Objectives. The aim of this presentation is to demonstrate first results of 68Ga-PSMA PET/CT scans in Latvia; to reveal indications and usefulness of examination; advantages, disadvantages and pitfalls of 68Ga-PSMA PET/CT, to compare our experience with worldwide experience.

Materials and methods. Totally 126 patients from autumn 2016 to autumn 2018 were scanned with 68Ga-PSMA PET/CT. Main indications for PET/CT were listed and imaging results were analysed.

Results. Indications of PET/CT examination: localization of tumour tissue in recurrent prostate cancer – 59,5% (n=75/126); staging – 24,6% (n=31/126); monitoring of disease 5,6% (n=7/126), suspect prostate cancer – 7,1% (n=9/126), therapy response evaluation – 3,2 % (n=4/126).

Localization of tumour tissue in recurrent prostate cancer with mean PSA value – 5,12 ng/ml; 65% (n=49/75) cases with 68Ga-PSMA revealed pathological 68Ga-PSMA uptake: local uptake in prostate or prostate bed – 27% (n=20/75), lymph node uptake – 40% (n=30/75), and uptake in distant metastases – 16% (n=12/75).

Primary staging with mean PSA value – 11,15 ng/ml; 97% (n=30/31) 68Ga-PSMA positive cases with 68Ga-PSMA local uptake in prostate – 97% (n=30/31), lymph node uptake – 6% (n=2/31) cases, and uptake in distant metastases – 10% (n=5/31) cases.

Conclusions. 68Ga-PSMA PET/CT examination has an important role as a diagnostic tool for patients with prostate cancer, it specially for primary staging in high-risk PCa patients and localization of recurrent prostate cancer, although indications and patient selection should be individually assessed, as well as imaging protocol adaptions need to be established in further studies.

**18F-PSMA PET/CT for prostate cancer: based on experience of East-Tallinn Central Hospital**
Anne Poksi
*Nuclear Medicine Centre, Clinic of Diagnostics, East Tallinn Central Hospital, Tallinn, Estonia*

On January 12th, 2018 East-Tallinn Central Hospital made an important step forward in the therapy of patients with prostate cancer - the first 18F-PSMA PET/CT scans in Estonia were performed. First patients who underwent 18F-PSMA PET/CT imaging were with biochemical recurrence after surgical treatment and with primary diagnosis in evaluating the dissemination of the disease. Based on PET/CT examination results, it is possible to choose the best treatment method for every single patient.

PSMA or prostate-specific membrane antigen binds to prostate cancer cells in the primary and also in metastatic lesions.

18F is a radioactive isotope of fluorine, it enables visualisation of the PSMA molecules by means of a hybrid imaging device. The hybrid imaging scanner consists of a positron emission tomograph (PET) and a computer tomograph (CT). The major advantage of PET/CT scan is the big imaging area – as a patient is examined from the base of skull to the midthighs, it is possible to find metastases outside the pelvic area also.

18F-PSMA PET/CT examination is predominantly used in case of biochemical recurrence of prostate cancer. This examination allows very early detection of recurrent lesions in patients with very slight elevation of prostate-specific antigen (PSA) (starting from 0.1–0.2 ng/ml). Furthermore, the 18F-PSMA PET scan is beneficial in patients with primarily diagnosed high-risk prostate cancer (Gleason score >7, PSA >20 ng/ml, clinical stage T2c – 3a).
PSMA PET/CT scans detect previously unsuspected disease and may influence planned clinical management in a high proportion of patients with prostate cancer. The implementation of this innovative method was made possible by international cooperation between Nuclear Medicine and Urology Centres of the East-Tallinn Central Hospital (Estonia), MAP Medical Technologies OY (Finland) and Alliance Medical BV (Netherlands).

Advanced Diagnostics and Treatment of Prostate Cancer in Latvia. Case report
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Introduction. Prostate cancer is the second most commonly occurring cancer and sixth most common cancer-specific cause of mortality in the world. Prostate cancer specific death rate in Latvia is one of the highest in Europe and in the world [5]. Prostate cancer is a curable and controllable disease. Over the past two decades the incidence of prostate cancer has increased, however the incidence of the cancer-specific death rate tends to decrease, which can be explained by better and earlier prostate cancer diagnostics and the availability and use of more radical treatment [2,5].

Aims and Objectives. In recent years, the world has seen an increased popularity of Positron Emission Tomography (PET/CT) with Ga68-PSMA. So far it has been classified as experimental, however the data from the research is promising. Ga68-PSMA PET/CT with the use of contrast medium can replace the Computed Tomography examinations of abdomen and pelvis in diagnosing metastases. The initial research findings also show that this method has a higher sensitivity as compared to an isolated CT and bone scan (skeletal scintigraphy) for the diagnosis of bone metastases [1].

There are a variety of therapies available nowadays when metastases are discovered - repeated surgery, conventional radiation therapy irradiating pelvis and/or surgical resection margin, and drug therapy - hormone therapy and chemotherapy, which, unfortunately, carries an array of unwanted side effects and over time resistance may develop. There are series of cases that have been published in recent years that show that both primary low and medium-risk cancer and oligo-metastatic prostate cancer patients can be treated successfully and with low toxicity by using a robotic radiosurgery - high-dose precision radiation therapy, where a small linear accelerator which is connected with a precision robot enables the delivery of a narrow beam radiation from multiple angles in various areas of metastatic sites [3].

Materials and methods. Patient, male 63 years old. Patient was diagnosed with a prostate cancer in March, 2013, PSA 4.4 ng/ml. Prostatectomy was performed in July, 2013 with findings of adenocarcinoma Gleason 3+4=7 pT2a 3-5% from the volume of the material, the resection line R0 - negative. PSA levels have started to gradually increase in October, 2013 - 0.002 ng/ml. PSA level was 0.33 ng/ml in December, 2014 and continued to increase until March, 2015 when it reached 0.956 ng/ml. In June, 2015 the patient has undergone radiation therapy of the prostate bed RD=2Gy, SD=66Gy. As a result, PSA fell slightly - in October, 2015 PSA was 0.294 ng/ml and then began to increase more rapidly. By March, 2016 it reached 0.58 ng/ml, but in October - 7.18 ng/ml. Then the patient had a PET/CT examination which was followed by robotic radiosurgery.

Results. The PET/CT study with Ga68-PSMA showed three pelvic lymph nodes up to 1 cm in cross-diameter with a high PSMA receptor expression - specific indication of metastases (see illustration 1,2). No other metastases were identified.

Due to discovery of oligo-metastatic recurrence of the cancer, the patient was offered to undergo radiosurgery of the metastatic lymph nodes instead of hormone therapy. Artificial markers were placed at the site of 2 nodes located in lower pelvic region in order to accurately track the nodes during therapy. However, the third (para-aortal) lymph node was located between the abdominal aorta and the spinal column and in this case the neighboring spinal vertebrae were used for tracking this node. The therapy was performed with a single dose of 10Gy in 3 fractions (total dose 30Gy) for the distal lymph nodes and 8Gy in 3 fractions (total dose 24Gy) for the anterior part of the urinary bladder, where the dose was reduced due to the fact that this part of the urinary bladder has received part of the radiation when the irradiation of the prostate bed was performed (see illustration 3). The patient's therapy did not cause any side effects (toxicity based on RTOG scale -0). Three months after the radiosurgery the PSA value fell to 1.3 ng/ml, but six months after the therapy - 0.326 ng/ml.
Conclusions. PET/CT with Ga68-PSMA has a very high specificity and sensitivity in diagnosis of prostate cancer and can provide a significant added value in examining patients and assessing further treatment strategies. Robotic radiosurgery is the latest method that provides good results with low toxicity not only for the treatment of the primary cancer but also for the treatment of oligo-metastatic prostate cancer. According to the available literature, such patients can postpone the use of the drug therapy for an average of two years, suggesting that this method has a potential to increase the longevity of patients with the metastatic prostate cancer. Patients in Latvia already today have access to these new and progressive methods in prostate cancer imaging and treatment with good first results, the effectiveness of which needs to be tested in the future with prospective randomized controlled trials.

Building up experience – prostate bone metastases treatment with Ra223
Renata Komiagiene
Vilnius University Hospital Santaros Klinikos

Introduction. Castration-resistant prostate cancer (CRPC) is associated with the development of bone metastases, increased mortality, and a reduction in the patient’s quality of life. Radium-223 dichloride is a radioactive isotope and a calcium-mimetic agent that specifically targets bone lesions. It has been approved for the treatment of metastatic CRPC with symptomatic bone metastases, without known visceral metastases. Radium-223 dichloride treatment is showing improvement in overall survival in patients with CRPC and bone metastases (phase III ALSYMPCA trial).

Aims and Objectives. The aim is to give a general review of the current radium-223 use in the treatment of patients with metastatic CRPC, and to discuss patients selection and treatment monitoring.

Materials and methods. Six radium-223 injections at 4-week intervals is indicated for patients with CRPC and symptomatic bone metastases. In period 2016-2018.04 nine patients with primary bone metastases received Ra-223. Changes in alkaline phosphatase and prostate-specific antigen were recorded. Bone scintigraphy was performed to assess treatment response. Re-treatment with a second course of six radium-223 injections is now performed in one patient and is well tolerated.

Results. Eight patients completed six cycles of Ra-223. Discontinuation was due to leuko- and lymphopenia or pancytopenia. On bone scan, four patients had stable disease, and four showed progressive disease or “flare” phenomenon.

Conclusions. Radium-223 is an important addition to the metastatic CRPC treatment options for carefully selected patients with advanced prostate cancer.

2nd PARALLEL SESSION | THORACIC RADIOLOGY

Infectious Respiratory Emergencies: HRCT Findings and Differential Diagnosis
Tomas Franquet
Director of the Section of Chest Imaging Hospital de Sant Pau, Universidad Autónoma de Barcelona, Barcelona (Spain)

Objectives:
• Review the spectrum of HRCT findings of varied life-threatening lung infections
• Correlate imaging findings with clinical setting and underlying histopathology
• Provide a structured framework for formulating a differential diagnosis

Infections are the most common pulmonary disease and the third leading cause of death in the United States, after ischemic heart disease and cerebrovascular disease. Infectious respiratory emergencies are responsible for significant morbidity and mortality, and frequently require treatment in Intensive Care Unit. Accuracy in the diagnosis remains a challenging task requiring careful correlation of clinical and imaging findings. This lecture will review the high-resolution CT manifestations of varied life-threatening lung infections. Infectious respiratory emergencies are varied and differ according to the type of microorganisms and the immunologic status of the patient. Recognition of specific imaging features allows the radiologist to present a focused differential diagnosis and help direct appropriate management.
Vascular
1. Infarction and hemorrhage (“Halo sign“): Fungi (Aspergillus, Mucor, Histoplasma); Viruses (Herpes)
2. Diffuse pulmonary hemorrhage: Viruses (CMV; influenza A (H1N1); Dengue), Leptospira (Weil’ syndrome)
3. Focal hemorrhage: Herpes virus infection
4. Septic pulmonary embolism and hemorrhage (“Halo sign“): Fungi (Aspergillus, Mucor, Histoplasma); Viruses (Herpes) Bacteria (S. aureus; Nocardia sp.; Actinomyces sp.); Fungi
5. Aneurysm (Rasmussen): M. tuberculosis
6. Embolism: Hydatid embolism; septic embolism;

Mediastinal
1. Mediastinitis/abscess with/without SVC
2. Mediastinal abscess and empyema

Pleural
1. Broncho-pleural fistula and acute empyema
   a. Tuberculous
   b. Non-tuberculous

Parenchymal
1. Acute necrotizing pneumonias
2. Aspiration Pneumonia
3. Lung Abscess
4. Pulmonary gangrene: Bacteria (C. perfringens; Klebsiella pneumonia)
5. Exogenous lipid pneumonia
6. Acute respiratory distress syndrome (ARDS)
7. Barotrauma: Pneumothorax, pneumomediastinum, interstitial emphysema
8. Chest Wall: empyema necessitates
9. Airway-compression
10. AFOP secondary to infectious process (viral)
11. OP secondary to infection

Bronchial
1. Hydatid vomica
2. Obstructive aspergillosis

**Imaging of Chest Trauma**
Tautdvydas Jankauskas1, Algidas Basevicius1, Mindaugas Jievaltas2, Juergen Biederer

Introduction. The respiratory system comprises the functional unit of lung parenchyma, pleura, airways, vasculature, mediastinum, chest wall, and diaphragm. Its genuine task is to guarantee gas exchange by ventilation and perfusion. Any trauma to single or multiple of these structures with functional impairment is therefore potentially life threatening.

Aims and objectives. The aim of this presentation is to review the mechanisms of chest trauma, the radiologic appearance of injuries to the respiratory system and consequences from this for imaging algorithms and image interpretation in the emergency room setting or in out-patients.

Materials and methods. Given a relevant mechanism and intensity of trauma, chest trauma is an immediately life threatening condition. For emergency room imaging (either with whole-body CT or “classical” X-ray/ultrasound) this requires fast imaging following precise, pre-defined algorithms and a similarly efficient concept for data management, reading and reporting on the radiologist’s side. Trauma mechanisms include perforation (e.g. stab and gunshot resulting in bleeding or pneumothorax), blunt trauma (e.g. deceleration from motorvehicle accidents or deep fall resulting in lung contusion, lung laceration or disruption/dissection of large vessels), barotrauma (e.g. diver’s decompression trauma and blast injury resulting in pneumothorax/pneumomediastinum), aspiration/inhalation (e.g. drowning, smoke inhalation resulting in lung edema and following aspiration pneumonia) or any combination of these with their specific radiologic appearance.
Results. In the severely injured patient, the reading approach of the radiologist should follow the trauma-ABC: Airway/Breathing/Circulation. The first look is dedicated to the position of the oro-tracheal tube, the second to the conditions of the tracheobronchial system and the lungs. The key diagnostic signs are abnormal lung opacity (aspiration, bleeding, laceration, atelectasis, pleural fluid accumulation, chest wall hematoma), pneumothorax/pneumomediastinum (alveolar rupture, tracheobronchial rupture or esophageal injury) or widened mediastinum (aortic/arterial injury, venous injury or fracture of sternum/spine). Fractures of the spine, sternum, clavicle, or scapula are not necessarily life threatening per se unless leading to thoracic instability (flail chest), but they are indicative of extreme forces and a high probability of other life-threatening injury, such as aortic rupture or cardiac contusion.

Conclusions. Since in the severely injured patient (“polytrauma”), chest trauma bears immediate life threatening conditions, it needs to be addressed first of all - in the pre-defined set-up of the work flow as well as in the reading and interpretation of the study.

Mediastinal Tumours: New Compartment Anatomy and Use of Cardiovascular Magnetic Resonance Imaging
Monika Arzanauskaite

The spectrum of mediastinal tumours is wide, as well as the spectrum of their clinical presentation. These tumours form a very heterogeneous group, ranging from thymic origin to mesenchymal tumours such as various types of sarcomas. Their histological type is related to the localisation, depending on the original tissue where they arise from. In 2017, the International Thymic Malignancy Interest Group suggested a new, simplified classification of mediastinal compartments.

ECG-gated cardiovascular magnetic resonance imaging is an advanced technique with high temporal and spatial resolution and good tissue characterisation. It helps to assess the extent of the mass, compression or invasion into chambers or vessels and their functional status. Velocity mapping is a reliable tool to diagnose obstruction, while accurate volumetric analysis of the ventricles is important before and during chemotherapy. The technique can be applied to lesions arising from all compartments and is particularly useful when vessels or heart are affected by primary growth, direct invasion or compression. Additionally, the protocol is valuable when there is a need to reliably evaluate tissue planes, for example, to assess for any pericardial involvement.

Learning objectives
1. To review the most recent classification of mediastinal compartments suggested by the International Thymic Malignancy Interest Group.
3. To review the utility of cardiovascular magnetic resonance imaging technique in mediastinal tumours.
4. To review imaging findings using a histologically confirmed case approach.

Intrapulmonary nodule differential diagnosis – problem based learning
Gunta Zepa, Ligita Skrule, Ilze Priedīte, Zanda Krastiņa, Ligita Zvaigzne
Pauls Stradins Clinical University Hospital

Introduction. Thoracic manifestations of rheumatoid arthritis (RA) include pleural disease, interstitial pneumonia, pulmonary vasculitis, airway disease and pulmonary rheumatoid nodules. Rheumatoid nodules are the most specific, although they are rare pulmonary manifestation (<1%) and require a more detailed evaluation to exclude pulmonary metastases, tuberculosis, fungal infection, granulomatosis and fibrotic changes.

Case Presentation:
CASE Nr.1: A 60-year-old woman was presented with a more than 5 years history of RA and discovery of multiple pulmonary nodules. The origin of the lung nodules was unclear and surgical exploration was performed to clarify diagnosis. The histological diagnosis was rheumatoid arthritis damage in lungs.
CASE Nr.2: A 59-year-old man was presented with a discovery of multiple small pulmonary nodules at first-time CT, without any history of oncological, systemic or other disease, so that diagnosis was unclear. It has been determined that a patient has RA but oncological disease was not proven and moreover performing CT control after 1 year pulmonary nodules did not change. Then with the highest probability they are RA intrapulmonary nodules, not the MTS process (not proven histologically).
Conclusions. Small pulmonary nodules often present difficulty determining a diagnosis, so it is very important to know the patient’s history and the dynamics of the process. Final diagnosis can only be determined after histological verification.

**CT angiography of congenital heart disease in neonatal period and infancy**

Mindaugas Matacinis, Nomeda Rima Valeviciene, Jurate Dementaviciene  
*Vilniaus Universiteto ligoninė Santaros klinikos*

**Introduction.** Congenital heart disease (CHD) is the most common cause of major congenital anomalies, representing a major global health problem. Twenty-eight percent of all major congenital anomalies consist of heart defects. Birth prevalence of CHD is approximately 8 per 1,000 live births. Massive breakthroughs have been achieved in cardiovascular diagnostics and cardiothoracic surgery over the past century, leading to an increased survival of newborns with CHD. There the need for thorough evaluation of anatomic details of particular defect non-invasively challenges imaging to diagnose and follow-up patients from neonatal period to adulthood.

**Aims and Objectives**
- To analyse the spectrum of neonatal CHD referred to investigate non-invasively using CT
- To define most frequent pathology found by CT
- To calculate radiation dose from CT to each patient.

**Materials and methods**
- Patients history records from Vilnius University Hospital Santaros klinikos 2006 to 2018 were analysed retrospectively. Only neonatal patients were included.

**Results**
- 169 neonates were found to be referred for CT investigation after inconclusive clinical or echocardiographic evaluation. The most frequent pathologies were aortic coarctation (50 cases, 29,6%) or solitary less pronounced form of aortic hypoplasia (42 cases, 24,9%), combination of aortic coarctation and hypoplasia was found in 16 cases (9,5%). Other pathologies (various forms and degrees of pulmonary hypoplasia, left heart hypoplasia, atrioventricular communication, septal defects) were less frequent. Average radiation dose was 2,8mSv.

**Conclusions.** The most frequent referral for neonatal CT was suspicion of aortic coarctation when echocardiography is inconclusive. Average radiation dose was 2,8mSv.

**Diagnostic and follow-up of TB - crossroads for different subspecialties in radiology and team work for doctors**

Elizabete Kadakovska  
*North Kurzeme State Hospital, Hospital of TB and Lung diseases of Riga Eastern University hospital*

Despite the extensive preventive and therapeutic measures present against tuberculosis (TB), this disease still remains as one of the important causes of mortality and morbidity in the world. Approximately 1 in 10 people with primary pulmonary tuberculosis (PTB) present clinically; of untreated cases, approximately 1 in 10 reactivate usually at a time of relative immunodeficiency. The spectrum of radiologic manifestations of TB can pose a variety of diagnostic and management challenges. TB infection often leaves long term sequelae of infection, particularly granulomatous nodules, cavitation, and fibrosis. Distinguishing dormant disease from reactivation is not always clear - cut. The radiologic presentation of primary PTB infection tends to differ from that of post-primary PTB, but there is significant overlap in the appearances.

Clinically, in the presence of infection, the main questions are whether M. tuberculosis is the infecting organism and, if treated, does the radiology indicate response to treatment. In order to interpret the radiology of TB one needs to be aware of the spectrum of presentation, the expected reaction to treatment, and the myriad of non-pulmonary sites of infection that may prove to be more clinically significant than the pulmonary infection.

As healthcare moves away from a focus on episodic acute care towards more holistic, continuous care, there is an acknowledgement of the importance of integrating health services and ensuring smooth transitions between health, social, community and other agencies.
2nd PARALLEL SESSION | RADIOGRAPHERS SESSION

Impact of patient positioning on radiation dose and image noise in computed tomography
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1. Tartu Health Care College
2. Tartu University Hospital

Introduction. This is a graduation thesis about impact of patient positioning on radiation dose and image noise in computed tomography. A lot of effort has been made to reduce radiation doses from computed tomography (CT) and improve image quality by implementing different setups of CT scanners. Nevertheless, such a critical aspect of radiation dose reduction as correct centering of the patient at the isocenter of the CT scanner has often been underestimated. Research results show that even a 2.2 cm vertical mis-centering can cause an increase of the dose index (CTDI) by 23% on the average due to changes in calculations of the automatic tube current modulation (ATCM).

Aims and Objectives. To explore the changes in radiation dose and image noise according to patient positioning in computed tomography. To achieve the aim the following objectives were identified: a) to describe the correlation between patient positioning, patient size, radiation dose and image noise in computed tomography; b) to describe the changes in radiation dose due to vertical positioning of phantoms and patients in computed tomography; c) to describe the changes in image noise due to vertical positioning of phantoms in computed tomography.

Materials and methods. Literature review based on 11 original research articles and 2 review articles published during past 10 years.

Results. Functions of modern CT equipment provide automatic setting of the radiation dose to be received by the patient. Automatic radiation dose modulation is related to patient positioning. When positioning the patient too close to the x-ray tube the patient measurements are over-estimated that in turn increases the radiation dose. By positioning the patient too far from the x-ray tube dose reduction occurs. To have an optimum radiation dose and good image quality it is essential to ensure accurate vertical positioning of the patient. Studies show that vertical mis-positioning of the patient increases the radiation dose. The more the patient is positioned below the isocenter, the more the radiation dose increases, e.g. mis-centering the phantom 6 cm below the isocenter caused 51.1% increase of the radiation dose; a 3.7 cm mis-centering the patient caused the average dose increase by 29.1%. Positioning the patient above the isocenter decreases the radiation dose. Studies on test phantoms show that an inaccurate radiation dose causes the decrease in image quality. The more the object under investigation mis-centered, the bigger the image noise, e.g. mis-centering the phantom 6 cm below the isocenter caused 15% increase in image noise. Similar results have been obtained in relation to mis-centering above the isocenter, e.g. 5 cm above mis-centering resulted in 15% increase in image noise.

Conclusions. Patient mis-centering may substantially influence the radiation dose and image noise, therefore, radiographers should pay more attention to patient centering in their daily practice.

The retrospective analysis of exposure from paediatric CT examinations
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Introduction. With the increasing use of CT scanning in paediatric patients, concerns about radiation exposure have been growing in recent decades. Paediatric patients are the most radiosensitive group because of their high sensitivity to ionizing radiation and longer expected life. Recent researches have been directed at reducing unnecessary CT usage and decreasing CT dose. Therefore, it is important to evaluate received dose during CT examination and estimate the diagnostic reference levels (DRLs) which serve as a basis for the system of
optimization and the protection of patients from medical exposure. DRLs are intended to act as benchmark levels for doses from common diagnostic procedures. These levels are expected not to be exceeded for standard procedures when good and normal practice regarding diagnostic and technical performance is applied.

Aims and Objectives. The aims of this study were to investigate the dose parameters in paediatric head, chest, trunk and abdomen/pelvic CT examinations and compare them with national DRLs.

Materials and methods. A study of paediatric patients that underwent CT examinations in 2010 and 2014 were done at hospital. A dose report sheet was available for retrospective analysis of CT scan protocols and dose, including the volumetric CT dose index (CTDI vol), dose-length product (DLP). Relationships between dose parameters and patients’ age, scan area were evaluated. Statistical significance of exams was evaluated by exposure parameters.

Results. 149 contrast enhanced CT scans were evaluated in 2010, 30 % of them were head CT scans and 26 % were chest CT scans. The mean DLP value for chest CT scan was 319.2 mGy cm, for head – 1690 mGy cm, for trunk – 812.8 mGy cm, and for abdomen/pelvis – 861.5 mGy cm. 101 contrast enhanced CT scans were evaluated in 2014, 20 % of them were head CT scans and 43 % were chest CT scans. The mean DLP value for chest CT scan was 245.75 mGy cm, for head – 708.3 mGy cm, for trunk – 798.9 mGy cm, and for abdomen/pelvis – 425.8 mGy cm. 577 non-contrast CT scans were evaluated in 2010, 340 of them were head CT scans and 37 were chest CT scans. The mean DLP for non-contrast head CT examinations was 667.2 mGy cm. In 2014 were evaluated 814 non-contrast CT scans, 499 of them were head CT scans and 59 were chest CT scans. The mean DLP for non-contrast head CT examinations was 325.6 mGy cm. The average doses to patient non-contrast CT exams were slightly lower than the national DRLs.

Conclusions. The results showed the significant pediatric CT examination exposure decrease from 2010 to 2014. Estimated doses were lower than national DRL. It is important to continue collecting data on pediatric CT examinations for future dose optimization. National DRLs is a useful tool to assess the dose optimisation, however their short scope limits their suitability. To bypass this, local health centres, especially such as specialised or paediatric hospitals, should set their own, local DRLs or adapt newly proposed European DLRs. While there are no national DRLs levels set for contrast enhanced examinations in Lithuania, it is important to ensure that examinations are performed at optimised state. We recommend to analyse the dose parameters of contrast enhanced CT examinations in order to determine local DRLs.

CT Angiography of the Upper Extremity in Pärnu Hospital
Reno Bleier
SA Pärnu Haigla

Introduction. In out hospital we have new 256 row computed tomography (from 2017). When it comes to imaging upper extremity arteries, when there are trauma patients, patients with ischemic symptoms or patients in need for pre-operative planning, computed tomography is the best modality in our hospital. Therefore it is very important to achieve best image quality, keeping in mind ALARA principle, and getting maximum out of possibilities that out new CT offers.

Aims and Objectives. The aim of this presentation is to introduce upper extremity CT angiography technique that we use in our hospital.

Based on the aim of the presentation following tasks were set:
1. Talk about upper extremity imaging methods, especially focus on CT angiography.
2. Describe patient preparation for CT angiography examination in out hospital.
3. Describe protocol management and parameters that we use with our CT.
4. Describe image quality that we achieve with our CT.

Materials and methods. Besides our own experience, I give a literature overview of CT angiography of the upper extremity arteries, when and why it is used, using scientific articles. The following search terms and combinations of them were used to find articles: Upper extremity imaging, CT angiography of the upper extremity.

Results. CT angiography of the upper extremity can be a difficult examination. Changing to more modern computed tomography device in our hospital gives us better opportunities to get better image quality for a better
examination result. But this can only be achieved when our protocol is optimized and used correctly according to the procedure guide.

Conclusions. CT angiography of the upper extremity is used on trauma patients, patients with ischemic symptoms and on patients who need pre-operative planning. Having new 256 row computed tomography gives us opportunities to achieve better quality in upper extremity angiography. Together with that we need a team including radiographers, radiologists and physicists with up to date knowledge and practice, to get the best result.

**Cardiac CT in Pärnu Hospital (EST)**
Ruta Kuusk
SA Pärnu Haigla

This presentation is based on our professional experience, including how to perform and prepare heart computed tomography as radiographer.

Introduction. Since 2017 Pärnu Hospital has new CT (computed tomography) with 256 rows which has bring along new technique how to perform heart CT. Previously we used another technique to monitor timing of the contrast media and it is quite different, also radiographer’s tasks are made easier at some point. We are not heart specialized hospital, but heart CTs are part of our everyday practice. The technique we use to monitor timing of the contrast media, is taught to us by Payam Ekblom, which is mainly used in Nordic region (GE users).

Aims and Objectives. The aim of this presentation is to introduce technique we use while performing heart CT with 256 row machine. Beneficial point is that some parts of this technique can also be adaptive with lower rows machines and it may be useful for radiologist, including radiographers.

Based on the aim of the presentation following tasks were set:
1. Give an overview of the heart CT
2. Describe the technique we use while monitoring timing of the contrast media in heart CT and advantages of 256 rows machine
3. Describe the preparation of patients who are undergoing heart CT

Materials and methods. Besides our own experience in our everyday practice I give short literature overview of the heart CT, using scientific articles and European Congress of Radiology 2018 materials. The following search terms and combinations of them were used to find articles: performing heart CT, heart calcium scoring.

Results. The advantage of using GE method for monitoring contrast media timing is it’s simplicity – it is robust and simple way to trigger cardiac scans. As this method is simple and adaptive, heart scans does not fail that often or even not at all because of contrast media timing. While performing heart CT, patients are not ideal and therefore need proper preparation, including administration of additional drugs. Despite of CT machine there are few suggestions how to improve the quality of the examination which is useful to clinician and patient.

Conclusions. With improvement of computed tomography machines more patients are undergoing heart CT. Expectations for these examinations are high but sometimes there may be obstacles to achieve good quality cardiac scans. It is important to keep radiographers up to date with various methods so they are able to choose and achieve diagnostic examination.

**Effect of the Injected Contrast Media Ratio on Contrast of Intraabdominal Structures During Pediatric CT Examination with the Method of Split Bolus Injection**
Liga Sembele, Inga Nalivaiko, Ilze Apine
Children's Clinical University Hospital

Introduction. Due to increased sensitivity of pediatric patients to ionizing radiation in pediatric CT imaging it is important to reduce the radiation dose avoiding multiple scanning phases. This creates a problem in assessment of abdominal organs in polytrauma patients where damage of parenchymal organs and urinary tract can be present requiring both parenchymal and late excretory phase. The split bolus technique is a solution to combine both phases in one by splitting the necessary amount of contrast medium in two parts, the first of which is administered but not
followed by immediate scanning and the second part is administered followed by scanning in portovenous phase. Thus the acquired images depict both parenchymal and excretory phases. Since there is limited evidence on the proportion of contrast medium to be split and literature data explaining the optimal proportions or volume of contrast medium are controversial with no common opinion, the aim of the study is to determine the best proportion of splitting the iodine contrast medium to achieve the best possible parenchymal and excretory phase pattern in pediatric politrauma patients at the Children's Clinical University Hospital in Riga, Latvia.

Aims and Objectives. The main aim was to determine proportions of contrast medium administered in split bolus technique in computed tomography (CT) for assessment of abdominal organs in politrauma patients.

Materials and methods. There were 21 CT exams performed using 4 different proportions of intravenous (i/v) contrast media from February until April, 2017 at the Children's Clinical University Hospital in Riga, Latvia. All CT exams were performed with 64-slice multidetector CT scanner using the split bolus technique with politrauma protocol by splitting the amount of contrast medium in certain proportions - 1/3+2/3, 1/4+3/4, 1/5+4/5, and 2/3+1/3, administering the 2nd portion 8 minutes after the 1st dose and scanning as in portovenous phase. For each proportion the contrasting of abdominal organs including the urinary tract in its whole length was assessed by 3 radiologists via questionnaire, rating the contrasting as poor, satisfactory or very good. The results were collected and processed by MS Excel.

Results. For the proportion of 1/3+2/3, the contrasting was rated as very good only in 10 % of cases but in the majority of structures it was rated as satisfactory or poor. For the proportion of 1/4+3/4, in almost 40 % of cases the contrasting of abdominal structures was rated as very good and in about 50 % of cases - as satisfactory. For the proportion of 1/5+4/5, in about 20 % of cases, the contrasting was rated as very good and 60% found it satisfactory, whereas for the proportion 2/3+1/3, only the urinary system showed very good contrasting but it was poor for other abdominal organs.

Conclusions. The recommended proportion of i/v contrast media in split bolus technique yielding the most optimal contrasting for most of abdominal structures and urinary tract is 1/4+3/4.

**Working together for the success: Clinician, Technologist, Interpreter**

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Bone mineral density (BMD) testing is used to diagnose osteoporosis, assess fracture risk and monitor changes in BMD while giving treatment for the patient. A variety of devices and technologies are used to measure BMD. Machinery varies between the hospitals and countries. In addition, there is a high degree of variability in the skills of the technologists performing the tests and the clinicians interpreting the results. Only cooperation and precise responsiveness between clinician (writing a referral for BMD), technologist (performing a study) and interpreter (giving a conclusion) – leads to reliable results. More advanced machinery provides a wider spectrum of information. Our purpose is to introduce a new promising features of DXA system. While performing a bone mineral density test, it could be discovered a fractured vertebrae. For the clinician this information is crucial, because the risk factors for the repeated fractures needs to be evaluated and decision on most effective individualized treatment approach made. This dual information from the study, eliminates the need to perform the thoracic or lumbosacral x-ray for differential diagnosis purposes. Also, the work of technician and additional radiation for the patient have been avoided. An early detection of the abdominal aorta calcification allows physician to evaluate the patient’s cardiovascular system and to prevent its complications in a timely manner.

In order to prevent osteoporotic fractures, beside BMD, it is necessary to evaluate risk factors for the incident of falling. One of these factors is sarcopenia - the loss of muscle mass, strength and its overgrowth with adipose tissue. Body composition analysis is becoming more and more useful tool for this evaluation: using a new BMD machine, it is possible not only to determine a mass and quality of muscle tissue, but also to estimate the amount of visceral fats and its dynamic during treatment. Whole body BMD is inevitable in diagnosing rare metabolic disorders. Working together will be more needed in the future.
Radiology management of terrorists attack
Philippe Gerson

Purpose. Terrorists Attacks – Paris 13 November 2015
Management of a crisis situation
Learning objectives. How to manage a crisis situation inside the hospital and in a radiology department
During and after the attack
- To become more familiar with radiology images of this particular event
- To understand the psychologic effects to the hospital staff and particular radiographers
- To focus on the staff preparation in case of another attack

2nd PARALLEL SESSION | ABDOMINAL RADIOLOGY

How to use LIRADS in CT and MRI
Maija Radzina
Riga Stradins university, Paula Stradina Clinical university Hospital, Riga, Latvia

Introduction. Since its introduction in 2011, Liver Imaging Reporting and Data System (LI-RADS) has become an increasingly utilized method for radiologists to categorize lesions for hepatocellular carcinoma (HCC) in patients at risk (American College of Radiology).

Aim and Learning Objectives. The presentation aim is to give an insight into possibilities of incorporating LI-RADS into an existing clinical practice. It will include the key differences in hepatocellular carcinoma (HCC) high risk patients and will include step by step diagnostic algorithm of LI-RADS with detailed explanations and imaging examples of LI-RADS categories. Additional features – such as ancillary features, other focal liver lesion categorization will be discussed in a comprehensive way, including differences between CT and MRI.

The importance of standardization will be addressed in order to improve the value of reporting before and after treatment. The presentation will be based on 2017 version of LI-RADS as the most recent update with the most current medical imaging evidence.

Main characteristic signs of HCC will be demonstrated – arterial hyperenhancement, the importance of the lesion size, washout presence, other malignancy signs, treatment response, categorization difficulties with clinical imaging examples.

Conclusions. In summary the efforts should be made to increase adherence and to enhance standardized use of LI-RADS. Ultimately, the objective of LI-RADS is to prioritize patient care and optimize medical outcomes by standardized reporting results and precise risk stratification in high risk patient groups, especially for hepatocellular carcinoma.

Imaging in chronic liver disease
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Introduction. Chronic liver disease (CLD) is multi-causal liver injury affecting significant amount of people in the world. Fibrosis (and cirrhosis) is common pathway despite multiple different etiologic factors.

The diagnosis of chronic liver disease most of the time is made by laboratory tests, medical imaging and liver biopsy in selected cases.

As for imaging transient elastography (TE, 1D elastography) (Fibroscan) is the most widely used technique also the only one suggested by clinician guidelines (like EASL-ALEH Clinical Practice Guidelines). Other new elastographic imaging modalities such as 2D shear-wave elastography (2D-SWE) and magnetic resonance elastography (MRE) are showing potential with the ability to overcome limitations of 1D technique.
Aims and Objectives. To review state of art imaging techniques in the field of diffuse liver parenchyma disease from imaging point of view.

Materials and methods. We reviewed available literature about possible radiologic imaging modalities in the field of diffuse parenchymal liver disease, paying specific attention to elastographic techniques.

Results. Despite multiple choices of elastographic imaging modality suggested by imaging societies, the only TE is recommended by clinical guidelines with others still needing more and multicenter studies. New elastographic imaging modalities such as 2D-SWE and MRE may be the most promising imaging modalities overcoming some limitations.

Conclusions. Multiple new and promising techniques are available for qualitative and quantitative imaging of diffuse liver disease, although still more and multicenter trials are needed to adopt these imaging modalities in clinical practice as “the modality of choice”.

Case series of Wilson’s disease - are there specific multiparametric liver ultrasound findings?
Ligita Skrule, Maija Radzina, A. Zarina, I. Tolmane
Pauls Stradins Clinical University Hospital

Introduction. Wilson's disease is a rare genetic disorder of copper metabolism, in which excessive amounts of copper accumulate in the body, particularly in the liver, brain, and eyes. There are 70 patients with diagnosed WD in Latvia.

Aims and Objectives. To evaluate the current liver ultrasound findings in patients with Wilson’s disease (WD) in correlation with clinical-laboratory findings.

Materials and methods. In a case series we have analysed 11 diagnosed cases of WD patients, evaluating for multiparametric ultrasound (US) findings: baseline US, point shear wave elastography (pSWE) and contrast enhanced ultrasonography (CEUS) of liver in correlation with clinical and laboratory findings.

Results. There were genetically proved 11 patients, 8 of them had non-differentiated liver disease in history. Baseline ultrasound revealed diffuse parenchymal changes with increased echogenicity (n=7), coarse-grained texture(n=6), multiple hypoechoic nodules(n=3), liver contour irregularity suggesting cirrhosis (n=4) and perihepatic fat thickening (n=3). Non-specific contrast enhancement (n=3) and nodular lesions with late washout (n=2) was proved by CEUS. Fibrosis was detected by pSWE measurements (F1 (n=2), F4 (n=1)). Decreased plasmatic ceruloplasmine (n=5) levels were associated with nodular liver changes on US and Kayser–Fleischer rings (n=3).All patients had elevated copper level in 24h urine sample, however liver functional analysis did not correlate with structural changes.

Conclusions. There are some specific findings – hypoechoic nodules and perihepatic fat thickening in liver US and nodularity on CEUS with late wash-out pattern with variable fibrosis grade on elastography, that can indicate possible Wilson's disease. Multiparametric ultrasound can be used as first modality to assess liver involvement as well as during progression of the Wilson's disease.

Percutaneous liver biopsy for diffuse hepatic disease. One center experience
Mindaugas Strazinskas
Klaipėda seamen’s hospital

 Despite increasing role of Fibroscan and liver elastography percutaneous liver biopsy still stays the „gold“ standard for diagnosing and staging diffuse hepatic diseases. During the presentation such actual questions as procedure premedication, procedure technique, biopsy sample quality, after-procedure patient observation issues are presented. Information provided is based on the results of recent studies in this field and the experience of performing such procedures in Klaipėda seamen’s hospital.
Pancreatic fibrosis: CT and MRI diagnostic value

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Introduction. Pancreatic fibrosis (PF) is a histological feature of chronic pancreatitis. The only method that can be used to determine the level of PF accurately is histological examination of pancreatic tissue. However, it remains a challenge to determine exact level of PF noninvasively. The main goal of this research was to evaluate MRI and CT imaging, as a non-invasive diagnostic PF method, value and compare it with golden standard – histological pancreatic tissue examination.

Aims and Objectives:
1) to evaluate the associations between preoperative CT, MRI and histologically assessed degree of PF of the resection margin of the pancreas
2) to determine whether MRI is a sensitive predictive tool to evaluate pre-clinical levels of fibrosis, while the exocrine pancreatic function determined by fecal elastase-1 is not yet diminished.

Materials and methods. We collected group of 104 patients, divided into two groups: pancreatic pathology group of 52 patients and control group of 52 patients. Patients in pancreatic pathology group underwent surgical resection of the pancreas, histological examination of resection margin, as well as preoperative abdominal CT and MRI. All MR examinations were performed by means of 1,5T Siemens Magnetom Aera unit (Siemens AG, Erlangen, Germany). Pancreatic tissue was identified on the T1, T2 and DWI sequences. Apparent diffusion coefficient (ADC) was measured using the largest possible region of interest (ROI).

All CT examinations were performed with a 64-slice unit GE Light Speed Pro, with and without the intravenous injection of 100 ml of water-soluble iodine contrast medium.

The pancreatic volumes were measured using a summation-of-areas method. Pancreatic tissue was referred as “atrophic” – enhancing or non-enhancing with contrast medium. While non-enhancing pancreatic tissue was referred as “potentially fibrotic”, and pancreatic tissue with multiple calcifications (>10) - rated as “pancreatic fibrosis”. The pancreatic tissue was processed with Masson’s trichrome staining for accurate estimation of fibrosis. Statistical analysis was performed using SPSS 22.0 (SPSS, Inc., Chicago, IL, USA) software.

Results:
1) There was significant correlation between preoperative DW MRI ADC values and contrast agent accumulation in the resection margin on CT scan (p=0.019). Preoperative DW MRI ADC values of the first and second group of patients were significantly different (p<0.001). We found significantly negative correlation between ADC mean and histologically determined pancreatic fibrosis (r=0.752, p<0.000, R²=0.566).
2) We calculated the sensitivity and specificity of two combined MRI scanning techniques (ADC and T1SI) for the determination of PF. First, we measured ADC and T1SI values separately and found the highest PF diagnostic sensitivity for ≥75% PF and the highest specificity for ≥10% PF. Cumulatively, both measurements provided significant sensitivity for diagnosing ≥75% PF, as well as ≥10% PF (97% for diagnosing ≥75% PF and 100% for diagnosing ≥10% PF). The specificity here was higher for diagnosing ≥50% PF (88%).
3) We used a linear regression equation (y = β₀+β₁x₁+ β₂x₂) to predict the percent of PF from the two independent variables MRI ADC and T1SI values.
4) Our study demonstrated a significant correlation between the fecal elastase-1 lower value and a higher percentage of PF (r=0.703 P<0.001).
5) The volume of the pancreas was significantly lower in patients with longer history of CP.

Conclusions. Combining both the ADC and T1SI measurement allows to detect PF in early stages with greater sensitivity and specificity, when other clinical signs are not presented yet. None of the tests used for the diagnosis of pancreatic fibrosis have been recognized as the “gold standard”; however, MR imaging has the advantage of being non-invasive and widely used in the clinical surroundings, thus making our results easily transferable to routine clinical practice. Since DW MRI can be performed relatively quickly, does not require the administration of gadolinium-based contrast agents, and enables the qualitative and quantitative assessment of tissue diffusivity, it can be routinely implemented in clinical protocols. Our results revealed that measuring of volume of the pancreas can also contribute to monitoring CP progression.
Volumetric MRI data analysis of the suicidal patients brain

Rimante Gleizniene, Kristina Banioniene, Matas Virsilas, Milda Sarkinaite, Andrius Radziunas, Virginija Adomaitiene, Kristina Dambrauskiene, Justina Juskiene, Vesta Steibliene

Introduction. According to the World Health Association data, there were estimated 788 000 suicidal deaths worldwide (10.7 per 100 000 population). Lithuania has been among the countries with the highest suicide rate for more than 20 recent years and has the highest suicide rate in the European Union. It is known that suicidal behavior is associated with psychosocial factors and mental illness. The evaluation of structural brain imaging on suicidal brain pointing at a higher prevalence of the changes in specific brain structures. It has been shown that suicide attempters showed reduced gray matter volume in prefrontal cortices and hippocampus and this caused serious cognitive deprivation leading to the suicide. Analysis of the affected brain regions in suicide patients could bring new understanding on neurobiology of this behavioral pattern and it’s prevention.

Aims and Objectives. The aim of our study was to evaluate demographic and brain volume parameters of patients who were hospitalized after suicidal attempts in association with their alcohol use, suicidal attempt recurrence and in comparison with healthy non-suicidal controls.

Materials and methods. During 2017 7-month-period 59 suicide attempters (SA) without cognitive impairment or any organic brain disorder were consecutively hospitalized at Psychiatry department of the Hospital of Lithuanian University of Health Sciences Kaunas Clinics. Patients were invited to participate in this prospective study: to fill sociodemographic questionnaire and perform brain magnetic resonance imaging (MRI). Healthy control (HC) group consisted of 54 non-suicidal persons, without history of mental disorders or organic brain. They were performed brain MRI, in order to compare brain volumetric parameters of the two groups. Brain MRI was performed by Siemens Avanto, 1.5T MRI. Volume of brain structures of these both groups were measured by using FreeSurfer v6.0 automated surface-based morphometry. The statistical analysis was performed using SPSS 21.0. GLM. Difference was statistically significant when p < 0.05.

Analyzed brain regions were divided into these groups: amygdala, 9 prefrontal brain, 4 hippocampus regions. These parameters were compared in 3 different groups (gr.): 1. Suicidal attempters gr. vs control gr.; 2. First time suicide attempters gr. vs recurrent suicide attempters gr.; 3. Alcohol intoxication before suicide attempt gr. vs suicide attempters without alcohol intoxication.

The study protocol and informed consent were approved by Bioethics Committee 2017-06-23, No. BEC-LSMUCR-67. Conflicts of interest none.

Results. The study consisted of 59 suicide attempters (24 men and 35 women) and 54 healthy controls (19 men and 35 women). The average age of SA was 40.81±16.40 years and of HC - 41.02±16.09 years. Between SA and HC groups statistically significant changes of the prefrontal cortex were detected in these regions: left and right pars orbitalis (p=0.037; p=0.002), right and left superiorfrontal (p=0.000; p=0.000), right and left lateralorbitofrontal (p=0.018; p=0.002), right and left caudalmiddlefrontal (p=0.033; p=0.001), left rostralmiddlefrontal (p=0.000). Suicide attempters while comparing to controls showed statistically significant changes in the specific regions of hippocampus: right and left subiculum (p=0.045; p=0.107), right and left hippocampus (p=0.036; p=0.047). Significant difference of the volume of the right and left amygdala (p=0.401; p=0.421) were not found. Comparing 9 prefrontal cortex regions between first time suicide attempters and recurrent suicide attempters only left superiorfrontal (p=0.096) cortex volume was statistically significant. Between these two groups volume of right and left amygdala (p=0.178; p=0.188), right and left hippocampus (p=0.178; p=0.188) did not differ except right and left subiculum (p=0.03; p=0.041). While comparing alcohol intoxication before suicide attempt group and suicide attempt group without alcohol intoxication these brain regions showed statistically significant changes: right pars orbitalis (p=0.076), right lateralorbitofrontal (p=0.036), right and left superiorfrontal (p=0.003; p=0.005), right and left caudalmiddlefrontal (p=0.005; p=0.03), left rostralmiddlefrontal (p=0.006), left hippocampus (p=0.039).

Conclusions:
1. No significant changes were found while analyzing suicidal attempt MRI images.
2. In suicidal attempt group prefrontal, hippocampus brain regions volumes were significantly smaller than in healthy control group.
3. In first time suicide attempters group, hippocampus part (left and right subiculum) volume was significantly bigger than in recurrent suicide attempters group.
4. Group of patients who were attempting a suicide while intoxicated with alcohol prefrontal brain parts and left hippocampus volume were significant smaller than of the group who were attempting a suicide without alcohol intoxication.

Thoracolumbar spine injuries - AOSpine classification system and (hopefully) clinically relevant report
Teele Jaanson
North Estonia Medical Centre

Spine injury must always be considered for patients with multiple trauma. AOSpine thoracolumbar spine injury classification system is widely used, comprehensive and easily applicable. It is very important to correctly report spine injuries and to speak the same language with spine/orthopedic surgeon you are working with. Correctly classified injury and communicated report helps the surgeon with decision making and impacts the management of the patient. Missed and understated injuries may lead to further damage to the patient. They can lead to irreversible neurologic deficit and other complications.

Functional changes in the brain in addicts with metcathinone-manganese neurotoxicity
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Introduction. A distinctive parkinsonism-dystonia syndrome occurs in intravenous abusers of a designer psychostimulant containing methcathinone. Methcathinone is obtained by oxidation of ephedrine or pseudoephedrine in over-the-counter cold medications in the presence of potassium permanganate. The resultant solution, containing both methcathinone and manganese, is injected intravenously. First symptoms typically appear during the first year of abuse. The syndrome involves varying combinations of parkinsonian features, dystonias and speech disturbances, while typical parkinsonian features such as rest tremor and lead pipe rigidity are usually absent. All major subgroups of antiparkinsonian drugs have been tried with no apparent effect. There is no improvement in symptoms after cessation of use, and occasionally even clinical deterioration is observed. Although structural changes underlying the syndrome – putaminal, thalamic and cortical atrophy, along with predominantly frontostriatal white matter damage – have recently been elucidated, changes in functional connectivity have not been comprehensively studied.

Aims and Objectives. Our goal was to elucidate changes in functional connectivity in the brain in patients with a parkinsonism-dystonia syndrome caused by chronic intravenous administration of methcathinone and manganese. Since the syndrome is predominantly motor in nature, we focused on cortical motor areas, basal ganglia and the cerebellum.

Materials and methods. 25 intravenous drug addicts with history of methcathinone abuse (19 males, mean age 37.8 years) and 36 healthy controls matched on age, gender, primary language and level of education (24 males, mean age 37.9 years) were included in the study. Patients were interviewed and their syndrome was assessed clinically using MDS-UPDRS [Movement Disorder Society-sponsored revision of the Unified Parkinson’s Disease Rating Scale]. Whole-brain T1-weighted MRI scans were acquired using a 3D FFE sequence and resting-state fMRI data were acquired using a dynamic T2*-weighted gradient echo single shot EPI-BOLD sequence. After preprocessing, fMRI data were decomposed with independent component analysis using MELODIC [Multivariate Exploratory Linear Optimised Decomposition into Independent Components], after which components representing noise were removed. Components corresponding to canonical resting state networks were selected for further analysis. Functional connectivity of the basal ganglia and the sensorimotor resting state network with the rest of the brain was then assessed using FEAT [fMRI Expert Analysis Tool].

Results. We observed significantly increased functional connectivity in patients between both putamina and the anterior lobe of the cerebellum, and between both putamina and cortical areas roughly corresponding to the primary motor cortex. There was also stronger functional connectivity between the sensorimotor resting state network and the primary motor cortex.

Conclusions. Increased functional connectivity between putamen and cerebellum, and between putamen and motor cortical areas, has recently been described in idiopathic Parkinson’s disease, subsides with levodopa administration.
Research on functional connectivity in dystonias has produced conflicting results – both increases and decreases of functional connectivity between the basal ganglia, cerebellum and cortex have been reported – interpretation is further complicated by many clinically and pathophysiologically distinct forms of dystonia. However, it remains plausible that dystonia in this unique syndrome is a result of the cerebellum “overcompensating” for damage to the basal ganglia.

Optimization of spine imaging in patients with low back pain
Indrek Hanso, Peeter Raudvere, Andres Kaalep
North Estonia Medical Centre

Introduction. Low back pain (LBP) is an extremely common disorder, and lumbar spine imaging (plain radiography, CT, and MRI) is often performed in patients with LBP, with an increasing number of referrals received from emergency medicine departments (EDs) in outpatient setting. Although clinical practice guidelines recommend imaging only in the presence of progressive neurologic deficits or signs or symptoms suggesting a serious or specific underlying condition (the so-called red flags of low back pain), imaging is often performed in the absence of a clear clinical indication. This fact is worrying, because routine imaging does not seem to improve clinical outcomes, exposes patients to unnecessary harms, and contributes to the rising costs associated with low back pain.

Aims and Objectives. To evaluate the effect of implementing an evidence based imaging guideline as part of standardization of care for ED patients presenting with LBP. To evaluate the effect of dose optimization of lumbar CT studies.

Our aim is to achieve better justification and optimization of radiological studies requested for patients with LBP.

Materials and methods. We analyzed the appropriateness of referrals to lumbar CT ordered by ED physicians of a big multidisciplinary hospital, both before and after implementing a simple evidence based imaging guideline that was worked out locally, based on well-established international guidelines and tailored to local needs and resources. In parallel, we carried out a dose reduction program for lumbar CTs, and evaluated its effect, comparing doses at the two time points that were used to evaluate clinical appropriateness of the studies.

Results. At the starting point of our survey (September and October 2015) 55% of the ED referrals to lumbar CT were inappropriate, and calculated radiation doses of the studies exceeded both North American and European diagnostic reference levels (DRLs) considerably. By the end point of the study (February and March 2018) still 57% of the ED referrals to lumbar CT were inappropriate, while calculated radiation doses of the studies matched within European DRLs.

Conclusions. More efficient methods and effort is required to change the referring behaviour of our ED colleagues dealing with LBP patients. We consider our dose reduction program successful.

2nd PARALLEL SESSION | HEAD AND NECK RADIOLOGY

CBCT in the head and neck: the added values and caveats
Davide Farina
Università degli Studi

CBCT offers a valid alternative to MDCT in numerous head and neck applications (namely, sinonasal, temporal bone and dental imaging), providing two main advantages. The first is represented by its unsurpassed spatial resolution, which can be exploited to image even the finest details of the anatomy, such as thin vascular and nervous channels of the maxilla and skull base that are very difficult to detect on MSCT. The second consists of the lower radiation delivered to patients, even more relevant advantage if we consider that many young patients are potential candidates to CBCT scan.

However, CBCT has drawbacks one should be aware of, to ensure that the scanner is used at its best. Motion artefacts, for example, are more common than in MDCT, owing to longer scan times. This problem, more significant in the pediatric population, is only partially solvable if patients are scanned lying on a table rather than sitting or in the upright position. Additionally, the representation of soft tissues is inherently poor. This is minor problem in dental and temporal bone imaging, but may become the source of serious underdiagnoses in sinonasal...
pathologic conditions transgressing the bony framework of the paranasal sinuses. Careful patients selection is therefore essential prerequisite.

The many faces of cystic head and neck lesions
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Introduction. Cystic lesions in the head and neck are important entities that increase cross sectional imaging utility. It is very important to know the main radiological pitfalls of cystic head and neck lesions in the differential diagnosis.

Aims and Objectives. Cystic masses of the head and neck consist of a variety of pathologic entities. There are diverse causes of cystic lesions in the head and neck, several of them are congenital lesions, infectious/inflammatory conditions, lymphatic malformations, neoplasms, and lymphadenopathy. It may be challenging for radiologist to make an accurate diagnosis due to many different causes. The correct diagnosis often depends on the clinical information combined with embryology knowledge and it can also lead to the right path choosing the most accurate imaging technique.

Conclusions. Ultrasound is frequently used initially to evaluate the nature of the lesion. Computed tomography and magnetic resonance imaging provide additional information not only about the cystic lesion location, but also can elucidate the etiology, that allows to choose the optimal treatment or follow-up plan.

CBCT in dental and maxillofacial imaging
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Cone beam computed tomography (CBCT) is an imaging technique that utilises cone-shaped x-ray beam and flat-panel detectors together with computational image reconstruction, yielding 3D imaging data of limited volumes with high spatial resolution. There is a remarkable variation between technical parameters of different scanners which has direct impact on their clinical performance. One of the undisputable advantages of CBCT over MDCT is its lower cost. The effective radiation dose from CBCT scans varies widely according to the equipment and settings used, but notable reduction in dose can be achieved with small fields of view

CBCT is especially well suited for hard tissue imaging and, hence, is increasingly popular in dentomaxillofacial radiology. In comparison with two-dimensional radiography, CBCT can provide increased geometrical accuracy and clinically useful 3D information. However, its use should be limited to selected indications.

This lecture will mainly focus on clinical use of CBCT in dentomaxillofacial radiology. Advantages and disadvantages of CBCT in comparison with MDCT and conventional radiography will be discussed. Recent literature and current guidelines for clinical use of CBCT in dental practice will be reviewed and the leading applications of CBCT, such as dental implant or mandibular third molar extraction planning, will be discussed. Some examples of CBCT's use in clinical practice will be provided together with hints for reading dental (CB)CT scans for those who are not too familiar with oral health or dental imaging problems.

Preoperative imaging of candidates for cochlear implantation: what radiologists should not miss
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Aims
1. To describe CT scan protocol for preoperative temporal bone evaluation.
2. To review anatomical variations, anomalies or malformations that may modify surgical approach.
3. To review other coexisting conditions or pathologies that may alter surgical approach or has to be treated before surgery.

Background and imaging findings. Cochlear implants (CI) are medical devices that bypass damaged structures of the inner ear and stimulates the auditory nerve and nervous system directly. Patients with profound to severe sensorineural hearing loss (SNHL) and some other pathologies of cochleae are potential candidates for cochlear
implantation. SNHL is caused by abnormalities of the membranous labyrinth or cochlear nerve, which may be congenital or acquired. All candidates have to undergo selection process and high resolution computed tomography (HRCT) plays an important role in it. HRCT is necessary to evaluate the anatomical features, possible malformations of temporal bone and allows excellent depiction of small bony structures which is essential for making the decision to perform cochlear implantation, plan surgical approach and prevent possible complications. For optimal interpretation HRCT scans have to be high quality and the radiologist must have a comprehensive knowledge of temporal bone anatomy and possible malformations.

Evaluation of mastoid cells and middle ear is important for surgery planning. Aeration of mastoid cells is important as surgery requires partial mastoidectomy. The width of middle ear, status of facial nerve recess has to be evaluated as the surgeon courses through them. Electrode array is inserted to the cochlea through the round window making it important to evaluate the features of the window. Detection of possible inner ear malformations or labyrinthitis ossificans is important for choosing the side for the implantation and the length of the electrode. Many complications may occur during the surgery, but the knowledge of particular anatomical variants may lower the risk. It is important to report abnormal facial nerve course to prevent a facial nerve injury during the procedure. Vascular variants such as aberrant carotid artery, high-riding or diverticulum of the jugular bulb may also predispose complications and have to be evaluated. Increased internal acoustic canal diameter, enlarged vestibular aqueduct may increase the risk of cerebrospinal fluid leak and possible meningitis. Evaluation of possible cochlear malformations is important when choosing the side for the implantation and the type, length of the electrode, they may also be associated with cerebrospinal fluid leak. The most common cochlear malformations are complete labyrinthine or cochlear aplasia, common cavity, cochlear hypoplasia, incomplete partition type I and II deformities, Mondini deformity.

Conclusions. CT scan plays essential role in planning the surgical approach for cochlear implantation. Detailed assessment of the temporal bone anatomy and possible malformations is important to plan the surgery, prevent complications and reach the best outcomes.

**Radiological imaging of acute mastoiditis**

Riste Saat

_East Tallinn Central Hospital, Radiology, Estonia_

Acute mastoiditis (AM) is a complication of bacterial otitis media in which purulent infection affects the mastoid cavity and the surrounding bone. AM most frequently affects young children but can occur in adults as well. Without adequate treatment, infection can spread through the bone and lead to serious complications such as generalized sepsis, intra- and extracranial abscesses, meningitis, and venous sinus thrombosis. Treatment of AM is usually conservative with surgery reserved for complicated cases and for patients in whom conservative treatment fails. Diagnosis of AM is usually clinical. Imaging is mainly needed to detect complications. The imaging modality of choice has been contrast-enhanced computed tomography (CECT), which can demonstrate the fine bony structures and their possible coalescence in AM. MRI has been valued for its greater sensitivity in detecting intracranial infection.

Current lecture will mainly focus on MRI in the diagnostics of AM. Typical intratemporal MR imaging features of AM will be presented together with examples of complications. Differences between true clinical AM and incidental imaging findings will be discussed. Warning MR imaging signs of complicated AM will be presented and compared with findings in CT.

**Imaging findings of CNS diseases in immunocompromised patients: from toxoplasmosis to lymphoma**

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Introduction. Immunocompromised patients belong to a high-risk group, prone to severe neurological complications, including infectious-inflammatory diseases and tumours. The numbers of susceptible patients are rising because of increasing rates of solid organ and bone marrow transplantations, chemotherapy, treated autoimmune diseases, as well as growing numbers of people living with HIV infection. The type of opportunistic
infection partly depends on the host's immune status and immunity type being most affected. The most common CNS opportunistic infectious agents are toxoplasma, fungi, mycobacteria, while the most common immune suppression related neoplasms are primary CNS lymphoma and posttransplant lymphoma.

Aims and objectives. The aim of this presentation is to highlight the importance of imaging patterns recognition of CNS abnormalities in immune suppressed patients.

Materials and methods. We present 3 cases of immune suppression related complications - CNS toxoplasmosis in a 43-year-old HIV infected man, fungal brain abscess in an 18-year-old woman with hematologic malignancy, and posttransplant CNS lymphoma in a 53-year-old woman after kidney transplantation. A brief review of the literature, imaging findings and differential diagnosis is provided.

Conclusions. Patients with immune suppression related CNS complications often present with nonspecific imaging findings. Patient's history and experience of the radiologist is very important for early and correct diagnosis.

**Diagnostics tips in head and neck oncology**

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Pretreatment imaging studies of the head and neck cancer patient are performed to determine the stage of the tumor or for the occult primary tumor detection. The accurate radiological report can help to establish the right diagnosis and to choose the best treatment plan for the patient. The evaluation of the tumor response and effectiveness of surgery or the other treatment option is done while performing various imaging studies. Complex anatomy and various treatment options of the head and neck cancer make the pretreatment and posttreatment imaging interpretation challenging. Important anatomical features, diagnostic challenges, surgeon expectations of the report will be discussed in this presentation.

Knowledge of the anatomy, various treatment techniques and their expected posttreatment imaging findings, can lead to an accurate diagnosis and avoid unnecessary further diagnostic work-up. The communication between the surgeon and the radiologist is essential for the correct diagnosis.

**2nd PARALLEL SESSION | CARDIOVASCULAR RADIOLOGY**

**Role of CT in non-coronary interventional procedures**

Antanas Jankauskas

Non coronary interventional procedures for structural heart disease experienced greatest growth over last decade. Especially grown rate of transcatheter aortic valve implantation and other valvular procedures. Whereas tendency of stabilisation or even decrease of coronary interventional volume during this period is observed. Increasing variety of devices and techniques currently allows minimal invasive procedures for valvular diseases, non-valvular congenital and non-congenital pathology. Moreover, refinement of already introduced devices results in thinner and more flexible delivery systems, possibility to correct implanted device, wider size variety, resulting in better availability. Electrophysiological procedures also advances, by using improved ablation techniques. These advances leads to expanding indications of interventional procedures and decreasing complication rate, which is also reinforced by growing experience and multidisciplinary cooperation.

During interventional procedure, only visualization of lumen is possible, so non invasive imaging for planning, as for looking for complications is very important. CT, MR and echocardiography are the three main imaging modalities, which can be used for this purpose. These imaging modalities are used to get high quality images for precise anatomy, sizing, morphological evaluation, 3D reconstructions and functional information. Also, non invasive imaging study preferably should be fast, easy to be performed and interpreted and also safe. Non invasive imaging also advances very quickly and good quality images additionally facilitates performance of interventional procedures.

Aortic valve implantation is one of the most common performed transcatheter procedure in high risk patient population. Recently, in human mitral valve and even tricuspid valve transcatheter implantation procedures were successfully performed. For these all procedures, relevant information about configuration of valvular complex, sizing, relationship to adjacent structures can be obtained by CT study, which is already established as important imaging tool in preinterventional and postinterventional period of procedure.
Conclusions: 
Interventional non coronary procedures experienced greatest growth
Advancements in non invasive imaging techniques facilitates this process
CT study provides essential information for preinterventional evaluation and postinterventional follow up
Multidisciplinary approach and multimodality imaging is important for successful performance of interventional non coronary procedures

**Coronary artery anomalies: imaging and clinical implications**
Maksim Zagura

Coronary artery anomalies are a heterogeneous group of diseases that affect approximately 1% of the general population. Congenital abnormalities of the coronary arteries include anomalies of their origin, course and termination. In many cases, coronary artery anomalies have minor hemodynamic relevance, remain asymptomatic for a long period of time and are discovered accidentally during examination for other diseases. However, certain types of coronary artery anomalies, including interarterial course of the ectopic coronary artery and anomalous origin of the left or right coronary artery from the pulmonary artery, carry a high risk of myocardial infarction, congestive heart failure and sudden death. In fact, 19% of sudden deaths in young athletes are related to coronary artery anomalies. Radiologic imaging can help to differentiate hemodynamically relevant anomalies from anatomic variants. Echocardiography enables visualization of proximal branches of left and right coronary artery. However, detailed assessment of the anatomical features of the aberrant coronary artery usually requires cardiac CT, MRI or digital subtraction angiography. Knowledge of the anatomical forms of coronary artery anomalies helps radiologist to correctly classify and report these abnormalities, which affects therapeutic approach and has important prognostic implications.

**Understanding the bicuspid aortic valve phenotype and associated aortopathy by CT and MRI**
Gintare Stonciunaite

Normal aortic valve is tricuspidal and has three leaflets. Any malformation of the aortic valve cusps is abnormal. Bicuspid aortic valve (BAV) is the most common malformation of the aortic valve. Several vascular abnormalities have been described in association with BAV: degeneration of valve leaflets; ascending aorta enlargement, aneurysm; coarctation; dissection, rupture. Cardiac computed tomography (CT) and cardiac magnetic resonance (MR) imaging are noninvasive techniques that may be used to characterize heart valve disease and aortopathies. The remodeling process of the left ventricle is also independently present in BAV patients is still debated. The gene that regulates how many leaflets develops in the aortic valve is associated with the genes that determine the quality of the elastic tissue of the ascending aorta. MicroRNAs (miRNAs) may play a major role in the different pathogenesis of aortopathy. Typical aortic involvement is commonly seen in patients with Turner syndrome (TS). Cardiovascular magnetic resonance study of 59 women with TS (mean age 30±8.9 ; 18-60 years) was made in Hospital of Lithuanian University of Health Sciences Kauno Klinikos. This study aimed to describe the spectrum and frequency of cardiovascular abnormalities in adult patients with TS using cardiac MRI and MR angiography.

**High Risk Plaque Features on Coronary CT Angiography**
Mai Puusepp
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Coronary computed tomography angiography (CCTA) is currently the only non-invasive imaging modality for the evaluation of non-obstructive coronary artery disease. It has an excellent negative predictive value and high specificity. In addition to visualization on the lumen, improved spatial resolution of CT scanners permits characterization of the vessel wall itself. Certain atherosclerotic plaque features, such as positive remodeling, low density, spotty calcium and napkin-ring sign, have been associated with an increased risk for future major cardiac events, such as acute myocardial infarction. This unique ability of CCTA to non-invasively detect high risk plaque features may improve individual risk assessment and to determine patients at high risk for adverse events.
Technical and clinical aspects of glomerular filtration rate calculation using 99mTc-DTPA dynamic renal scintigraphy
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Introduction. Glomerular filtration rate (GFR) is one of the most important measurements for early detection of deterioration of renal function. 99mTc-DTPA is cleared by glomerular filtration, and can be used for measurement of GFR using dynamic renal scintigraphy. GFR results are influenced by various technical features and individual clinical measurements of the patient.

Aims and Objectives. The aim of this study is to identify and analyze the elements that influence GFR measurement outcome using 99mTc-DTPA renal scintigraphy.

Materials and methods. This study included patients who underwent dynamic renal scintigraphy with 99mTc-DTPA during the period from March 2016 to September 2017 in Hospital of Lithuanian University of Health Sciences Kaunas Clinics, Radiology clinic using a double probe scanner (Philips, USA).
We retrospectively collected patient case-report variables like gender, age, weight, height, body mass index (BMI), Angiotensin converting enzyme (ACE) inhibitor usage. Also we assessed the technical aspect which could affect the measurement of GFR. Case-reports where collected with the acknowledgment of LSMU Kaunas Clinics bioethics committee.
Totally 228 case-reports where obtained. The influence of patient age, gender, weight, height and BMI on GFR was compared.
We analyzed the GFR in different age groups: 1st group from 18 to 59 years, 2nd group from 60 to 79, 3rd group from 80+
Also we examined the ACE inhibitor usage effect on patient GFR, we formed three groups: 1st group – 25mg ACE inhibitor before renal scan, 2nd group – 50mg ACE inhibitor before renal scan, and 3rd group no ACE inhibitor before renal scan.
Fisher’s least significant difference test, regressive analysis was performed for comparisons among different groups. p<0.05 was considered as statistically significant. We provide the received data as an arithmetic mean, +/- mean square error. Statistical analysis was performed using a commercially available statistical software (STATISTICA 12.0)

Results. In total, 203 GFR measurements were performed. 25 case-reports where data insufficient so they were excluded from the study. Women GFR mean 72.55 ± 31.44 ml/min/1.73m2, men GFR mean 56.39 ± 25.69 ml/min/1.73m2. We compared the two groups and found that female GFR mean is significantly bigger than male. 1st age group mean GFR 75.67 ± 31.84 ml/min/1.73m2, 2nd age group mean GFR 56.69 ±25.41 ml/min/1.73m2, 3rd age group mean GFR 47.9 ± 20.5 ml/min/1.73m2. Age groups have a weak negative correlation with GFR. The correlation is stronger in gender divided age groups. Weight mean 83.67 ± 17.76 kg, BMI mean 28.95 ± 5.18. Results suggest that GFR has a weak negative correlation with women weight and BMI. 1st ACE inhibitor group GFR mean 62.1 ± 26.98 ml/min/1.73m2, 2nd ACE group GFR mean 69.38± 32.72 ml/min/1.73m2. 3rd ACE group GFR mean 66.46 ± 32.29 ml/min/1.73m2. There was no difference in patient GFR who took ACE inhibitors compared to those who didn’t take it.

Conclusion. The accuracy of GFR measurement is dependent on technical dynamic renal scintigraphy aspects and individual clinical measurement of the patient. Measured GFR has a weak negative correlation with age, weight, body mass index. There was no difference in patient GFR who took ACE inhibitors compared to those who didn’t take it.

Evaluation of 18F-FDG PET/CT metabolic values in different types of non-small cell lung cancer
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Introduction. Non-small cell cancer is one of the most common oncological diseases and cause of cancer related deaths in many countries. Precise staging is important to select correct treatment for each patient. 18F-FDG PET/CT has proven to be a powerful diagnostic tool which compliments the anatomical information provided by
CT with metabolic information about the tumor. The aim of this study was to analyse the features of 18F-FDG PET/CT semiquantitative metabolic values for different types of NSCLC.

Aims and Objectives. The purpose of this study was to evaluate metabolic activity of different pathomorphologic types of non-small cell lung cancer.

Materials and methods. This was a retrospective study of 209 (176 male, 33 female, age median 66.73±0.64 and 65.94±1.3 respectively) patients with histologically confirmed non-small cell lung cancer (72 adenoc, 118 squamous cell, 6 others) who were staged using 18F-FDG PET/CT prior to treatment. 18F-FDG avidity was measured using semiquantitative metabolic values – maximum and mean standardized uptake values (SUVmax, SUVmean), total lesion glycolysis (TLG), metabolic tumor volume (MTV), tumor-to-liver and tumor-to-blood standard uptake ratio (SUR). Statistical analysis was performed to determine whether different metabolic values correlate with tumor's histological features.

Results. Squamous cell carcinoma displayed a higher SUVmax and SUVmean than adenocarcinoma (p=0.001 and p=0.001) and neuroendocrine carcinoma (p=0.011 and p=0.012). Tumors with G3 differentiation had higher SUVmax and SUVmean than G2 tumors (p=0.035 and p=0.025) in addition G3 adenocarcinoma had a statistically significant higher SUVmax and SUVmean than G2 adenocarcinoma (p=0.007 and p=0.012).

Conclusions. Analyzed 18F-FDG PET/CT semiquantitative metabolic values varied based on pathomorphologic types as well as different differentiation grades of non-small cell lung cancer.

Metabolic tumor volume and total lesion glycolysis predictors of primary treatment outcome in lymphomas
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Introduction. There is a clinical need to early identify high-risk patients for treatment intensification to introduce a survival benefit. Since lymphoma is often identified as multiple lesions with different size and metabolic activity, estimates of lymphoma treatment prognosis include total metabolic tumor volume (TMTV) and total lesion glycolysis (TLG) calculated from positron emission tomography with low dose computed tomography (18F-FDG PET/CT) data. However, there is paucity of published data on large series to justify a role for pre-therapy quantitative PET metrics affecting clinical outcomes of lymphoma patients.

Aims and Objectives. To evaluate 18F-FDG PET/CT prognostic role in predicting treatment response to first-line treatment of Hodgkin lymphoma patients.

Materials and methods. We retrospectively analyzed 62 patients with newly diagnosed HL treated at Vilnius University Hospital Santaros Clinics Hematology department from 2015 to 2017. All patients routinely underwent pretreatment and control 18F-FDG PET/CT. PET/CT scans from mid skull to upper thighs were obtained 1 hour after injection of 4 MBq/kg 18F-fluordeoxiglucosis and quantitatively analyzed. The stage of the disease (Lugano classification) before treatment and response to treatment (the Deauville criteria) was determined by assessing PET/CT data according to guidelines approved by European hematologists. The maximal standardized uptake value (SUVmax) was defined as the maximum voxel intensity within the volumetric region of lesion. A threshold of 41% of the maximum signal intensity was used to delineate the metabolic tumor volume (MTV). Patient with TMTV represent the sum of every individual lesion MTV. The TLG was calculated as the result of TMTV and SUVmean mean multiplication.

Results. Sixty-two patients enrolled into this study with mean age 37±16 year, including 31 (50%) females, 39 (63%) with advanced stage disease (Lugano III and IV). Overall, 48 of 62 (77%) patients achieved complete response (defined as Deauville ≤2) following first-line treatment. Pre-treatment SUVmax, MTV and TLG means were significantly higher in patients with Deauville score ≥3 (SUVmax 9.57±3.67; MTV 233.42±191.84; TLG 2621.43±2837.02) than in patients with Deauville score ≤2 (SUVmax 8.08±2.71; MTV 101.82±81.61; TLG 896.8±40.19) (p=0.005; p<0.001; p<0.001, respectively). A high pre-treatment TMTV and TLG were correlated with a negative post-treatment Deauville score at 0.38 and 0.381, respectively, and a high pre-treatment TMTV and TLG results were a significant predictors of a negative post-treatment Deauville score (p = 0.002).
Conclusions. These results suggest that higher TMTV and TLG correlated with lower response to first-line treatment. Pre-treatment metabolic lesions attribution acquired from 18F-FDG PET/CT is promising as a prognostic indicator in HL, treated with standard first-line chemotherapy regimen.

The Results of Radioactive Iodine Treatment of Thyrotoxicosis Induced by Autonomic Adenomas
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Introduction. Treatment of hyperthyroidism is a topical problem because several treatments are available. None of them is a "golden standard" for treatment. Radioactive iodine (131I) is one of the most effective treatment method of a toxic thyroid adenoma. The efficiency of 131I therapy is high because an autonomous hyperfunctioning nodule concentrate 131I and the surrounding tissues are relatively safe. The clinical outcomes: recurrence of thyrotoxicosis, euthyrosis, hypothyrosis. The current purpose of treatment is euthyrosis or hypothyrosis.

Aims and Objectives. The aim of this study is to assess the results of the treatment with radioactive iodine.

Materials and methods. The retrospective study evaluated 63 patients who underwent 131I therapy. The data were collected from medical records of the Endocrinology outpatient clinic of Hospital of Lithuanian University of Health Sciences Kaunas clinics. The treatment was effective if developed into hypothyroidism or euthyroidism, ineffective – hyperthyroidism. All patient were examined properly: thyroid hormones (FT4, FT3, TTH) and anti-TPO levels were examined, thyroid scintigraphy was performed, the weight of the thyroid gland was evaluated, the amount of 131I dose and absorbed dose, effective half-time (Tef) were calculated. The efficiency of the treatment was evaluated 6, 12 and 24 months after the 131I therapy.

Results. The study included 63 patients: 56 females (88.89%) and 7 males (11.11%), with a mean age of 62.84±12.92 years and a mean duration of thyrostatics use before 131I therapy of 12.7±15.93 months. The mean weight of the thyroid gland was 10.62±5.02 g, 131I dose – 210.46±77.25 MBq, absorbed dose – 187.66±42.31 Gy, Tef – 6.48±2.43 days. After 6 months 59 patients (93.7%) were treated effectively (hypothyrosis – 12.7 (7.94%), euthyrosis - 54 (85.71%)) and the treatment was not effective for 4 patients (6.35%). The clinical outcomes after 12 months: 59 (93.65%) of patients were euthyroid, 4 (6.35%) had hypothyroidism – effective treatment of 63 patients (100%). The 131I therapy was effective for 63 patients (100%) after 24 months (hypothyrosis – 7 (11.11%), euthyrosis - 56 (88.89%)). The results did not differ statistically significantly (p> 0.05) after 12 and 24 months.

Conclusions. Persistence or recurrence thyrotoxicosis was not observed in the studied population. The efficiency of treatment should be evaluated after one year and determine whether re-treatment of 131I is required.

In vitro-based functional quality control of radiopharmaceuticals Ga-68 and Lu-177
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Introduction. In the modern radio-oncology, diagnostics, choice of therapeutic strategy, and control of metastatic prostate cancer (mPC) and many types of metastatic neuroendocrine tumours (mNET) is unimaginable without Ga68-PSMA and Ga68-DOTA–TATE radionuclide-guided PET/CT. In the world’s leading clinics Lu177-PSMA and Lu177-DOTA–TATE – the theranostic counterparts of the abovementioned radiopharmaceuticals (RP) – are currently used for treating mPC and mNET when other therapeutic approaches fail. Such therapy is capable of substantially improving the patients’ quality of life and overall lifespan. This theranostic approach represents a substantial step towards personalized targeted diagnostics and therapy. However, there is interindividual heterogeneity even of a specific cancer type, e.g., among patients with mPC, 5-10% there is no profound PSMA expression on metastatic cancer cells. In such cases, the costly examination with Ga68-PSMA and therapy with Lu177-PSMA lacks the rationale and implies for a need of companion diagnostics.

Aims and Objectives. The aim of this study was to develop a simple, sensitive and accurate in vitro test system that is based on the determination of receptor binding affinity of synthesized radionuclides to be used for functional
quality control and further as the reference for accurate prediction of the targeted radionuclide binding potential to individual patients’ cancer cells.

Materials and methods. The following radionuclides were synthesized: Ga68-DOTA-TATE, Ga68-HA-DOTA-TATE, Ga68-PSMA-11, Ga68-PSMA-I&T, Lu177-DOTA-TATE, Lu177-PSMA-617, Lu177-PSMA-I&T. The synthesis was done in TEMA isolators class A zone by use of Scintomics Ltd equipment and methodology. Peptides and active molecules were provided by ABX LTB and University of Munich; Lu177 and Ge68/Ga68 generator by ITG (Germany). For quality control, methods suggested by European Pharmacopoeia have been used: HPLC, TLC, Gamma spectrometry, and Endotoxin testing.

The development of the test system was based on the usage of stable cancer cell lines. The mPC cell lines PC3 (PSMA+/−) and LNCaP (PSMA+), and lung cancer cell lines NCI-H69 (SSTR2+) and CorL23 (SSTR2−) were seeded in triplicates in 6-well plates, 8 x 105 cells per well. Radioactive labelling of cells was done in serum-free medium with 1% BSA by adding the synthesized radionuclides in activity range of 0.5-5 MBq. Cells were incubated in standard conditions in S-Bt Smart Biotherm, Compact CO2 Incubator (Biosan) for 1h at 37°C, medium was withdrawn and cells washed 5 times with PBS. Washed cells were collected by centrifugation (suspension cultures) or lysing with 1M NaOH for 30 min at 50°C (adherent cells). To determine the amount of bound peptide, samples were measured for 60s in gamma spectrometer (BSI) using fixed channel.

The level of the specific receptor expression on cancer cells was visualised by immunocytochemistry using mouse monoclonal antibody against human PSMA and SSTR2 and visualised by anti-mouse Cy5-labelled secondary antibody. Results were assessed by fluorescence microscopy.

Current Status of Quality Assurance for Radionuclide Dose Calibrators and Results of Quality Control
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Introduction. In nuclear medicine, an administration of correct radiopharmaceuticals activity (dose) to the patient is strongly dependent on the accuracy of the quality control measurements. The equipment used to measure the activity is radionuclide dose also called activity calibrator, activity meter, radionuclide calibrator and etc.) calibrator (a gas-filled ionization chamber coupled to a high voltage supply, electrometer and display). It is widely used due to a good stability, simple service and relatively low price of this equipment. In accordance with national and international recommendations and legislations, quality assurance programme should cover all clinical aspects of smooth nuclear medicine work including quality control (QC) of radionuclide dose measurement means. QC procedures must be performed prior to radiopharmaceuticals administration. For instance, daily control of radionuclide dose calibrators with a long half-life check source allows detecting potential failure of the ion chamber components and enabling staff to reduce the probability of an incorrect injection of radiopharmaceuticals activity to the patients.

Aims and Objectives. The aim of this study was to analyze the current status of the quality assurance requirements of the radionuclide dose calibrator in Lithuania and to evaluate the results of quality control tests of radionuclide dose calibrators in Vilnius University Hospital Santaros Klinikos (VUHSK) Nuclear medicine department.

Materials and methods. The study was performed with Veenstra VDC-404, Veenstra VDC-405 and PITAGORA dose calibrators in VUHSK nuclear medicine department. In this study, the results of the three quality control methods were overviewed and summarized: activity check source (relative response) of dose calibrators, linearity of dose calibrators and the source geometry effect. For relative response assessment 137Cs was used as a check source. Linearity checks were fulfilled with 99mTc and 18F sources for Veenstra VDC-405 and for PITAGORA, respectively.

Results. A total of 220 quality control procedures performed in VUHSK consisted of daily, quarterly and yearly checks and included: source check, test of linearity of activity response, test of geometry effect, test of high voltage and check of background. The measurement uncertainty was generally less than 5% when dose calibrators Veenstra VDC-404 and Veenstra VDC-405 have been used with the 137Cs calibration source in P6 vial geometry, taking into account the averaged discrepancy of measured values from the calculated activity of the source and the
standard deviation of the mean as the main components of the uncertainty. For the same radionuclide calibrators, the linearity deviation did not exceed 2.5 % while the geometry effect was less than 5 % for 99mTc solution in 5 ml syringes. Similarly, the uncertainty of the relative response was less than 3 % and the linearity deviation did not exceed 2 % for PITAGORA equipment.

The analysis of the current status of the quality assurance content revealed that there are less requirements in Lithuanian legislation for the use of radionuclide calibrators as compared to European guidelines (Measurement Good Practice Guide No. 93 - Protocol for establishing and maintaining the calibration of medical radionuclide calibrators and their quality control, 2006; Quality Assurance for Radioactivity Measurement in Nuclear Medicine - Technical Report Series, No. 454, 2006 (IAEA); Quality Control Of Nuclear Medicine instrumentation And Protocol standardisation, Technologist’s guide, 2017, EANM), for example: checks for testing repeatability measurements with long-lived nuclides such as 57Co, 60Co, 133Ba, 137Cs are not included; requirements for different source geometries (volumes) are not specified; the maximum tolerance error for gamma- and beta-ray sources is not described; there are no requirements for metrological traceability and verification of radionuclide calibrators or intercomparison measurements with secondary standard radionuclide calibrators.

Conclusions. The results of performed measurements of the dose calibrators stability, accuracy, linearity and dependence on source geometry were in accordance of requirements of the Lithuanian hygiene standard HN 77:2015 “Radiation protection in nuclear medicine”.

The appropriate quality management programme, traceability of measurements (reference instrument calibrated against standardised reference sources traceable to the National Metrological Institute) are necessary to ensure the accuracy of the administrated patient dose. The quality of nuclear medicine procedures besides other factors such as QC of hybrid imaging equipment, radiation protection of both patients and staff, radiopharmaceutical preparations and total quality management, are also dependent on the accuracy of dose calibrators. Correct measurement of administrated activity is important for imaging, patient dose optimisation, setting the local diagnostic reference levels, administration of beta-ray emitters and for measurement of activity for quantitative imaging in molecular radiotherapy (activity-time integral within the defined volume).

KEYWORDS. Quality control in nuclear medicine, radionuclide dose calibrators, calibration.

Nuclear medicine in chronic liver disease
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Introduction. Chronic liver disease (CLD) is multi-causal liver injury affecting significant amount of people in the world. Fibrosis (and cirrhosis) is common pathway despite multiple different etiologic factors. The diagnosis of chronic liver disease is made by laboratory tests, medical imaging and liver biopsy in selected cases. As for imaging, transient elastography (TE) (Fibroscan) is the most widely used technique, with nowadays implemented new 2D shear-wave elastography (2D-SWE) and magnetic resonance elastography (MRE). Though nuclear medicine has never been systematically used in CLD, it may have a role with several tracers in CLD setting especially with new ability of dynamic SPECT technique.

Aims and Objectives. To review nuclear medicine techniques capable to detect diffuse liver parenchyma changes and to stage CLD in multifactorial etiologic insults.

Materials and methods. We reviewed available literature about nuclear medicine techniques in the field of diffuse parenchymal liver disease.

Results. Several tracers (99mTc-GSA, 99mTc-SC, 99mTc-Mebrofenin and others) showed potential role in imaging CLD with the ability to stage severity and extent of compromised liver by means of either fixed time point parameters (such as functional liver volume (FLV) or total liver function (TLF)) or dynamic measures such as hepatic extraction fraction (HEF), time to peak or half-life of the tracer activity due to liver uptake.

Conclusions. Despite being out of the scope as imaging modality of choice in the field of diffuse liver disease, molecular imaging modalities may have a place showing the molecular changes in multifactorial chronic liver damage.
Lung Ultrasound
Maija Radzina
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Introduction. The diagnosis of lung diseases has recently become highly dependent on chest X-ray or chest CT, exposing patients to the radiation. Although limited by the presence of air, lung US has proved to be useful in the evaluation of many different acute and chronic chest conditions and has been proposed as an alternative first-line imaging modality to diagnose chest pathology in children and adults, especially in the setting of point of care ultrasound.

Aim and Learning Objectives. Interpretation of ultrasound findings of the thorax and lung different conditions is based on number of patterns and their combinations, which lead to several algorithms are mainly targeted to the evaluation of real anatomic images, detection of pleural effusion, empyema, pleural masses, lung consolidations, pneumonia, atelectasis and diffuse acute and chronic lung diseases. First step is imaging of the anatomy and/or pathology, followed by direct and indirect signs (artifacts) that help to differentiate cardiogenic and non-cardiogenic pulmonary edema, ARDS, pneumothorax, pneumonia, atelectasis and consolidation. This method can also help to monitor the fluid administration in intensive and emergency care setting and may assist the invasive procedure guidance.

The different signs and their interpretation will be discussed in the presentation.

Novel techniques, such as contrast enhanced ultrasound will be discussed to bring this method even further for the assessment of the lung perfusion.

Aim of this presentation is to inform the audience about possible scenarios of lung US use, highlight the importance of this method necessity in the daily routine, performed by skilled radiologists and sonography specialists to facilitate it’s use in order to reduce unnecessary radiation exposure, especially in the pediatric, pregnancy and frequent follow up applications.

Conclusions. In summary, Lung US may be defined as a powerful diagnostic imaging technique for pathology in the pleural space and a reliable monitoring tool for the lung parenchyma.

The advantages of Lung US should be included in clinical practice, as it offers often cost-, time- and potentially life- and radiation exposure-saving; as well as one should remember it’s limitations that should never be forgotten for a correct use of this technique.

MRI role in pulmonary lesions diagnostics - first Lithuanian experience
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LUHS Medical Academy Department of Radiology

Introduction. Trachea, bronchus and lung cancer takes leading places among causes of cancer deaths both in Lithuania and the world. In order to reduce these numbers, early and accurate diagnosis, as well as timely treatment is extremely important. Chest MRI in Lithuania is a modern and new valuable diagnostic tool: it can not only replace conventional methods (radiography, CT) when exposure to ionizing radiation is undesirable or contraindicated, but also may be important in early diagnosis of asymptomatic lung cancer, differentiating malignant and bening parenchymal lesions, or in young patients, especially those who require frequent follow-up examinations (e.g., every 3-6 months). Dynamic CE, SSFS without CE and DWI MRI sequences are modalities of great accuracy which may be equal to other ionizing cross-sectional radiological methods (CT, PET, PET/CT) in characterization of lung lesions. MRI DWI provides useful information when there is unclear diagnosis after standart examinations or when the precise evaluation of chest wall and mediastinum invasion is needed, also it helps in planning the patients’ treatment.

Aims and Objectives
Aim. To estimate magnetic resonance imaging diagnostic possibilities in differentiating benign and malignant pulmonary lesions using LUHS Hospital Kaunas Clinics patients’ medical investigation and documentation.

Objectives:
1. Evaluate and compare size of bening and malignant pulmonary lesions in magnetic resonance images.
2. Evaluate and compare accumulation of contrast agent in benign and malignant pulmonary lesions in contrast-enhanced MRI. 3. Evaluate and compare ADC values of benign and malignant pulmonary lesions in DW MRI.

Materials and methods. Profiles of radiological tests and medical documentation of 21 patients, who had their chest MRI examination done in LUHS Hospital Kaunas Clinics Radiology Clinic in 2013-2016, have been reviewed. Final diagnosis was confirmed with histologic examination and/or observation using radiologic imaging (CT, MRI, PET/CT). The size of pulmonary lesions, accumulation of contrast agent in the lesions in VIBE sequence and ADC values of the lesions in diffusion-weighted imaging were evaluated. Statistical analysis was performed using MS Excel 2016 and IBM SPSS Statistics 22.0 programs.

Results. The average size of benign pulmonary lesions was statistically smaller than that of malignant tumors (2.40 ± 0.39 cm and 4.97 ± 0.58 cm, respectively) (p=0.001). Average signal intensity (SI) in native images of benign lesions was 136.93 ± 12.14, average SI of malignant lesions was 131.44 ± 15.64 (p=0.784). After 25 s after administration of contrast agent the average SI of benign lesions was 298.67 ± 36.81, the average SI of malignant lesions was 370.44 ± 17.12 (p=0.163). However, after 5 min after administration of contrast agent the average SI of benign lesions was statistically lower than that of malignant tumors (193.40 ± 23.76 and 384.33 ± 28.71, respectively) (p<0.001). Mean ADC value in benign pulmonary lesions was 1.67x10^-3± 0.20 mm²/s, and it was statistically higher (p=0.046) than that of malignant tumors (1.06x10^-3± 0.17 mm²/s).

Conclusions. Mean size of bening pulmonary lesions is significantly smaller than of malignant tumors; average SI in contrast MRI in bening lesions is significantly lower than in malingnant tumors; ADC value in bening lesions is significantly higher than in malignant lesions.

Pulmonary sequestration - problem based learning
Ligita Skrule, Gunta Zepa, Zanda Krastina, Ligita Zvaigzne, Ilze Priedite
Pauls Stradins Clinical University Hospital

Introduction. Pulmonary sequestration is a congenital malformation, with aberrant formation of segmental lung tissue that has no con-nection with the bronchial tree or pulmonary arteries and receives its vascular supply from the systemic rather than pul-monary circulation. Failure to diagnose and treat this condition can lead to recurrent pneumonia and fatal hemoptysis.

Aims and Objectives. Demonstrate clinical cases in order to discuss the importance of contrast enhanced multiplanar CT reconstruction in order to detect pulmonary sequestration.

Materials and methods
CASE PRESENTATION:
CASE Nr.1: A 47-year-old male with a history of Non Hodgkin's lymphoma in remission (from 2004) was presented with prolonged productive cough, more pronounced in the morning. After multiplanar CT reconstruction evaluation, intrapulmonary sequestration was detected and selective catheterisation and embolisation of a bronchialis dxt was performed.
CASE Nr.2: A 58-year-old male with a history of unspecified radiation exposure and pneumofibrosis with no symptoms underwent a CT scan where an intrapulmonary sequestration was incidentally detected and patient was discharged for ambulatory therapy.

Conclusions. Pulmonary sequestration is a rare condition and often has no symptoms, so it can be detected only in contrast enhanced CT images. It is important not to hang on single pathology based on patient history and to perform multiplanar reconstructions.

Visual and quantitative assessment of chronic obstructive pulmonary disease
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Lithuanian University of Health Sciences Hospital Kaunas Clinics, Department of Radiology

Introduction. Pathomorphologically chronic obstructive pulmonary disease (COPD) is heterogenous group of diseases characterized by distinctive pattern: the destruction of the alveoli results in emphysema and chronic airway inflammation causes reversible and irreversible airway obstruction. By standard, main tool for cCOPD assessment
is spirometry, which helps to evaluate the degree of airway obstruction. In practice clinical and functional COPD classification does not always correlate with morphological phenotype of the disease: spirometry results in patients with advanced emphysema can be similar to those with airway predominant disease with little or no emphysema. Morphological changes of emphysema and airway disease are found in many patients whose spirometric tests are not characteristic to COPD diagnostic criteria. CT based quantitative measures of lung parenchyma density can be used to reveal the extent airway and parenchymal disease earlier than changes in functional respiratory examination become evident.

Learning objectives
1. Review imaging-based COPD phenotypes.
2. Evaluate signs of airway disease.
3. Review quantitative imaging features of COPD.

Findings and procedure details. COPD can be divided into emphysema predominant, airway predominant or mixed type. Emphysema can be further divide into centrilobular, panlobular and paraseptal subgroups and combinations of various extent. Airway disease is characterized by bronchial wall thickening. Phenotyping of COPD requires non-contrast CT scans. Quantitatively small airway disease is diagnosed by analyzing lung parenchyma density and volume changes on inspiration and full expiration scans. Data obtained during inspiration is not sufficient to fully evaluate air-trapping phenomena. Emphysema predominant phenotype of COPD is diagnosed when ≥ 6% of voxels have density of ≤ -950 HU. Thickening of bronchial walls with or without changes in bronchial diameter are detected in airway predominant phenotype. Air-trapping phenomenon is diagnosed when voxel density is between -856 HU and -950 HU in expiratory scans. Functional disease extension (%) is equal to volume of parenchyma with density between −856 HU and −950 HU in expirational images. Evidence of significant morphological changes can be found within patients with normal functional respiratory tests.

Conclusions
1. Evaluation of CT scan data is sufficient for qualitative assessment of COPD phenotype.
2. The most common sign of airway disease is bronchial wall thickenings. Small airway disease is evaluated by the presence of air trapping and functional disease extension volume.
3. Quantitative CT data analysis is used to further clarify COPD phenotype and can be an important prognostic tool for obstruction, treatment response and progress of disease.

**Lung diseases in patients with immunodeficiency**

Elina Valtere
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The respiratory system is one of the most frequently affected organ systems in immunodeficient patients and respiratory infections are one of the leading causes of high mortality in this patient group. Immunodeficiency disorders can be described as primary (hereditary) or secondary (acquired). Secondary immunodeficiencies can be encountered in routine clinical practice, arise from several conditions, such as treatment with glucocorticoids and immunomodulatory drugs, surgery and trauma, extreme environmental conditions, malnutrition and chronic infections, such as those caused by HIV. Other diseases that might present with secondary immunodeficiency include metabolic disorders and genetic multisystemic syndromes. Secondary immunodeficiencies are much more common than primary immunodeficiencies. In an Immunocompromised (ICP) pneumonitis may occur due to disease progression, infections or secondary to non-infectious causes like drug induced toxicities. Recognition of the radiologic manifestations of lung diseases in patients with immunodeficiency help expedite diagnosis and treatment.

The aim of this work is to provide a literature review about lung diseases and their radiological appearances (usual and unusual) in patients with secondary immunodeficiencies illustrated with cases from Centre of Tuberculosis and Lung diseases (Riga, Latvia).
3rd PARALLEL SESSION | RADIOGRAPHERS SESSION

Long leg alignment and full spine X-rays. Procedure and indications
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Over the last few decades, x-ray radiography has secured it's place in today’s medical society for being one of the most informative, non-invasive and a widely available tool for solving a variety of clinical problems. However, despite being such an asset in medical world on a daily basis, all the radiographic procedures must be done and positioned properly, so it could serve it's purpose and be appropriately evaluated by the doctors. Accurate positioning reduces the x-ray exposure of the subject and produces a valuable x-ray image for diagnosis. In this study we discuss two uncommon radiographic examinations in which the panoramic view is used. Both long-leg alignment x-ray and full spine radiography are done with computed radiographic systems and are composed of 3 to 5 images per examination. Primarily we overview the long-leg alignment x-ray. This imaging technique is important while measuring the alignment of the lower limb as the restoration of the mechanical alignment of the knee is one of the key criteria of a successful knee joint replacement. The long-leg radiography is safe and is currently the only modality that is indicative of weight-bearing alignment and so it is necessary for those patients who will be having total or partial knee replacements, or who are candidates for osteotomies. The ideal patient positioning is done in a anterior-posterior weight bearing position, which shows the hip, knee and ankle on one x-ray film, on which the lines can be drawn in order to measure various angles around the knee including the anatomical and mechanical axis of the lower limb. Secondarily, we look over the full spine x-ray, the examinations that helps to produce a high quality diagnostic film from the cervicothoracic junction to the pelvis for the purpose of evaluating spinal deformities or spinal disbalance. In addition, the reviews of the diagnostic perks of these examinations are followed by the technical guides on how to do these x-rays. The most frequent mistakes of radiographic technologist, the key points on the most important strategies of these studies and the guidelines how to reduce the radiation doses are also overviewed. In a word, this study gives the correct approach towards two of the rarest x-ray technologies and reviews the advantages and disadvantages of the panoramic imaging systems whose rates are constantly increasing in recent years.

Imaging of Post Traumatic Wrist Arthritis
Julius Lavinskas

Learning objectives. To describe aetiology, pathogenesis and imaging of scapholunate advanced collapse (SLAC) and scaphoid nonunion advanced collapse (SNAC), dorsal intercalated segment instability (DISI).

Background. Fractures of the scaphoid and rupture of scapholunate ligament occur in people of all ages, usually when falling onto an outstretched hand. These injuries, if not diagnosed or untreated, develops into arthritis. Scapholunate advanced collapse (SLAC) and scaphoid nonunion advanced collapse (SNAC) are the two most common patterns of post traumatic wrist arthritis. Over time, this can lead to dorsal intercalated segment instability (DISI), followed by carpal collapse.

Findings and procedure details. There are key radiologic findings which confirms the diagnosis of post traumatic wrist arthritis. SLAC is typically diagnosed when scapholunate diastasis and DISI are observed. SNAC is usually diagnosed when there are signs of scaphoid fracture with scaphoid distal fragment angulation, forming DISI.

Conclusions. Wrist radiographs are informative imaging modalities and advanced imaging for post traumatic wrist arthritis is rarely indicated. Therefore, it becomes essential for radiographers to produce well positioned wrist radiographs, which determines accurate diagnosis.

Radiotracer CT-guided marking for lung nodules and ablation
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Introduction. The ROLL (Radioguided Occult Lesion Localization) technique is a useful and helpful technique to mark non palpable nodules for its subsequent removal in a radio-guided surgery using a gamma-detecting method.
Aims and Objectives. To describe the CT and SPECT/CT radiotracer marker system used in our centre for intraoperative localization of non palpable small lung nodules.

Materials and methods. Once the patients are accepted by the oncologic committee, the first step is a CT guided marking needle to localize the nodule and inject it with radiotracer. The second step is to verify the correct location of the radiotracer using the images obtained with a SPETC. Finally, surgeons localize de nodule using a gamma-detector probe in a thoracoscopic surgery and remove the nodule. The gamma-detector probe indicates whether the nodule is completely removed.

Results. This multidisciplinary technique, all done on the same day, is a quick and safe method for localizing and removing pulmonary nodules. This method also ensures that the totality of the nodule has been extirpated using a minimally-invasive surgery technique.

Conclusions. Coordination between the three departments (Radiology, Nuclear Medicine and Thoracic Surgery) has created a quick, effective and dynamic method to localize, verify and remove pulmonary non palpable nodules.

MRI in radiation therapy treatment planning
Elvis Russki
North Estonia Medical Centre

This presentation is based on a literature review and on a professional experience from my working hospital.

Introduction. The use of Magnetic Resonance Imaging (MRI) in Radiotherapy (RT) planning is rapidly expanding. We review the wide range of image contrast mechanisms available to MRI and the way they are exploited for RT planning. However a number of challenges are also considered: the requirements that MR images are acquired in the RT treatment position, that they are geometrically accurate, that effects of patient motion during the scan are minimised, that tissue markers are clearly demonstrated, that an estimate of electron density can be obtained (Riches et. al. 2014). To get a best results from the MRI procedure it needs a major preporation from the radiographer/radiologic technician and great cooperation between radiographer and patients.

Aims and objectives. The aim of this presentation is to give an overview about radiation therapy treatment planning using a magnetic resonance imaging (MRI) and application of magnetic resonance imaging (MRI) during the radiation therapy planning. Based on the aim of the research and experience of my working hospital the following tasks were set:
1. Give an overview of the radiation theprhy treatment planning;
2. Describe the use of magnetic resonance imaging (MRI) in radiation therapy treatment planning and give advantages over radiation therapy planning with computed tomography (CT)
3. Describe the preparation of patients who are undergoing radiation therapy for the study in MRI

Materials and methods. Beside my own experience in my everyday working hospital with radiation therapy planning in MRI the research materials for this work were scientific articles, review articles, manuals, doctoral thesis, clinical guidelines which where searched using a variety of electronic databases like PubMed, ScienceDirect, EBSCO: Academic Search Complete, EBSCO Host, Web of Science, Wolters Kluwer, MEDLINE, intrnet magazine " Eesti arst " and google search engine. The following search terms and combinations of them were used to find articles: Magnetic Resonans Imaging (MRI), radiation therphy, radiation treatment, radiation therapy planning, MRI in radiation therphy planning, Computed tomography (CT).

Results. The advantage of MRI compared with CT scanning for radiotherapy planning is the excellent soft tissue contrast. MRI uses low amplitude non-ionising radio waves, unlike CT scanning which uses ionising radiation. MRI is of particular benefit for paediatric populations in which radiation dose needs to be carefully controlled, and in cases where repeat scans are helpful during treatment both to ensure that the treatment plan is revised to follow radiation-induced tissue changes, and also to monitor early response (Lagendijk et al. 2014).

Conclusion. Magnetic Resonance Imaging (MRI) is increasingly being used in Radiotherapy (RT) planning owing to its superior soft-tissue contrast compared with CT. The improved tumour delineation available with MRI compared with CT is slowly making its way into clinical practice, as MRI scanners become more widely available to RT planning. (Schmidt and Geoffrey 2015).

Best theme that suits with my abstract is radiology technologist sessions.
MRI of prostatic gland – possibilities and future
Jonas Wallström

How we diagnose prostate cancer, the most common cancer among men in Europe is changing. Prostate MRI has emerged as an important diagnostic tool for detecting prostate cancer and evidence is amounting that risk assessment with MRI before biopsy is superior to standard transrectal ultrasonography guided biopsy in men at clinical risk of prostate cancer. MRI has both a high sensitivity for clinically significant cancer and also a high negative predictive value. By detecting fewer low risk cancers the number of men in active monitoring can be reduced thus avoiding unnecessary repeat biopsies and also reducing the risk of over treatment with radical prostatectomy or radiation therapy.

In this lecture I will give a short introduction to prostate MRI including prostate anatomy, the PIRADS version 2 syllable, common pitfalls and structured reporting. We will discuss what level of experience is needed, touch on technical considerations and some of our experiences working with prostate MRI in the Gothenburg 2 screening study and also experiences of working with prostate MRI in a regional network of radiologists from hospitals of different sizes.

Although not a part of national guidelines as of yet the future development of a population based MRI screening program for prostate cancer is under discussion and would be a challenge for the radiological community. Diagnostic networks and technical developments such as AI and may aid in this process.

Multiparametric MRI targeted prostate biopsy: Expectations and Reality
Martin Kivi

In the European Union, prostate cancer is the most frequently diagnosed cancer among men and the second leading cause of cancer death. Systematic transrectal ultrasound-guided biopsy (TRUS-Bx) is the gold standard for detecting prostate cancer. This systematic approach is characterized by low sensitivity (42-55%) and high specificity (94-98%).

Transrectal ultrasound-guided prostate biopsy has been the cornerstone of prostate cancer diagnosis. Systematic 12-core TRUS-Bx might detect low risk, insignificant prostate cancer, leading to overdiagnosis and overtreatment of indolent cancers. Increasing the number of cores at the initial biopsy did not appear to significantly improve the diagnostic rate, because this procedure does not sample the anterior and transitional zones where some lesions may originate. PCa detection rate on repeat biopsies ranges between 10% and 20%.

Multiparametric magnetic resonance imaging (mpMRI) has good sensitivity for the detection and localisation of clinically significant prostate cancers (csPCa, Gleason ≥ 7) with a negative predictive value (NPV) 63-98% depending on patient selection. Targeted biopsy of the mpMRI-visible lesion is a better alternative to systematic TRUS biopsy in the diagnostic pathway for prostate cancer detection and therefore benefits the diagnosis of cancer. Targeted mpMRI/ultrasound fusion biopsy (MRI-TBx) compared with standard systematic prostate biopsy associated with an increased detection rate of csPCa and decreased detection of low-risk prostate cancer.

There are two main clinical applications of mpMRT: in biopsy-naïve men or in patients before a repeat biopsy in the case of a negative previous prostate biopsy and suspicion persists of PCa.

Role of mpMRI in biopsy-naïve men:
In this diagnostic pathway, magnetic resonance imaging-targeted biopsies (MRI-TBx) would be added to systematic biopsies in case of a positive mpMRI, and systematic biopsies would be performed in all patients with a negative mpMRI.

In the triage diagnostic pathway in case of abnormal MRI, only a targeted biopsy of the abnormal lesion would be performed without a systematic biopsy. According to PRECISION study, the detection rate of clinically significant cancer was 38%, and the detection rate of taking insignificant cancer was 9%. Using mpMRI as a triage test before biopsy might allow 28% of patients to avoid a primary biopsy, reduce overdiagnosis of clinically insignificant prostate cancers, and improve detection of csPCa.
Role of mpMRI in patients before a repeat biopsy:
*According to the European Association of Urology Guidelines

Recommendations LE

Perform multiparametric magnetic resonance imaging (mpMRI) before a repeat biopsy when clinical suspicion of PCa persists in spite of negative biopsies. 1a Strong

Include systematic biopsies and targeting of any mpMRI lesions seen during a repeat biopsy. 2a Strong

Whether systematic biopsies can be omitted in patients with negative mpMRI depends on the NPV of mpMRI?
The answer is not so simple.
The NPV of mpMRI varied greatly depending on different factors. Risk stratification of patients should be the initial step before considering pre-biopsy mpMRI and defining when biopsy may be omitted if the mpMRI is negative.

Patients at a higher risk would need biopsy even in case of negative mpMRI.

Another common problem with mpMRT outside of expert centres is that inter-reader reproducibility of mpMRI remains moderate at best, which currently limits its broad use outside expert centres.

Standardization, certification and mpMRI images quality assurance is necessary.

CT differential diagnosis of small solid renal masses
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Introduction. The increasing indications for abdominal CT, MRI or sonography have led to increase incidental detection of small solid renal masses. Therefore, differentiation of benign from malignant lesions has become an important issue.

Aims and Objectives. The aim of this lecture is to present CT differential diagnostics of small solid renal masses.

Materials and methods. Literature review of a small renal masses.

Results. CT characterization of small renal masses.

Conclusions. A good knowledge of small solid renal masses and how to manage them is therefore needed.

Sertoli – Leyding cell tumor: a rare ovarian neoplasm
Ruta Jone Nakaite, Vaida Atstupenaite, Arnoldas Bartusevicius
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Introduction. Sertoli–Leydig cell tumors (SLCTs) are subtype of gonadal sex – cord stromal tumors. They are extremely rare, accounting for less than 0.5% of all ovarian neoplasms and are most frequently located in one ovary. SLCTs present with a wide variety of clinical manifestation, ranging from an asymptomatic clinical profile to extreme symptoms and signs of virilisation. Therefore, on the basis of clinical and radiological findings and the women’s age, it should be possible to suggest a correct preoperative diagnosis of SLCT. Thus, recognition of the spectrum of variable morphological SLCTs appearances on magnetic resonance (MR), computed tomography and ultrasound (US) may assist to narrow the differential diagnosis as well as clinicopathologic features when facing ovarian neoplasms.

Case. This case presents a 27-year-old woman who was examined by US and MR imaging which revealed a mass with features suggestive of malignancy arising from the left ovary. The only abnormal laboratory finding was an increased serum level of alpha – fetoprotein (AFP). After MR imaging findings evaluation combined with patient’s medical history information SLCT was suspected. The patient underwent laparoscopic resection of the tumor and the histopathological diagnosis of well differentiated SLCT was confirmed. After that an adjuvant chemotherapy was performed.
Conclusions. According to literary sources, SLCT has a nonspecific imaging appearance. Nevertheless, preoperative radiological diagnosis of SLCT was suggested and verified histologically in this case. Although there are not many cases of ovarian SLCTs associated with altered serum AFP level they are one of the most common AFP-producing non-germ cell ovarian tumor. Therefore, SLCT should be included in radiological differential diagnosis in the presence of such cases.

3rd PARALLEL SESSION | CARDIOVASCULAR RADIOLOGY

CTt and MRI in the evaluation of congenital heart defects
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Introduction. Congenital heart disease (CHD) is a malformation of the heart or major vessels present in newborns. It is one of the most frequent form of major birth defect (6-8/1000). Children and adults with CHD have been routinely examined with plain films, ultrasound (US) and cardiac cathetrization. Nowadays CT and MRI are becoming increasingly important and are part of the diagnostic algorithms stated in guidelines.

Aims and Objectives. The purpose of this presentation is to familiarize audience with the main indications for CT and MRI in the patients with the congenital heart diseases (CHD). We will discuss guidelines and advantages and disadvantages for both methods.

Materials and methods
Computed tomography (CT):
CT is very fast method with better spatial resolution than MRI. Time resolution is not as good compared to MRI, but it is possible to calculate the left and right ventricle function. However the biggest drawback is high doses of ionizing radiation therefore it is not appropriate method for a long-term follow up. It is very suitable for imaging coronary arteries, a parenchymal lung disease and in acute situations (eg. acute complications after surgery).
CT protocol depends on the particular CHD. An arterial phase with ECG synchronization is usually the most important and most informative, with contrast injection protocol to depict pulmonary and systemic circulation together. But in certain cases native and / or venous phase could be appropriate. We will discuss recommended amount of iv. contrast and injecting protocols for children and adults.
In paediatric patients is also very important to reduce dose and scan - "As Low As Reasonably Achievable." We can achieve this e.g. - with low kV scanning, high-pitch mode scanning, and other discussed techniques.
Magnetic resonance imaging (MRI):
MRI is a very robust method. It has an excellent temporal resolution and good spatial resolution. We can use MRI for the evaluation of the left and also the right ventricular function, flow measurement, tissue characterization and MR angiography including 4D dynamic angiography, noncontrast angiography. It is suitable for screening and long term follow-ups.
The main drawbacks are examination time and need of patient cooperation (stay in one position for a long time and perform multiple breathholds). General anesthesia is required in some cases (usually for age under 6, but border is individual).
The protocols depend on particular disease, clinical problem and the specific anatomy of each patient.
In general, each protocol consists of basic cardiac sequences: spin-echo, gradient echo, respiratory gated 3D SSFP, ventricular cine stack, velocity-encoded phase-contrast (PC) sequence, first pass perfusion or contrast enhanced angiography and late gadolinium enhancement.

Conclusions. CT and MRI are valuable diagnostic tools for the evaluation of congenital heart diseases. They can be used as an alternative to diagnostic cardiac catheterization and as a complementary tool for US.

Storage diseases in the lungs and heart
Monika Arzanauskaite

Storage diseases reflect a haematogenous deposition of abnormal amounts or types of molecules within the tissues. The spectrum is vast: they can occur as secondary metabolic conditions such as amyloidosis due to renal failure or cardiac haemosiderosis due to transfusion therapy. They can also be inherited in genetic disorders such as lysosomal storage diseases or, for example, mutant TTR type amyloidosis in Afro-Caribbean populations. Diverse
clinical and imaging manifestations make it a challenging area of medicine for clinicians, radiologists and pathologists.

Thoracic and cardiac imaging techniques advance quickly: high-resolution computed tomography and cardiovascular magnetic resonance imaging is readily available in many centres. Characteristic HRCT findings in conjunction with clinical evaluation may be sufficient to establish a high-confidence diagnosis. Cardiac MRI findings may suggest a diagnosis of cardiac involvement and are vital for appropriate treatment planning (i.e. chelation, ICD implantation).

Teaching Points
1. To explain the utility of imaging modalities and suggest study protocols
2. To review the imaging appearances of pulmonary and myocardial storage diseases

Importance of incidental cardiac findings on routine chest CT
Eglė Bakucionyte, Antanas Jankauskas
LSMUK KK Cardiothoracic section

Introduction. Recent advancements of CT technology have allowed us to see heart with less cardiac motion artefacts due to their greater temporal and spatial resolution. The purpose is to encourage radiologists to pay more attention to the heart reporting chest CT.

Aims and Objectives
• To review normal heart anatomy on non gated CT.
• To learn about the CT signs of pathologies that can be seen on non-ECG gated chest CT.
• To talk over the pitfalls.
• Sharing common and rare cardiac pathologies from daily practice

Conclusions
• Radiologist should be familiar with heart anatomy and common pathologies on non-gated CT.
• Reporting cardiac findings on routine chest CT could critically change the clinical decisions.

Pulmonary hypertension radiological examination prospects, importance and challenges
Lina Padervinskiene

Pulmonary hypertension (PH) is defined as an increase in mean pulmonary artery pressure (mPAP) > 25 mmHg evaluated by right heart catheterisation (RHC). Classification of PH is very wide. Different disease manifestations share similarities not only in pathophysiological mechanisms, but also in terms of clinical presentation and therapeutic approaches. PH is divided into 5 main groups: pulmonary arterial hypertension (PAH), PH due to left heart disease, PH due to lung diseases and/or hypoxia, chronic thromboembolic PH (CTEPH) and other pulmonary artery obstructions and PH with unclear and/or multifactorial mechanisms.

Physician ability to predict PAH disease progression is critical for determining optimal care of patients. Accurate risk assessment allows clinicians to determine the patient’s prognosis, identify treatment goals, and monitor disease progression and the patient’s response to treatment. Because of the nonspecific PAH nature of its symptoms, and the low level of suspicion among clinicians, prompt and accurate diagnosis of PAH as a rare disease remains a challenge. I will try to explains some of the issues that need to be addressed when faced with a patient with suspected PAH and to describe how noninvasive techniques can be used effectively to ensure an accurate diagnosis.

The first step after symptoms, signs and history evaluation is noninvasive assessment (chest X-ray, Echocardiography, HRCT, V/Q scan and MR).
Although chest radiographs may be normal in the early stages of PAH, they will be abnormal in the vast majority of patients by the time of diagnosis.
Echocardiography allow quantitative assessment of measures of right ventricular function, which is central to risk prognostication.
An important step in the differential diagnosis is the exclusion of other causes of PH, such as respiratory disorders (Group 3) and chronic thromboembolic PH (CTEPH). For this purpose, high-resolution computed tomography (HRCT) scanning is extremely useful, in addition to pulmonary function tests and arterial blood gas analysis, to rule out the presence of significant lung parenchymal disease and is also important in distinguishing PAH from pulmonary veno-occlusive disease.

Ventilation/perfusion scintigraphy is the standard test to raise a suspicion of CTEPH and may prompt the requirement for an angio computed tomography scan and/or a pulmonary angiography, to determine the presence of operable disease.

Cardiac MRI is another noninvasive, high-resolution technique allowing for the visualization and direct measurement of anatomical and functional changes in the right heart and is becoming an increasingly used tool in the clinical study of PAH.

In recent years, the availability of PAH-specific therapy means that there have been significant improvements in the management of PAH and this is reflected in improved survival in the modern treatment era. However, despite improvements in management and treatment, for the majority of patients with PAH, disease progression is inevitable and long-term survival remains poor.

Vascular compression syndromes in the abdomen and pelvis: what should we know?
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Medical Academy, Lithuanian University of Health Sciences Department of Radiology

Introduction. Because abdominal cavity organs are arranged in confined anatomic space, various anatomical structures can compress blood vessels, or arteries of harder consistency can compress internal organs. Abdominal vascular compression syndromes are uncommon and can be a diagnostic challenge for attending physician, because they present with nonspecific symptoms. However, their imaging findings are characteristic and must be recognized by radiologists.

Aims and Objectives. To evaluate prevalence rate of superior mesenteric artery syndrome in CT imaging research carried out in The Hospital of Lithuanian University of Health Sciences Kauno Klinikos radiology clinic.

Materials and methods. Evaluation of 330 patients abdomen CTs. Program Advantage Workstation 4.2P. was used for multiplanar reconstruction. Statistical analysis was performed with SPSS v. 23.0.

Results. Superior mesenteric artery syndrome risk factors were identified: small aortomesenteric angle and decreased aortomesenteric distance with prevalence of 18,2 pct. and 14,3 pct. of cases, respectively. At least one risk factor was prevalent in 25,6 pct., both in 6,7 pct. of patients. Low origin of SMA was observed in 6,7 pct. cases. Compression of the left renal vein between the SMA and aorta in 24,0 pct. cases: 7,0 pct. of them had radiology signs compatible with Nutcracker syndrome. Identified lower than 10 mm cut-off value with 73 pct. sensitivity and 81 pct. specificity of the distance between SMA and abdominal aorta at the level of left renal vein.

Conclusions:
1. The prevalence rate of SMA syndrome risk factors indentified: SMA angle less than 28° - 18,2 pct, distance between SMA and AA less than 10 mm - 14,3 pct, low SMA branching position from the abdominal aorta - 6,7 pct patients.
2. 7,0 pct of patients had radiology signs compatible with NS.
3. Identified lower than 10 mm cut-off value with 73 pct sensitivity and 81 pct specificity of the distance between SMA and abdominal aorta at the level of left renal vein.
Seminar “How to prepare and submit scientific papers in radiology”
Rudiger von Kummer

Topics to be discussed
The efficacy of diagnostic imaging
Types of scientific papers in radiology
- Guidelines for reporting observational studies (STROBE)
- Standards for Reporting Diagnostic accuracy studies (STARD)
- Guidelines for Reporting Reliability and Agreement Studies (GRRAS)
- Consolidated Standards of Reporting Trials (CONSORT)
- Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)
- Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0)
Ethical standards of scientific publishing
How to proceed? The first steps towards a successful submission.

Endovascular Treatment of Gastroduodenal Ulcer Bleeding In Patients with High Rebleeding Rate
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2. Riga East University Hospital, Department of General and Emergency Surgery
3. Riga East University Hospital, Surgical Department

Introduction. Transarterial gastroduodenal artery embolization (TAE) is an alternative hemostatic method for patients with nonvariceal upper gastrointestinal bleeding (NVUGIB) and high rebleeding risk after endoscopic examination and treatment.

Aims and Objectives. Aim of retrospective study was to show the effectiveness of haemostasis and technical performance using endovascular embolization of gastric and gastroduodenal arteries using different embolization techniques.

Materials and methods. During time period from 2014 to 2017 december, 131 patient with high grade rebleeding rate after endoscopic haemostasis were selected for endovascular embolization of gastric and gastroduodenal arteries. All patients had multiple comorbidities with high risk for open surgery. Endoscopically Forrest I-IIb ulcer and the clinically Rockall score ≥ 5 were the selection criteria for the identification of high-risk candidates for TAE.

Results. 54 females (41.22%) and 77 males (58.78%) in age group from 25 to 93 years underwent endovascular treatment. From 143 selected patients, technically successful embolization was achieved in 91.6%. In 76 cases (58.02%) gastroduodenal artery was embolized. In 52 cases (39.69%) with gastric ulcer disease left gastric artery was embolized, in one case with antral ulcer right gastric artery and gastroduodenal arteries were embolized, in two cases with gastric ulcer right and left gastric arteries were embolized. In most of the cases – 94.53% embolization with coils was applied. Mostly, in 62.82% pushable coil embolization was used, in 33.05% cases combination of pushable and detachable coils and 4.13% - detachable coils. 4 patients had embolization using combined occlusion method with microspheres and coils, and three patients - liquid embolic material in combination with coils. On average each patient was treated using 7 coils with overall length of 77 cm. No technical complications causing clinical consequences were noted. One patient after treatment with microspheres in combination with coils had ischemic changes of the stomach without longer hospitalization or additional need for medications. Haemostasis was achieved in 124 cases (94.65%) with mortality from repeated bleeding in 3 cases (2.29%). Overall mortality from rebleeding or other diseases including intoxication, myocardial infarction and decompensation of heart failure was in 12 cases (9.16%).

Conclusions. Endovascular embolization of gastroduodenal arteries in patients with gastric and duodenal ulcer bleeding and high rebleeding rate after endoscopic treatment has good haemostatic effect with low periprocedural
complication rate. This treatment method is good alternative for patients with multiple comorbidities and restrictions for open surgery. Endovascular embolization has high performance rate but is operator dependent.

Endovascular treatment of cerebral vasospasm. Results after endovascular pharmacotherapy and angioplasty of cerebral arteries
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Introduction: Cerebral vasospasm after subarachnoid haemorrhage (SAH) is a major complication causing cerebral ischemia and infarction. Main reason of subarachnoid haemorrhage is acute aneurysm rupture which is common in any age, but highest incidence between working age females. It is common from 4th to 14th day after SAH and severity depends on early treatment.

Aims and Objectives: Aim of retrospective study was to show treatment possibilities using minimally invasive techniques in treatment of clinically significant cerebral vasospasm and clinical results using modified Rankin scale (mRS).

Materials and Methods: During time period from December 2015 to December 2017, 18 patient with cerebral vasospasm after aneurism rupture underwent intracranial pharmacotherapy and angioplasty. 16 aneurysms were treated by endovascular embolization and 2 patients by open surgery with simultaneous hematoma evacuation. Patients were selected for cerebral angioplasty and pharmacotherapy regarding clinical findings and results of cerebral angiography.

Results: 10 females (55.55%) and 8 males (44.45%) in age group from 27 to 84 years had new neurological impairment in average 7 days after SAH with spastic reaction in cerebral digital subtraction angiography (DSA). Most common localization of ruptured aneurism was anterior communicating artery in 50,0% of cases with severe diffuse SAH involving cerebral parenchyma or intraventricular space in 83.33%. Mainly clinical presentation by Glasgow coma scale was 14 to 15 in 50.00%, 12 – 13 in 33.33% and less than 12 in 16.67%. Overall 49 treatment sessions were performed with mean amount of 2.7 per patient. Main treatment method was infusion therapy with calcium channel blockers for 12 to 24 hours in 24 sessions, local calcium channel blockers injection in bolus dose was applied in 21 sessions. Intracranial angioplasty with compliant balloon was used in 7 cases and angioplasty with temporal stent implantation – in one case. Clinical results using mRS after aggressive vasospasm treatment with 2 or less points was in 44.4% of cases. Procedure related complications were in 1 case with proximal carotid artery occlusion without clinical consequences and compensated flow from contralateral side. Mortality was 11.2%. Conclusion: Endovascular treatment of cerebral artery vasospasm can be promising and only treatment method for patients with severe vascular flow compromise. More treatment sessions were linked to worse clinical outcome and earlier detection of cerebral vasospasm - to better outcome by mRS. Additional non-invasive radiologic examination for cerebral vasospasm should be applied for better patient selection and optimal clinical results.

Cryoablation of inoperable and multiple tumours in solitary kidney
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National Cancer Institute of Lithuania

Background and objectives. Cryoablation and thermal ablation are well established methods for treating T1a kidney tumours for elderly patients or patients with comorbidities who are not suitable for surgery. Ablation is a nephron sparing method as it only slightly reduces the number of nephrons and does not require intraoperative ischemia as kidney resection does. Cryoablation does not induce scarring what is important issue while treating central tumours and it has this advantage to thermal ablation. Cryoablation of malignant tumours in Lithuania is performed at National Cancer Institute (NCI) from 2012 for inoperable tumours. We would like to present the results of cryoablation of inoperable and multiple tumours in patients with a solitary kidney. This indication is approved by authorities in Lithuania.
Material (patients) and research method used. Seven patients (median age 63, range 28-75) with inoperable or multiple tumours in solitary kidney were treated using argon helium cryoablation system at NCI from 2012 to 2016. All ablations were performed under CT guidance. Intentional ablative margin was 5-10 mm where feasible. Contrast enhanced CT was used for follow up.

Findings/ results in sufficient details to support conclusions. There were 14 tumours (median size 18mm, range 13-42 mm) treated in nine cryoablation sessions. All tumours were biopsy proofed to be clear cell renocellular carcinomas Fuhrman grade II. One patient with von Hippel Lindau syndrome had six tumours that were treated in two sessions with 27 months interval. There were no major complications observed after all ablations. The detected median minimal ablative margin was 2 mm (range 0-9mm). Despite the fact that only two tumours had an ablative margin of 5 mm or more, on median follow up of 27 months (range 3 - 54 months) no local tumour progression was observed. The mean increase in creatinine concentration next day after the ablation was 24 μmol/l 95% CI 19-29.

Conclusions and recommendations. Cryoablation is a safe and effective treatment modality for T1a single kidney tumours even in inoperabile circumstances that provides possibility to preserve solitary kidney and its function. Effectiveness for T1b tumours should be further investigated.

Venous malformations - can we help?  
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Introduction. Vascular malformations typically are present at birth and represent channels of abnormal vascular architecture affecting capillary, venous, lymphatic, or arterial systems, or a combination. Venous malformations (VMs) are slow-flow malformations. These masses potentially can undergo rapid expansion. Treatment options consists of observation, laser treatment, sclerotherapy, endovascular embolization, or surgical excision. Sclerotherapy has recently become the primary treatment for most VMs.

Aims and Objectives. To overview causes, symptoms and potential treatment options of VMs. To share our initial treatment experience of VMs.

Materials and methods. A total of 29 patients (11 males and 18 females) with VMs, who were treated via direct puncture and sclerotherapy at Pauls Stradins Clinical University Hospital between 2010 and 2018., were included in this retrospective study. Indications for treatment included pain, swelling and cosmetic concerns.

Results. A total of 129 sclerotherapy sessions were performed (4.4 sessions per patient). All VMs were low-flow. 28 VMs were treated via sclerotherapy and 1 via a combination of embolization and sclerotherapy. In 1 patient, after sclerotherapy, lesions were partially excised by surgery. In the 27 patients who did not have surgery, the lesions significantly decreased in size. In one case with big pelvic VM no significant treatment results were achieved. In three patients, skin ulcerations were identified.

Conclusions. VMs sclerotherapy is less invasive than surgery, it is safe and effective method. On the other hand, repeated sessions are commonly required to achieve satisfactory response.

3rd PARALLEL SESSION | NUCLEAR MEDICINE BRAIN

Correlation of epileptogenic changes detected on PET/CT, MRI and electrophysiological studies  
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Introduction. Epilepsy is a neurological disorder when activity in the brain becomes abnormal, causing seizures or periods of unusual behavior. As the disease itself the diagnosis is also very complex. Electroencephalography (EEG) is considered the most important tool for evaluating the patient with epilepsy. When abnormal, it may contribute to the seizure classification, either focal or generalized and it also may characterize the epilepsy syndrome presented by the patient. This possibility allows a prognostic view in most cases in relation to seizure control and also may lead to better treatment choices.
While in most of the epilepsy cases magnetic resonance imaging (MRI) is the imaging test of choice, the acquired information may not be enough when planning the outcome of surgical treatment. New imaging tests like Fluorodeoxyglucose-18-PET/CT scan (FDG PET/CT) can be performed in this case. We compared results from standard diagnostic studies with the FDG PET/CT scan results to see whether FDG PET/CT provided comparable, conflicting or additional information.

Aims and Objectives
1. Correlation between the number of epileptogenic foci detected on PET/CT, MRI and EEG studies.
2. Measurement of concordance between all three studies.

Materials and methods. Thirty five patients with clinically proven refractory epilepsy were included into the study. All patients underwent a Fluorodeoxyglucose-18-PET/CT scan, MRI scan with epilepsy protocol, and an EEG at least 1 hour prior to a PET study and minimum 60 min in duration. The MRI was performed not earlier than 6 months before the PET/CT scan. Statistical data was analyzed with the SPSS 23.0 program. The Wilcoxon Signal Criteria were used to compare the two dependent samples which did not match the normal distribution. Concordance was evaluated by using Cohen's kappa (κ).

Results. According to Wilcoxon signed ranks test we can make assertion that there was a statistically significant difference between the number of epileptogenic foci found in PET/CT and EEG studies (Sig. 0.008<0.05) and between EEG and MRI lesion numbers (Sig. 0.001<0.05). There was no significant difference between MRI and PET/CT lesion numbers (Sig. 0.144>0.05)

Measure of Agreement Kappa between PET/CT and EEG value was 0.613 (p<0.05). Between PET/CT and MRI value was 0.035 (p>0.05).

Conclusions. PET/CT is extremely useful imaging method to assist in the localization of epileptogenic zones. Functional information that brain PET/CT provides is complementary to anatomical imaging of MRI and functional information of EEG and is a very important technique in the process of sorting out patients in whom surgery may be indicated. We found that epileptogenic foci detected on PET/CT and EEG had quite good correlation, but correlation on MRI and PET/CT was much lower. That might indicate that not all structural lesions are epileptogenic.

Amyloid avid imaging and CSF biomarkers
Juhan Reimand, Malle Paris, Sergei Nazarenko
North Estonia Medical Centre

Introduction. Alzheimer’s disease (AD) is attracting much attention in developed world due to its raising significance in ageing societies. Big efforts are put to create reliable diagnostic tools for early and accurate detection in this disease. Today, it is commonly recognized that a wide range of biomarkers with a sophisticated decision support system has to be taken into consideration when trying to timely establish the onset of AD. In 2016, our group reported at BCR’2016 about our first experience with amyloid-avid PET/CT in patients with mild cognitive impairment. Our first experience was encouraging to further clinical use of this method.

Aims and Objectives. In our study we present our experience with amyloid-avid PET/CT, and an overview of recently published data about clinical and laboratory findings in patients who underwent amyloid-avid imaging.

Materials and methods. In our patients PET/CT scans were acquired as previously described: on a standard scanner (Discovery VCT, GE, USA). Prior to PET acquisition, a low-dose CT scan of the head was registered for attenuation correction. 18F-flutemetamol was injected as a single intravenous bolus of 185 MBq into antecubital vein in total volume of 10 ml. Acquisition of PET scans was started 90 min after tracer injection and lasted for 30 min. Visual image interpretation using special rainbow-colour-scale was carried out by experienced nuclear medicine specialists who were previously trained and accredited for this work. Image assessment was performed in five Regions of Interest (ROI): frontal lobes, posterior cingulate and precuneus, lateral temporal lobes, inferolateral parietal lobes, striatum. Pons served as reference region.

Results. During 2015-2017 we performed 18F-Flutemetamol-PET/CT in nine patients. Out of 9 patients, 5 were amyloid-positive, and 4 – amyloid negative. To increase diagnostic confidence, in all 9 patients laboratory evaluation of cerebrospinal fluid was performed for amyloid, as well as total tau and phosphorylated tau protein. Our work describes different patterns of 18F-Flutemetamol-PET/CT and presentation of laboratory biomarkers in CSF, based on own experience and published data.
Conclusions. Based on our own data, and recent publications, amyloid-avid-PET/CT plays significant role in exclusion of Alzheimer’s disease. This is of particular importance in clinically unclear diagnosis, and at early stage of the disease, especially for prognosis evaluation and adequate treatment establishment.

**Differential diagnosis of dementias: nuclear medicine tools**

Malle Paris, Juhan Reimand, Sergei Nazarenko
*North Estonia Medical Centre*

Introduction. Differential diagnosis of dementias has become relevant, because the aging of the population due to expected and achieved success in control of infectious and non-communicable diseases, as well as low birth rate, are shifting age-related and premature health problems into the center of socio-medical concern in Estonia and other Baltic States. Nuclear medicine tools have been used to diagnose dementias since decades, starting with nuclear brain perfusion studies. In early 2000 dopamine transporter studies with 123I-ioflupane were introduced. Recently, new diagnostic methods have become available. In 2015 visualization of amyloid deposits in the brain tissue with 18F-flutemetamol was introduced in Estonia in our hospital, thus adding value to much used 18F-FDG-PET/CT, opening new horizons for medical professionals.

Aims and Objectives. Aim of current study was to analyse clinical experience obtained in nuclear medicine department in differential diagnosis of dementias and to propose recommendations for use of nuclear medicine tools in similar socio-economic conditions.

Materials and methods. Retrospective analysis of experience gained at North Estonia Medical Centre using nuclear medicine tools for differential diagnosis of dementias was performed.

Results and conclusions. During the period of 2010-2017 we had 428 patients with mild cognitive impairment or dementia syndrome referred to 123I-ioflupane-SPET, 64 patients were referred to 18F-FDG-PET/CT, and 9 patients were referred to 18-F-flutemetamol-PET/CT. Nuclear medicine study was part of the clinical work up aiming on uncovering neurodegenerative diseases causing dementia. Our work describes different patterns of 123I-ioflupane-SPET, 18F-FDG-PET/CT, and 18-F-flutemetamol-PET/CT in different neurodegenerative diseases. An algorithm for use of these methods in daily clinical practice was elaborated and shall be presented.

Conclusions:
1. Evaluation of CT scan data is sufficient for qualitative assessment of COPD phenotype.
2. The most common sign of airway disease is bronchial wall thickenings. Small airway disease is evaluated by the presence of air trapping and functional disease extension volume.
3. Quantitative CT data analysis is used to further clarify COPD phenotype and can be an important prognostic tool for obstruction, treatment response and progress of disease.

**4th PARALLEL SESSION | THORACIC RADIOLOGY**

**MRI in Lung Cancer Screening**

Juergen Biederer
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Introduction. Based on the documented reduction of lung cancer mortality in heavy smokers by the National Lung Screening Trial (NLST), the implementation of low dose computed tomographic (LDCT) lung cancer screening has already started in the USA. Studies in Europe were so far not able to confirm this result. The discussion on inclusion criteria, radiation exposure, management of false positives, cost issues and over-diagnosis is continued. Therefore, many European countries remain undecided, awaiting the results of ongoing trials or suggest screening examinations only in a very limited frame, e.g. within dedicated studies.

Aims and objectives. The aim of this lecture is to discuss the potential role of lung MRI as an alternative technology against the back-ground of the current controversies on early lung cancer detection programs based on CT.
Materials and methods. From a technical point of view there is little doubt that MRI could play a significant role in lung cancer screening. Clinical experience with lung MRI is growing and image quality has become more robust. The continuous technical development achieved by stronger gradients, parallel imaging and shorter echo time has made lung magnetic resonance imaging (MRI) an interesting alternative to CT. For the detection of solid lesions with lung MRI, experimental and clinical studies have shown a threshold size of 3-4 mm for nodules, with detection rates of 60-90% for lesions of 5-8 mm and close to 100% for lesions of 8 mm or larger. From experimental work, the sensitivity for infiltrative, sub-solid lesions would be expected to be similarly high as that for solid lesions, but the published data e.g. for the MRI detection of lepidic growth type adenocarcinoma is sparse. Moreover, biological features such as a longer T2 time of lung cancer tissue, tissue compliance and a more rapid uptake of contrast material compared to granulomatous diseases, in principle should allow for the multi-parametric characterization of lung pathology.

Results. In lung cancer screening potential applications range from using lung MRI as the first choice screening modality to the role of an ad hoc on site test for the detailed evaluation of a subgroup of positive screening results. How and when it could be implemented will depend on the threshold needed for positive screens (e.g. lesion volume and required diagnostic accuracy), cost-effectiveness and improved patient outcomes resulting from a reduction in the need to follow up benign nodules. Meanwhile, the required prerequisites have been achieved: There are now standardized protocols which are easy to implement on current scanner hardware configurations and currently ongoing studies will help to further contribute experience with multi-center, multi-vendor and multi-platform implementation of this technology. Calculations based on the available data from CT screening trials and the so far conducted small MRI based trials already suggest an equal cost-effectiveness of both methods.

Conclusions. From a technical point of view there is little doubt that MRI could play a significant role in lung cancer screening. However, a dedicated prospective MRI based lung cancer screening trial to investigate these issues in large scale is sorely needed and it is about time to take this next big step.

Hold your breath! Inhalational lung disease – imaging findings
Vytaute Buroviene

Different inhaled substances, varying from gas, fumes, vapors and dust to liquid materials, can be the cause of inhalational lung injury. Inhaled substances may cause epithelium injury at various levels of respiratory tract, depending on the characteristics of the inhaled material, leading from simple symptoms to severe disease. Manifestations of inhalation of the toxic agent can vary from acute reactions with direct irritation and inflammation of the tracheobronchial tree, pulmonary edema and acute chemical pneumonitis to chronic inflammatory changes with or without fibrosis or granuloma formation. Most commonly inhalational lung injury is caused by inhalation of noxious gases, fine dust particles, such as silica, and also aspiration of liquid material from upper gastrointestinal tract. Depending on the causative agent, exposure time and individual susceptibility different radiologic patterns can be seen on imaging, varying from pulmonary edema to severe fibrosis. Recognizing inhalational lung injury is of great importance, especially for avoiding and managing possible serious complications.

Different faces of pulmonary aspergillosis
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Aims and Objectives
1. To overview different forms of aspergillosis and their radiologic appearance.
2. To enlist predisposing factors and clinical data that are specific for different forms of aspergillosis.
3. To present differential diagnosis for different forms of aspergillosis.

Background and imaging findings. Aspergillosis is mycotic disease, usually caused by saprophytic and ubiquitous airborne fungus Aspergillus. According to The European Society for Clinical Microbiology and Infectious Diseases, the European Confederation of Medical Mycology and the European Respiratory Society (ESCMID-ECMM-ERS) Joint Clinical guidelines (2017) aspergillosis is divided into two groups: invasive aspergillosis (IA) and chronic pulmonary aspergillosis (CPA); according to Infectious Diseases Society of America (IDSA) guidelines (2016) is divided into three groups: invasive aspergillosis, chronic and saprophytic syndromes of Aspergillus and allergic syndromes of Aspergillus. The occurrence and form of pulmonary aspergillosis depends
on immunologic status, hypersensitivity and underlying lung disease, though can occur in immunocompetent healthy patients in rare cases.

Invasive pulmonary aspergillosis (IPA) can be divided into two types: angioinvasive pulmonary aspergillosis (AIPA) and bronchoinvasive pulmonary aspergillosis (BIPA). IPA is the most devastating form of aspergillosis that predominantly occurs in severely immunocompromised patients with neutropenia yet may occur without the classic risk factors in patients with chronic obstructive pulmonary disease (COPD), also in intensive care settings and healthy individuals after massive exposure to Aspergillus conidia. The mortality rate is high and early diagnosis is essential for better outcomes. On HRCT AIPA classically manifests as nodules with or without halo sign, pleural based wedge-shaped areas of consolidation, alveolar consolidations, masses, reverse halo sign, cavity or air crescent sign, pleural effusion. BIPA may appear as tracheal or bronchial wall thickening, centriflobular nodules with tree in bud appearance (bronchiolitis), peribronchovascular consolidation or bronchopneumonia. All those features are not specific, but consistent with Aspergillus infection and has to be differentiated from other lung pathologies with similar radiologic appearance.

Chronic pulmonary aspergillosis (CPA) usually appears in non or mildly immunocompromised patients with underlying chronic lung disease. The most common form of CPA is chronic cavitary pulmonary aspergillosis (CCPA), which may progress to fibrosing pulmonary aspergillosis. Other forms of CPA include Aspergillus nodule and aspergilloma (saprophytic form). CCPA manifests as progressive radiographic abnormalities: cavitation (thick or thin walled), pericavitary infiltrates, pleural thickening, parenchymal destruction or fibrosis. Chronic fibrosing pulmonary aspergillosis is fibrotic destruction of at least two lobes of lung complicating CCPA. Aspergilloma (Aspergillus fungal ball) occurs in patients with cavitations due to the underlying chronic lung disease. It may coexist with any forms of CPA except Aspergillus nodule. Aspergillus nodules may be single or multiple, usually rounded, might be with low internal attenuation or cavitation, may also be spiculated and mimic carcinoma or nodules of other causes. Subacute invasive pulmonary aspergillosis (SAIA) was previously called chronic necrotizing pulmonary aspergillosis and should be considered as invasive aspergillosis which progresses in 1 to 3 months. SAIA has variable radiological features including cavitation, nodules, progressive consolidation and affects moderately immunocompromised patients.

Allergic broncho-pulmonary aspergillosis (ABPA) is results from hypersensitivity to Aspergillus antigens and usually affects patients with asthma and cystic fibrosis. Radiologically manifests as mucous impacted cystic or varicose bronchiectasis giving gloved finger appearance. Mucous plug might be of high attenuation and is very specific for ABPA. Small airway obstruction may also be present and manifest as centriflobular nodules.

Conclusions. The diagnosis of allergic bronchopulmonary aspergillosis and chronic pulmonary aspergillosis is difficult but not challenging in appropriate clinical settings. Invasive aspergillosis is a life-threatening condition which makes it diagnostic challenge because neither clinical nor radiologic features of IPA are specific and diagnosis must be based on the integration of clinical, radiological and microbiological data.

Towards and end-to-end learning model for exhaustive chest x-ray pathology classification

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Introduction. Despite increasing volume of other imaging techniques, chest X-rays (CXRs) still make up a large fraction of all radiological studies. Thus, increasing accuracy and productivity of radiologists reading CXRs remains of paramount importance. However, CXRs constitute a stark challenge for computer-aided diagnosis. This is because (i) CXRs are two-dimensional projections of three-dimensional data; (ii) at least three major different types of CXRs exist (i.e., AP/PA/LAT); (iii) many different radiological findings of the lungs, the heart, and the spine are observed from a single CXR; (iv) in clinical practice, additional information besides the image is used to make radiological conclusions.

Aims and Objectives. In this work, we attempt to tackle challenges (i)-(iii) by creating a set of Deep Learning (DL) models which take AP/PA/LAT images as input, and output scores pertaining to 53 different radiological features and their localizations.

Materials and methods. A database of CXR images (n = 230 000) was used to train the model. To our knowledge, this is the biggest CXR database reported in the context of a CXR CAD to date. We used labels that were text
Results. Our model was able to reach average AUC score of 0.91 throughout 53 classes. List of all classes with corresponding AUC scores: Atelectasis 0.91, Enlarged Heart 0.89, Edema 0.98, Pleural Effusion 0.96, Pulmonary Emphysema 0.91, Subcutaneous Emphysema 0.98, Consolidation 0.89, Pneumothorax 0.92, Tuberculosis 0.91, Hypoventilation 0.86, Lymphadenopathy 0.87, Hypertension 0.94, Calcification 0.84, Elevated Diaphragm 0.89, Dislocated Mediastinum 0.92, Widened Mediastinum 0.89, Congestion 0.91, Fibrosis 0.88, Pleural Adhesion 0.88, Abnormal Hilar 0.85, Enlarged Hilar 0.81, Mass 0.85, Sarcoïdosis 0.99, Hernia 0.89, Lung Removal 0.97, Enlarged Aorta 0.88, Goitre 0.93, Aortic Sclerosis 0.90, Respiratory Distress Syndrome 0.99, Retrosternal Airspace Obliteration 0.96, Pleural Thickening 0.86, Pneumomediastium 0.91, Pericardial Effusion 0.91, Pleural Plaque 0.91, Pneumoperitonum 0.92, Central Venous Catheter 0.97, Intubation 0.98, Chest Tube 0.95, Sternal Wires 0.97, Stent Graft 0.89, Artificial Heart Valve 0.96, Intra Aortic Balloon 0.98, Ventricular Assist Device 0.99, Gastronomy Tube 0.99, Pacemaker 0.99, Bone Fracture 0.85, Osteochondrosis 0.89, Spondylosis 0.89, Osteoporosis 0.87, Spinal Deformities 0.86, Ligament Ossification 0.94, Spinal Enthesopathy 0.86, No Cardiopulmonary Findings 0.91

Conclusions. We have created a Deep Learning model that covers 53 chest X-ray radiological findings with an AUC over 90%. This model shows promise for various applications, such as patient triage and pre-generating structured reports.

Dual energy CT Imaging in pulmonary embolism
Natalja Igumenova

CT angiography plays an important role in the evaluation of pulmonary embolism. Thanks to a simultaneous acquisition at high and low kilo-voltage, dual energy computed tomography can achieve material-based decomposition (iodine, water) and reconstruct images at different energy levels. Iodine map helps to identify and quantifiy perfusion defects. Virtual mono-energetic images at a low energy setting allow better attenuation of the pulmonary artery to be achieved in case of suboptimal enhancement. The new generation scanners can produce good quality images at a lower radiation dose. With the help of dual energy acquisition increasing diagnostic performance for detecting pulmonary embolism can be achieved.

Differences in chest XRay assessment: pulmonary tuberculosis
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Lithuanian University of Health Sciences Hospital Kaunas Clinics, Department of Radiology

Introduction. Radiologic disease monitoring is routine practice in the setting of tuberculosis. Recognition and interpretation of distinctive radiological features is important for establishing the diagnosis, as well as in disease management. According to the literature, the interpretation of chest XRay may vary because of subjective and objective factors. Overall accuracy of radiological diagnosis is high, yet there is only a small number of studies that focus on agreement for distinctive radiological features between radiologists.

Aims and Objectives. To assess intra-observer agreement of qualitative and quantitative findings in chest X-Ray films of adult patients diagnosed with pulmonary tuberculosis.

Materials and methods. Plain chest X-Ray films of adult patients with confirmed pulmonary tuberculosis were interpreted by four independent researchers with different levels of experience in chest radiology: two experts and two radiologists in training. Nodules, air-space consolidation, cavitation, intrathoracic lymphadenopathy, pleural effusion, calcification and fibrotic pulmonary parenchymal changes were assessed qualitatively and quantitatively. Quantitative assessment of findings was calculated using Chest XRay score (CXRs) (CXRs = proportion of total lung affected (in %) + 40 if cavitation is present) and sum of affected lung (in %) regardless presence of cavitation. Agreement between researchers was assessed using Cohen's kappa statistic for nominal variables within groups, Fleiss kappa statistic for nominal variables between groups, intraclass correlation coefficient was used to find an
Results. 98 plain chest XRay images were interpreted. There was moderate to substantial agreement for consolidation, cavitation, lymphadenopathy within experts, fair to substantial for consolidation, cavitation, pleural effusion, calcification within radiologists in training. Agreement for consolidation, cavitation and pleural effusion was fair to substantial between groups. Highest differences of agreement was for intrathoracic lymphadenopathy, calcification and fibrotic pulmonary parenchymal changes between researchers. Agreement of quantitative measures was very good within and between groups.

Conclusions. Agreement of quantitative measures was very good within and between researcher groups, yet agreement of qualitative findings in chest XRay images were higher within the group of experienced radiologists compared to radiologists in training.

4th PARALLEL SESSION | RADIOGRAPHERS SESSION

Challenges for radiographers – non-standard MRI examinations
Monika Siaulyte, Arturas Ciuvosas
Republican Klaipeda Hospital

Introduction. Magnetic Resonance Imaging (MRI) is an ever-advancing. The increase in the scope of MRI applications means that radiographers have extended their roles to incorporate advanced techniques. Radiographers take the most important part of performing high quality MRI exams. They have to be highly skilled to provide safe and effective services not only for daily routine but also for non-standard examinations.

Aims and Objectives. The purpose of this presentation is to share experience how to perform non-standard MRI examinations: whole body, long bones, elbow, fingers, TMJ, prostate and etc.

Materials and methods. To analyse non-standard MRI exams used 1.5T and 3T MRI techniques and literature overview.

Results and Conclusions. MRI radiographers have to be prepared for facing challenges in theirs work. Detailed knowledge, experience and understanding safety aspects helps to make highest quality non-standard MR images.

Potential clinical possibilities of novel MRI techniques based on Compressed Sensing data reconstruction - abdomen, heart and soft tissue imaging
Artur Synowiecki, Paweł Wawrzyniak, Magdalena Kozakiewicz
Compacta Gdańsk, Institute of Oncology Gliwice

Introduction. Compressed Sensing data reconstruction of MRI sequences, just introduced as product option gives potentially more possibilities to exam patients, which not cooperate during exams of abdomen, heart or soft tissue of different regions of body. Techniques based of novel type of data reconstruction should t give images completely insensitive of breathing or other reason of moving tissue artefacts.

Aims and Objectives. Practical, quality comparism of classic techniques dedicated for abdomen, prostate, head&neck and heart MRI imaging versus compressed sensing data reconstruction sequences.

Materials and methods. All the studies were performed on 3T MAGNETOM Vida scanner (gradient 200 T/m/s, slew rate 60 mT/m) with 18 channel Body surface and 18 channel small flex coil, Head-Neck Biomatrix 20 channel coil. Following scanning protocol was used: GRASP-Vibe, CS-trufi cine – sequences. Number of evaluated cases under the process

Results. Grasp-Vibe sequence really improves quality of free breathing patients with upper abdomen imaging. Full dynamic t1 weighted imaging is possible with high quality. Grasp-Vibe also improves quality of head neck and prostate imaging. CS Cine TrueFisp sequence provide us for high quality of real time imaging not only in cardiac region.
Conclusions. Compressed Sensing MRI data reconstruction is really useful and expected method of imaging technology. Relatively long reconstruction time requiring data is not a crucial problem of the method. We hope to get more other MR sequences with combination of CS data reconstruction.

**Specific Absorption Rate (SAR) and it’s Possible Optimisation During MRI Examinations**  
Dace Skrejne; Uldis Ozoliņš  
**RAKUS Oncological Center**

**Introduction.** Specific absorption rate (SAR) is a measure of the rate at which energy is absorbed by the human body when exposed to a radio frequency electromagnetic field. We can find this measure along with a mobile phone and MRI usage. Before MRI examination accurate patient weight must be entered into the scanner, and system calculates energy level for hydrogen atoms to absorb and emit radiofrequency energy.

In routine work we, sometimes, did not pay attention to the patient’s weight. Incorrectly increased data can heat up patient- proven microwave heating effect.

We must pay special attention to cancer patients. They have undergone many procedures - CT's, MRI's with contrast media, chemotherapy and nuclear medicine treatments as well. Similarly to CT examinations, radiographer's responsibility is to ensure the highest possible image quality with lowest possible harm to the patient - as low as possible. Incorrectly entered patient's weight can decrease a comfort level for those patients. Patient comfort is important, because, as we know, MRI examinations can last 30 minutes or longer.

**Aims and Objectives.** The goal of this presentation is to increase radiographers' awareness and knowledge of non-ionising radiation processes, which can be potentially harmful for the patient. Understanding those processes will ensure safer MRI examinations for oncology patients.

The main objective is to prove that the human body cells get heated when an incorrect patient weight is entered by a radiographer into the scanner software before the MRI examination.

**Materials and methods.** The radiographers performed an experiment using DIY phantom to collect heating data with different FOV, patient weight and SAR levels (GE 1.5T for specific exam protocols). The NaCl solution filled self-made phantoms measured the temperature at different places in the gantry during the test, and the MR unit quality measurement phantom was used, in which the image quality can be compared.

The SAR describes the potential for heating of the patient's tissues due to the RF energy necessary to produce the MR images.

The literature was collected and analyzed on the image processing and physics of MRI, as well as on patient's safety in MRI examinations.

**Results.** Temperature measurements from NaCl solution phantoms from two different places in MR gantry with correct and incorrect patient's weight. Image quality measurement from the MR phantom.

**Conclusions.** SAR values may become a quality index to monitor MR procedures. SAR increases a temperature in human body cells. It is very important to enter the correct weight of the patient. Every MR examination room must have scales.

**Difficulties of acquiring magnetic resonance liver elastograms on 3T MAGNETOM Prisma scanner, own experiences**  
Iwona Pawlik, Pawel Wawrzyniak, Artur Synowiecki  
**Institute of Oncology Gliwice; Compactiva - Gdańsk**

**Aim.** Analysis of technical difficulties in magnetic resonance elastography (MRE).

**Material and methods.** All the studies were performed on 3T MAGNETOM Prisma scanner (gradient 200 T/m/s, slew rate 80 mT/m) with 18 channel Body surface coil.

Following scanning protocol was used:
1. **T2_haste_cor_bh:** TR 1400 ms; TE 91 ms; slice thickness 5 mm; 30 slices; FoV 380 mm.
2. **T2_haste_tra_bh:** TR 1600 ms; TE 97 ms; slice thickness 5 mm; 35 slices; FoV 350 mm.
3. T2_haste_trb_h: TR 1600 ms; TE 98 ms; slice thickness 5 mm; 1 slice; FoV 300-340 mm (FoV similar to elastography acquisition was set).
4. Gre_MRE_trb_h: TR 50 ms; TE 22.47 ms; slice thickness 5 mm; 1 slice; FoV 300-340 mm.

RESOUNDANT elastography device was used, which consisted of:
- Active element (speaker producing 50-60 Hz sound wave);
- Passive element (vibrating disc, placed on patient);

Method was tested on 35 healthy volunteers.

Results. The best elastograms were obtained when:
1. Passive part was placed on a line starting from a middle of a collarbone, with upper part of disc placed on a xiphoid process level.
2. Disc placed in expiration period, secured with elastic belt.
3. Acquisition time 22s (lowest acceptable time).
5. Examination in expiration period.

Conclusion. For a good quality MRE acquisition:
1. One need to rehearse breathing regime with patient.
2. Proper placement of passive element (placed on a line starting from a middle of a collarbone, with upper part of disc placed on a xiphoid process level, secured with elastic belt).
4. Examination in expiration period.

East-Tallinn Central Hospital experience in using Primovist for liver examinations
Edith Nigumann
East Tallinn Central Hospital

This presentation is based on our professional experience in using liver - specific magnetic resonance (MR) contrast agent Primovist.

Introduction. In our hospital we have gastroenterology department so we do a lot of liver examinations. 2010 we started using new liver-specific contrast agent Primovist. Examinations using Primovist became rapidly very popular among gastroenterologist. Now this examination is a standard. We also have found that Primovist helps in examining patients with bile leakage.

Aims and Objectives. The aim of this presentation is to introduce the technique and protocol that we use in East Tallinn Central Hospital to perform liver examinations with Primovist
1. Patient preparation before the examination
2. Overview of the protocol

Materials and methods. Our own experience in our everyday practice.

Conclusions. High number of request for examinations using Primovist has made it a standard examination in our hospital. It has become a highly requested examination but there are some pros and cons for this examination.

Artifacts in magnetic resonance Imaging
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Introduction. Magnetic resonance imaging (MRI) technology has been in continuous development for last decades. One of the main direction of the development has been to increase the speed of data acquisition for scan time reduction or to improve ultrafast imaging techniques, which are in use for dynamic MR angiography, MR perfusion, cardiac CINE imaging, real time imaging etc. Together with implementation of modern rapid scan techniques, there are remarkable increase in the number of acquisition parameters that effect to speed of data acquisition but also to image quality and artifacts.
Aims and Objectives. The aim of this review is to introduce several of most frequent MRI artifacts like motion, flow and pulsation artifacts, intensity and geometrical distortion and susceptibility effects, but also artifacts caused of hardware limits, hardware and software malfunction or not optimized acquisition parameters. The appearance of artifacts or loss of image quality may be caused by inappropriate values of acquisition speed acceleration parameters like turbo factor, partial Fourier technique, partial echo technique, parallel imaging factor or combination of the parameters. In this review are introduced and described the scan parameters and techniques to optimize image quality and to reduce intensity and appearance of the artifacts.

During last decade 3T MRI systems has come to routine clinical practice beside of 1.5T imaging systems. Although 3T MRI system permit to increase significantly signal to noise ratio (SNR) or image resolution that are major advantages compared to 1.5T MRI system, but on the other hand several artifacts like signal intensity variation, geometrical distortion, banding artefacts or inhomogeneous fat suppression are more dominant in 3T MRI. In this review are paid attention to most relevant artifact which are more prominent and disturbing in 3T imaging compared to 1.5T imaging systems.

Conclusions. Increase the number of scan parameters in modern MRI scan techniques makes more and more complex task to find the optimum values of the acquisition parameters and to understand the relations between the artifacts, imaging parameters and techniques. Excessive acceleration of imaging speed to reduce acquisition time by modifying imaging parameters like partial Fourier, partial echo, parallel imaging factor, may dramatically reduce image quality and may cause dominance of artifacts. In 3T MRI several artifacts are more dominant compared to 1.5T MRI, which makes usage of 3T MRI system bigger challenge for MRI staff. However, most of the 3T artifacts can be avoided or minimized by modifying acquisition parameters or by using supplemental or modern techniques.

Adaptation of Ecg-Gated Non-Contrast Enhanced Magnetic Resonance Angiography Trigger Delay Technique for Patients with High Heart Rate
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Non-contrast enhanced magnetic resonance angiography (MRA) is a magnetic resonance imaging (MRI) method for imaging cardiovascular system without using any contrast agents. There are numerous different techniques to perform non-contrast enhanced MRA images. Their usage depends on the scan region and purpose of the procedure. For imaging peripheral arteries without contrast enhancement, mainly ECG-synchronized 3D turbo-echo (TSE) sequence is used. In this research authors compare quantitative values of ECG-synchronized non-contrast enhanced 3D TSE images, which are generated using two different trigger delay techniques to create a possibility to use a new technique for patients with elevated pulse frequency. Research results are based on experiment MRI scans performed on volunteers, who agreed to participate in the study. Existing ECG-synchronized peripheral arterial imaging method is limited for patients with elevated heart rate (greater than 80 beats per minute). The research goal was to modify a trigger delay technique so that this method could also be applied to patients with an increased pulse frequency. This study showed that selecting the diastolic trigger delay value from the beginning of the TR cycle (modified method) is a solution for performing ECG-synchronized non-contrast enhanced 3D TSE technique on patients with elevated heart rate.

Keywords: MR angiography, trigger delay, 3D TSE, peripheral arteries, TRANCE

4th PARALLEL SESSION | EMERGENCY RADIOLOGY

Acute abdominal pain. When and what kind imaging we need
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Diagnostic practice for acute abdominal pain at the Emergency Department varies widely and is mostly based on doctor’s preferences and experience. No uniform definition of acute abdominal pain exists worldwide. Dutch guidelines propose the use of the following definition for acute abdominal pain: pain of nontraumatic origin with maximum duration of 5 days. 5-10% of presentations at the Emergency Department are because of acute abdominal pain. Acute abdominal pain can be caused by a variety of diseases ranging from mild and self-limiting (gastroenteritis, lymphadenitis, epiploic appendagitis, omental infarction, cecal diverticulitis) to life-threatening
diseases (pancreatitis, bowel ischemia, perforation of gastrointestinal tract, aortic aneurysm rupture). Causes for acute abdominal pain can be classified as urgent and nonurgent. Urgent causes require immediate treatment (within 24 h) to prevent complications; whereas for nonurgent causes, immediate treatment is not necessary. Complaints of acute abdominal pain can be very nonspecific at the beginning and evolve to more disease-specific symptoms over time. Clinical assessment is a first step to make preliminary diagnosis. Diagnostic accuracy of medical history, physical examination, and laboratory parameters is usually insufficient to accurately identify the correct diagnosis. However, diagnostic accuracy of medical history, physical examination, and/or laboratory parameters is sufficient to discriminate between urgent and nonurgent causes and justify the choice for additional imaging in suspected urgent conditions. If patient present with mild symptoms and after clinical evaluation the suspicion of an urgent condition is low, outpatient reevaluation is a safe alternative instead of additional imaging. In patients with a high suspicion of an urgent condition after clinical evaluation, additional imaging is needed. C reactive protein (CRP) and white blood cell (WBC) count alone are insufficient to differentiate urgent from nonurgent conditions. When clinically nonurgent condition is suspected but the CRP is above 100 mg/l or the WBC count is above 15 x 10⁹/l, the suspicion of an urgent condition rises and additional imaging is warranted. Plain radiography (XR), ultrasound (US), and computed tomography (CT) are widely acceptable at the Emergency Departments today. The use of imaging helps make final diagnosis and avoid unnecessary surgery because many causes of acute abdominal pain can be treated conservatively. The increase in use of diagnostic modalities also has downsides. The use of imaging leads to higher costs, protracted patient throughput at the Emergency Department, and an increased risk of negative side effects such as contrast-induced nephropathy and ionizing radiation exposure. XR has a diagnostic accuracy of 47 – 56%. It does not have an added value on top of clinical assessment in correctly discriminating between urgent and nonurgent causes. XR leads to a high percentage of false positive and false negative diagnoses. The diagnosis based on clinical assessment and US corresponds with the final diagnosis in 53 – 83% of patients. Compared with clinical diagnosis, the use of US in all patients reduces the number of false positive urgent diagnoses, but around one third of urgent conditions are missed. When compared with CT, the sensitivity and specificity of US are lower. US has higher interobserver variability also. Clinical assessment and CT combined correctly identifies an urgent cause in 89% of patients. Another option is to perform a CT scan after negative or inconclusive US (conditional CT strategy). It has a sensitivity of 94% and a specificity of 68%. This strategy reduces number of missed urgent conditions compared to CT alone. It would result in the lowest overall exposure to radiation also. With conditional CT strategy, only half patients would require CT.

Recommendations. Conventional radiography has a limited value in the evaluation of acute abdominal pain. Ultrasound is preferred as the first line imaging modality. When ultrasound is negative or inconclusive, a computed tomography scan can be performed (conditional CT strategy).

Life teaches us case by case
Mari-Liis Riibak
East-Tallinn Central Hospital

With a speedy workflow, as is very often necessary at the department of emergency radiology, or on the nightshift, it might be quite easy to overlook some important pathologies. Acquiring some useful habits or comparing and paying attention to “hints” we see during radiological studies, could guide us to serious conditions not noticed initially. Good clinical and laboratory information are often necessary to come to the right conclusion.

Learning objectives:
- To recognize the signs of pathology in non-traumatic acute abdomen.
- To differentiate the “the benign” from “serious” condition.

Emergency cases in oncology
Jurgita Usinskiene1, Vykinas Sabaliauskas1, Augustinas Bielinis1, Tadas Letauta1, Rowland Illing2
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2. Affidea

Oncologic emergencies are either due to primary tumour, metastasis, paraneoplastic syndromes or complications related to therapy. Correct diagnosis usually depends on detailed disease and treatment history. Radiologists have essential role in diagnosis, as well as management in some cases. Clinical oncologic cases that requires urgent treatment are presented and radiological signs are discussed.
Diagnostic workup in patients with non-specific chest pain
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Introduction. Nonspecific chest pain is very common in the emergency department. Because the management of patients mainly depends on the cause of the pain, imaging plays an important role in patients' evaluation. It is crucial to know about the most common pathologies leading to nonspecific chest pain and their imaging findings.

Aims and Objectives
1. To review the most common pathologies leading to nonspecific chest pain.
2. To understand the importance of clinical assessment for the selection of the right diagnostic test for a particular patient.
3. To present current imaging techniques for evaluation of nonspecific chest pain.
4. To become familiar with the typical imaging findings.


Results/Conclusions. Chest pain is a common presenting symptom in the emergency department and often presents diagnostic difficulties. Acute aortic syndrome and pulmonary embolism are rare but important causes of chest pain. These potentially treatable illnesses, if not identified, can lead to morbidity and death. In appropriate clinical settings CT and CT angiography have been established as the first methods of choice to accurately detect of potentially life threatening conditions.

Ultrasound in Traumatic Cardiac Arrest
Vilmija Traskaite – Juskevičienė, Arunas Gelmanas
Lithuanian University of Health Sciences

Benefits of ultrasound during traumatic cardiac arrest will be discussed in our presentation. Ultrasound is getting more and more popular these days and with more portable devices coming into our practice it turns out that it is an especially valuable and not interchangeable measure under various circumstances both in emergency department and on the scene of trauma.

Trauma is usually associated with road traffic accidents or penetrating injuries which frequently results in traumatic cardiac arrest (TCA) when spontaneous circulation becomes absent because of a certain amount of reasons. Traumatic cardiac arrest carries a very high mortality, but in those where return of spontaneous circulation can be achieved, neurological outcome in survivors appears to be much better than in other causes of cardiac arrest so all possible measures must be taken to bring those patients back to life and no cost is too high. Traumatic cardiac arrest has been discussed in details in the most recent edition of European Resuscitation Council Guidelines for Resuscitation 2015 Section 4. Cardiac arrest in special circumstances. Unlike cardiac arrest because of ischaemic cardiac event, immediate resuscitative efforts in TCA focus on simultaneous treatment of reversible causes, which takes priority over chest compressions. Having this in mind all interventions other than definitive (surgical/radiological) haemorrhage control should be taken prior to ‘transport to hospital’ including needle decompression, thoracostomies or even clamshell thoracotomy if required. Ultrasonography should be used in the evaluation of the compromised trauma patient to target life-saving interventions if the cause of shock cannot be established clinically is what the most recent guidelines and protocols for trauma management state.

Why is ultrasound needed and should be performed as soon as possible? One of the main reasons is that physical exam may be inaccurate or misleading. Studies comparing stethoscope or feeling for pulse in favor of ultrasound in case of emergency demonstrate an inconclusive data. Moreover, other diagnostic tools (CT, chest X-ray) are too slow and take too much time and effort to perform in the emergency room let alone on the field. Whereas ultrasound is portable and could be performed at the bedside with minimal effort and time consumption and it should definitely be included into primary survey.
How could ultrasound help during TCA? The most accurate way to diagnose the absence of spontaneous circulation is to look at the heart. That could be easily performed using ultrasound. What is more, ultrasound helps us to diagnose the etiology of instability and take the adequate measures to correct the critical condition. Haemoperitoneum, haemopericardium and cardiac tamponade can be diagnosed reliably and treated in minutes, even in the prehospital phase.

Ultrasound can perform a completely approach changing role in management of trauma patient in the emergency room or on the field. Conditions which could be easily diagnosed using ultrasound and treated immediately if performed an emergency intervention include cardiac tamponade, tension pneumothorax. Cardiac tamponade is the underlying cause of approximately 10% of cardiac arrest in trauma. Where there is TCA and penetrating trauma to the chest or epigastrium, immediate resuscitative thoracotomy (RT) via a clamshell incision can be lifesaving. The chance of survival is about 4 times higher in cardiac stab wounds than in gunshot wounds. To perform a clamshell thoracotomy might be an extremely difficult decision and ultrasound undoubtedly helps to diagnose an urgent condition and to foresee if this procedure would be of any use for the patient. Similarly, interventions regarding tension pneumothorax are also always lifesaving and ultrasound here is an invaluable diagnostic tool.

In conditions when any surgical intervention would most definitely be not required like ventricular fibrillation, asystole, severe hypovolemia or pulseless electric activity, ultrasound might also be an approach changing device stopping us from performing clamshell thoracotomies and helping to choose less invasive techniques like CPR or fluid resuscitation.

The well-known advantages of ultrasound in an emergencies are that it is fast, reliable, easy repeatable and relatively easy to perform. Moreover, it can be easily performed at the bedside or even on the field as small and portable devices are relentlessly coming into our daily practice. Use of ultrasound is most definitely recommended for every physician dealing with trauma patients and treating urgent conditions.

Traumatic liver injuries in Estonia – experience from 2009–2013
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Introduction. The liver is the second most commonly injured abdominal solid organ. Unfortunately there are very few studies focused on traumatic liver injuries in Estonia so far. To improve our clinical practices in trauma situations we need to analyse our previous performance using existing injury scoring criteria and imaging characteristics regarding clinical outcomes and decision making.

Aims and Objectives. The aim of the study was to elucidate the correlation between CT-based liver injury severity scoring, contrast extravasation and subsequent management and to investigate epidemiology, management and outcomes of liver injuries in major trauma centers in Estonia.

Materials and methods. Data on consecutive trauma admissions to all major national trauma facilities with liver injuries between 1/2009 and 12/2013 were retrospectively reviewed using ICD-10 codes (S36.10). The images were accrued from the population-based Picture Archive (PACS). CT scoring per American Association for the Surgery of Trauma organ injury scale was utilized to stratify liver injuries into minor/moderate (grades I–III) vs. severe (grades IV–V) injuries. The primary outcomes were operative management and in-hospital mortality. Secondary outcome was hospital length of stay (HLOS).

Results. A total of 81 cases were included. The mean age of the cohort was 31.5 ± 12.2 years and 26.9% were female. Overall, grade I–III injuries in 86.4% (n=70) and grade IV–V injuries in 13.6% (n=11) were observed. The most common associated injuries involved chest wall (n=44; 54.4%), lung (n=42; 51.8%), lower ribs (n=32; 39.5%). Overall, 17.3 % (n=14) and 82.7% (n=67) were subjected to operative and non-operative management, respectively. There was no correlation between CT scoring of liver injuries and surgical management (p=0.196). CT signs of active bleeding was noted in 20 patients (25%) and 30% (n=6) of these patients underwent operative treatment. The remaining 10% (n=2) of patients with active bleeding were embolized per interventional radiology (IR). One patient had IR intervention for a concomitant abdominal injury and one was treated surgically for a splenic injury. A total of 8 cases (13%) without CT-verified active bleeding (n=60) required surgery. There was no
statistically relevant correlation between CT-based active liver hemorrhage and subsequent operative treatment (p=0.102). The overall mortality of the study population was 2.5% (n=2). Mean HLOS was 11.2 ± 10.4 days.

Conclusions. The majority of the population-based liver injuries were minor or moderate and CT-scoring of liver injuries did not determine subsequent surgical management. There was no correlation between CT signs of active bleeding and operative treatment decision, although this result might rise from the limitation by cohort size. Further prospective studies are warranted.

**Challenges in correct diagnosis of acute appendicitis**
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Introduction. Acute appendicitis is the most common cause of acute abdominal pain requiring urgent surgery. But the diagnostic algorithms and role of imaging is still very variable among different regions and countries resulting in high variation of negative appendectomies from 6% to 30%. Choosing the right diagnostic strategy to diagnose acute appendicitis is important to keep the lowest negative appendectomies and false negative results rates.

Aims and Objectives. To present the results of two retrospective studies done in University Hospital Santaros Klinikos analysing diagnostic accuracy results before and after the application of new diagnostic algorithm of acute appendicitis using conditional computed tomography strategy and to compare their diagnostic accuracy, usage of diagnostic modalities, and the amount of negative appendectomies

Materials and methods. Two retrospective analyses of adult patients who were admitted in Emergency room at University Hospital Santaros Klinikos with suspected acute appendicitis were done: first study analysed group of 554 patients who from 2008 to 2013 underwent operation for suspected acute appendicitis before the new algorithm was established and the second study included group of 74 patients who were suspected for acute appendicitis in first three months after the establishment of new diagnostic algorithm. The results of both algorithms were compared and the positive and negative effects of new diagnostic algorithm were evaluated.

Results. In the first study inflamed appendix was found in 77.1% patients and the amount of NA was as high as 22.9%. Application of new diagnostic algorithm dramatically reduced the amount of NA to 0.0%, and increased the usage of imaging tools: ultrasound from 75% up to 100% and computed tomography from 3.4% up to 50%. Ultrasonography detected uninflamed appendix in 7% of cases, inflamed appendix in 43%, and in 50% of cases appendix was not detected. From all computed tomography scans applied using new diagnostic algorithm only 33% were positive for acute appendicitis and 19% had other pathological findings.

Conclusions. In the first study the amount of negative appendectomies dramatically differed from the results that were reached after the application of the new diagnostic algorithm. Although applying computed tomography scan in acute appendicitis diagnostic protocol reduces the amount of negative appendectomies, it increases exposure to ionising radiation, and taking in to account that potential patient population includes mostly young adults, some new alternatives should be searched.

**4th PARALLEL SESSION | MUSCULOSKELETAL RADIOLOGY**

**Shoulder MR – easy to report when You know what to look for**
Tatjana Vask, Aleksandr Samarin
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Shoulder MR is one of the most frequently carried out study in the field of musculoskeletal radiology – actually second after the knee in terms of joint imaging demand. There are well known changes related to various pathologic mechanisms, thus uptaking certain variances can still be challenging for a reporting radiologist. Specific athletic and occupational activities result in predictable injury patterns.
The aim of this lecture is to introduce a spectrum of pathologic findings and bring out concomitant silent lesions to the classical anterior/inferior capsulolabral lesion after traumatic anterior dislocation/subluxation in young active patients. Uptaking these possible concomitant pathologies may change management approach.

**Triangular fibrocartilaginous complex (TFCC). MR imaging of the traumatic tear**  
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Triangular fibrocartilage complex is a major stabilizer of the distal radioulnar joint (DRUJ). However, triangular fibrocartilage complex (TFCC) tear is difficult to be diagnosed on MRI for its intrinsic small and thin structure with complex anatomy. The purpose of this article is to review the anatomy of TFCC, state of art MRI imaging technique, normal appearance and features of tear on MRI according to the Palmar’s classification. Atypical tear and limitations of MRI in diagnosis, MR arthrography possibilities.

**Pain in The Hip – Sports Radiology – 3 Cases with Different Outcome**  
Klas-Goran Gravandera

After installing a Picker Ourlook (0,21T open MR), the ortopedic surgeons wanted help with three different racketplayers, who had pain in the hip, but normal X-ray. All had the same problem when taking a long step forward with the painful leg. They believed there was something wrong with the patient even the x-ray was normal. All three patient had pathology seen om MR, but not on X-ray.

Background. The ortopedic surgeons thought the patient had real pathology in the hip, even it not was seen on normal X-ray. They wanted to know if MR was a better modality for this kind of problem. In 1995 we had not so big experience in MR.

Method. We took them to the department, to see if MR could give us more information. We made sequenses in all three planes.

Result. We found a patient who showed sign of overuse of his hip, another patient with sign of anomali, that caused problem and a third patient with alarming findings of sarcoma.

Conclusion. Three young athletes with the same kind of problem had all different findings, not seen on X-ray. MR were helpful to have the right diagnose, so they could have the help needed and in one case it was life changing, so we found MR being a good method to find pathology in young athletes with real pain.

**Application of Magnetic Resonance Imaging and Computer Vision Technologies for Analysis of Knee Articular Cartilage Degeneration**  
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Introduction. Today there is a remarkable growth in the number of people with osteoarthritis(OA) in response to decreasing human physical activity. In osteoarthritis, the knee cartilage becomes thin, worn or torn. Therefore, the analysis of knee articular cartilage degeneration by magnetic resonance imaging data is very important. Magnetic resonance imaging (MRI) is used to analyze and display knee articular cartilage. A knee MRI scanning result contains a lot of information. A radiology technologist which uses simple (grayscale) images can see and analyze only small part of knee MRI scanning information. This small part of information hence technologist fails to make early osteoarthritis diagnostic. The aim of this work is to provide more information about knee soft tissues using computer vision technologies. Computer vision technologies allow to analyze all knee MRI scanning information. This analysis can be helpful for early osteoarthritis diagnostics.

Aims and Objectives. Ramifications of OA are very dangerous: limiting the range of movement, pain and other problems. It is therefore important to start, as soon as possible, treatment of OA. The early OA detection gives a
chance to completely cure osteoarthritis. The early OA detection is rendered difficult for a radiology technologist which uses simple (grayscale) images. The aim of this work is to help a radiology technologist make the right OA diagnosis by computer vision technologies. To reach this aim, it is useful to solve three problems: the visualization of a knee MRI scanning result - displaying the important information about knee cartilage for radiology technologist; the automatic/semi-automatic tissue segmentation - knee tissue segmentation for further analysis; the tissue analysis - get the quantitative information about knee tissues condition.

Materials and methods. Usually MRI scanning result is saved in the DICOM file. This file contains a knee image of signal intensities. This image of signal intensities is main source of information for the tissue analysis. The range of signal intensity values is very wide: from 0 to 6 000 (sometimes reaches 15 000). However, this image must be converted to display signal intensities on computer. The result of this conversion is a grayscale image. Grayscale image value is in the range from 0 to 255. Therefore, the grayscale image shows only a small part of knee MRI scanning information. However, it is possible to show more information about knee tissues by using colourful image. Colourful image values are in the range from 0 to 16 777 215. It is important to choose the most appropriate colour model, keeping in mind the human perception of colour. One of those appropriate colour systems is hue-saturation-value (HSV) colour model. Special visualization methods of a knee MRI scanning result can be useful for displaying signal intensities.

The automatic /semi-automatic tissue segmentation is important and complicated task. Tissue segmentation allows to make analysis of different tissues. This segmentation can be helpful for 3D reconstruction of knee tissue. Today there are many methods for segmentation: k-means clustering, watershed segmentation, active contour segmentation and other methods. It is possible to separate different tissues by using a combination of these methods. Each tissue type has unique texture. For this reason, knee tissue segmentation results could be improved by textural tissue features analysis. Textural tissue analysis can be performed by analyzing spatial frequencies, statistical characteristics, structural elements.

After tissue segmentation, it is possible to make separate tissue analysis. The analysis is based on physical and biochemical tissue features, biological information of knee structure. This type of analysis identifies the tissue anomalies, pathology. Therefore, it is possible to define knee articular cartilage degeneration by using quantitative information about knee tissues condition.

Results
- Experiments were performed with special visualization methods, aiming to look for cartilage degeneration by using HSV colour model. The results of those experiments showed that cartilage changes are seen better in the colourful image.
- Experiments were performed with k-means clustering and watershed segmentation. The results showed that some tissues are difficult to separate from each other. Therefore, additional textural tissue features analysis should be used.
- The results of separate tissue analysis showed that healthy patient has lesser dispersion of cartilage signal intensity values than patients with OA.

Conclusions. The above-mentioned methods and results can be useful for OA diagnosis, which allows starting treatment earlier and therefore reduces the risk of cartilage destruction.

Clinical and radiological result after meniscus implantation with Actifit polyurethane scaffold
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The purpose of the study was to follow up and compare patients subjective satisfaction and radiological findings two and three year after meniscus implantation with Actifit polyurethane scaffold.

The indication for meniscus scaffold implantation was symptomatic knee pain for a minimum of 6 months caused by subtotal removal of meniscus.

In all cases, standing long axis X-ray of both knees and and MRI were performed preoperatively. MRI was done before, 6, 12, 24 and 36 months after operation. The MRI examination was done in a 3T MRI-unit with 3D PD-FS series.

The scaffold signal changes, size, bone reaction, additional cartilage lesions and meniscus scaffold extrusion were studied. Clinical evaluation was done preoperatively, 24 and 36 months after the operation using KOOS, Tegner and Lysholme scores.
Improvement was reported in all clinical outcome scores between preoperative and 24 months and non-significant improvement between 24 and 36 months follow-up. MRI examination and clinical outcomes support the use of the polyurethane Actifit scaffold for the treatment of painful meniscal defects.

**Whole Body Low Dose Computed Tomography in comparison with Conventional Radiographic Skeletal Survey in the assessment of disease in Multiple Myeloma: radiological findings and radiation exposure in Vilnius University Hospital Santaros Klinikos**

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**Vilnius University Hospital Santaros Klinikos**

Introduction. Multiple Myeloma (MM) is a malignant neoplasm that affects primarily elderly patients. During the past decade, considerable progress has been made in the management of MM, prompting the International Myeloma Working Group (IMWG) to develop updated guidelines (Lancet Oncol 2014; 15: e538–48). The diagnostic process aims to distinguish between Monoclonal Gammapathy of undetermined significance (MGUS), asymptomatic (smoldering) MM, symptomatic MM, Solitary Plasmacytoma, and other plasma cell diseases based on the IMWG criteria.

Aims and Objectives. The aim of this pilot study was to optimise the scanning protocol of Whole Body Low Dose Computed Tomography (WBLDCT) and to compare its radiation dose with Conventional Radiography Skeletal Survey (CRSS) for the detection of osteolytic bone lesions and also to compare the sensitivities of both modalities in detecting said lesions in patients with MM.

Materials and methods. WBLDCT and CRSS were performed using established protocols for the first 13 patients with newly diagnosed MM. The effective radiation dose was calculated for each patient.

Our study protocol for unenhanced WBLDCT was performed on a 64-slices scanner (Light Speed VCT 64, General Electric) with the following acquisition parameters: tube voltage 120 kV; tube current auto mA (10-120 mA); collimation 40 mm (64 x 0,625 mm); pitch 0,98; slice thickness 3,75 mm and processing iterative reconstruction technique algorithm ASIR have been used. Images were reconstructed in 0,9 mm sections using filter Bone Plus and Soft. The mean dose and length product (DLP) was 285,2 mGy x cm (157,5–383,0) and the mean effective dose delivered by WBLDCT to each patient was 4,28 mSv.

Radiographs for CRSS were performed on a digital radiography system (Axiom Aristos MX, Siemens) of the following locations: skull (PA, LAT), cervical spine (AP, LAT), thoracic spine (PA, LAT), lumbar spine (AP, LAT), pelvis (AP), hips (AP), ribs (AP), lower extremities, and upper extremities. Exposure parameters for each patient were: average tube voltage 68,9 kV (67,6-70,4); average value for total product of tube current and exposure time was 361,7 mAs (127,0-611,0). The mean total dose and area product (total DAP) was 67,6 dGy x cm² (25,7-125,7) and the mean effective dose delivered by CRSS to each patient was 0,83 mSv.

The presence or absence of osteolytic skeletal lesions was registered for both WBLDCT and CRSS, and both methods were tested for difference in detection sensitivity with the McNemar test.

Results. The mean radiation exposure was 4,28 mSv for WBLDCT and 0,83 for CRSS. WBLDCT was not found to have a significantly higher sensitivity than CRSS (p=0,5) in detecting osteolytic skeletal lesions. CRSS overestimated bone involvement in 2 patients and underestimated it in none of the patients. WBLDCT found no bone involvement that was not seen in CRSS.

Conclusions. The mean radiation exposure of WBLDCT was within ranges reported by other similar studies, though probably could be optimised even further. The sensitivity of WBLDCT in detecting osteolytic bone lesions in patients with MM in our study did not prove to be higher than CRSS, even though it resulted this could be explained with a small study population and, perhaps, overdiagnostic tendencies in radiography. Further research with a bigger patient population and further WBLDCT dose optimisation is warranted.
Imaging of peripheral nerve tumours
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Nerve (sheath) tumours of the peripheral nervous system account for approximately one tenth of all soft tissue tumours. Malignant peripheral nerve sheath tumours form approximately 8% of all malignant soft tissue tumours. In this presentation typical imaging findings of common nerve tumours will be presented. Although the malignant nerve tumours are rare, when compared to some of the benign nerve sheath tumours (e.g. neurofibromas and schwannomas), it is important for the radiologist to recognise the features suggestive of malignancy.

4th PARALLEL SESSION | MANAGEMENT RADIOLOGY, RADIATION PROTECTION AND MEDICAL PHYSICS

Radiologists as communicators, a prerequisite for patient empowerment
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Patient empowerment is one of the key elements of patient-centered healthcare. (EPF 2017). Patient empowerment requires that patients have enough information to make decisions concerning their own health. (Miller 2013) Nowadays, in most subspecialties a technologist performs the imaging procedure. The radiologist has become invisible to the patient. PACS and teleradiology have further reduced contact between radiologists and their patients. (Glazer 2011) In popular media and television shows, radiology is prominently present, but radiologists are much less. (Bosmans 2016) A survey among 1146 patients has shown that patients are even ill-informed as to the question whether radiologists are medically qualified and enjoy all the privileges thereof. (Bosmans 2016) Despite this, most patients find radiologist consultation beneficial. Patients are comfortable hearing results from the radiologist. (Pahade 2012) Many patients would also like to view their images and receive copies of their reports, potential avenues through which radiologists could add value. (Cabarrus 2015) Patient empowerment requires a better understanding of the role of radiologists. Radiologists must develop strategies to become visible and attainable for consultation. Different population subgroups necessitate specific information strategies. (Bosmans 2016) Initiatives to improve communication, both by radiological societies such as ESR and RSNA and at local institutions, are ongoing. Despite that, it remains essential to create more awareness among radiologists, and think of innovative strategies to reach patients and the public.

International programme in Master of Advanced Studies in Medical Physics. Personal experience
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The Master of Advanced Studies in Medical Physics is a two-year advanced training programme run jointly by International Centre for Theoretical Physics (ICTP) and the University of Trieste, started from the year 2014. The programme is mainly designed to provide young, promising graduates of physics or of similar related fields (mainly from developing countries) with postgraduate theoretical and clinical training so that they may be recognised as clinical medical physicists in their home countries. The first year of the programme comprises a year of basic and advanced theoretical courses and practical sessions prepared with the assistance of experts from Trieste Hospital, AIFM (Italian Association of Medical Physics), EFOMP (European Federation of Medical Physics) and IAEA (The International Atomic Energy Agency). The second year of the programme is dedicated to professional clinical training in a medical physics department of a hospital in the programme’s training network with respect to the student specialization field (radiology, radiotherapy or nuclear medicine). In addition to course examinations, the Master of Advanced Studies in Medical Physics requires students to work on a thesis work to be submitted and defended during the last month of the programme. At the end of the programme, successful graduate will be awarded with the master's degree by the University of Trieste. This programme has been also accredited by the International Organisation for Medical Physics (IOMP).
Creating of diagnosis – based CT protocols
Ilze Apine

During the last three decades, the technology of computed tomography (CT) has evolved considerably providing faster imaging thus giving opportunity to perform imaging of fast moving structures as well as improving temporal and spatial resolution. However, the price of these achievements can be increased radiation dose to patients. Justification is the first step in reducing exposure doses, but apart from a number of technical options, CT protocols adapted to certain indications can also make a significant contribution to reducing the dose of radiation exposure. In this lecture basic principles on adjustment of CT protocols tailoring its settings to clinical diagnosis will be given based on the novelty cultural trend in diagnostic imaging and patient safety- ‘quality enough for diagnosis’ instead of ‘perfect’ image. In the presentation suggestions will be given how to realize this conception practically along with examples on diagnoses and clinical situations at which this principle can be achievable without reducing diagnostic information.

Workflow in teleradiology of the Tartu University Hospital
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The basis of teleradiology in Estonia is the All-Estonian Picture Archive (PACS) which was founded by Estonian biggest hospitals – the Tartu University Hospital and the North Estonia Medical Centre in 2006. In this nationwide picture archive all radiological patient investigations, such as ulytrasonography, x-rays, CT, MRI, etc, are stored. The study in PACS includes medical images, dose reports and reports of radiologists. This archive has opened new era not only in radiology but for all the clinicians who have access to the studies and reports in this database. The PACS has open also the possibilities to teleradiology. The most important in teleradiology is standardized exchange of information between the hospitals. The hospital information system is configurated so that this sends the report request of the investigation to the hospital information system of the reporting hospital. The report request contains also the relevant clinical information and important data about how the study was performed. The radiologist of the reporting hospital can see the investigation in the workflow of the radiological information system. If there is an urgent need for report and during night time the referring hospital must make a call to be sure that the urgency of the report has been understood by the reporting hospital. The report will be stored in the radiological information system of the reporting hospital and will be sent back to the referring hospital as well as to the PACS. From PACS all the referring clinicians and also other possible consultants can evaluate the images and read the report to make clinical desicions.

In 2017 radiologists of the Tartu University Hospital compiled radiological reports for 14 hospitals and the other medical institutions in Estonia. In 2009, 15626 investigations were telerported by the Tartu University Hospital, in 2017 the number was increased four times by 67940 investigations. Teleradiology is a growing technology that improves patient care by allowing radiologists to provide services without actually having to share the location of the patient and making available the quick report in urgent cases. Teleradiology allows well-trained experienced radiology specialists to be available 24/7 for all hospitals of the region.

Changes in the use of CT investigations in children in the Tartu University Hospital
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Introduction. The number of computed tomography (CT) procedures has been steadily increasing. While the number of x-ray examinations as a percentage of all radiological procedures is decreased from 52 to 32% in the Tartu University Hospital during the last10 years, the number of CT investigations is increasing. In 2008 was in Tartu University Hospital in CT investigated 16260 patients, in 2017, 25085 patients (54% more). Furthermore, doses of CT examinations are typically many-fold (up to 1000 times higher) than patient doses in conventional plain film radiography, therefore the contribution of CT investigations to the total population dose from all x-ray procedures has increased significantly.
Doses to paediatric patients are of particular concern because children are more sensitive to radiation and have a longer life expectancy: the total risk of the youngest patients is about three times higher than the risk of the whole population.

In 2011, the Nordic study led by Hannu Järvinen (Finland) collecting radiation doses and referral data in CT investigations of children was performed. After the study the strict referral guidelines in CT investigations of children were introduced in the Tartu University Hospital which allowed to study only acute cases in CT. If clinically possible, the children were investigated with magnetic resonance imaging.

The aim of the study was to collect patient dose and referral data in paediatric CT examinations and to compare these data with previous investigation in 2011.

Methods. The data about radiation dose, information about the referral diagnosis, speciality of the referral physician, and the study type were evaluated prospectively in children below 17 years of age in the Tartu University Hospital between the period of 1.11.2011-10.08.2012 and 01.01.-31.12.2017.

Results. Although the number of patients has increased from 21272 to 25085 (18%) during the study period, the number of CT investigations in children has been decreased from 352 patients in 9 months in 2011/2012 to 160 in 2017 (p< 0.0001, OR=2.6 95%CI: 2.2-3.2). The CT investigations of head have decreased from 87.8% to 63.8% of all investigations (p<0.0001, OR=4.1 95%CI: 2.6-6.4). The number of CT investigations of chest and abdomen in children show no significant difference during the study period. Usually only one most important serie was used and contrast enhancement was needed in 18 patients in 2011 (5% of the patients) and in 13 patients in 2017 (8% of the patients). Only one body region was investigated in 86% of patients in 2011 and 89% in 2017.

Conclusions. The use of CT in children has decreased in the Tartu University Hospital, while the number of CT investigations steadily increases. The number of head CT investigations but not chest and abdominal investigations are significantly decreased. Radiologists have an important influence in changing the management of young patients in CT.

Dose excellence program in “Affidea Lithuania”

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Introduction. CT is a diagnostic imaging technique that utilises X-ray radiation to produce detailed images of internal structures of the body. Affidea has launched a company-wide Dose Excellence Campaign to minimise radiation dose levels and make CT scans as safe as possible.

Aims and Objectives. Dose excellence program (DEP) was implemented in Affidea Lithuania during 2016-2017 year. The aim of DEP was to standardise, optimise and monitor all CT protocols in Affidea Lithuania centres.

Materials and methods

Comprehensive team consisting of radiographer, radiologist and medical physicist was established in 4 Affidea Lithuania departments with CT. During first stage of DEP all protocols were standardised and monitored dose per protocol. In second phase protocols with dose above acceptable level were optimised.

Results. Decrease of the dose up to 40% in particular protocols.

Conclusions

• Rigorous CT exam quality controls, tracking patients’ dose and checking cumulative dose provide insightful, actionable information to adjust dose settings.
• CT protocol parameters can be optimised by comprehensive team work to deliver the lowest radiation dose to the patient without compromising image quality.
Stroke diagnostics in the new era of thrombectomy
Rudiger von Kummer

In 2015, 20 years after the approval of intravenous (IV) alteplase as treatment of choice for ischemic stroke, the publication of 5 successful controlled randomized trials (CRTs) on thrombectomy in ischemic stroke patients has opened a new era of ischemic stroke management. The era of IV alteplase was characterized by dogma and myth. A myth was that almost all ischemic stroke patients would benefit from IV alteplase irrespective of their arterial pathology and it became soon a dogma that treatment with alteplase beyond 3 or 4.5 hours after stroke onset would mean treatment failure and an increased risk for symptomatic brain hemorrhage. The time period from stroke onset was accepted as surrogate for ischemic brain pathology. A pooled analysis of all participants of CRTs on the effect of alteplase in ischemic stroke patients (N=6756) finally showed, however, a significant effect of alteplase on excellent functional outcome (modified Rankin Score, mRS 0-1) lasting for more than 5 hours with a very modest average effect size (excellent functional outcome after alteplase and placebo in 34% and 29% of patients, respectively), but a significantly increased risk for fatal intracranial hemorrhage in the alteplase group that was not affected by the time to treatment delay (Emberson et al. Lancet 2014).

In contrast to the era of IV thrombolytics, endovascular treatment with thrombectomy (EVT) requires the diagnosis of the primary target, the thrombo-embolic occlusion of major brain supplying arteries. This is non-invasively feasible with non-enhanced CT and CT- or MR-angiography. A meta-analysis of individual patient data from the first 5 CRTs (Goyal et al., Lancet 2016) showed that EVT doubles the chance of excellent functional outcome (mRS 0-1) in almost all subgroups of patients. So far no subgroup was identified in which EVT increases the risk for symptomatic hemorrhage, disability, and death. New CRTs have shown that EVT is effective even at late time-windows. This is the era of a pathology orientated ischemic stroke treatment.

Head and spine Injuries in polytrauma patients. Radiological assessment and questions to be answered
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Introduction. Polytrauma is a term used to describe acute trauma patients with two or more severe injuries in at least two areas of the body that endangers the life of the injured person. The management of head and spine injured patients with polytrauma is one of the most challenging and difficult clinical issues in trauma critical care. The treatment of other injuries, such as thoracic, abdominal, pelvic blunt trauma and orthopaedic fractures, has the potential for worsening the neurologic outcome because additional surgery with potential blood loss, hypotension and hypoxia can severe adversely affect injured brain. The overall approach to the head and spine injured polytrauma patients should be aggressive and timely treatment of the primary injury for avoidance of secondary injury.

Aims and objectives. To study the frequency and type of head and spine injured polytrauma patients depending on the type of injury, gender, and age. To establish the MDCT protocol and determine its usefulness, advantages and limitations in acute polytrauma patients with head and spine injuries. To define additional MRI indications and role in acute head and spine injured polytrauma patients.

Materials and methods. 618 consecutive polytrauma patients within one year at the Department of Emergency Radiology, Riga Eastern Clinical University Hospital were examined according established standard MDCT protocol including head, neck, thorax to pelvis and legs regions, if necessary. Post-processing of images, radiographic assessment and analysis of head and spine injuries were performed.

Results. Severe head and/or spine injuries were found in 248 patients (41%), of them head 38%, spine 45%, head and spine 17%. In head trauma skull fracture with haemorrhage 44%, penetrating injuries 6%, subarachnoid haemorrhage 68%, intraparenchymal haemorrhage 45%, subdural hematomas 43% epidural hematomas 4%, DAI 8%. Unstable spinal fractures with spinal canal stenosis 14%, of them lumbar 71%, thoracic 24%, cervical 5%.
Conclusions. MDCT is the imaging modality of choice in head and spine injured polytrauma patients that help in selection of optimal management protocol. Additional MRI may be necessary in the diffuse axonal injuries of the brain, spinal cord, spinal ligaments and paraspinal hematomas verification. The basic diagnostic questions that need to be answered early in the head and/or spine injured polytrauma patients are to diagnose traumatic abnormality and characterize the type of injury; does the injury need immediate surgery or in the near future, or is this an injury not likely to need surgery? In spinal trauma the rational of imaging is to estimate potential spinal instability, the state of spinal cord and surrounding structures.

**Acute extracranial arterial dissections**
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Acute carotid and vertebral arterial dissections are among the causes of stroke and is a leading cause of stroke for younger patients groups. Among the others, external neck manipulations, blunt trauma, connective tissue disorders and hypertension outstand as the major causes of arterial dissection. Acute onset of dissection usually presents in symptoms such as headache, transient episodic blindness, neck swelling, loss of coordination, pulsatile tinnitus, focal weakness and others. Following a physical examination, radiological examination takes a major role in diagnosing dissections. As a conventional angiography stands as a gold standart, in many situations MRI/MRA or CTA are deployed as a routine diagnostic tool. US in many cases can be a powerful extention of a physical examination, depending only on the examiner skills. Controversies rise in such patients treatment: depending on the vessel and its’ level stand alone medication, endovascular treatment or a combination of previous two can lead to succesfull results, non the less there is no consensus for the best choice of treatment. We include cases illustrating the pathology.

**Radiological evaluation of neurosarcoidosis. Leptomeningeal, vascular and parenchymal findings in patients with histologically proven systemic sarcoidosis**
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Introduction. Sarcoidosis is idiopathic disseminated systemic disease characterised by tissue granulomatous infiltration. More often it presents between the ages of 20 and 40 years and is prevalent among African Americans and Northern Europeans. It can affect any organ system, but most commonly involves lungs, lymph nodes, skin and eyes. Central nervous system involvement (CNS) in post-mortem studies is about 15-25%, but this is less than imaging findings (10%) and symptomatic CNS involvement (5%). It is estimated that less than 1% of patients have isolated CNS involvement. Disease aetiology and pathophysiological mechanisms remains elusive but it is thought to represent as autoimmune response to a yet unidentified antigen. The characteristic lesion of sarcoidosis is epithelioid cell granuloma with minimal or no necrosis. Post-mortem studies demonstrated that in the CNS perivascular and vessel wall granulomas were the dominant component and therefore CNS involvement is presumably haematogenous, given the preferential perivascular distribution and absence of a well-defined intracranial lymphatic system. Post-mortem studies have also report perivascular connective tissue involvement, mostly along the basal meninges, brain sulci and deep brain substances. Brain parenchymal involvement typically occurs from extension of granulomatous inflammatory exudates along Virchow–Robin spaces. In addition, granulomatous invasion of the blood vessel walls is frequent, with vasculitic disruption of the media and intima causing stenosis or occlusion and small arterial perforators are most frequently affected. The gold standard in diagnosing neurosarcoidosis would be histopathological confirmation, which is rarely performed due to its invasiveness and the diagnosis must be inferred through other tests, including magnetic resonance imaging (MRI). Making a diagnosis of neurosarcoidosis on MRI can be difficult and typical findings are quite variable. These include leptomeningeal and dural involvement, cranial nerve involvement, contrast non-enhancing and enhancing parenchymal lesions with different distribution, perivascular involvement, parasellar and cavernous sinus involvement, hydrocephalus, ischemic lesions.

Aims and Objectives. To characterize intracranial leptomeningeal, vascular and parenchymal MRI findings in patients with histologically proven systemic sarcoidosis and neurological complaints.
Materials and methods. We reviewed medical records of patients who underwent treatment for sarcoidosis at the Riga East Clinical University Hospital over the period of five years (2012 – 2017).
In a retrospective study were included patients according to the following criteria:
1) biopsy proved systemic sarcoidosis
2) neurological complaints
3) MRI findings suspecting neurosarcoidosis.
Twenty-nine patients met the criteria and totally 71 primary and follow-up MRI were done, all of which included contrast-enhanced sequences. All MRI were performed at a field strength of 1.5T with a standard protocol.
The patients were divided into seven groups according to imaging manifestations, which included dural meningeal involvement, leptomeningeal involvement, non-enhancing brain parenchymal lesions, enhancing brain parenchymal lesions, cranial nerve involvement, perivascular spaces and cavernous system involvement. The results of the clinical and MR examinations performed after treatment were reviewed, when available, and compared.

Results. The median age at the time of diagnosis with neurosarcoidosis was 44 years with a range of 21 to 65 years, and 23 (79%) patients were female. Leptomeningeal enhancement with small granulomas were the most common imaging finding present in 27 patients 93%; followed by cranial nerve enhancement in 21 patients (72%). 11 patients (38%) had dural involvement and 5 (17%) patient had also pathological cavernous sinus thickening. Non-enhancing parenchymal lesions were present in 18 patients (62%), 55% of them were subcortically based, 24% periventricular distribution and only 14 % were found on basal ganglion region. Contrast enhancing lesions were found in 3 patients (10%). Pathological enhancement along perivascular spaces in basal ganglia region were seen in 8 patients (27%)

Conclusions. Regarding to our study central nervous system involvement most frequently affects the leptomeninges and cranial nerves, though the brain parenchyma, perivascular spaces and pachymeninges may also be involved. This study characteristically show granulomatous meningitis predominantly involving the basal meninges, with frequent perivascular and parenchymal involvement, that correspond the histopathology data about disease haematogenous and lymphatic spread.

Anatomical brain structure segmentation using convolutional neural networks
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Introduction. Brain magnetic resonance imaging (MRI) post-processing tools can facilitate the workflow of a radiologist as well as increase the accuracy of diagnostics by providing various quantitative and qualitative measurements. A tool for anatomic segmentation of brain MRI images could be used for diagnostics and progression tracking of various diseases that present with brain atrophy (i.e. Alzheimers, MS, others). If combined with pathological structure segmentation (i.e. lesions) it could be used as a diagnostic tool that provides the radiologist with extensive information about the pathology and its anatomical context.

Aims and Objectives. We aimed to build a convolutional neural network model for segmentation of 87 different anatomical structures of the brain using T1 head MRI scans.

Materials and methods. We used a database of n=211 T1 head MRI scans downloaded from „Human Connectome Project” database. Segmentation maps for training of the model were created using Atlas segmentation software with additional relabelling by a radiology resident. A single mask region based convolutional neural network model (Mask R-CNN) was used to construct a model for T1 head MRI segmentation.

Results. Our model was able to reach an average dice coefficient of 0.91 throughout 87 classes. A list of dice scores for all classes: Brainstem: 0.85, Cerebellum: 0.87, Insula (gm): 0.94, Insula (wm): 0.88 Ventricular System : 0.88, White matter (cerebrum): 0.85, amygdala (gm): 0.95, amygdala (wm): 0.99, angular gyrus (gm): 0.89, angular gyrus (wm): 0.9, anterior orbito-frontal gyrus (gm): 0.93, anterior orbito-frontal gyrus (wm): 0.94, basal forebrain: 0.96, caudate nucleus: 0.95, cingulate gyrus (gm): 0.86, cingulate gyrus (wm): 0.79, claustrum: 0.94, cuneus (gm):
0.89, cuneus (wm): 0.89, fusiforme gyrus (gm): 0.86, fusiforme gyrus (wm): 0.87, globus pallidus: 0.96, gyrus rectus (gm): 0.91, gyrus rectus (wm): 0.93, hippocampus (gm): 0.92, hippocampus (wm): 0.89, inferior colliculus: 0.97, inferior occipital gyrus (gm): 0.90, inferior occipital gyrus (wm): 0.91, inferior temporal gyrus (gm): 0.86, inferior temporal gyrus (wm): 0.86, lateral geniculate nucleus: 0.97, lateral orbitofrontal gyrus (gm): 0.90, lateral orbitofrontal gyrus (wm): 0.94, lateral ventricle: 0.93, lingual gyrus (gm): 0.91, lingual gyrus (wm): 0.91, mammillary body: 0.99, medial geniculate nucleus: 0.98, middle frontal gyrus (gm): 0.88, middle frontal gyrus (wm): 0.87, middle occipital gyrus (gm): 0.89, middle occipital gyrus (wm): 0.89, middle orbito-frontal gyrus (gm): 0.93, middle orbito-frontal gyrus (wm): 0.94, middle temporal gyrus (gm): 0.86, middle temporal gyrus (wm): 0.85, nucleus accumbens: 0.97, paracentral lobule (gm): 0.93, paracentral lobule (wm): 0.94, parahippocampal gyrus (gm): 0.90, parahippocampal gyrus (wm): 0.88, pars opercularis (gm): 0.89, pars opercularis (wm): 0.92, pars orbitalis (gm): 0.91, pars orbitalis (wm): 0.93, pars triangularis (gm): 0.89, pars triangularis (wm): 0.91, post-central gyrus (gm): 0.84, post-central gyrus (wm): 0.85, posterior orbito-frontal gyrus (gm): 0.93, posterior orbito-frontal gyrus (wm): 0.95, pre-central gyrus (gm): 0.86, pre-central gyrus (wm): 0.86, pre-cuneus (gm): 0.87, pre-cuneus (wm): 0.85, putamen: 0.95, subcallosal gyrus (gm): 0.98, subcallosal gyrus (wm): 0.99, superior colliculus: 0.98, superior frontal gyrus (gm): 0.88, superior frontal gyrus (wm): 0.88, superior occipital gyrus (gm): 0.88, superior occipital gyrus (wm): 0.91, superior parietal gyrus (gm): 0.86, superior parietal gyrus (wm): 0.86, superior temporal gyrus (gm): 0.89, superior temporal gyrus (wm): 0.88, supramarginal gyrus (gm): 0.89, supramarginal gyrus (wm): 0.91, temporal pole (gm): 0.91, temporal pole (wm): 0.94, thalamus: 0.96, third ventricle: 0.92, transverse frontal gyrus (gm): 0.89, transverse frontal gyrus (wm): 0.92, transverse temporal gyrus (gm): 0.92, transverse temporal gyrus (wm): 0.93.

Conclusions. We have created a convolutional neural network model for exhaustive segmentation of T1 head MRI scans with an average dice score over 0.9. After additional validation and expansion of the training size this model could serve as a valuable tool for a faster and more accurate evaluation of T1 head MRI scans.
POSTER PRESENTATIONS

The abstracts are arranged by congress themes in alphabetical order.

BREAST RADIOLOGY

Diagnosis of Women with Breast Cancer Aged 65 and Above
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Introduction, Breast cancer incidence in women increases with age, while survival rates decrease. Diagnosis of the elder patient with breast cancer is complicated by inadequate representation of this group. Breast cancer is a disease in which abnormal cells in the breast tissue multiply and form a tumour. Breast tissue consists mainly of fat, glandular tissue, milk ducts and connective tissue. In the majority of invasive breast cancers, the tumour begins in the lining of the milk ducts. If undetected, these rogue cells may also spread to other parts of the breast, the lymph nodes under the arm, and to other parts of the body. Prevention of breast cancer in older women has primarily focused on chemoprevention strategies. Traditional breast cancer risk factors including early menarche, family history of breast cancer, late age at birth of first child, late menopause, and a history of benign breast disease are factors that have been defined in the general population but that cannot be altered in the elderly patient.

Aims and Objectives
To show the role of mammography in Diagnosis of Women With Breast Cancer Aged 65 and Above

Materials and methods
To show the role of mammography in Diagnosis of Women With Breast Cancer Aged 65 and Above

Results
At 21% (315) of the patients are found normal findings, at 46.4% (696) are found fibrocystic dysplasty, at 6.1% (91) are found cysts and fibroadenomas, at 4.1% (62) are found inflammations, at 3.6% (54) are found breast cancer and at 18.8% (282) are found other diseases. In 7 patients older than 65 years was diagnosed with breast cancer.

Conclusions
The survival of women with breast cancer aged 65 and above was affected negatively by age at diagnosis, clinical stage, and the presence of comorbidity. Early diagnosis also is very important for elderly women.

Invasive Lobular Breast Cancer on Ultrasound - Show me the lesion!
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Centro Hospitalar Barreiro Montijo, E.P.E.

Introduction
Breast cancer is the most common female cancer in the developed world and accounts for 25%-30% of all new cancer diagnoses in the women. Invasive lobular cancer is the second most frequent subtype after invasive ductal cancer, accounting for 8%-15% of cases. The incidence of invasive lobular cancer has been steadily increasing since 1987 while rates of IDC have remained relatively constant.

Due to its morphology and growth pattern, invasive lobular cancer often does not in result mass lesions on imaging and can be challenging to diagnose both clinically and radiologically.

Aims and Objectives
Present the clinical and pathophysiological features of invasive lobular cancer and some of its characteristics on ultrasound imaging.
Materials and methods
Through a pictorial review of illustrative and informative cases with histological confirmation of invasive lobular cancer, we present and describe its most characteristic imaging findings on ultrasound.

Results
The medical history, physical examination and imaging findings have a paramount importance in order to accurately diagnose the presence of invasive lobular cancer.

Conclusions
The evaluation of invasive lobular cancer requires an important degree of suspicion and expertise by the radiologist performing the ultrasound examination, in order to identify the most clinically significant imaging findings that suggest the diagnosis.

Individual approach in the complex diagnosis of mammary glands in the age group 40-49 years
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Central Military Clinical Hospital

Introduction
Despite many studies, there is no common opinion on the age and the range of screening for breast cancer in women aged 40-49.

Recommendations in this group are different
Younger women tend to have breast tissue of such a density that it could be difficult to identify some abnormalities on a mammogram. Breast cancers in younger women grow faster compared with older women. It means that mammography in younger women should be done every 1-2 years which allows to diagnose breast cancers as early as possible increasing the survival.

Aims and Objectives
A retrospective analysis of complex diagnostics of the mammary gland in women (age group 40-49 years) with the use of bilateral x-ray mammography, ultrasound and further verification of the diagnosis with the help of minimally invasive diagnostic methods (fine-needle and trepanobiopsy) was held.

Materials and methods
Bilateral mammograms with two standard projections (Senographe 700 T), ultrasound examination of breast (ultrasound scanner Medison SonoAce) was carried in 216 women (age 40-49) without the symptoms or suspicion on breast cancer.
All women directed to screening answered a questionnaire for the group of risk. Based on the results of the mammography and ultrasound study, further follow-up was carried out if necessary with the verification of changes in the mammary gland. Further follow-up was performed depending on the primary data of the study (taking into account the density of the breast parenchyma, the revealed pathology) and taking into account the risk factors.
Results
The results of the study were analyzed: 38 patients had relatives of first line with the breast or ovarian cancer), 112 had other risk factors (mastopathy and other diseases of the mammary glands, lack of breastfeeding, gynecological pathology, the use of hormonal contraceptives or hormone replacement therapy, etc.). 12 women refused from MMI and ultrasound of the mammary glands was performed after the questionnaire.
In 39 cases, after mammography there was a necessity for ultrasound examination due to high density of the breast parenchyma (ACR-c, d) and low sensitivity of MMI. In 72 cases there was a need for additional ultrasound examination in connection with the changes detected at MMI (in 70 women, the pathology was confirmed by ultrasound examination: in 35 cases - fibrocystic transformation, in 27 - formations of fibroadenosis. In 7 cases fibroadenomas, post-operative complex cysts were detected.
23 women underwent ultrasound guided biopsy under the control of ultrasound to verify changes in the mammary gland (in the case of PGZ: 7- ductal adenocarcinoma, 12 - fibroadenosis, 8 - fibroadenoma, 4-complex cyst). Taking into account the data of the primary examination and risk factors, further observation of patients was suggested.
High-risk women were advised mammography once a year, with a control examination for ultrasound in women with dense parenchyma of the breast, with the revealed pathology of the mammary gland (fibrocystic
transformation, complex cysts, fibroadenomas) ultrasound observation was suggested 1 time per 6 months; 2 women in the high risk group were advised to undergo mammography once a year. Women with moderate risk and dense parenchyma of the breast were advised to have an ultrasound scan every year with mammography screening every 2 years.

Conclusions
Considering the rather high risk of rapid development of breast cancer pathology in group of women aged 40-49, individual approach to diagnostic is necessary taking into account density of breast parenchyma, concomitant pathology and risk factors.

EMERGENCY RADIOLOGY

Imaging of polytrauma patients in Vilnius region: experience and new trends
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Introduction
Significant injuries affecting more than one body region usually result from high energy impact to the body, consequently, road traffic crashes are the most common predominant causes of severe injuries in Europe. Polytrauma can be defined as significant injury in at least two out of the following six body regions: head, neck and cervical spine; face; chest and thoracic spine; abdomen and lumbar spine; limbs and bony pelvis; external (skin). Multidisciplinary teamwork approach, polytrauma protocols and guidelines improve survival in polytrauma patients, as well as immediate and accurate assessment and therapy of possible life-threatening lesions. In recent years whole-body CT is progressively replacing conventional radiography and US in the initial assessment of polytrauma patients.

Aims and Objectives
- To introduce polytrauma imaging protocols used in Vilnius region
- To elucidate the role of early and fast diagnostic imaging in patients after severe trauma
- To highlight the importance of modern ultrasound and rational use of FAST protocol
- To present currently worldwide accepted protocols for polytrauma CT imaging and selection of trauma patients

Materials and methods
We have two major trauma centers in Vilnius region: “Vilnius university hospital Santaros Klinikos” (VUHSK) and “Republican Vilnius university hospital” (RVUL). Our standard approved examination of severe trauma patients is composed of ATS guidelines. It consists of a primary survey, where E-FAST and cervical spine, chest and pelvis x-rays are performed and a secondary survey, which consists of ultrasound and CT (selective or whole-body). In RVUL there is possibility to perform LODOX scan- which is a whole body x-ray scanner adopted for polytrauma patients. Whereas in VUHSK there is possibility to perform a contrast enhanced ultrasound examination.

Results
In ultrasound examination techniques differ in various clinical situations. In hemodynamically unstable patients we perform E-FAST examination asap to evaluate free abdominal fluid or air as well as fluid in pleural cavities. In hemodynamically stable patients primary role of ultrasound is to select patients who require CT examination. Ultrasound has a low sensitivity for parenchymal lesions: normal ultrasound examination does not exclude a possible parenchymal injury. Observing patients for 12 hours assists in excluding life-threatening injury, otherwise a CT examination should be performed.

There are a few differences in our trauma centers regarding the usage of CT for polytrauma patients. New biphasic whole body CT is adopted from Camp bastion (Graham RN. Battlefield radiology. Br J Radiol. 2012;85(1020):1556-65) and CT is performed more frequently in VUHSK, while in RVUL there are more selective CT scans performed due to surgeons request. There are wide discussions concerning the of usage of whole-body CT, including, when it is necessary and how it should be performed, in literature, and so far no clear consensus
exists. New information came to light after REACT 2 trial, in which no differences were observed comparing standard protocol and right-to-CT protocol.

Conclusions
- There are different tactics in managing a polytrauma patients depending on patient condition as well as medical institution experience. Latest publications show no significant difference in standard or whole-body-CT in patients survival or outcome rates.
- Ultrasound plays a key role in hemodynamically unstable patients detecting free fluid. It cannot reliably exclude a parenchymal injury, therefore, a CT scan must be performed for selected patients.

Addressing the Elephant in the Womb – Sonographic Evaluation of the Female Pelvis in the Emergent Setting
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Sonography remains the study of choice when acute female pelvic pathology is suspected. Clinical signs of acute pelvic pathology are non-specific; consequently, imaging performs a paramount role in evaluation. Knowledge of the specific imaging features are crucial to aid in diagnosis, recommend appropriate imaging follow-up, and guide management.

This pictorial review is designed for trainees, general and abdominal radiologists, and non-radiology participants. The goals are to describe the imaging features of a variety of pelvic pathologies with pathological correlation from our patient database.

1. Transabdominal and transvaginal sonographic technique including grayscale, M-mode, color, spectral, and power Doppler, and 3D ultrasound, with practical troubleshooting strategies
2. Normal sonographic appearance of the female pelvis
3. Multimodal imaging characteristics of emergent pelvic pathologies including: ovarian torsion, tubo-ovarian abscess, ruptured/hemorrhagic cyst, endometrioma, ectopic pregnancy, abortion, malpositioned IUD, endometritis, ovarian and endometrial malignancy, appendicitis, and hemoperitoneum

Representative Figures

**Figure 1:**

![Image A](image_a.png)

![Image B](image_b.png)

![Image C](image_c.png)

![Image D](image_d.png)
Sonographic images utilizing grayscale (Fig A) and color Doppler technique (Fig B) demonstrating an enlarged right ovary without vascular flow identified and periovarian free fluid in keeping with ovarian torsion.

Separate patient with an enlarged left ovary and periovarian free fluid (Fig C) without vascular flow (Fig D) and a twisted vascular pedicle (arrow) in keeping with ovarian torsion.

Figure 2:

Sonographic image demonstrating an extrauterine gestational sac in the left adnexa separate from the left ovary with M-mode (Fig A) demonstrating a fetal pole with a heart rate of 140bpm. Color Doppler image (Fig B) demonstrates a vascular ‘ring of fire’ appearance with findings in keeping with a live ectopic pregnancy.

Figure 3

Tubal Abnormalities

Sonographic images demonstrating a tubular structure in the right adnexa (Fig A and B) containing septa (arrows) in a patient with pelvic pain. Coronal T2-weighted FSE MR images confirm a corresponding septated T2-hyperintense structure (arrow) with findings in keeping with a hydrosalpinx.

Sonographic image of a separate patient (Fig C) demonstrating a multiseptated tubular structure in the right adnexa with increased vascular flow in a febrile patient. Sagittal contrast enhanced CT image (Fig D) confirms a multiseptated mass (asterisk) with an enhancing wall and reticulation (arrows) of the surrounding fat in keeping with a tubo-ovarian abscess.
Ovarian Cystic Lesions

Fig A: Cystic structure containing lace-like internal echoes in keeping with a hemorrhagic cyst

Fig B: Cystic structure with hyperechoic mural nodules with posterior acoustic shadowing in keeping with a mature cystic teratoma (dermoid)

Figs C and D: Large cystic ovarian structure with thickened internal septa and mural nodularity (arrow) on sonographic examination in a patient with pelvic pain with findings confirmed as a multi-septated T2-hyperintense mass with mural nodularity on T2 fat saturated FSE MRI examination with pathology demonstrating a serous cystadenocarcinoma

Figure 5

Sonographic images (Fig A and B) demonstrating thickened tubular structure (bracket) with internal echogenic foci with dirty shadowing (arrows). Axial contrast enhanced CT image (Fig C) demonstrates a dilated appendix (arrow) with mucosal enhancement moderate surrounding free fluid (dashed arrows) and foci of intraluminal gas in keeping with acute appendicitis.
Optimisation of CT scanning protocols for polytrauma patients
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Introduction
Traumatic injuries are one of the top ten causes of death in all race/sex groups, and the main reason in children and young adults (1-45 years of age). (1) The cut-off values for polytrauma defining parameters, such as Injury Severity Scores (ISS) vary between 16 - 25 and sometimes require additional data (such as two or more injured body regions, high Abbreviated Injury Score (AIS)). (2) The severity and high mortality in polytrauma patients (PP) requires quick, standardized and organized care protocols, hence the implementation of Advanced Trauma Life Support (ATLS) guideline in clinical practice. The first steps of emergency care are clinical evaluation, chest X-ray and Focused Assessment with Sonography in Trauma (FAST). The necessity for organ-specific computed tomography (CT) is determined individually, based on preliminary data.(3,4)

CT imaging has become critical in emergency diagnostics to the point where whole body CT (WBCT) scans are being recommended as a main diagnostic tool for PP. (5) However, with the widespread use of CT scans, especially contrast enhanced or WBCT scans, problems (such as unnecessary health risks for the patients and irrational workload for the personnel), and ways of protocol standardization need to be assessed. (6–8)

Aims and Objectives
The aim of this study was to evaluate the significance and validity of CT scanning protocols used for PP in The Hospital of Lithuanian University of Health Sciences Kaunas clinic (HLUHS KC).

We distinguished multiple objectives:
1. To assess the most prevalent traumatic CT scan findings in PP.
2. To evaluate the efficacy and rationality of using three-sequential CT scans for PP.
3. To assess the CT scan determined iatrogenic radiation doses and changes in oncogenic risk for PP.
4. To assess the workload of the radiologist when evaluating CT scans of PP.

Materials and methods
This was a retrospective study that included PP (n = 103) admitted to the HLULS KC between 2011 and 2016. Polytrauma was defined by a high ISS score (>16).

For the evaluation of CT scan phase significance, we selected patients (n = 62) who had undergone chest - abdomen - pelvis (C-A-P) three sequential CT scans. Pathologic CT scan findings were separated into dichotomous groups (present/ not present) and evaluated in each phase.

Radiation doses of WBCT, C-A-P CT scans and separate phases were determined using fixed technical parameters. Effective dose (ED) was calculated using standardised dose-length product (DLP) parameters and conversion coefficient k (k = 0.015 mSv/mGy x cm): ED (mSv) = DLP (mGy x cm) x k (mSv/mGy x cm)

Changes in cancer risk for PP who had undergone WBCT scans (n = 49) were also calculated.

To measure the workload of a radiologist, CT scan image count for all phases was documented and compared between different phases.

Patients with insufficient medical record data, poor quality or incomplete CT scans were excluded from the study. We used related-samples non-parametric Qochran's Q and McNemar tests to evaluate significance of differences between different phase findings and group homogeneity using χ², one-way ANOVA and Kruskal-Wallis tests. Values of P < 0.05 were considered significant.

Results
82 (79 %) male and 21 (21 %) female subjects were included in the study. The trauma severity representing parameters of the study sample were as follows: ISS was 30.17 (± 15.05), Glasgow Coma Scale (GCS) 12.72 (± 3.8), hemodynamic instability was 36.5% (n = 31) and hospital stay was 19.10 (± 21.92) days. Most injuries sustained by the subjects were blunt (92.6 %) and usually resulted from vehicle accidents (31.2 %) or falls from heights more than 3 meters (24.7 %).

The most prevalent traumatic findings in the CT scans were blood and/or hematoma within the abdominal cavity (11.8%), lung contusion (11.2%), pneumothorax (9.5%), parenchymal organ injury (hepatic - 5.9%; splenic - 4%; renal and adrenal- 3% each) and rib fractures (9.5%). Within the sample of PP that had undergone C-A-P three sequential CT scans (n = 62) statistically significant superiority of arterial and venous phases compared to non-enhanced was noted when diagnosing parenchymal organ injury with and without active haemorrhaging (P < 0.001). The non-enhanced phase did not supply any additional information.
The mean ED was 61.2 (± 27.7) mSv and 28.2% of the reported dose could be attributed to the radiation exposure during the arterial phase, 29.5% to the non-enhanced scan and 32.9% to the venous phase. Patients, exposed to 109.4 (± 30.5) mSv (mean ED value of the WBCT scan) had the cancer morbidity risk of 0.5% or 1/167. Mean C-A-P CT scan image count was 631.88 (± 160.4), with arterial phase attributing to 32.6%, non-enhanced - 19.7%, both - 52.3% of the images.

Conclusions
1. Most prevalent CT scan traumatic findings in PP were lung contusions, air or blood in the pleural cavity, hepatic/ splenic/ renal/adrenal gland injury.
2. Non-enhanced CT scan phases attribute to nearly a third of ED and supply no significant additional information, making them unnecessary and detrimental.
3. WBCT scan ED is 109.4 mSv and it increases the risk of cancer by 0.5% (or 1/167).
4. The workload of a radiologist when evaluating PP' CT scans could be decreased by more than a half, were the scanning protocols to include only the venous phase, or by 32.6% if the arterial phase and 19.7% if the non-enhanced phase were to be discarded from imaging protocols.

Diagnosis Of Gastrointestinal Tract Perforation On Computed Tomography
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Introduction
Gastrointestinal(GI) tract perforation is an emergent condition that requires prompt surgery. Diagnosis largely depends on imaging examinations, and correct diagnosis of the presence, level, and cause of perforation is essential for appropriate management and surgical planning. Plain radiography remains the first imaging study and may be followed by intraluminal contrast examination; however, the high clinical efficacy of computed tomographic (CT) examination in this field has been well recognized. Extraluminal air that is too small to be detected by conventional radiography can be demonstrated by CT. Indirect findings of bowel perforation such as phlegmon, abscess, peritoneal fluid, or an extraluminal foreign body can also be demonstrated. Gastrointestinal mural pathology and associated adjacent inflammation are precisely assessed with thin-section images and multiplanar reformations that aid in the assessment of the site and cause of perforation.

Aims and Objectives
Evaluate the findings of gastrointestinal perforation on computed tomography.

Materials and methods
In the study were included 138 patients who were hospitalized in Riga East University Hospital Clinic of Emergency Medicine in period of 01.09.2014 – 05.11.2015 (64 men and 74 women, in age 23 to 94, average age – 62 years). In research were included patients who undergo CT because of suspected GI perforation and patients with GI perforation diagnosed by CT. CT findings were analyzed in all cases, US, X-ray or surgery findings were analyzed if they were done. Evaluating findings of perforation by CT, depending on the perforation localization, patients were divided into three groups-1) stomach and duodenum; 2) small intestine; 3) large intestine and appendix.

Among 138 cases, were detected 104 perforations, six microperforations of them and in 12 cases perforation diagnosis was questionable.

Results
Using CT in 110 (79.7%) cases has been detected extraluminal air, in 99 cases (71.7%) free liquid. Of 98 people whom perforation was confirmed free air with CT was found in 97 cases (98.9%), 80 people had free liquid (81.6%). Most common causes of perforation: ulcer perforation - 38 cases (32.48%), diverticular perforations - 27 cases (23.08%) and tumor-induced perforations - 17 cases (14.53%). Most affected GI tract part is the stomach - 28 cases (23.93%); second is S-shaped intestine - 25 cases (21.37%). After data processing, was concluded that gastrointestinal perforation findings depend on the perforation location. In case of gastric and duodenal perforation is high incidence extraluminal air and free fluid - 87% and 89% respectively. Small bowel perforation air and liquid were found less frequently - 64.7% air and 52.9% liquid. Colon perforation - air 80.3%, the liquid - 62.2%. The
surgery was applied to 88 patients (63%), perforation was confirmed in 75 cases (85.2%). Basing on the surgery results calculated CT sensitivity is 94.9% and specificity - 70%.

Conclusions
CT of the abdomen can be a valuable investigative tool with high sensitivity and specificity in detecting and localizing a GI tract perforation site at any location. Preoperatively diagnosing the site and cause for the perforation is important for surgical planning.

GASTROINTESTINAL RADIOLOGY

Efficacy of Peroral Endoscopic Myotomy for Achalasia: Evaluation of Treatment Effect using Timed Barium Esophagography according to the Diameter of Lower Esophageal Sphincter
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Introduction
Achalasia is esophageal motility disorder with absent peristalsis and incomplete lower esophageal sphincter (LES) opening. Primary achalasia is probably autoimmune disorder and neuronal degeneration of myenteric plexus ganglia. Short-term control can be made by Botulinum toxin injection to LES and long-term treatment can be made by pneumatic dilatation or Heller myotomy. Peroral endoscopic myotomy (POEM) is less invasive approach for long-term treatment with fewer complications.

Objectives
To evaluate the efficacy of POEM for achalasia by measurement of the diameter of LES using timed barium esophagography (TBE) before and after POEM.

Materials and Methods
A total of 32 patients (M:F=20:12, mean age: 43 years-old) underwent pre- and post-POEM TBE for achalasia confirmed by manometry, who were divided into 3 groups according to LES diameter (A: less than 5 mm, B: 5 to 8 mm, C: more than 8 mm). The increased diameter of LES after POEM were measured in each group for comparison of treatment effect. Esophageal shape (bird’s beak [n=24], diffuse narrowing [n=4], tortuous [n=2], sigmoid [n=2]) on pre-POEM TBE, Eckardt score, and history of pre-POEM pneumatic dilatation (n=14) were also compared in each group. All data were statistically analyzed using Kruskall-Wallis test (esophageal shape), Mann-Whitney U test (LES diameter group, prior pneumatic dilatation), or simple correlation (Eckardt score).

Results
The mean increased diameter of LES after POEM was 5.5 mm, 2.9 mm, and 3.3 mm in group A (n=10), B (n=18) and C (n=4), respectively. Group A showed statistically significant treatment effect (p < 0.01), compared with group B, but there was no statistically significant difference (p > 0.01) between group A and group C, or between group B and group C. Regarding on the esophageal shape on pre-POEM TBE, bird’s beak shape showed statistically significant treatment effect (p < 0.01) rather than other shapes. The history of pneumatic dilatation and pre-POEM Eckardt score showed no statistical significance (P > 0.01) in the treatment effect of each group.

Conclusion
The treatment effect of POEM for achalasia was the most useful in group A with the narrowest LES and in patients with bird’s beak shape on TBE.

Difficulties of radiological diagnostics in abdominal sarcoidosis mimicking primary biliary cirrhosis
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Introduction
Sarcoidosis is an inflammatory disease of unknown etiology, forming noncaseating epithelioid cell granulomas in the absence of other identified granulomatous diseases. Women are more frequently affected than men and it is usually diagnosed between 20 and 40 years of age.
The most frequently involved sites include the lungs and lymph nodes. Intra-abdominal sarcoidosis is less common, mostly asymptomatic, and can be found without pulmonary or lymphatic disease. Hepatic involvement has been reported in 50%–79% of patients by biopsy, and 67%–70% in autopsy series.

Despite this common hepatic involvement, liver function abnormalities are found about in 35% of patients. It is known that less than 5% of patients with sarcoidosis suffer from symptomatic liver disease. Granulomatous involvement of the common hepatic duct and accompanying enlarged granulomatous lymph nodes are reported leading to obstructive jaundice; it may cause strictures in extrahepatic bile ducts mimicking cholangiocarcinoma, liver cirrhosis. Long-standing unrecognized intra-abdominal sarcoidosis can result in life-threatening complications - terminal fibrosis. Biopsy is necessary to make a true diagnosis. Enlarged parenchymal organs and abdominal lymph nodes are the most common CT and MRI imaging findings and it should be differentiated mostly from malignant diseases.

Aims and Objectives
The aim was to describe clinical, computed tomography (CT) and magnetic resonance imaging (MRI) most important features of the patient with histopathologically diagnosed old stage abdominal sarcoidosis; to evaluate granulomatous damaging abdominal lymph nodes and liver parenchyma, and make the differential diagnosis of asymptomatic abdominal sarcoidosis with manifestation of terminal liver fibrosis.

Materials and methods
A 50 - years - old woman with suspected abdominal malignant lymphadenopathy and damaged liver case have been reviewed. Clinically was complaining of general fatigue. Abdominal US and CT scan showed enlarged inhomogeneous liver, enlarged portal lymph nodes and spleen. Malignant lymphadenopathy was suspected in CT and MRI scans. It was analyzed lymph nodes CT attenuations, MRI signal intensities in different T2, HASTE, DWI sequences.

Results
On CT images affected abdominal lymph nodes were soft tissue attenuation, on MRI T2-weighted fat-saturated series lymph nodes appear homogenously hyperintense or hypointense surrounded by peripheral high signal intensity. They are mildly enhanced on gadolinium-enhanced T1-weighted images, in DWI sequences ADC was approximately 1,0-1,3. The first answer of malignant lymphadenopathy of laparoscopic biopsy was negative. Later patient lost weight and started complaining of itching. Because of unknown reason of enlarged liver and liver enzymes, it was performed liver biopsy under US control, answer: mostly suspected primary biliary cirrhosis. Only repeated lymph nodes laparoscopic biopsy again; answer was: noncaseating granulomuc inflammation. It was considered as an asymptomatic sarcoidosis and it was treated with glucocorticoids, symptoms regressed.

Conclusions
Sarcoidosis should be considered in the differential diagnosis when enlarged liver, spleen and intra-abdominal lymph nodes are detected, despite pulmonary sarcoidosis manifestation. Confirming pathology by histology is important to avoid unnecessary radiological and especially surgical/interventional examination.

Magnetic resonance enterocolonography comparison with Crohn's disease activity index in evaluation Crohn's disease
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Introduction
Magnetic resonance enterocolonography (MRE) has an increasing diagnostic impact on patients suffering from inflammatory bowel disease. Its attributes include: high soft tissue contrast, static and dynamic imaging capabilities, direct multiplanar imaging capabilities, and the use of non-ionizing radiation. MRE would be the preferable diagnostic procedure for the initial evaluation and the follow-up of these patients that need repeated examinations during their life. Also cross-sectional enterocolonography technique complement ileocolonoscopy and can visualize intramural and proximal small bowel inflammation in approximately 50% of Crohn's disease patients who have endoscopically normal examination.
Aims and Objectives
To assess the accuracy of MRE for evaluation of disease activity and severity in patients with Crohn's disease (CD) and compare with Crohn's disease activity index (CDAI).

Materials and methods
Forty four patients with proven Crohn's disease (mean age 38 years, 23 female and 21 male) underwent 1.5-T MR enterocolonography. Inflammatory lesions and the existence of signs of severity were analysed. Inclusion criteria included endoscopically and histologically proven CD. Exclusion criteria included contraindications to MRE, such as the presence of pacemaker or metal implant, claustrophobia. All MRE were performed on 1.5 Tesla MR unit (Siemens Medical Systems, Erlangen, Germany) using manufacturer's phased-array body coils in the prone position.

Patients were asked to take bowel cleaning agent at personalized doses to cleanse the bowel and to fast an overnight before the exam. MRE in our institution always are performed early in the morning. Each patient's bowel segment was assessed as to the presence or absence of MRE signs: mural thickening, hyperintensity on T2 weighted images, mucosal abnormalities, enhancement ratio of the bowel wall, patterns of enhancement, enlarged lymph nodes, abscesses, fistulas. These parameters were compared with disease clinical activity indexes using Spearman correlation, Chi-squared tests.

Results
MR-EC was well tolerated by all the patients. No adverse reactions were observed from any of the study examinations. Fifty five segments (33 terminal ileum, 5 ascending colon, 6 transverse colon, 4 descending colon, 7 sigma, 1 rectum) were analyzed as inflamed. Mural thickness, contrast enhancement, comb sign correlated with CDAI with moderate correlation (r= 0.595, 0.562, 0.491 respectively. All P<0.05). No significant correlation was seen between other MRE signs and CDAI.

Conclusions
Quantitative MRE parameters moderately correlate with CDAI. Means that both of these studies complement each other.

The clinical benefit of magnetic resonance imaging for the diagnosis and treatment of invasive placenta
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Introduction
Invasive placenta is an anomalous penetration of the chorionic villi due to an abnormal placement of the placenta along the uterine wall. This pathology involves placenta accreta, increta and percreta. The latter two are rare (the incidence rate in our hospital is 0.781/1000), but extremely threatening obstetric pathologies that increase the perinatal morbidity and mortality rates, which can lead to serious complications such as massive bleeding, coagulopathies, uterine rupture or even death. Hysterectomy of reproductive-age woman may be unavoidable in the treatment of this pathology. Daily performed by obstetrician gynecologist ultrasound (US) examination is important for the diagnosis of invasive placenta but the magnetic resonance imaging (MRI) has a higher sensitivity, helps to predict the location and degree of damage more precisely, and to prepare for surgery more effectively. Early diagnosis, planning of delivery and preparation of multi-disciplinary team can help to reduce or even avoid serious obstetric complications.

Aims and Objectives
The study aim is to evaluate the benefit of MRI in diagnosing an invasive placenta, predicting pregnancy and delivery outcomes, and establishing a treatment plan.

Materials and methods
A retrospective analysis of the medical records of 13 patients diagnosed with invasive (increta and percreta) placenta in the Vilnius University Hospital Santaros Clinic in 2013-2018 was performed. All patients were divided
into two groups: the first group consisted of 6 patients who had an MRI performed and the second group of 7 patients who had not MRI performed.

Results
The mean age of group I patients was 33.3 ± 3.1 years, II - 35.7 ± 4.5 years (p = 0.285). The average of gestational age was 28.2 ± 5.9 weeks in the group I and 33.0 ± 9.1 weeks in the II group (p = 0.279). 3 (42.8%) patients from group II were admitted due to spontaneous labour at term.

All patients in group I had a previous caesarean delivery. 3 (42.8 %) women had a previous caesarean delivery, 3 (42.8 %) patients underwent uterine cavity curettage and 1 (14.4 %) did not had uterine surgery in the past in the group II. All patients in the group I had US examination, in which placenta previa was detected, placenta covered the uterus scar area and the signs of invasive placenta were detected. The US examination in the group II was performed for 57.1 % of patients (4 women) however US signs of invasive placenta were observed for only 1 woman (14.2 %).

All patients in the group I showed signs of invasive placenta by MRI: 1 (16.7 %) patient had an emergency caesarean hysterectomy due to severe bleeding, 5 (83.3 %) patients had elective surgery by multidisciplinary team, hysterectomy was completed for 4 (66.6 %) patients, the diagnosis of invasive placenta was ruled out after surgery for 1 (16.7 %) patient. In group II, all operations were performed as emergency procedures, all patients had hysterectomy, uterine rupture was diagnosed for 2 (28.5%) patients and 2 (28.5%) women had bladder damage. The average duration of the operations in groups: I – 105.0±84.6 min., II – 97.1±38.4 min. (p=0.84).

The mean loss in blood volume was 2.23 times higher in group II, which have not undergone MRI: 1900.0±2302.1 ml vs 4238.6±1248.0 ml (p=0.059). The average red blood cell transfusion in group I was 5.7±6.9 units, II - 12.3±6.7 units (p=0.11); fresh frozen plasma 5.3±5.6 vs 16.9±25.5 units (p=0.285); platelets - 2.7±6.5 vs 2.6±2.8 units (p=0.974); cryoprecipitate 3.3±8.2 vs 4.6±8.5 units (p=0.795). All patients were treated in the intensive care department after surgery: the average duration of treatment was 34.0±28.5 hrs. in the group I, 87.1±136.4 hrs. in the group II (p=0.35).

The diagnosis of invasive placenta was confirmed clinically and by MRI for all patients from group I however, the diagnosis was confirmed histologically after surgery for 5 (83.3 %) patients and excluded for 1 (16.7 %) patient. All patients from group II have histologically confirmed diagnosis of invasive placenta.

Conclusions
The MRI is very important for determining the diagnosis of invasive placenta and planning the surgical treatment by a multidisciplinary team more precisely, reducing the blood loss and the duration of treatment in the intensive care unit.

Transjugular intrahepatic portosystemic shunt in treatment of portal hypertension – one centre experience
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Introduction
Transjugular intrahepatic portosystemic shunt (TIPS) is an effective treatment modality for the life-threatening complications of portal hypertension (PH). However the use of the procedure is limited by a high rate of post-procedural hepatic encephalopathy (HE) (10 – 55%) and early mortality (25-30%).

Aims and Objectives
The objective of the current study was to evaluate the efficacy of TIPS, rate of short-term complications and factors predicting patient survival after TIPS procedure.

Materials and methods
A retrospective analysis included 56 patients with refractory ascites/hydrothorax, recurrent variceal bleeding and Budd-Chiari syndrome who underwent TIPS procedure between 2002 and 2015 at the Department of Gastroenterology of Lithuanian University of Health Sciences Hospital. The efficacy of the procedure, rate of HE and stent dysfunction and mortality were evaluated 30 days after the procedure. Child-Pugh class, Model of end stage liver disease (MELD) score, serum bilirubin, creatinine, albumin and international randomized ratio (INR) before TIPS (pre-TIPS) were assessed as possible prognostic factors of early mortality.
Results
The mean age of the study group was 53.0 years (range 26-82 years); 58.9% (33) were male. TIPS was performed on elective basis in 66.1% (37) of our patients. Most common indications for TIPS placement were refractory variceal bleeding 51.9% (29) and refractory ascites 33.9% (19). Variceal bleeding was controlled in all the patients, whereas the control of refractory ascites and hydrothorax improved in 96.2% (54) of patients. The rate of early stent dysfunction was 3.7% (2) and worsened or newly developed HE was observed in 39.3% (22). 30-day mortality in our study after TIPS placement was 26.8% (15). Univariate analysis showed that Child-Pugh class C, pre-TIPS Child-Pugh score >11, pre-TIPS MELD score >18, pre-TIPS creatinine level >176 µmol/l and infectious complications, newly developed or worsened hepatic encephalopathy after TIPS placement were predictors of 30-day mortality. We found that with one point increase in Child-Pugh score, the risk of death increased 1.9 times (p<0.04; 95% CI 1.1-3.02).

Conclusions
TIPS is an effective treatment modality for the complications of PH. Hepatic reserve, renal function and presence of infection and hepatic encephalopathy after the procedure can predict 30-day mortality after TIPS placement.

Retrograde Urethrography – The Long and Short of It
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Retrograde urethrography continues to be the best initial diagnostic study for evaluation of urethral pathologies. Interpretation of these studies in both the pre and post-operative setting can be challenging and knowledge of normal and abnormal findings is essential. This exhibit will provide a thorough review of RUG examinations as well as a multitude of urethral pathologies in a case-based format. Surgical management for urethral pathologies will be reviewed with pathological correlation.

Table of Contents/Outline
This pictorial review is designed for residents, fellows, general radiologists, abdominal radiologists, and non-radiology participants. The primary goals are to provide a thorough review of retrograde urethrography (RUG) including anatomy, technique, and imaging findings with pathologic and surgical correlation from our patient database.

This will be achieved by:
1. Illustrating both the normal and post-surgical anatomy of the male urethral system
2. Describing the appropriate technique for performing a RUG with troubleshooting strategies
3. Providing a thorough review of urethral pathologies with practical tips for aiding in diagnosis. Pathologies include urethral transection, urethral fistula, post-traumatic urethral stricture, post-infectious stricture, and balanitis xerotica obliterans as well as post-surgical changes of stenting, urethroplasty, and phalloplasty
4. Correlation with surgical outcomes and pathologic correlation from our patient database

With urethral strictures present in a significant portion of the elderly male population and urethral trauma present in a large fraction of pelvic injuries, accurate technique and interpretation of RUGs is essential for the modern radiologist.

Representative Figures
Figure 1:

Normal retrograde urethrogram of a 53 year-old male demonstrating normal urethral anatomy.

Figure 2:

Long segment of narrowing involving the mid and distal bulbar urethra (Fig A) compatible with a long segment urethral stricture. Multifocal areas of narrowing involving the penile and bulbar urethra (Fig B) with a beaded appearance in keeping with a multifocal stricture.

Figure 3

RUG following penetrating gunshot trauma (Fig A and B) demonstrating a distal bulbar urethral tear. Corresponding CT pelvis (Fig C) shows emphysema in the scrotal and penile soft tissues (dashed arrows) with metallic shrapnel (curved arrow). One month later (Fig D) there has been resolution of urethral injury following conservative management with a Foley catheter.
**Figure 4**

RUG (Fig A) demonstrates opacification of the rectum (asterisk) via a posterior urethrorectal fistula (solid arrow). A small amount of contrast is in the bladder (dashed arrow). Incidentally noted is a bullet in the right thigh soft tissues. A CT pelvis examination 4 years prior (Figs B and C) show an abscess in contact with the posterior urethra (solid arrow) and rectum (dashed arrow) suggesting a post-infectious etiology.

**Figure 5**

Retrograde urethrogram (Fig A) demonstrates an irregular filling defect in the proximal penile / distal bulbar urethra (arrows). Subsequent ureteroscopy demonstrated a pendunculated mass in this location. Following biopsy, pathology (Figs B and C) was consistent with squamous metaplasia of a transitional cell carcinoma.
Multiparametric MRI targeted and transrectal ultrasound guided transperineal prostate biopsy in men with previous negative prostate biopsy.

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Introduction
Aims and Objectives
To report the East Tallinn Central Hospital’s first experience of diagnosis of prostate cancer (PCa) using a multiparametric MRI (mpMRI) in fusion with transrectal ultrasound (TRUS) guided biopsy in men with one or more previous negative prostate biopsies and persistently elevated serum prostate-specific antigen (PSA) level.

Materials and methods
From March 2017 to March 2018, men with one or more previous negative TRUS biopsies and elevated PSA levels underwent mpMRI investigation. In cases where Prostate Imaging Reporting and Data System (PI-RADS version 2) score 3-5 lesions were detected, the mpMRI-targeted and TRUS-guided prostate biopsy was performed transperineally using the BioJet system. In all cases targeted biopsy was combined with systematic biopsies.

We evaluated the detection rate of PCa from all patients with PI-RADS score 3-5 lesions; diagnosis rate of clinically significant PCa (csPCa, Gleason score≥7) from all detected PCa patients in the targeted areas and by the systematic access; and proportion of PCa within the anterior zone of the prostate, which is generally not sampled on systematic biopsies.

Results
From the 76 studied men, in 38 men the lesions with PI-RADS score 3-5 were detected. The highest PI-RADS score was 3 in 14, 4 in 13 and 5 in 11 patients. The median PSA values were 7.3, 11.3 and 12.1 ng/ml in the PI-RADS score 3, 4 and 5 groups respectively. By targeted biopsy, PCa was histologically diagnosed in 21 patients (PCa detection rate 55%). csPCa was diagnosed by targeted biopsy in 2/14, 4/13 and 8/11 patients with PI-RADS score 3, 4 and 5 lesions respectively with csPCa diagnosis rate 67%. PCa detection rate by systematic biopsies was 16% (PCa detected in 6 patients from 38). Systematic biopsies confirmed csPCa in 3 cases. Systematic access detected PCa only in cases where PCa was also diagnosed by targeted biopsies. Of all diagnosed PCa cases, PCa was detected within the anterior zone of prostate in 48% (10) patients.

Conclusions
Despite of a limited number of patients, our results show that mpMRI/TRUS-guided prostate biopsy gives additional value for diagnosis of csPCa in patients with previous negative prostate biopsies and persisting clinical suspicion of PCa. Multiparametric MRI/TRUS-guided prostate biopsy with transperineal approach improves detection of PCa in anterior prostate.

CT value of differentiating small renal masses
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Introduction
With the widespread use of cross-sectional imaging modalities, an unprecedented number of incidental small renal masses have been identified. It is very important to separate malignant mass from benign.

Aims and Objectives
To determine CT value diagnosing small renal masses less than 4 cm and to distinguish benign from malignant renal masses.

Materials and methods
98 patients were retrospectively analyzed to determine the characteristic features for the prediction of subtypes of small renal masses. Two independent radiologists also analyzed CT images without knowing histology. The patients’ age, gender, and tumor size and CT features, including the presence of contrast enhancement, calcification, central scar and contain of fat, were evaluated. The relationship between the subtype of the small
renal masses and the gender, morphological features, and pattern of contrast enhancement on the CT was analyzed by using the chi-square test. Tumor size and degree of contrast enhancement were compared by the Mann-Whitney U test. The predictive value of each of the CT features was determined by multivariate logistic regression analysis.

Results
98 patients (W = 57 (58.2%), M = 41 (41.8%)) CT images were analysed. Of the 98 small renal masses, 35 (35.7%) were benign and 63 (64.3%) were malignant. Univariate analysis analyzing all CT images (n - 98) showed that mass size was statistically significant (HR 1.76, 95% CI 1.2-2.5, p=0.003%) value to determine the correct diagnosis. The multivariate analysis also showed that only the mass size had a statistically significant correlation (HR 2.23, 95% CI 1.39-3.56, p=0.001%). From 98 patients for 68 both of independent radiologists determined the same diagnosis.

Conclusions
For the characterization of small renal masses, the size is a valuable parameter. For ~ 70 % of cases both of radiologists set the same diagnosis.

Diagnostic Capabilities of Ultrasonography and Computed Tomography of Gallbladder Cancer
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Introduction
The gallbladder cancer is usually diagnosed only when the specific symptoms of the disease start to emerge. Only 1 out of 5 cancers of the gallbladder are diagnosed in the early stages when it has not spread outside of the organ yet. Most of these early stage cancers are diagnosed histologically after cholecystectomy due to cholelithiasis. Some cancerous structural changes of the gallbladder can be detected radiologically. When pathology of the gallbladder is suspected the first-line diagnostic test is ultrasonography (US). If any uncertainties occur, the following test after US is usually computed tomography (CT). CT is also very useful for the evaluation of cancer spread.

Aims and Objectives
Aim: to identify the clinical symptoms of the gallbladder cancer and evaluate the sensitivity of radiological methods (US and CT) in detecting the disease.
Objectives:
1. To identify the most frequent clinical symptoms of the gallbladder cancer.
2. To determine the most common radiological signs of the gallbladder cancer.
3. To evaluate and compare the sensitivity of US and CT when diagnosing the gallbladder cancer.

Materials and methods
We performed a retrospective analysis of 120 medical records of patients with the gallbladder cancer treated in the departments of General Surgery, Gastroenterology and Oncology of Hospital of Lithuanian University of Health Sciences from the year 2008 to 2017. Only 48 suitable patients that were diagnosed with the gallbladder cancer at the time of hospitalization and were radiologically tested were selected for further analysis. The rest of the patients were hospitalized for the treatment of spread of the cancer (metastases) or chemotherapy. The radiological tests (US and/or CT) were considered positive if any suspicion of cancerous process was mentioned in the test results interpretation by the radiologist. It was assumed that the diagnosis of the gallbladder cancer was established if confirmed histologically (from surgical specimen or biopsy) and/or by combining the results of CT scan and clinical symptoms. Statistical analysis of the data was performed using IBM SPSS Statistics 25.0 software. Mann-Whitney U Test was performed for comparisons within the groups. The differences were considered statistically significant when p value was <0.05. Sensitivity was counted using the specific formula A/(A+C) × 100 (A - patients with the disease and positive test results; C - patients with the disease and negative test results). Specificity could not be counted because all of the patients had cancer so there were no disease-free cases.

Results
The cohort of the retrospective analysis - 48 patients. 14 of them were men (29.2%), 34 - women (70.8 %). The mean age of the patients was 71.7±11.2 years; of men - 69.9±9.9 years, of women - 72.4±11.7 years, p>0.05. The mean duration of hospitalization was 16.8±13.3 days (2 to 49 days). In 26 (54.2%) cases the cancer was confirmed histologically. All of the histologically confirmed cancers were adenocarcinomas. The remaining patients were diagnosed with gallbladder cancer by combining their symptoms and CT scan results. The most frequent clinical
symptom was abdomen pain or pain in the upper right quadrant of the abdomen - it was present in 37 patients (77.1%). Jaundice was present in 24 (50%) patients, nausea in 16 (33.3%) and weight loss before the hospitalization in 10 (20.8%) patients. Only 3 (6.3%) patients had no clinical symptoms at all. US results were available in 38 patients. CT results were available in 42 patients. In detailed analysis 6 (12.5%) patients had undergone only ultrasonography, 10 (20.8%) patients had undergone only computed tomography (CT) and 32 (66.7%) patients had undergone both of the radiological tests. The most common findings during ultrasonography were concrements in the gallbladder in 23 (60.5%) patients, tumorous masses in the gallbladder in 12 (34.3%) patients and polyps in 2 (5.9%) patients. The most common findings during the CT scan were thickened gallbladder wall in 32 (76.2%) patients, tumorous masses in the gallbladder in 20 (47.6%) patients and concrements in the gallbladder in 16 (38.1%) patients. During ultrasonography cancer was suspected in 18 patients and during CT cancer was suspected in 35 patients. The sensitivity of these radiological tests of diagnosing the gallbladder cancer: US - 47.4%; CT - 83.3%.

Conclusions
1. The most common clinical symptoms of the gallbladder cancer are abdomen pain or pain in the upper right quadrant of abdomen, jaundice and nausea.
2. The most common radiological findings of the gallbladder cancer: US - concrements and tumorous masses in the gallbladder; CT - thickened gallbladder wall, tumorous masses and concrements in the gallbladder.
3. The sensitivity of US when diagnosing gallbladder cancer - 47.4%; CT - 83.3%. CT is much more sensitive when diagnosing this disease than US.

Retrospective Comparison of Renal Ultrasonographic and Clinical Findings in Patients with Rhabdomyolysis
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Introduction
Rhabdomyolysis is a syndrome characterized by breakdown of muscle tissue, followed by dispersing its intracellular components into the circulatory system, leading to muscle ischemia and cell breakdown. These components include electrolytes, purines, enzymes (such as creatine kinase) and myoglobin. The syndrome may be expressed as elevated levels of blood creating phosphokinase and leading to acute kidney injury and death. About 33-50% of rhabdomyolysis patients will develop acute kidney injury, as 7-10% of all occurring acute kidney injury is due to rhabdomyolysis. In patients with acute kidney injury related to symptomatic rhabdomyolysis, ultrasonography can be used as the first imaging study to evaluate the renal function and renal size. However, discrepancy between renal ultrasonographic findings and clinical findings has been argued in patients with rhabdomyolysis.

Objective
To retrospectively compare the ultrasonographic and clinical findings between two groups with abnormal and normal ultrasonographic findings of kidneys who clinically diagnosed as rhabdomyolysis.

Materials and Methods: A total of 78 patients were divided into two groups: A group with abnormal renal ultrasonographic findings and B group with normal renal ultrasonographic findings. Blood urea nitrogen, creatinine, potassium, prothrombin time, activated partial thromboplastin time (aPTT), creatine kinase, myoglobin in serum and urine, dark urine and microscopic hematuria were assessed, which were checked within 3 days before or after renal ultrasonography. All data were statistically analyzed using student’s t-test or Mann-Whitney U test.

Results: The most common cause of the rhabdomyolysis in this study was intense exercise, followed by general weakness, muscle ache, intense shivering from generalized tonic seizure, drug intoxication, burn, and operation or trauma, etc. On renal ultrasonography of group A (n=26; M:F=19:7; mean age, 48.7 years), both kidneys show enlarged size, increased cortical thickness and diffusely decreased cortical echogenicity, suggestive of acute and diffuse renal disease. Group A showed elevated blood urea nitrogen, creatinine, potassium, and prolonged aPTT compared with those in Group B (n=52; M:F=36:16; mean age, 41.6 years), which were statistically significant (p value < 0.01). Other parameters including prothrombin time, creatine kinase, myoglobin in serum and urine, dark urine and microscopic hematuria showed no statistical difference between two groups.

Conclusion
The patients with elevated blood urea nitrogen, creatinine, potassium, and prolonged aPTT showed the renal ultrasonographic findings of acute and diffuse renal disease, but other parameters showed no statistical difference between two groups with rhabdomyolysis.
Nutritional evaluation and surgical outcome measures in patients scheduled for pancreatoduodenal resection
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Introduction
Impairments of nutritional status are encountered in many patients scheduled for pancreatoduodenal resection. Nutritional impairment observed in the majority of these patients in the early stages is characterized by sarcopenic obesity. Many complications of pancreatic diseases including pain, pancreatic exocrine and / or endocrine insufficiency, jaundice, systemic inflammation and hypermetabolism due to systemic effects of cancer, may lead to various nutritional impairments. Majority of patients undergoing pancreatoduodenal resection have normal or overweight and an average weight loss of only ≥7%. However, pancreatoduodenal resection is a major surgery characterized by a high rate of postoperative complications. Acute impairment of nutritional status in these patients is associated with stress and systemic inflammatory response. Impairments of nutritional status have a negative impact on mortality, morbidity and are associated with a higher incidence of postoperative complications, longer hospitalization and higher treatment costs. Numerous studies have shown a clear association between nutritional impairments and poor surgical outcomes.

Aims and Objectives
The aim of this study was to evaluate nutritional status of patients scheduled for pancreatoduodenal resection and its association with outcome measures.

Materials and methods
Nutritional status of 51 patients scheduled for pancreatoduodenal resection was evaluated by using Nutritional Status Screening tool NRS–2002, measurement of muscular tissue mass by using CT scan and body composition evaluation by using bioelectrical impedance analysis. Surgical outcomes and technical issues of every method were analysed. Descriptive statistics and SPSS program was used for statistical analysis.

Results
The cohort of patients consisted of 28 male and 23 female patients with the mean age of 62,8 years. Mean BMI was 26.9 kg/m2, only 3 patients had BMI<20 kg/m2 and 31 (60,8 %) patients were overweight or obese. NRS–2002 ≥3 points was in 27,45% of patients. The mean lumbar skeletal muscle index of males was 42,31cm²/m² (n.>55) and of females 33,05 (n.>39). Only 11,1% of males and 21% of females had normal index. The mean bioelectrical impedance analysis phase angle of males was 5,74 (n.>6) and of females 5,49 (n.>5). 61% of males and 22% of females had diminished phase angle. Overall morbidity was 80,4%, while Clavien–Dindo classification grade ≥3 were observed in 17,65% patients. 64,7% of patients had the Comprehensive Complication Index (CCI) ≤20,9; the mean of postoperative hospitalization days in these patients was 16,2 days vs. 29,7 days for patients with CCI >20,9. Preoperative nutritional management was instituted in 21 of 51 patients (41%); complication rate in this group of patients was 71,43% vs. 86,67% in a group of patients without nutritional management. Besides, mean CCI was 19,36 vs. 23,21 and Clavien Dindo ≥3 grade complications were observed in 14,29% vs. 23,33% in a group of patients with preoperative nutritional management vs. a group without management, respectively.

Conclusions
Majority of patients scheduled for pancreatoduodenal resection due to pancreatic cancer have impairments of nutritional status that have an impact on outcome measures, therefore, routine preoperative nutritional evaluation and management are recommended for all patients.

Comparison of magnetic resonance enterocolonography indices with clinical activity in Crohn's disease
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Introduction
Crohn’s disease (CD) is chronic gastrointestinal inflammatory disease characterized by disabling bowel symptoms. Ongoing inflammation leads to progressive bowel damage and complications, often requiring surgery.
Grading CD activity is important in daily clinical practice to monitor the often costly and burdensome treatment. However, conventional magnetic resonance imaging has intrinsic limitations with regard to objective grading of disease activity and medical therapy response. Dynamic contrast enhanced (DCE) MRI and diffusion weighted imaging (DWI) have been recently investigated for assessing disease activity and results appear promising. Therefore, these sequences provide valuable information on tissue perfusion, vascular leakage and water diffusion. A lot of CD assessment indices and scoring systems are invented. But none of them are used in clinical practice because of complicated calculation and complex formulas. To calculate one of the indices takes a lot of time and skills.

Aims and Objectives
To achieve objective evaluation of the CD in our study we decided to quantify all MRI enterocolonography (MR-EC) with calculating Magnetic Resonance Index of Activity (Maria), magnetic resonance enterography global score (MEGS) comparing with clinical disease activity Crohn's Disease Activity index (CDAI) and biologic activity C-reactive protein (CRP).

Materials and methods
Thirty three patients (20 males and 13 females; 42 mean age ) with proven Crohn’s disease Hospital of Lithuanian University of Health Sciences Kauno Klinikos (LUHS Kauno Klinikos) from June 2015 to January 2016 were enrolled for this prospective study. Ethical permission was obtained by the local ethics committee. Informed written consent was obtained from all patients. Inclusion criteria included endoscopically and histologically proven CD. Exclusion criteria included contraindications to MRI, such as the presence of pacemaker or metal implant, claustrophobia. All patients fulfilled CDAI questionnaire and underwent clinical assessment, CRP, MR enterocolonography (MR-EC) within 2-4 days. All MR-EC were performed on 1.5 Tesla MR unit (Siemens Medical Systems, Erlangen, Germany) using manufacturer's phased-array body coils in the prone position. Patients were asked to take bowel cleaning agent at personalized doses to cleanse the bowel and to fast an overnight before the exam. MR -EC in our institution always are performed early in the morning. On the examination day about 60 minutes prior examination each patient received orally 2,5% -1500ml solution of mannitol. Just before starting MR-EC examination and before injecting contrast media for inhibiting of bowel peristalsis 20 ml/mg N-butyl scopolamine (Buscopan, Boehringer, Ingelheim, Germany) was injected intravenously. Two radiologists who were unaware of any clinical data evaluated MR-EC images on PACS workstation. The bowel was divided in 7 segments jejunum, proximal ileum, terminal ileum, caecum/ascending colon, transverse colon, descending colon, sigmoid colon/rectum. To quantify the small bowel and colon inflammation each segment was evaluated for T2-weighted mural signal intensity, mural wall thickness, mural edema, inflamedated segment length, ulcers, haustral loss, mesenteric edema, lymph nodes (≥1cm measured in shortest diameter), comb sign (linear densities on the mesenteric side of affected bowel segments), abscess, fistulae.

Relative contrast enhancement (RCE) was calculated according the following formula: RCE=[(wall signal intensity (WSI) postgadolinium – WSI pregadolinium)/(WSI pregadolinium)] X 100 X (SD noise pregadolinium / SD noise postgadolinium) [(Rimola et al., 2011)]. For all CD patients MaRIA and MaRIA total (T) (for all segments), MEGS and MEGS total (T) indices were calculated. MaRIA was calculated according to Rimola et al. formula [(Rimola et al., 2011)]; MaRIA (segment)=1.5*wall thickness (mm)+ 0.02*RCE+5*edema+ 10*ulceration MaRIA cutoff point ≥7 in any segment categorized the patient had active disease (Rimola et al., 2011). Maria Total (Maria-T) was also calculated the sum of each patients all segments. MEGS activity for bowel segments, grading mural thickness, T2 signal, mesenteric oedema, T1 enhancement and pattern, and haustral loss. Segmental scores were multiplied according to disease length. Five points each were added for lymphadenopathy, comb sign, fistulae and abscesses. Total possible score 296 (Makanyanga et al., 2014). CDAI was calculated from the questionnaire. CRP data was obtained from the laboratory. The statistical analysis was performed using the SPSS software package for Windows V20.0 (Statistical package for the social sciences, Chicago, Illinois, USA). Kolmogorov – Smirnov test confirmed non-normality of CDAI, MaRIA, MEGS, CRP.
For descriptive statistics frequencies, means, medians and standard deviations were calculated. A p value of <0.05 was considered statistically significant.

Results
MR-EC was well tolerated by all the patients. No adverse reactions were observed from any of the study examinations.

Pearson correlation analysis showed the correlation between indices CDAI, Maria-Total, MEGS-Total and CRP. Strong correlation was found between Maria-T and MEGS-T (r=0.926, P<0.001). Moderate correlation was between MEGS-T and CRP (r=0.541, P<0.05).

Pearson correlation analysis showed the weak correlation between CDAI and MEGS-T, Maria-T, CRP respectively (r=0.469, P<0.05, r=0.497, P<0.05, r=0.446, P<0.05).

Limitation of investigation
We analyzed only the suitability of CD indices in comparison with clinical activity. We did not expand our work to determine if it could provide a prognosis for patients.

In the present study we investigated a small group of patients, but we presume that a larger size of sample would show more precise results.

Conclusions
Index counting would help to clarify communication and treatment tactics selection between radiologists, gastroenterologists or surgeons. Also in the future it could help to predict the course of the disease.

However, the indices counting methodologies are rather complicated. They need to be modified, simplified, but the most important thing reliable results. For that purpose, further clinical trials are needed.

The diagnostic value of computed tomography in the evaluation of the spread of ovarian cancer
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Ovarian cancer is one of the most common oncogynecological diseases diagnosed all over the world, which takes the fifth place amongst women malignant tumors. The reason is that an early stage of ovarian cancer has no characteristic symptoms, it is usually diagnosed in III-IV stages. Early ovarian cancer diagnostics and detailed evaluation of tumor spread in later disease stages are relevant topics in oncogynecology. Timely diagnosis of the disease and rating its spread helps to choose optimal treatment tactics which are important for the prognosis of disease, the quality of life of the patients and the response to the treatment. Various diagnostic tests are used to evaluate the spread of ovarian cancer, however computed tomography (CT) remains the main test not only for ovarian cancer diagnosis and spread measurement, but also for the evaluation of the possibility of optimal cytoreduction and response to the treatment.

Aims
To determine the diagnostic value of CT in the evaluation of the spread of ovarian cancer.

Objectives
1. To determine the sensitivity, specificity, accuracy, positive predictive value (PPV) and negative predictive value (NPV) in the evaluation of the spread of ovarian cancer.
2. To determine the distribution of tumors size, histological type, degree of the differentiation and the stage of disease.

Materials and methods
The data of 64 female patients who underwent abdominal and pelvic CT due to the suspicion of ovarian cancer during 2014–2015 in Lithuanian University of Health Sciences, Kaunas Clinics (LUHS, KC) were analyzed. All patients were operated and ovarian cancer was confirmed histologically.

Results
The average size of the tumors was 11.93±5.0cm, 18 (28.13%) cases of tumors were >15cm, 17 (26.56%) – 7–11cm, 16 (25%) – <7cm and 13 (20.31%) cases of tumors were 11–15cm. By the histological type, 37 (57.7%) cases of tumors were serous type, 13 (20.3%) cases of endometrioid tumors, 4 (6.3%) – mucinous tumors, 3 (4.7%) of clear cells tumors, 2 (3.1%) – mixed epithelial tumors, and for only one case of other histological types (sex cord–stromal, germ cell, transitional cell tumors). By the differentiation degree, 41 (63.5%) cases of tumors were
G3, 16 (25.0%) – G1 and 7 (10.9%) – G2 degree of differentiation. 27 (42.2%) of all the cases of ovarian cancer were diagnosed in the stage IIIC, 10 (15.6%) – IVA, 8 (12.5%) – IA, and 7 (10.9%) of cases were diagnosed in IC.

CT sensitivity in the assessment of pathological lymph nodes was 41.9%, specificity – 81.8%, PPV – 68.4%, NPV – 60.0%, accuracy – 51.6%. CT sensitivity in the evaluation of peritoneal carcinomatosis was 62.5%, specificity – 81.3%, PPV – 90.9%, NPV – 41.9%, accuracy – 67.2%. The CT sensitivity to ascites was – 86.5%, specificity – 88.9%, PPV – 91.4%, NPV – 82.8%, accuracy – 87.5%.

Conclusions
1. There were a similar number of cases in all tumor size groups, but the most of all cases of ovarian cancer were serous type, G3 degree of differentiation and most often diagnosed in the stage IIIC.
2. The evaluation of ascites showed that CT sensitivity, specificity, PPV, NPV, and accuracy were high. The results of lymph nodes and peritoneal carcinomatosis showed that CT had moderate sensitivity, NPV, and accuracy, but it had high specificity. According to the pathological lymph nodes, PPV was average, but high according to peritoneal carcinomatosis

A Review of the Technique and Pathology of Hysterosalpinography - More than Just “Going with the Flow”
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With recent advances in reproductive medicine, coupled with increasing maternal age, hysterosalpingography (HSG) plays an increasingly important role in the evaluation of the uterus and fallopian tubes. Interpretation of these cases in both the pre- and post-operative setting can be challenging. With increasing demand for HSGs in reproductive medicine, knowledge of accurate technique and interpretation is essential for today’s radiologist. This exhibit will provide a thorough review of HSG examinations as well as a multitude of uterine and tubule pathologies in a case-based format.

Table of Contents/Outline
This pictorial review is designed for residents, fellows, general radiologists, abdominal radiologists, and non-radiology participants. The primary goals are to provide a thorough review of hysterosalpingograms (HSG) including anatomy, technique, and imaging findings with pathologic and surgical correlation from our patient database.

This will be achieved by:
1. Illustrate normal and abnormal uterine and tubule anatomy on hysterosalpingography (HSG).
2. Describe the HSG technique used at our institution with practical tips for aiding in real-time troubleshooting and diagnosis.
3. Discuss and illustrate a variety of uterine and fallopian tubule pathologies which can be assessed on HSG from our fluoroscopic imaging department.

Hysterosalpingography continues to be a versatile study to assess for uterine and tubule pathology, particularly in reproductive medicine. Knowledge of accurate technique and interpretation is essential for today’s radiologist.

Representative Figures
Figure 1:

Normal hysterosalpingogram

Figure A: Early spot radiographs demonstrate filling of the endometrial cavity to assess for mass
Figure B: After further instillation of contrast, there is opacification of both fallopian tubes (arrows)
Figure C: Subsequent free intra-peritoneal spillage of contrast (arrows) indicates bilateral tubule patency
Figure D: Tubule patency is further confirmed on the oblique images

Figure 2:

Müllerian Anomalies

Figure A: Uterine didelphys (single cannulated cervix)
Figure B: Unicornuate uterus
Figure C: Bicornuate uterus
Figure D: Septate uterus
Figure 3

Uterine Masses

Figure A: Bicornuate uterus with a lower uterine segment mass confirmed to be an endometrial polyp on biopsy
Figure B: Uterine body mass with distortion of the endometrial canal secondary to a large submucosal leiomyoma
Figure C: Round cervical filling defect suspicious for a cervical mass. The patient was subsequently lost to follow-up with pathology unavailable

Figure 4

Uterine and Tubule Pathologies

Figure A: Multiple linear filling defects compatible with intrauterine synechiae (arrows) in the setting of Asherman Syndrome
Figure B: Large left hydrosalpinx (asterisk)
Figure C: Shaggy endometrial canal contour (arrows) in keeping with adenomyosis
Figure D: Same patient with nodular outpouchings of the right fallopian tube (arrows) compatible with salpingitis isthmica nodosa
Figure A: Successful Essure™ (arrows) without opacification of either of the fallopian tubes confirming tubule occlusion

Figure B: Unsuccessful Essure™ with the left fallopian tube demonstrating patency (solid arrow). There is successful right fallopian tube occlusion (dashed arrow)

Figure C: Malpositioned Essure™ outside the right fallopian tube (dashed arrow) which demonstrates patency (solid arrows)

Figure D: Vascular contrast intravasation into parametrial veins (arrows), a potential complication of HSG. Usually clinically insignificant, potential for a systemic anaphylactoid response exists

CT value in assessment of resectability of pancreatic adenocarcinoma

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Introduction
Pancreatic cancer is one of the most lethal forms of cancer worldwide and one of the most common causes of deaths from cancer in developed countries. The 5-year survival rate is on average 6%. (2-9%), with an average survival time of 6 months.

In 2012, mortality from pancreatic cancer was sixth among all deaths from cancer and reached 6% in 2012. The main type of pancreatic cancer is pancreatic adenocarcinoma, diagnosed in 85% of all case, neuroendocrine tumors account for about 5%. Pancreatic adenocarcinoma is diagnosed over the age of 50 years in most patients, with an average age of 60-80 years.

High mortality rate is due to aggressive tumor behavior, late diagnosis of the disease, when surgery is not possible, and high mortality rates due to postoperative complications. Survival increases in early stage of diagnosis of pancreatic adenocarcinoma; therefore early radiological diagnostics is essential, when surgical treatment is still possible.
Aims and Objectives
The aim of our study was to identify CT diagnostic values in resectability of pancreatic adenocarcinoma.

Materials and methods
This was a retrospective clinical study, in which patients with pancreatic adenocarcinoma were studied (n=62). All the patients underwent 64-slice CT scanning.
In all CT images we analyzed localization of pancreatic tumor, invasion into adjacent structures, vascular involvement and distant metastases.
The results of preoperative CT staging were compared to the postoperative histological data.
To determine diagnostic values of CT, we calculated the sensitivity, specificity, positive and negative prognostic values (PPV, NPV). All calculations were performed using SPSS for Windows 22.0 software.

Results
During year 2015 in Lithuanian University of Health Sciences, pancreatic adenocarcinoma was histologically confirmed in 62 patients. 35 patients were operated, 8 patients of them underwent palliative surgery.
12 men (34.3 %) and 23 women (63.7) underwent surgery.
The age range varied between 40 and 85 years. Total average age of patients was 68.3 ± 1.725 years.
Most of the tumours localized in the head of the pancreas (91 %(n=33)); other localization: body of the pancreas - 3 % (n=1); pancreatic tail - 3 %(n=1); infiltrative type - 3 % (n=1).
The mean tumor size was ~ 3.2 cm. Only 3 patients had a tumor less than 2 cm in size during CT scan. The tumor was greater than 2 cm in size in 32 patients.
Radiological preoperative CT (T) stage statistically reliably corresponded to postoperative T stage in 31 case (χ² = 60.383 P <0.001).
Stage (T) CT diagnostic values: sensitivity 88.5 %, specificity 100 %, PPV 96.8 %, NPV 100 % .
There was no statistically significant difference between preoperative distribution to the lymph nodes and postoperative stage N (χ² = 3.795 p> 0.05).
Stage (N) CT diagnostic values: sensitivity 52%, specificity 72%, PPV 76 %, NPV 47%.
Preoperative CT evaluation of tumor resectability was not statistically significantly different from the resectability found during the operation (χ² = 20.92 p <0.01). Diagnostic CT tumor resectability value: sensitivity 100%, specificity 66%, PPV 89%, NPV 100%.

Conclusions
• CT was sensitive and specific for localized pancreatic tumor (T).
• CT was not sufficiently sensitive but specific for determining the spread to the lymph nodes (N).
• Preoperative CT assessment of tumor resectability was not different from determined during the operation.

HEAD AND NECK RADIOLOGY

Evaluation of the role of 3D reconstruction technique in traumatic CT-HEAD scans
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Introduction
Conventional radiographs depict a three-dimensional patient body as a two-dimensional image in which overlying structures are superimposed because image is obtained from single projection. Later, CT uses ionizing radiation to create cross sectional images of human body. With the invention of CT, the limitation regarding superimposition has been eliminated because scanning occurs in thin sections with a narrow x-ray beam which rotates creating obvious differentiation between the structures of similar and different density

Aims and Objectives
• To find out the efficacy of the 3D reconstruction technique in traumatic patients
• To evaluate the perfect diagnostic tool for the traumatic patients
• To evaluate the types of fractures and other pathologies in traumatic cases
Materials and methods

16-channelled bright speed CT scanner of GE used for data collection. All the traumatic patients were scanned with slice thickness of 5mm and then further reconstructed with 1.25mm in both standard window and bone window. Thin slices of bone algorithm were used to form 2D MPR for better visualization of bone in multi-plane and slices with standard filter were used for 3D VRT. These images were examined in 2D then, finding was correlated with reading in 3D weather any extra information could be extracted.

Results

Statistical method shows that there is no significant difference in between diagnostic value of 2D and 3D in the fracture of maxillary, mandible, nasal bone, orbital bone and other fractures except in case of intracranial bleed. The 3D reconstruction technique turned out to be useful in the evaluation of fractures and dislocations, especially in case of facial injury.

Conclusions

In conclusion, it provides good spatial information in a clearly familiar anatomical structure facilitating the accurate and rapid communication of this information to other inexperienced observers also. 3D CT reconstruction increases the diagnostic effectiveness of CT examinations and contributes in surgical planning in complex fractures of facial skeleton also.

HDR brachytherapy at non-melanoma skin cancer

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Introduction

Non-melanoma skin cancer includes basal cell, which in the structure is approximately 80 %, and squamous cell carcinoma – 20 %. Every year the frequency of its occurrence grows. Complete recovery of basal cell carcinoma and squamous skin can be achieved with the modern method of radiotherapy – brachytherapy, which provides the supply of radioactive material, directly to the primary eye. Despite a large number of recommendations for the installation of applicators with high-power brachytherapy, there are many controversial questions regarding the choice and placement of applicators, normalization and dose selection. There are recommendations for setting applicators: they can be flexible or rigid, placed in parallel. Taking into account the histological origin of the tumor process, the volume of the tumor, the data of other diagnostic studies are taken into account.

Objective

To assess the effectiveness of interstitial HDR brachytherapy under irradiation regimen of 32 Gy for 4 fractions when dosing twice a week.

Materials and methods

In the department of radiotherapy from 2012 to 2017, 46 patients with histologically confirmed basal cell (34 patients – 72 %) and squamous – 13 (28 %) skin cancer were treated. According to the International Classification, the stages were set in patients: T1N0M0 – in 16 patients (34 %), T2N0M0 – 23 (49 %), T3N0M0 – 8 (17 %). The localization of the primary tumor was as follows: cheek – 9 (19 %), forehead – 6 (13 %), scalp – 5 (11 %), ear region – 5 (11 %), lip – 6 (10 %), nose – 5 (11 %), the temple area – 3 (7 %), the angle of the eye – 5 (11 %), the rest of the body – 3 (7%). All patients were irradiated with MicroSelectron (radioactive source 192Ir) using interstitial HDR brachytherapy. After local anesthesia, patients were administered "hand free" metal needles directly into the tumor process at each irradiation session. The location of the needles was determined by the need to bring the optimal dose to the tumor with an additional irradiation of 3-7 mm with respect to the visible border of the tumor.

The number of needles ranged from 2 to 10 depending on the extent of the lesion and closely located critical organs (the lens of the eye, the mandible, etc.). The single focal dose was 8 Gy. The irradiation sessions were carried out 2 times a week, in total 4 fractions. The duration of the entire treatment period is two weeks. The planning of the treatment process was carried out under 3D CT control using Oncenter software 3.1. Optimization of the curative plan was carried out graphically. The results of treatment were monitored monthly for the first 4 months, then for 1 time per quarter (patients were examined by a radiation therapist, ultrasound, CT, and MRI, if necessary).
Results
Patients could observe a small bleeding immediately after the extraction of needles, after a few minutes it stopped. The needles were removed from the tumor process after each irradiation session, so patients felt comfortable between the factions. At the same time, the risk of infection was reduced, which is often observed with the introduction of flexible applicators for the entire treatment period. Edema of surrounding tissues after the introduction of needles usually passed by the evening of the same day as the irradiation session. This allowed the next time to bring more accurately the dose to the tumor. In all patients 2-3 weeks after the end of the course of interstitial brachytherapy local radiation reactions were observed in the form of temporary hyperemia of surrounding healthy tissues, to which 60-80 % of the total dose was administered according to the recommendations. After 3-4 observations in all patients, the radiation reactions died down and at the site of irradiation crusts were formed, under which a new young tissue was formed. In five years of follow-up after the completion of the full course of interstitial HDR brachytherapy, 96 % of patients had complete regression of the primary tumor process and no radiation complications were observed, and 4 % had local relapses at an average of 18 months after treatment (1 – in the patient with cancer of the lower lip with repeated injuries of the irradiated site in the post-ray period, 1 – with repeated relapse of the auricular cancer after surgical treatment).

Conclusions
Thus, the fractionation regime of 8 Gy 2 times a week, totaling 4 fractions, allows achieving a good local control of the primary tumor process. During the study period, no radiation complications were observed in this fractionation regime.

INTERVENTIONAL RADIOLOGY

Outcome of endovascular embolization for control of hematuria in patients with inoperable urinary bladder cancer
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Introduction
Hematuria due to inoperable bladder cancer can be life-threatening condition. In case of refractory hematuria conservative treatment is not always successful. Most patients are elderly and unfit for radical surgery. Endovascular embolization should be considered as an alternative less-invasive and safe treatment modality.

Aims and Objectives
The aim of this study was to demonstrate the possibilities of endovascular treatment and to evaluate the results of endovascular embolization in patients with hematuria due to inoperable bladder cancer and to evaluate the complications risk after embolization.

Materials and methods
We retrospectively analysed the cases of 23 patients (17 male and 6 female; mean age 71 years) with urinary bladder cancer, who underwent endovascular embolization between August 2013 and December 2016. Selective embolization was performed in 16 patients (bilateral and unilateral internal iliac artery embolization in 15 and 1) and superselective bilateral vesical artery embolization was performed in 7 patients. Clinical bleeding control and post-embolization angiography findings were used to evaluate the effectiveness of the treatment.

Results
After the first procedure bleeding was controlled in 18 of 23 cases (78,2 %). During the mean follow-up period of 8 days re-bleeding was reported in 2 cases (11,1 %). Both patients had undergone bilateral internal iliac artery embolization. Procedure-related minor complications were post-ischemic pain in the lumbosacral region after bilateral internal iliac artery occlusion in 1 patient (4,3%) and post-embolization syndrome after bilateral superselective embolization in 1 patient (4,3%). One major complication of treatment was glue migration into the right popliteal artery during bilateral internal iliac artery embolization. Procedure-related mortality was 0%. There were no cases of re-bleeding and no major complications related to superselective embolization of bilateral vesical arteries.
Conclusions
Endovascular embolization is a minimally invasive and effective procedure for managing hematuria for patients with urinary bladder cancer. This procedure should be recommended for older adults with severe comorbidities when radical surgery is associated with a higher risk of complications. Superselective bilateral embolization is associated with lower risk of complications and with decreased risk of rebleed.

Allergic reactions received by nurses while warning with disinfectants in surgery profile departments including X-ray catheterization laboratories and therapy profile departments
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As occupational allergic reactions are becoming more frequent among the nurses, more attention is given to this type of pathology. The most frequent reasons for occupational allergy among nurses are the working environment, disinfection, and long-term wearing of protective gloves. Allergic reactions may cause significant chronic health problems, have adverse effect on the nurses’ quality of life, therefore, it is important to analyse nurses’ working environment and possible causes of allergic reactions.

Aims and Objectives
To analyse allergic reactions received by nurses while warning with disinfectants in surgery profile departments including X-ray catheterization laboratories and therapy profile departments.

Materials and methods
- Analysis of scientific literature
- Quantitative research, anonymous questionnaire survey

The methods of the research
A quantitative research was performed using a condensed version of survey, i.e. 27 questions of the survey developed by Vidmantas Januškevičius when writing a doctoral dissertation “Assessment of Interrelations between Nurses’ Working Conditions and Health” (2006). Statistical data processing method was used. The sample consisted of 161 nurses from surgery profile departments including X-ray catheterization laboratories and therapy profile departments in one hospital of Klaipeda. The research was carried out adhering to the principles of ethics.

The results of the research. It was determined that only 35.2 percent of therapy and 41.1 percent of surgery profile departments including X-ray catheterization laboratories considered their health to be good. The research revealed that nurses from surgery profile departments including X-ray catheterization laboratories were more satisfied with their working conditions than nurses from the therapy department, 4.01±0.90 and 3.76±0.82 scores respectively. The nurses from therapy department indicated significantly more frequently that there was a lack of description of disinfection materials in their workplace - 42.6; also, a quarter of the total number of the respondents, i.e. 23 percent, emphasized that there were no user manuals of disinfectants in their workplace. The nurses stated that skin damages caused by disinfectants were on the hands - 95 percent and on the face – 42.2 percent of the total number of replies. While working, the nurses experienced the following symptoms: runny nose – 60.9 %, coughing – 44.1 %, husky voice – 23.6 % and dyspnoea – 21.7 % of all cases. When comparing the nurses’ skin damages, the nurses from surgery profile departments including X-ray catheterization laboratories significantly more frequently related skin redness to the use of disinfectants than the nurses from the therapy department – respectively, 63.6 % and 40.7 percent of cases (p<0,05).

Conclusion
In the opinion of the nurses, most nurses experience health disorders due to the use of disinfection materials. The nurses from the therapy department believe that lack of disinfection materials user manuals, insufficient description of disinfectants and their storage in inappropriate places at work increase the risk of allergic reactions when working with disinfectants.

Keywords: nurses’ opinion, disinfection materials, protective gloves, allergic reactions.
Transarterial genicular artery embolization for the treatment of chronic knee pain.
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Introduction
Osteoarthritis is a common cause of pain and disability. Symptoms are seen in an approximately 10% of people over age of 55 years. Mild to moderate knee osteoarthritis resistant to medication therapy, yet not severe enough to warrant joint replacement, represents a challenge in its management. Recent publications demonstrated that transcatheter arterial embolization for chronic painful conditions resulted in excellent pain relief.

Aims and Objectives
To demonstrate the safety and efficacy of transcatheter arterial embolization for mild to moderate knee osteoarthritis that is resistant to conservative treatment.

Materials and methods
We share our initial experience of four cases. Patients had moderate to severe medial knee pain resistant to at least 3 months of conservative therapy. Under local anesthesia common femoral artery was punctured and percutaneous arterial access was obtained in an ipsilateral anterograde fashion. Abnormal neovessels were identified within soft tissue surrounding knee joint in all cases by arteriography. We used embolization particles 40-150 μm in two cases and 75 μm Embozene microspheres in other two cases. Embolic agent was infused until hemostasis in pathological neovessels was achieved. The patients were discharged on the same day.

Results
The technical success rate was 100%. No major adverse events were related to the procedures. Knee pain of treated patients significantly decreased 1 month after the procedure.

Conclusions
Transcatheter arterial embolization for mild to moderate knee osteoarthritis refractory to traditional nonsurgical management was effective, minimally invasive and safe treatment option.

A proposal for novel radiological objective infrageniculate artery run-off scoring system application in patients prior to endovascular or open bypass surgery treatment modality selection
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Introduction
Infrageniculate artery run-off plays an important role in treatment modality selection for patients with peripheral arterial disease (PAD). Nevertheless application of radiological objective quantitative infrageniculate artery run-off scoring prior to appointment to endovascular treatment or open bypass surgery is not highlighted in any current guidelines of critical limb ischemia (CLI) management. Generally during interdisciplinary discussion infrageniculate vessel status is simply described as “good” or “bad”, although it is clear that such robust description is not objective and reproducible.

Aims and Objectives
The aim of this study was to test author’s proposed infrageniculate artery run-off scoring system application in preoperative (open surgery versus endovascular treatment) evaluation of patients with CLI and long femoropopliteal atherosclerotic lesions involving popliteal artery P1-P2 segment.

Materials and methods
For this single centre case-control study 83 patients who met the following inclusion criteria were selected: a) infrageniculate bypass surgery (IGBS) (n=47) or endovascular therapy (EVT) (n=36) of long femoropopliteal segment performed in year 2015-2016; b) preoperative evaluation performed with digital subtraction angiography (DSA); c) hemodynamically significant atherosclerotic lesion >7cm in length involving popliteal artery P1-P2. Infrageniculate run-off scoring system proposed by the authors (total occlusion=0 point, intact=22) was used to
analyze infrageniculate artery status based on preoperative DSA images. Age, gender, location of residence (rural area, regional town or capital), Rutherford category, femoropopliteal lesion TASC II type, infrageniculate run-off score and the association of these variables with revascularization method selection was analyzed. Univariate and multiple logistic regression analysis performed by SPSS 22 program, $p<0.05$ were assumed as statistically significant.

Results
Mean patient age was higher in the EVT than in the IGBS group: $74.03 \pm 8.96$ vs $68.87 \pm 8.22$. Males more frequently undergone IGBS ($p=0.032$). In IGBS vs EVT group mean total infrageniculate run-off score was $15.36 \pm 3.99$ and $9.51 \pm 5.73$ respectively. In univariate analysis age ($p=0.008$), gender ($p=0.032$), femoropopliteal lesion TASC II type ($0.006$) showed to be strong predicting variables for treatment modality selection, whereas Rutherford category and location of patient residence didn’t show statistically significant association with treatment modality choice ($p=0.582$ and $p=0.235$ respectively). Finally in multiple logistic regression analysis only infrageniculate run-off score along with femoropopliteal lesion TASCII type showed the strongest association with revascularization method choice.

Conclusion
Infrageniculate artery run-off score calculated by authors proposed scoring system was successfully tested and showed to be a statistically strong predicting variable for treatment modality selection in patients with long femoropopliteal lesions involving popliteal artery P1-P2 segment.

Do we need bridging treatment with intravenous thrombolysis before thrombectomy in large artery occlusion stroke?
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Acute ischemic stroke endovascular treatment

Introduction and Aim
Intravenous thrombolysis (IVT) is recommended for all acute stroke patients within time window and no contraindications, but benefit of Bridging treatment (BT) is still debated for patients with large vessel occlusion (LVO). The aim of the study was to compare procedural parameters, neurological outcome and complications in BT in comparison with ET

Materials and methods
We analyzed 513 patients in this prospective single center study, 146 patients were enrolled by subgroups, 84 received BT - (IVT) followed by EVT and 62 patients received only EVT. For early outcome we used NIHSS scale and for late functional outcome we used mRs. All patients received multimodal CT imaging at admission (NECT, CTA, CTP).

Results
Results showed that mRs (0-2) in ET group consisted of 25 (42%), in BT 37 (43%) patients ($p=0.14$). Successful recanalization rate (TICI 2b-3) was slightly higher in BT - 79 (94%) versus 55 (89%) in ET group ($p=0.4$). Recanalization was achieved by 1 pass in more than 50% of cases within both groups. IVT before ET did not decreased the procedural time, median time in BT was 37 (27-50) minutes versus ET group 31 (22-59) minutes ($p=0.71$). 90 days mortality rate was 21% in the ET group (n = 13) and 17% in the BT (n = 14), $p=0.57$. Any bleeding was more common in BT 27 (32%) versus 12(19%) ET group ($p=0.09$).

Conclusions
Bridging treatment group did not show significantly better neurological outcome, higher recanalization and mortality rates compared with ET alone. There was a tendency of a higher any bleeding risk in Bridging treatment group, but no significantly higher risk for symptomatic intracerebral hemorrhage. BT did not show significant impact on procedural time and number of passes.
Advantages of The New European Guidelines Applying in VUL SK for Adrenal CT Exams
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Introduction
The adrenal glands are routinely visualized on every computed tomography (CT) scan of the abdomen and in the recent years these examinations have largely increased in numbers. Approximately, in 5 percent of patients undergoing CT examinations, incidental adrenal nodules are detected. In most of the cases adrenal incidentalomas are non-functioning adrenocortical adenomas, but the common diagnostic issue - there is no dedicated or widely recognized standardized adrenal incidentalomas scan protocol for these patients.

Aims and Objectives
The purpose of this study was to analyse all adrenal CT exams performed in 2017 for outpatients and to compare it with the latest guidelines in the literature. Combining all this data, we have discussed the methodology and set a new pilot protocol in VUL SK for patients with adrenal incidentalomas. In April of 2018, the new protocol has been applied in a clinical practice for a trial period.

Materials and methods
All patients’ data from 2017 was collected retrospectively using VUL SK internal database and pictures archiving system. All prospectively performed CT scans in April of 2018 were performed using the new-dedicated scan protocols with additionally reduced field of view. Both, retrospective and prospective, CT exams were performed with the same GE Healthcare Discovery CT750 HD CT scanner. Working radiologist assessed prospectively performed adrenal CT scans on the same time. The volume of iodinated contrast was recalculated for patient’s body mass (1.5 ml/1 kg), when was used.

Results
We have reduced radiation dose by 31.11 percent for patients undergoing primary contrast enhanced adrenal CT examination in 2018 (n=4), compared with 2017 (n=117), average dose length product (DLP) value was reduced to 1044.3 from 1515.9 mSv×cm, p<0.05. Average DLP value in primary non-contrast adrenal CT in 2018 (n=9), compared with 2017 (n=13) was almost identical, 239.2 and 239.0 mSv×cm, respectively, p<0.05.
We have reduced radiation dose by 21.36 percent for patients undergoing repetitive contrast enhanced adrenal CT examination in 2018 (n=3), compared with 2017 (n=59), average DLP value was reduced to 1441.6 from 1833.2 mSv×cm, p<0.05. We have reduced radiation dose by 6.43 percent for patients undergoing repetitive non-contrast adrenal CT examination in 2018 (n=6), compared with 2017 (n=69), average DLP value was reduced to 447.9 from 478.7 mSv×cm, p=0.19.

Conclusions
Combining the latest European guidelines with the VUL SK data analysis, we can conclude that adjusting the newest prospective adrenal CT examination protocols for outpatients, we can reduce radiation dose significantly. However, this is only the first group of patients who were scanned with this new protocol in 2018 and we need to collect more patients’ data to prove the advantage of this protocol.

Gamma quantum interactions in organic tissue
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Introduction
After irradiation of organic tissue we measure the integral value – kerma or absorbed dose. But what happens in reality during small times before the measurements?
Aims and Objectives
The aim of the work was to formulate the concept of constructing a temporal and energy hierarchy of processes that occur when a gamma quantum passes through an organic tissue.

Materials and methods
Analysis of experimental and theoretical data on gamma interactions.

Results
γ-quantum is a product of nuclear field. γ-quantum has no mass and spin and independently is a scalar value, but in interaction of nucleons in nucleus it gets tensor quantity with dimension at least 9. And it interacts with nuclei. It does not interact with electrons, protons, atoms (only indirectly - through the nucleus). It interacts only with the nuclear field.

Klein-Nishina formula was created in 30 years of the last century in the frames of Thompson model. This model does not work - model of pudding. That was an attempt to describe theoretically Compton effect.

There are few channels of reaction. The simplest - when gamma quant is absorbed by nucleus field and this nucleus moves with kinetic energy during nuclei times ($\approx 10^{21-23}$ sec). The point is that nuclei times are approximately five orders higher than that of atomic ones. This nucleus leaves all the electron shells behind. For instance, the irradiation of Pb when all 82 electrons are remained orphaned - what impulse - what a current. If nuclei move even 10 nm (atom is measured in A) the ionization will be strong.

Nucleon separation from the nucleus is possible (probability is proportional 1/N).
Then β + and β- disintegration in super weak interactions etc.
There was no even electrodynamics interaction since gamma has no electromagnetic features.

Conclusions
Since Time and Energy are bounded with one conceptual chain it is necessary to build Energy (Time) hierarchy of processes occurring in organic tissue after gamma irradiation. May be dose requires structuring.

H-NMR Spectroscopy in Prostate Cancer: pH Evaluation as Additional Indicator for Malignant Tissue
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Introduction
Proton magnetic resonance spectroscopy (MRS) is an advanced magnetic resonance technique that can mark the presence of metabolites such as citrate, choline, creatine and polyamines in a selected voxel or voxels inside prostatic tissue. Abundance or lack of these metabolites, which occur prior to structural changes, can discriminate between pathological and healthy tissue. Although the use of MRS is well established, quantification of metabolites in prostate can be very difficult to achieve, due to poor signal to noise ratio, overlapped peaks and strong $J$-coupling of the citrate.

Aims and Objectives
The purpose of this study is to adapt MRS technique at Vilnius University Hospital Santaros Klinikos (VULSK) and to test alternative algorithms for prostate malignance identification.

Materials and methods
Spectroscopic experiments were carried out on 3T Philips MR scanner operating at 128 MHz and on high resolution 9.4T Bruker NMR spectrometer operating at 400 MHz for $^1$H. Homemade prostate phantoms with
different compositions and pH were prepared. For comparison with experimental results, in-vivo spectra were analysed retrospectively using 2016 and 2017 MRI data.

Results
The study shows behaviour of spectrum under changes of pH, which occurs if benign tissue becomes malignant. Different pH (from 5.5 to 7) of the samples had a significant influence on citrate demonstrating variation in its central chemical shift (2.66 - 2.56 ppm), integral of peaks, and distance between doublets. For in-vivo spectra analysis and graphical representation we introduce our custom software based on Python programme language, which automatically compares chemical shift of citrate in relation to choline.

Conclusions
According to our results we have reasons to believe that a difference in chemical shifts between citrate and a significantly more stable (in respect of pH) metabolite choline might be a good additional indicator for malignant tissue.

Possibility of accelerating the introduction of tomosynthesis into clinical practice by upgrading the operated regular X-ray radiographic units with tomosynthesis
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Introduction
Tomosynthesis is new technology of X-ray visualization, allowing increase the efficiency of X-ray diagnosis. Currently for execution of tomosynthesis expensive specialized X-ray equipment is used, inaccessible to health care entities with restricted financial resources.

Aims and Objectives
The purpose of the work is demonstrating the possibility of tomosynthesis implementation on standard radiographic diagnostic equipment, thus allowing to reduce essentially the expenses of tomosynthesis implementation into the clinical practice.

Materials and methods
In the present work tomosynthesis modality has been realized on three units of standard X-ray diagnostic equipment: Cabin fluorograph, X-ray unit with 2 workplaces and remote tilting table with analog tomography mode. 5 kW X-ray unit from C-arch on mobile platform was installed on the fluorograph. Instead of fluorographic chamber a dynamic digital receiver with 43x60 cm work field was installed on the cabin of the fluorograph. The X-ray units were equipped with high-frequency pulse-fluo mode feeding device and dynamic digital receiver with 43x43 cm work field. Tomosynthesis modes with ± 20° tomography angle were used in the studies. Exposure time was 4-6 sec. Chest test phantom with X-ray target was studied.

Results
200-400 slices of study object were received in tomosynthesis mode. Resolution in image plane amounted to 2.1 x 1.6 lp/mm and the effective thickness of tomographic slices was 2-8 mm. The total exposure in chest tomosynthesis did not exceed 20.0 mAs that is 3-6 times more than with the standard chest radiography and 5-10 times less than with the standard computer tomography. According to experts, the obtained chest phantom slices presented details that are poorly visible on X-ray images. Tomosynthesis mode compared to X-ray enabled to measure more accurately the geometric dimensions of the studied objects, as well as to assess the relative density of tissues in each slice. In the end of 2017 the remote tilting table with tomosynthesis mode has been installed in the health care entity. Its use in clinical conditions allowed to increase probability of correct diagnosis without referring the patient to CT or MRI study.

Conclusions
Using standard X-ray equipment tilting devices allows reducing by not less than 30% the expenses connected with introduction into clinical practice of tomosynthesis that substantially expands the possibilities of roentgen diagnostics and reduces the number of patients’ referrals to CT and MRI examinations.
The Radiologist’s Guide to Malpositioned IUDs and associated complications
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Introduction
Intrauterine devices (IUD) are commonly used for contraception worldwide, with 98-99% effectiveness in preventing pregnancy. The mechanism of contraception is due to the chronic inflammatory changes induced by the IUD in the endometrium and fallopian tubes, which in turn has spermicidal effects, inhibits fertilization, and creates an inhospitable environment for implantation. However, a frequent complication of IUDs is migration from its normal position, leading to secondary complications of malpositioning such as ectopic location, embedment, perforation, or expulsion. Malpositioned IUDs may also result in unplanned pregnancies or surgical intervention for device retrieval.

Aims and Objectives
This pictorial review is directed towards in-training radiology residents and fellows, general and body radiologists, and non-radiology audiences to recognize the normal and abnormal imaging findings associated with IUDs, the clinical implications of a malpositioned IUD, and the appropriate imaging follow-up that will provide guidance for physicians and clinical management.

Materials and methods
This was a retrospective review using the PACS imaging system at our institution of malpositioned IUDs from patients, with cases collected over a 10 year period. The clinical and radiological follow-up they underwent and their clinical outcome were evaluated.

Results
We will discuss the pre- and post-medical/surgical treatment outcomes of our patients who presented with malpositioned IUDs, and what radiologists can do to aid in clinical management.

Conclusions
Radiologists play a critical role in assisting clinicians with the location of IUDs, and providing clinically impactful information on potential associated complications of a malpositioned IUD. Radiologists should be familiar with the normal appearance and location of IUDs, along with the treatment algorithm for locating IUDs that are not identified within the uterus, as these patients may require further medical or surgical management, and also because of the decreased contraceptive efficacy.

Few cases from our patient population:

Figure 1: 34 year old female with history of 3 cesarean sections presented for evaluation of IUD placement. Ultrasound (top) revealed a complex collection at the cervicouterine junction which contained a portion of the IUD. Findings of near complete dehiscence at the C-section scar site which contained the IUD were confirmed on MRI (bottom). She eventually underwent laparoscopy for IUD removal.
MUSCULOSKELETAL RADIOLOGY

Bone angiosarcoma: two recent cases
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Introduction
Bone angiosarcomas constitute less than 1% of all primary malignant bone tumours. As these tumours are very rare and most commonly present with osteolysis that may mimic other malignancies, e.g. metastasis, the correct diagnosis may be delayed, especially in elderly patients. Unfortunately also the nomenclature of these tumours in literature has been quite inconsistent.

Aims and Objectives
To present two patients diagnosed with bone angiosarcoma.

Materials and methods
Main imaging findings of two elderly patients with bone angiosarcoma will be discussed and compared to available literature. One of them had an amputation of the leg, while the other was directed to palliative care.

Results & Conclusions
As malignant bone angiosarcomas are very rare tumours, the doctors have to be vigilant not to miss them for a metastasis or lymphoma. Usually they show multiple lytic lesions that may be present in single bone or at least in the same extremity (first patient), although initial wider presentation is also possible (second patient).

Chronic nonbacterial osteomyelitis in childhood: five years’ experience of imaging at a tertiary hospital
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Introduction
Chronic nonbacterial osteomyelitis (CNO) is a rare auto-inflammatory bone disorder of unknown etiology that results in a spectrum of bone lesions, and within which chronic recurrent multifocal osteomyelitis (CRMO) is the most severe form. In children and adolescents CNO/CRMO predominantly affects the metaphyses of the long bones, but single or multiple lesions can occur at any site of the skeleton. Delays in diagnosis may lead to prolonged courses of antibiotics, unnecessary radiation exposure from multiple radiographs or bone scans and repeated surgery including bone biopsies.
Aims and Objectives
To determine patient characteristics, clinical presentation, imaging strategies and diagnostic workup, and pattern of involvement of patients with CNO.

Materials and methods
Retrospective analysis of electronic records of children diagnosed with CNO/CRMO in Children’s Clinic and/or Department of Maxillofacial Surgery, Stomatology Clinic, Tartu University Hospital, was done to evaluate imaging data and clinical course. All performed images were analysed for the presence and number of bone lesions.

Results
Nine patients (five boys) were diagnosed with CNO/CRMO. The mean age at diagnosis was 11.4 (range 5.5 – 17.5) years.
All patients complained about pain, six had localized swelling and only one presented with fever. One child had associated Crohn’s disease, none of the patients had pustulosis.
The mean time from the symptoms onset to the diagnosis of CNO was 6.3±4.2 months.
Mean CNO clinical score according to Jansson at the diagnosis was 45 ± 10 points.
In our institution initial imaging consisted of radiographs (CR) at symptomatic sites followed by local MRI (67%) or CT (33%). Whole body MR (WBMR) was done in five patients (56%), SPECT/CT in two and PET/CT in one patient.
In our study the appearance of bone lesions on CR ranged between purely osteolytic, osteolytic with a sclerotic rim, mixed lytic and sclerotic, and purely sclerotic according to the severity and duration of the disease. Also, in different extent the laminated periosteal reaction and hyperostosis was seen.
In MRI examinations in all cases we revealed bone marrow oedema with associated periosteal reactions and surrounding soft tissue oedema. Joint effusions were demonstrated when adjacent to the osseous lesions. In initial acute phases of CNO the destructions in the affected metaphyses of long tubular bones and vertebral bodies were demarked by a sclerotic rim. One child with vertebral involvement developed multiple vertebral planae.
Five patients presented with clinically unifocal disease, but two of them had radiologically more than one lesion. In cases of multifocal disease, the mean number of lesions was 6±4.1.
In five children with solitary bone lesion in atypical location or/and suspicious general symptoms, a biopsy was performed to rule out an infectious or tumoral process.
In all, 41 bony lesions were identified. They were located in the spine (total 19, in three children), mandibula (five, in three), tarsals (five, in one), tibias (three, in one), phalanges (four, in two), femur (two, in two), fibulas (two, in one), metacarpal and rib.
Seven subclinical sites were diagnosed by whole body imaging.

Conclusions
CNO has been more recognised and diagnosed in the recent years, but can still remain a diagnostic challenge. Symmetricity, multifocality and particularly specific patterns of lesions appear suggestive to CNO.
MRI should be preferred instead of CT and nuclear imaging.
WBMR is a valuable and radiation-free imaging modality of choice in patients with clinical multifocal symptoms and in detection of subclinical lesions.

NEURORADIOLOGY
Neoplastic process verification in the structure of cortical substrates of unclear etiology in children with epilepsy
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Introduction
Prospective analysis of epileptogenic images of cortical substrates with blurred radiological picture, to identify specific criteria for MRI-negative cases of dysembryoplastic neuroepithelial tumors (DNETs), and gangliogliomas (GGs).
Aims and objectives
The aim of this study was to identify specific criteria for MRI-negative cases of DNETs, and (GGs).

Materials and methods
The study encompassed 27 children with neuronal-glial tumors associated with symptomatic epilepsy, during 2007 – 2018 period.
10 pre-operative patients with radiological and clinical signs of drug-resistant epilepsy with DNEO and GG were selected for prospective images analysis and comparing with the histological tests results.
Dynamic MRI on the imaging 3.0, 1.5 Tesla were analyzed to reveal the specific signs DNEO and GG.
Used: one-molar and semi-molar drugs contrast enhancement; sevoflurane for anesthesia.

Results
DNEOs were identified in 15 patients, GGs – in 12 patients. Associated FCD Type IIIb -in 6 patients; the signs of DNEO and GG histologically were revealed in the same tumor in 3 patients; the DNEO, GG and FCD IIIb signs presence was shown histologically in 2 patients.
16 patients showed temporal lobe localization.
10 patients with DNEO and 8 patients with GG had the peculiar signs of the triangular configuration, the comet tail and the bubble symptoms.
Peritumoral local or regional tumors; signal hyperintensity, disruption of gray-white differentiation and cortical arrangement, perversion of the gyri and the presence of trans-mantle sign revealed in 12 patients, let us to suggest the presence of FCD IIIb.
Four GGs and 3 DNEOs were contrast – positive (1 DNEO + FCD IIIb).
10 pre-operation children with a differential diagnosis of DNEO/GG/FCD IIb were identified based on the results of histology, retrospective MR-image analysis of operated patients, and the literature review.
8 patients had the signs of dysplastic variation of DNEO and GG; 4 of them had signs of associated FCD.
Reliable signs of neoplasm, contrast enhancement, bone remodeling and enlargement were diagnosed in 2 cases.
On DTI and FA in seven patients the changes shifted and moved the paths apart. ASL showed low blood flow rate in 4 cases and close to the normal in the patient with of FCD IIIb signs. One patient was operated; histological test confirmed the concomitant form of FCD IIIb + GG.

Conclusions
MR – image of the DNEOs and their division into types are relevant for the most of GGs. Multi-nodular, nodular and diffuse variants of the structure were also registered in patients with GG. In some cases in the absence of typical radiological tumor signs, it was not possible to accurately differentiate them with some glial tumors Gra I-II and FCD IIb.
On revealing unclear cortical lesions with FCD associated symptoms, the usage of MRI BP on the epileptic scanning Protocol in the complex pre-surgical examination is strongly recommended.

Ischaemic stroke outcomes and relation with aspects
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Introduction
It is very important to select patients for treatment of acute ischaemic stroke (AIS) because clinical outcomes after treatment frequently are not satisfactory. Alberta stroke program early CT score (ASPECTS) on baseline imaging is an established predictor of AIS outcomes. However, according to different investigators analysing ASPECTS prognostic value, the results are controversial. For this reason we investigated the possibility to predict outcomes and haemorrhagic complications after thrombolytic therapy and/or thrombectomy using ASPECTS.

Aims and Objectives
To evaluate baseline ASPECTS and follow-up at 24 hours ASPECTS correlation with AIS clinical outcomes. To evaluate the possibility to predict haemorrhagic complications after AIS using baseline ASPECTS.

Materials and methods
The analysis included 160 patients who experienced AIS in the territory of medial cerebral artery and were treated by thrombolysis and/or thrombectomy. Ischaemic changes in the brain were evaluated on baseline and 24-hour follow-up CT scans using ASPECTS method by two radiologists independently and consensus score approach was
used in the analysis. Patients were stratified into those with high ASPECTS (8-10 scores), moderate ASPECTS (5-7 scores) and low ASPECTS (<5 scores). Baseline neurological condition was evaluated at the time of arrival to the Emergency department, clinical outcomes were evaluated at 7th day of treatment. Analysis of baseline neurological condition and clinical outcomes was based on National Institutes of Health (NIH) scores.

Results
High baseline ASPECTS (8-10 scores) was noticed for 93% patients while high ASPECTS at 24 hours was noticed only for 54%. Dramatic infarct progression (decrease in ASPECTS ≥6 points at 24 hours) frequency didn’t differ significantly in cases when baseline ASPECTS was high (8-10 scores) or lower (≤7 scores) (10% vs. 9%, P=0.957). NIH scores at 7th day of treatment correlation with baseline ASPECTS was weak, while correlation with ASPECTS at 24 hours was strong. It was noticed that baseline ASPECTS score didn’t predict haemorrhagic complications.

Conclusions
Prediction of clinical outcomes and haemorrhagic complications after AIS based on baseline ASPECTS score is not satisfactory. ASPECTS score at 24 hours is related to patient’s neurological condition after seven days, however, it is not useful for selecting patients for thrombolytic therapy and/or thrombectomy. Follow-up at 24 hours ASPECTS could be used in clinical work to evaluate size of brain damage and effectiveness of earlier treatment, to predict outcomes and to choose later treatment/rehabilitation.

Visualization aspects of rare forms of childhood degenerative diseases like leukoencephalopathy with brain stem and spinal cord involvement and lactate elevation (LBSL)
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Introduction
Leukoencephalopathy with brainstem and spinal cord involvement and elevated lactate (LBSL) is an autosomal recessive white matter disorder, first described in 2003 by its unique pattern of MRI abnormalities (van der Knaap et al., 2003). LBSL typically involves the cerebral, cerebellar white matter and specific tracts in the brainstem and spinal cord and is characterized by slowly progressive cerebellar ataxia and spasticity with dorsal column dysfunction (decreased position and vibration sense) in most patients. The neurologic dysfunction involves the legs more than the arms. The tendon reflexes are retained. Deterioration of motor skills usually starts in childhood or adolescence, but occasionally not until adulthood. Dysarthria develops over time. Occasional findings include: epilepsy, learning problems, cognitive decline and reduced consciousness, neurologic deterioration, and fever following minor head trauma (van der Knaap et al., 2003; Scheper et al., 2007).

Aims and objectives
The aim of this study was to share our experience with such a rare childhood degenerative disease like LBSL and give some take home key points that could help us make a more accurate diagnostic of LBSL in a future.

Materials and methods
The study included 2 children in age of 1 year 7 months and 1 year 5 months that presented with clinical manifestations of neurologic dysfunction after an episode of high fever and acute respiratory viral infection that was caused by a tooth growth. Both of the patients were examined by neurologist and underwent spine and brain MRI examination, including T1, T2 and FLAIR sequences. The first patient was examined by 0.4 T MRI with routine protocol, the second patient was examined by 1.5 T MRI also with routine scanning protocol. In both cases MRI spectroscopic imaging was not been obtained.

Results
MRI examination of the first patient revealed:
1) Subtotal leukopathy and signal abnormalities in cerebral white matter of both hemispheres;
2) Diffuse leukopathy and signal abnormalities in corpus callosum;
3) Symmetrical signal abnormalities in brain stem at the level of pons and cerebral peduncles;
4) Linear signal abnormalities in dorsal columns of the cervical spinal cord
MRI examination of the second patient revealed:

1) Total leukopathy and signal abnormalities in cerebral white matter of both hemispheres;
2) Diffuse leukopathy and signal abnormalities in splenium of the corpus callosum;
3) Symmetrical signal abnormalities in internal capsule of the brain, dorsal columns and lateral corticospinal tracts in brain stem at the level of pons and cerebral peduncles
4) Restruction of the diffusion in periventricular areas of the temporal lobes as a sign of active demielization
Conclusions: In conclusion we would like to say that MRI criteria of LBSL is quite typical and could be well seen not only on high frequency MRI, but also using a low frequency MRI, so we believe that sharing our experience with other colleagues and together with clinical and literature data the diagnosis of LBSL with other differential diagnosis, like canavan disease, x linked adrenoleukodystrophy and other leukodistrophies could be made more frequently in the future.

Also we would like to remind you that in case if you see non specific signal changes in white matter of the brain in a child, you should advise to make a follow up MRI examination after 6,8 and 12 month to exclude, for example, hypoxic ischemic encephalopathy.
The role of computed tomography in the modern diagnosis and treatment of epilepsy

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Introduction

At present, the unconditional primacy of magnetic resonance imaging (MRI) in the visualization of structural epilepsy ont is being questioned. At the same time, the role of computed tomography (CT) in the differentiation of the genesis of these changes, complex pre-surgical examination and intraoperative support remains extremely topical. In addition, the combination of these two methods in the diagnosis of certain structural bases of epilepsy can significantly increase the specificity of the neuroradiologic picture and significantly affect the tactics and scope of surgical intervention. Neuronavigation (frameless stereotaxis) is a method of rapid and precise localization of a tumor in the brain tissues, developed in the 90s of the 20th century in the USA (first described in 1986). It is a control computer equipped with a two-way antenna and markers, through which it displays the necessary information to the neurosurgeon - the most accurate coordinates of the location of the target point of impact relative to blood vessels, tissues and vital brain structures.

The use of multispiral CT (MSCT) in neuronavigation in cases of resection of the epileptogenic substrate has a number of characteristics. Currently, it is used in the presence of absolute contraindications to MRI. In complex surgical manipulations under the control of neurophysiological systems, programmable VPSh, metal structures, subdural grids, deep electrodes, etc. SutTech neuronavigation combines the intraoperative pattern with three-dimensional images of brain structures and a pathological focus that the control computer processes. With some forms of symptomatic epilepsy, implantation of the electrodes in the brain structures is performed, registering, with high accuracy, the spread of an attack from the epileptogenic zone, which is mandatory for epileptic surgery. Installation of structures using metal components makes it impossible to use MRI for dynamic up to intra and post-operation evaluation of the manipulations performed, however, in such cases it is successfully replaced by computed tomography.

Case 1. Patient M. (age 8) suffers from pharmacoresistance symptomatic epilepsy for 4 years. According to MRI, a pathological focus in the cortical plate of the right parietal lobe was found, correlated with the focus of epileptiform activity according to video EEG monitoring data. During the pre-operative catamnesis, an anticonvulsant therapy was selected that did not significantly affect the course of the disease. According to the decision of the consultation, the patient was shown surgical treatment, in particular, the installation of subdural electrodes that fit on the surface of the brain and are so-called flat membranes with integrated electrodes that are not compatible with MRI. Also considering the installation of metal structures, it was shown the use of CT neuronavigation, with subsequent dynamic control.

In addition, the role of radiation diagnostic methods in the complex pre-surgical examination, in the final diagnosis and planning of therapy tactics, in cases of verified neoplastic process remains significant. Case 2. Patient C. 26 years old. Since 2011, observed and treated with a neurologist with a diagnosis of myasthenia gravis, generalized form. According to MRI data from 2010, a pathological contrast-negative focal point of unknown origin was found in the cortical plate of the right temporal region, without mass effect, perifocal edema. With periodic dynamic monitoring, for 8 years, there was no significant dynamic transformation of pathological changes, the addition of contrast enhancement or changes in configuration. In comparison with MRI from 19.03.18, the picture has not fundamentally changed. Differential diagnosis was conducted between focal cortical dysplasia 2b type (PCD 2b), glial tumor GraI-II and PCD-associated tumor. To determine the genesis of the unclear epileptogenic substrate, a full-scale complex pre-surgical diagnosis was performed: (MRI using the protocol of epileptic scanning with inclusion of the methods of non-contrast MR-perfusion (ASL) and tractography), which indirectly confirmed the presence of the neoplastic genesis of the revealed changes. At the same time, for a reliable verification of the neoplastic process, a PET / CT scan of the brain with methionine [11C] -L-methionine ([11C] -MET) was recommended by the decision of the consultation. According to PET, the zone of pathological changes in the right temporal lobe is regarded as glioma with a moderate degree of activity. The patient was shown and performed surgical treatment - removal of the tumor of the right temporal lobe, using electrophysiological monitoring. Histological diagnosis-Ganglioglio, WHO Grade I.
Intradural Intramedullary Teratoma Presenting in the Lumbar Spine: Report of a Rare Case
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Teratomas of the spinal cord constitute 0.1-0.5% of all spinal tumors, and these lesions are extremely rare in adults. The authors describe a rare case of intradural intramedullary teratoma at the L1-level and perform review of literature of adult onset spinal teratomas.

Case presentation
A 36-year-old woman presented with 8 years of progressing lower back pain. There was no history of spinal dysraphism, congenital spinal abnormalities, previous spinal surgery, or lumbar puncture.

Management and outcome
Neurological examination revealed hyperesthesia at L1 dermatomes on both sides and at L2 dermatomes on the right, higher reflexes in legs than in arms, positive Babinski reflex on the right. Lumbar magnetic resonance revealed intradural intramedullary tumor at the L1-level, located on the left side of spinal cord with spinal cord compression and myelopathy. Th12-L2 left hemilaminectomy was performed with total extirpation with MEP and SSEP monitoring. Histopathology examination of the resected tumor revealed transitional and respiratory epithelium, acinar structures and hyaline cartilage. There were no immature elements or malignant cells. Post-operatively neurological symptoms regressed, patient was mobilized and was able to start walking with assistance.

Discussion
Teratoma is defined as a neoplasm that is composed of a variety of parenchymal cell types derived from three germinal layers (ectoderm, endoderm, and mesoderm). Intramedular spinal teratoma is the most common type of spinal teratomas. The main spinal teratoma symptoms are pain, weakness and numbness of the legs, sphincter and/or gait dysfunction, intramedullary teratomas present early on with increased reflexes and loss of vesical and rectal control. Histopathologic examination is the gold standard for definite diagnosis. Teratomas are diagnosed when remnants of all three germ layers are present. MRI is the gold standard diagnostic technique for spinal teratoma. The tumor presents as inhomogeneous intensities in both T1- and T2-weighted images due to teratoma’s tissue heterogeneity. Surgical resection is the first line treatment for spinal teratoma, usually decompressive laminectomy is performed. The goal of surgery should always be the most radical removal possible with relieve of the nerve compression with the aim of preventing progressive deterioration.

Conclusions
Teratomas should be taken into consideration in the differential diagnosis of intramedullary lesions when the imaging reveals variable signal intensity because of tissue heterogeneity. A partial resection is a viable treatment option when the lesion is attached to vital structures because of the low recurrence rates reported in the literature.

Neoplastic process verification in the structure of cortical substrates of unclear etiology in children with epilepsy
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Aims and objectives
The aim of this study was to identify specific criteria for MRI-negative cases of DNETs, and (GGs).
Materials and methods
The study encompassed 27 children with neuronal-glial tumors associated with symptomatic epilepsy, during 2007–2018 period.
10 pre-operative patients with radiological and clinical signs of drug-resistant epilepsy with DNET and GG were selected for prospective images analysis and comparing with the histological tests results.
Dynamic MRI on the imaging 3.0, 1.5 Tesla were analyzed to reveal the specific signs DNET and GG.
Used: one-molar and semi-molar drugs contrast enhancement; sevoflurane for anesthesia.

Results
DNETs were identified in 15 patients, GGs – in 12 patients. Associated FCD Type IIIb - in 6 patients; the signs of DNET and GG histologically were revealed in the same tumor in 3 patients; the DNET, GG and FCD IIIb signs presence was shown histologically in 2 patients.
16 patients showed temporal lobe localization.
10 patients with DNET and 8 patients with GG had the peculiar signs of the triangular configuration, the comet tail and the bubble symptoms.
Peritumoral local or regional tumors; signal hyperintensity, disruption of gray-white differentiation and cortical arrangement, perversion of the gyri and the presence of trans-mantle sign revealed in 12 patients, let us to suggest the presence of FCD IIIb.
Four GGs and 3 DNETs were contrast – positive (1 DNET + FCD IIIb).
10 pre-operation children with a differential diagnosis of DNET/GG/FCD IIb were identified based on the results of histology, retrospective MR-image analysis of operated patients, and the literature review.
8 patients had the signs of dysplastic variation of DNET and GG; 4 of them had signs of associated FCD.
Reliable signs of neoplasm, contrast enhancement, bone remodeling and enlargement were diagnosed in 2 cases.
On DTI and FA in seven patients the changes shifted and moved the paths apart. ASL showed low blood flow rate in 4 cases and close to the normal in the patient with of FCD IIIb signs. One patient was operated; histological test confirmed the concomitant form of FCD IIIb + GG.

Conclusions
MR – image of the DNETs and their division into types are relevant for the most of GGs. Multi-nodular, nodular and diffuse variants of the structure were also registered in patients with GG. In some cases in the absence of typical radiological tumor signs, it was not possible to accurately differentiate them with some glial tumors Gra I-II and FCD IIb.
On revealing unclear cortical lesions with FCD associated symptoms, the usage of MRI BP on the epileptic scanning Protocol in the complex pre-surgical examination is strongly recommended.

Unusual primary central nervous system lymphoma location
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In 2015, previously healthy 69-year-old woman presented at Ukmerge Hospital with a 4-week history of memory loss, dizziness, weakness, quickly worsening loss of orientation and walking impairment. During physical examination no palpable lymphadenopathy or organomegaly was detected. Blood tests, including serology for HIV and other infections, were negative. Patient was referred for MRI. MRI scans were performed at „Affidea” diagnostic centre and revealed contrast-enhanced hypothalamus tumor. A stereotactic biopsy at LSMU Kaunas Clinics led to a diagnosis of diffuse large B-cell lymphoma, primarily located in the central nervous system (PCNSL). After the completion of chemotherapy treatment patient’s condition remained severe (acute confusional state with the need of 24-hour nursing care) and MRI showed no evidence of hypothalamus tumor but emerging multifocal parenchymal changes.
Diagnostic challenge of post-operative visual loss after cardiac surgery: a case report
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Introduction/Background
Post-operative vision loss (POVL), is a rare but devastating complication that has been reported after spine, cardiac, and head–neck surgeries. Various causes attribute to post-operative blindness: ischemic optic neuropathy, central or retinal artery branch occlusion, cortical blindness, and external ocular injury. This case report highlights the importance of radiologic imaging in clinical POVL diagnostics.

Case presentation
A 51-year-old man, hypertensive with aortic valve stenosis and coronary artery disease, underwent a conventional aortic valve replacement and coronary artery bypass graft surgery with extracorporeal circulation. No complications concerning surgery or general anesthesia were noted. Post-operatively patient was hemodynamically compromised due to bleeding. First day after the surgery, he complained of a severe bilateral visual loss. Careful ophthalmologic examination did not conclude any pathologic changes in the eyes. Bedside transorbital duplex ultrasound did not reveal any abnormality in the blood flow of a central retinal artery. The neurologic analysis detected agnosia, an inability to interpret sensory stimuli. Head computed tomography angiography with perfusion showed no abnormalities. To differentiate the ethology of bilateral visual loss, head magnetic resonance (MRI) was carried out. On MRI, multiple hyperintense cortical lesions on T2 sequence with diffusion restriction (DWA, ACD) on the left basal and medial surface of temporo-occipital region were observed, together with small hyperintense foci on the right hemisphere. These findings were consistent with transient peri-operative brain hypoperfusion diagnosis, and it most probably was the cause of POVL in this case. After a week, patient regained his vision.

Conclusions
A careful differential diagnosis is required in order to suspect transient cortical hypoperfusion and head MRI should be the diagnostic test of choice if POVN or a similar condition is suspected.

NUCLEAR MEDICINE

Relation between metabolic PET textural indices and differentiation grade of head and neck squamous tumors
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Introduction
Quantitative analysis of malignant tumor characteristics, based on medical imaging is an emerging field of research that is attractive by possibility to overcome the subjectivity of visual interpretation. Besides the simple and well-established quantification methods in metabolic PET/CT (such as SUVs and their combinations) diagnosis and lesion characterization done by visual analysis can be complemented by many different features that could be quantified by imaging such as shape, intensity-based and textural properties, linked to the phenotype of underlying tumor biology.

Aims and Objectives
To retrospectively analyze, whether there is a connection between textural indices derived from 18F-FDG PET/CT images of head and neck squamous carcinomas and their differentiation grade defined by histopathological examination, as one of the biologic parameters, affecting disease prognosis.

Materials and methods
PET/CT data from baseline studies of 37 patients with head and neck squamous carcinomas were analyzed. Tumor differentiation grade was defined by means of histological examination of biopsy specimens (11 patients with grade 1, 17 patients with grade 2 and 9 patients with grade 3 tumors). All imaging exams were performed according to EANM guidelines for PET/CT imaging of solid tumors with Philips GEMINI PET/CT combined
scanner. Image reconstruction was performed with standard vendor algorithms, textural analysis with LIFEx software. Volume of interest segmentation (primary tumor) performed with fixed thresholding technique (41% of maximum uptake). First order features (histogram and shape) as well as gray-level zone length (GLZLM), gray-level run length (GLRLM), neighborhood grey-level different (NGLDM) and grey level co-occurrence (GLCM) matrixes indexes were calculated (total 39 features) inside segmented metabolic volume.

Results
Among calculated textural indices seven showed statistically significant (p<0.05) difference for different histological tumor grade, but only to discriminate poorly differentiated tumors (grade 3) from highly differentiated (grade 1). No indices reached statistically significant difference in grade 1 vs grade 2 tumors or grade 2 vs grade 3 tumors in this patient population. ROC analysis of significant indices for discriminating poorly differentiated tumors (grade 3) from other tumors yielded the biggest AUC of 0.764 for GLRLM feature of short-run low gray-level emphasis (SRLGE).

Conclusions
Several textural indices of metabolic PET images showed connection to head and neck squamous carcinomas differentiation grade in current patient cohort, being able to discriminate poorly differentiated tumors (grade 3), demonstrating the ability of imaging textural features to provide additive value in characterization of pathological tracer uptake. Taking into account retrospective nature of this study and relatively small patient population, further investigations with larger cohort to validate these preliminary results and explore prognostic values of baseline textural features are needed.

Evaluation of recurrent prostate cancer using 68Ga-PSMA PET/CT, mpMRI and 99mTc bone scintigraphy.
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Introduction
Biochemical recurrence occurs approximately 15-25% patients after radically treated prostate cancer. Early and precise diagnostics of recurrent prostate cancer are cornerstone for further adequate therapy planning. 68Ga-Labeled Prostate-specific Membrane Antigen Ligand Positron Emission Tomography/Computed Tomography (68Ga-PSMA PET/CT) are new diagnostic modality that combines functional and anatomical imaging and is used in prostate cancer. Multiparametric magnetic resonance imaging (mpMRI) of prostate is proven precise method for diagnosis of local recurrence of prostate cancer after prostatectomy and radiation therapy. Bone scintigraphy is the standard modality used to detect bone metastases in prostate cancer patients.

Aims and Objectives
The purpose of this prospective study was to evaluate diagnostic modalities (68Ga-PSMA PET/CT, mpMRI and 99mTc bone scintigraphy) for detection of recurrent prostate cancer, to clarify indications and advantages/disadvantages for each examination.

Materials and methods
In this prospective study were enrolled 22 patients with biochemical recurrence and histologically proven prostate cancer with previously (but not longer than 10 years ago) received radical prostatectomy and/or radiation therapy. Patients were included in this study based on PSA level and previously received therapy. All included patients were divided into two groups due to PSA level and received therapy: 1) after radical prostatectomy, PSA 0.2 – 5.0 ng/ml; 2) after radiation therapy- PSA 2.0 – 10.0 ng/ml. All included patients underwent 68Ga-PSMA PET/CT, mpMRI and 99mTc bone scintigraphy. Histopathology and clinical/imaging follow-up data were taken as the reference standard. Results were compared using statistical data processing program SPSS.

Results
Local recurrent disease in 22 patients was detected by PET/CT in 27,27% (n=6/22) and MRI in 45,45% (n=10/22) with sensitivity and specificity 62,5%, 92,9% and 100%, 85,7%, respectively. Nodal involvement was evaluated by PET/CT and MRI in 36,36% (n=8/22) and 27,27% (n=6/22) with sensitivity and specificity 100%, 100% and...
Conclusions
Study results show that multimodality imaging is the cornerstone of precise diagnostics in recurrent prostate cancer. MRI revealed higher results for local recurrency detection compared to PET/CT, but PET/CT showed higher diagnostic value for evaluation of regional lymph node metastases. Bone scintigraphy and PET/CT are concurrent methods for evaluation of bone metastases, although the study contained small amount of patients, therefore the study should be continued for more precise evaluation of the role of imaging modalities in recurrent prostate cancer.

Stereotactic body radiosurgery and positron-emission tomography (PET) for solitary and oligometastatic cancer.
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Introduction
The oncological disease develops from the initial lesion of neoplasm, which might be controlled by surgery or some ablative techniques such as radiosurgery. If disease has spread outside initial lesion spread to multiple sites in the body requiring systemic treatment such as chemotherapy, hormonal or immunotherapy. Investigation of genetic material in metastatic spread shows that metastatic spread is not limited to initial lesion but raised also from first metastatic lesions. Within the increased sensitivity and specificity of modern nuclear medicine isotopes and technologies it is possible to detect these initial metastatic lesions early. Modern ablative treatment technologies such as robotic radiosurgery gives ability to eradicate these initial metastatic lesions early in any part of the body stopping or delaying metastatic spread. Combination of these diagnostic and ablative technologies shows potential of increase therapeutic outcomes. PET-CT also gives valuable imaging information for target volume delineation for radiosurgery planning especially for primary and metastatic prostate cancer.

Aims and Objectives
Analysis of patients who underwent PET-CT scanning and received stereotactic body radiosurgery describes pattern of utility of PET-CT for patients receiving radiosurgery for primary extracranial cancers and solitary or oligometastatic disease.

Materials and methods
190 patients receiving radiosurgery in Sigulda radiosurgery centre from December 2015 to February 2018 were analysed. 42 patients (22%) receiving radiosurgery for extracranial disease were scanned with PET-CT imaging modality prior decision making and preparation of radiosurgery treatment plan. Patients were sorted according to ligand which was used for PET-CT scanning, diagnosis and according to the aim of the investigation.

Results
From 42 patients undergone PET-CT scanning 22 (52,4%) were prostate cancer patients undergone scanning with 68Ga-PSMA (gallium – 68 – prostate-membrane-specific-antigen). This highly specific ligand was used for detection of relapse of prostate cancer after radical therapy after surgery (3 patients), radiotherapy (2 patients) or both treatments (5 patients). For 12 patients PET-CT with 68Ga-PSMA were prescribed due to high risk of regional or distant metastases. For all cases it was used as additional imaging modality together with mpMRI for target volume delineation showing increased precision for involved lymph node radiosurgery and dominant lesion delineation inside prostate gland for patients receiving radiosurgery with heterogeneous dose distribution pattern (HDR-like brachytherapy dose distribution).
20 patients (47,6%) were scanned with PET-CT using 18-fluoro-deoxi-glucose ligand (18FDG PET-CT). Following primary glucose consuming cancers were scanned to specify distribution of cancer cells in the body: renal cell cancer (5 patients), breast cancer (4 patients), leiomyosarcoma, pancreatic cancer, melanoma, colon cancer (2 patients each) and parotid gland, hepatocellular and uterine cancer (1 patient each). For 6 patients (30%) 18FDG PET-CT was used as additional imaging resource together with mpMRI and CT-topometry for target volume delineation. For other patients 18FDG PET-CT was used to exclude other lesions in the body.
Diagnostics of Paget’s disease of bone with X-ray, SPECT/CT, PET/CT and MRI – review of literature
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Paget’s bone disease can be diagnosed and monitored using several methods including imaging with projectional radiography, single-photon emission computed tomography, positron emission tomography–computed tomography and magnetic resonance imaging. Radiography enables visualization of osteolytic, osteosclerotic or mixed changes in the skull (including mandible and also shading of the paranasal sinuses) and other bones, mainly spine, pelvis and femur. All of these changes together with osteolysis circumscripita should be differentiated with a variety of other lesions characteristic for hyperparathyroidism, inflammation, neoplasms and some types of anemia. Magnetic resonance imaging can show bone involvement in wider scope, especially hypervascularity and oedema of bone. Scintigraphy shows increased uptake of the radiotracer in the affected parts of bones with high sensitivity but low specificity. Whole body bone scanning can depict specific problems resulting from disease-related bone involvement, e.g. ocluar disorders. The exact location of the radiotracer accumulation can be determined on the basis of SPECT/CT. Additionally PET/CT with different tracer (FDG or F18) enables finding focal changes of the disease but should be differentiated with a variety of other tumors. Even with this method, a false negative result was found in a person with Paget’s disease. Particular attention should be paid to pathological fractures and the development of osteosarcoma, which are possible to observe by all above methods. Summarizing, the individual components of the multimodal imaging complement each other and are used for diagnosing and assessment the course of the disease and its treatment. Some examples of the application of the above methods described in the literature also present diagnostic problems, in particular regarding differential diagnosis.

PEDIATRIC RADIOLOGY

Sequelae of Bronchopulmonary Dysplasia in Early Childhood: Radiology Diagnostic
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Broncho-pulmonary dysplasia (BPD) was firstly described by Northway W. (1967) as iatrogenism in deeply premature children, who continued to be on artificial ventilation of the lungs. Later, due to the improvement of the protocols for the provision of assistance to premature infants, a so-called "new form" was identified that is typical for children receiving surfactant and easy-mode ventilation. Currently, BPD to the structure of diseases is considered as a variant of chronic obstructive pulmonary pathology. However, with the definition of a new working classification of bronchopulmonary diseases in children (2008), the diagnosis of BPD is established in children under 3 years old. At the same time, the long-term outcomes of BPD remain inadequate. Today adult populations that are available for study received treatment according to out-of-date protocols, thus the validity of both clinical data and relevant X-ray data of BPD outcomes are not adequate. Summarizing the current information about catamnesis of children with BPD, one can distinguish the following variants of the finals for this disease: 1) clinical recovery; 2) chronic bronchitis; 3) interstitial pneumonitis of infants; 4) emphysema; 5) obliterating bronchiolitis; 6) recurrent obstructive bronchitis; 7) pneumosclerosis; 8) bronchiectasis.

The literature presents contradictory information about the informativeness of the radiological criteria for the diagnosis of the disease, the timing of preservation and the predictive value of the radiological symptoms of BPD, their comparison with anamnestic criteria of severity. Until the end, the possibilities and informality of the spiral computed tomography (SCT) of the chest in the catemistic study of patients with BPD are not clear.

Aims and Objectives
The purpose of our work was to increase the efficiency of radiological diagnostics of the consequences of bronchopulmonary dysplasia in children of early age.
Materials and methods
The data of radiological methods for the study of 18 children with a history of BPD (11 boys, 7 girls) aged 3 to 7 years have been analyzed. Subjects were preterm born 16 (88.9%) with body weight at birth from 690 to 2400 g; full-term born 2 (11.1%). All children from birth were on artificial ventilation an average of 24 days (min - 5; max - 38). By severity of BPD children were distributed as follows: light - 5 children (27.8%); average - 9 (50.0%); heavy - 4 (22.2%).
All children were followed by X-ray examination of chest, CT of the chest and echocardiography.

Results
According to our data, the following consequences of BPD have been diagnosed:
- recurrent obstructive bronchitis (ROB) - 8 children (38.8%);
- chronic bronchitis (CB) - 4 (22.2%),
- Obliterating bronchiolitis (OB) - 3 (16.7%);
- Clinical recovery - 3 (16.7%).

On the review of chest X-rays in 15 children (83.3%), signs of lung swelling, deformation of the pulmonary pattern due to pneumofibrosys, signs of pulmonary hypertension were determined. In 3 children (16.7%) with clinical recovery at the review chest X-rays pathological changes were absent.

In the analysis of chest CT in children with a clinical diagnosis of "chronic bronchitis" and "recurrent obstructive bronchitis" were determined:
• uneven elevation of transparency in the anterior parts with squeezing of the lung tissue in the intercostal spaces,
• thickening of the walls of subsegmental bronchi
• single cylindrical bronchiectasis,
• "mosaic" pneumatization in a limited area of the lung.

In children with obliterative bronchiolitis in the chest CT were determined
• "air traps",
• "mosaic" pneumatization,
• emphysema
• thickening of the walls of the bronchi
• cylindrical bronchiectasis.

Three children with clinical recovery have been diagnosed with:
• moderate increase in the transparency of the pulmonary tissue in the anterior parts
• Single delicate transpulmonary fibrosis strains.

Conclusions
Consequently, we can conclude that the data of chest X-ray do not allow to determine in a proper way the nature of the pathological process and the degree of its prevalence. Based on the analysis of literature data and our own observations, we consider it appropriate to use CT in diagnosing both the BPD itself and its consequences. In a retrospective study of the obtained data, it was determined that the broncho-pulmonary process chronicity is the severity of the course of BPD, which is confirmed by the formation of chronic bronchitis, recurrent obstructive bronchitis and obliterans bronchiolitis.

Radiological diagnostics of necrotizin enterocolitis in newborns
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Necrotizing enterocolitis (NEC) - is a nonspecific inflammatory disease caused by infectious agents against the background of immaturity of local protection mechanisms and / or hypoxic-ischemic injury of the intestinal mucosa, prone to generalization with the development of systemic inflammatory response and characterized by high mortality.

Aims and Objectives
The aim of the research- to study the peculiarities of X-ray and ultrasound semiotics of NEC in newborns depending on the severity of the disease.
Materials and methods
The study included 32 infants (21 boys and 11 girls), 28 of children (87.5%) were prematurely born, 4 of them (12.5%) were full-term. In 25% of cases the diagnosis was confirmed at autopsy. All newborns were carried out the plan X-ray of the abdomen in AP projection and lateroposition supine. Ultrasound investigation performed on ultrasound devices using multifrequency convex probe 8C (4.0-10.0 MHz). All children were performed in B scanning mode, if necessary it was performed by color Doppler mapping mode (DMM).

Research results
NEC staging was performed by Kliegman R.M., Walsh M.C. (1987). NEC of 1 stage was diagnosed in 18.8%. While performing X-ray investigation there were found: at stage I “A” moderate hyper pneumatosis of intestines was found (16.7%), at stage I “B” uneven expansion of bowel loops, loops in the form of “staples”, thickening of the intestine walls (83.3%); enlargement of the liver; small horizontal level of liquid with gas above them (33.3%). While performing ultrasound a thickening of the intestine walls, decreasing of motility in the affected segments, enlargement of the liver and spleen was found. II NEC of stage "A" was found in 31.3%. X-rays investigation of the abdomen determined "rigid" loops of intestine (30%); static (fixed) loop of intestine (40%) Ultrasound scan revealed thickening of the walls of the intestine, reduced motility in the affected segments and the presence of "transparent" effusion. Pneumatosis of the bowel wall was determined in 20%. While DMM - reinforced or hyperemic type of intestinal wall blood flow as a result of vascular dilatation due to inflammation. At NEC stage II B ultrasound showed gas in the portal vein (30%). III NEC of stage "A" was diagnosed in 28.1% of infants. While X-ray investigation: pneumatosis of intestinal wall was diagnosed in 77.8%; air circuit of branches of the portal vein was determined in 33.3% against a background of the liver shadow ("the tree of death"). While performing ultrasound investigation: the signs of the intestinal wall inflammation, infiltrates were found out, liquid with sediment in the abdomen (77.8%), pneumatosis of bowel wall (88.9%) and distribution of gas in the portal vein (44.4%), ascites were detected (22.2%). At the III "B" stage pneumoperitoneum was found in 21.9% of infants.

Conclusions
Radiological study of children with NEC allows to identify the full range and manifestation, respectively, to determine adequate treatment for the patient. Ultrasound should be performed in all patients, particularly with nonspecific radiological or questionable clinical NEC signs.

CT evaluation of mesentery in children presenting with acute abdominal pain.
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Introduction
Acute abdominal pain is a common complaint in childhood. The frequency of surgical interventions in patients with acute abdominal pain is around 1 percent. Plain X-Ray abdomen is an excellent screening investigation. Ultrasound and or CT scan may be required for defining intra abdominal lesions.

Aims and Objectives
- To evaluate mesentery on CT examination in children presenting with acute abdomen.
- To correlate CT findings with final diagnosis achieved by surgical findings, FNAC / histopathology.

Materials and methods
- Prospective study of all patients under 14 years of age presenting with acute abdomen with involvement of mesentery evaluated with US/CT.
- After imaging patients were subjected to surgery and diagnosis was confirmed or refuted.
- All patients of or below 14 year of age presenting with acute abdomen with involvement of mesentery were included.
- Patients more than 14 year of age and those with contraindication to CECT were excluded.

Results
- Thirty patients were included in study. Age of patients ranged from one day to 14 years.
Most common presentation was abdominal pain followed by abdominal distension, vomiting, fever and failure to thrive.

US and CECT was done in all patients.

Non-cystic pathology was seen in 16 patients and cystic in 14 patients.

The most common causes were mesenteric lymphadenitis, mesenteric cyst, duplication cyst which were seen in five patients each. Intussusception was seen in three patients.

Mesenteric lymphadenopathy was seen in 12 patients, out of which eight patients had primary and four patients had secondary lymphadenopathy. Three patients with primary lymphadenopathy were complicated by intussusception.

One case each of primary omental hydatid cyst, meconium pseudocyst after perforation of ileum, mesenteric cystic lymphangiomata, malrotation with duodenal stenosis, congenital paraoesophageal hernia with volvulus of intrathoracic stomach, diaphragmatic hernia with intestinal obstruction, AML related typhlitis, acute appendicitis with gangrenous changes were seen in this study.

In patients with cystic disease there were two patients where the provisional diagnosis made on CECT abdomen was found incorrect. One patient who was diagnosed as ? lymphangioma ?? mesenteric cyst proved to be a case of meconium pseudocyst after perforation of ileum due to meconium ileus on surgery and histopathology. Second patient was diagnosed as mesenteric cyst on imaging but on histopathology diagnosed as mesenteric cystic lymphangioma.

Conclusions
The accuracy of CECT in diagnosing cystic pathology was found to be 85.71% and in non-cystic pathology was 100%.
The overall accuracy of CECT in evaluation of mesenteric pathology was found to be 93.33%.

Fetus magnetic resonance in pregnancy
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Introduction
Although ultrasound remains a major and preferred radiological study during pregnancy, the benefits and possibilities of using magnetic resonance imaging are rapidly developing. High-resolution ultrasound examination is usually followed by a magnetic resonance imaging to clarify the results.

Aims and Objectives
The aim is to present the major indications of fetal magnetic resonance imaging during pregnancy, discuss safety aspects and the use of the intravenous contrast agent Gadolinium.

Materials and methods
A literature review was conducted to summarize the general aspects of performing MRI during pregnancy. Articles presenting evidence, summarized indications and long-time safety for fetal MRI were included. Online databases of Science Direct, PubMed, UpToDate and ELSEVIER were used. This article includes several clinical cases of fetal MRI performed in Vilnius University Hospital Santaros Clinics.

Results
Fetal magnetic resonance is a particularly informative technique to evaluate sonographically suspected central nervous system and gastrointestinal tract abnormalities. Turbo spin-echo is a standard sequence for fetal MRI examinations using a single Time Repetition (TR single shot) also known as Single-Shot Fast Spin Echo (SSFSE). The most frequent fetal brain MR imaging indications are ventriculomegaly, agenesis of corpus callosum and abnormalities of the posterior fossa. Compared to ultrasound, magnetic resonance leads in tissue contrasting
and detailed visualisation of the developing parts of the brain allowing to detect abnormalities that can be associated with ventriculomegaly. Fetal MRI provides detailed corpus callosum visualisation, enables to distinguish between isolated or secondary agenesis of corpus callosum and detects additional pathology unnoticed by ultrasound. It is a necessary technique for the proper visualisation of the brainstem, tentorium cerebelli position, cerebellar hemispheres, vermis, cisterna magna and the size of the fourth ventricle. The most common indications for fetus gastrointestinal tract in MR imaging are the suspected obstruction of oesophagus, small and large bowel, malrotation and perforation of fetus GI, abdominal wall defects. Signal intensity of the amniotic fluid and meconium mixture serves in identifying different parts of the gastrointestinal tract. There is currently no evidence that MRI is harmful to the fetus, but there is also not enough research to prove long-term safety. There are uncertainties about the safety of the fetal MRI, its impact to fetal growth restrictions in the uterus, premature birth, and the damage to the inner ear due to high acoustic disturbances during the procedure. The use of Gadolinium during pregnancy is highly controversial. Gadolinium MRI at any time during pregnancy was associated with an increased risk of a broad set of rheumatological, inflammatory, or infiltrative skin conditions and stillbirth or neonatal death.

Conclusions
Fetal MRI is a rapidly evolving technique in perinatology due to its accuracy and excellent quality of images. In many cases combining fetal MRI with high quality ultrasound, additional diagnostic information is obtained, which widens the possibilities for detecting early perinatal development disorders. Fetal MRI does not use ionizing radiation and is assumed to be safe, but there is not enough evidence to prove its long-term safety.

RADIOGRAPHERS SESSION

Identify the point of central ray chest X-ray as tool in analyze rejected images

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Introduction
Using the point of central beam (PCB) incidence during X-ray imaging is an element of radiographer's good clinical practice. During positioning the patient for a chest X-ray in the posterior-anterior radiography, central beam incidence is in the posterior midline, at the lower angles of the shoulder-blades. This point corresponds to the 7th thoracic vertebra. The main factor modifying PCB is the type of patient's body structure. In tall and thin people, it is 8th (the vertical dimension is dominant) but 6th for obese (the horizontal dimension is dominant). Analysis of rejected images is a tool for improving the quality of radiography. It allows you to determine what mistakes are made during radiography and to plan corrective and preventive actions.

Aims and Objectives
The aim is to identify the point of central beam incidence during chest X-ray imaging by marking the diagonals and use that in quality control.

Materials and methods
The point of central beam incidence was assessed on 160 chest radiographs in the posterior-anterior projection. Digital X-ray images were taken at the Department of Radiology, Medical University Hospital in Bialystok. Radiographs were randomly selected for analysis among those taken in the period from January 1 to June 30, 2015. The point of central beam incidence was determined by marking the diagonals of the radiograph on the monitor displays. The place of diagonals intersection was identified by vertebral body in the thoracic spine. The results were calculated using MS Excel 7.0.

Results
In the analysis, the most numerous group were radiographs made for women (n = 84, 52.5%) aged 23-83 (M = 52 years). The most common point of central beam incidence was at the 8th thoracic vertebra (n=61; 38,1%), 7th (n=31; 19,4%), and 9th (n=17; 10,6%). In 23% of radiographs, identification of the vertebral body was impossible due to low contrast and lack of visible details. Mean body mass index (BMI) of patients whose radiographs had low contrast was higher than in the group where interpretation was possible (34,2 vs. 24,4).
Conclusions
Identifying the point of diagonals intersection seems to be an appropriate tool for assessing radiograph quality. It can be used to analyze rejected images. A limitation of using this method is low-contrast radiographs in patients with high BMIs.

Effects of ubiquitous 360° patient counselling environment in CCTA patient’s anxiety and adherence to treatment
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Introduction
Ubiquitous environment means an environment that is present throughout the merging technology, enabling individual learning and counselling to its user at an appropriate time and in an appropriate manner. In this study, the ubiquitous environment is a 360 ° panoramic photo-based network environment, incorporating digital materials that enable versatile authentic counselling.

Aims and Objectives
The purpose of the study is to evaluate the effectiveness of the ubiquitous 360° counselling environment in the anxiety and adherence to treatment of the patients coming to CCTA (coronary computed tomography angiography).

Materials and methods
In the planning phase of the intervention, a systematic literature review describes the ubiquitous counselling environments and their effects in long-term patients.

In the evaluation phase of the intervention’s feasibility a) the ubiquitous counselling environment with its materials will be developed in cooperation with CCTA patients, healthcare and IT professionals and health care students b) the usability of the environment will be pretested in the pilot: the CCTA patients (n = 10), the health care professionals (n = 10), health care students (n= 30) and an information technology expert (n = 1) use ubiquitous counselling environments for a month, after which they are interviewed on a thematic form. The interview explores user experiences on the feasibility of the ubiquitous education environment. The data will be analyzed by deductive and inductive content analysis.

In the evaluation phase of the intervention, Oulu university hospital’s CCTA patients will be randomized in RCT-study design to the test and control groups (100 patients / group). The test group is counselled in the ubiquitous environment, the control group receives counselling in accordance with current practice. The data is collected with valid anxiety and adherence to treatment instruments before and after the intervention, as well as 6 and 12 months after counselling intervention. The data will be analyzed statistically using the SPSS software package.

Results and Conclusions
Data collection and analysis of the first phase of study is going on, the results will be reported as a poster in the congress. The research faces the challenge of health care digitalization and is important both nationally and internationally. Comparable patient counselling environments using similar technology have not been reported nationally or internationally in previous studies. The research will be carried out in a multidisciplinary Business Finland-funded project, in cooperation with healthcare staff and trainers as well as information technology industry representatives. The wider usage of the developed environment is significant.
Optimization of Computed Tomography Protocol for Fungal Infection of Chest at Vilnius University Hospital Santaros Klinikos
Loreta.V Milikienė, Leonid Krynke
Vilnius University Hospital Santaros Klinikos.

Introduction
Fungal infection has been developing in 10 to 30% of patients with onco-hematologic diseases, after organ transplantation receiving immunosuppressive therapy. In assessing the patient's condition and response to treatment, various radiological studies are performed, including full-body or abdominal and pelvic CT. Radiological studies were performed for main disease treatment and follow-up, which results in high levels of exposure. In these patients, the immune system is impaired due to applied chemotherapy treatment and is susceptible to infection and additional exposure. Depending on weakness of the immune system, various pathogens (e.g. S. aureus, P. aeruginosa, aspergillus, candida, pneumococcus and pneumocystis) damage the lung tissue and cause pneumonia. The Computed Tomography method is a more precise and sensitive method of investigation than conventional radiography, for the lungs tissue exploration in the early stages of the disease. On the other hand, CT increases the risk of additional negative health effects due to applied high radiation doses.

Aims and Objectives
The aim of this pilot study was to optimise the scanning CT protocol for chest, applied for the group of patients with suspicion on fungal infection and to evaluate radiation dose of this CT exam.

Materials and methods
In this study, we used 64-slices scanner (Light Speed VCT 64, General Electric). After taking into account main scan area anatomical peculiarities (chest area), the optimised acquisition parameters have been set: tube voltage 100 kV (120 kV for obese patients); tube current 80-100 mA (up to 200 mA for obese patients); collimation 40 mm (64 x 0,625 mm); pitch 0,98; slice thickness 0,625 mm. ASIR dose reduction and enhancement algorithm has been used as well. This year, 17 patients had been scanned with this protocol. The mean dose and length product (DLP, mSv×cm) and the mean computed tomography dose index (CTDI, mSv) parameters values were used to represent dose to the patient in each study. The information about each patient’s weight and height were recorded in order to estimate relation between BMI (body mass index) and patient dose. CT unit technologists attentively performed study, partly changing protocol parameters according to patient anatomy. For obese patients (> 30 BMI) higher kV and mA were used. Each patient was carefully positioned in the isocenter, with arms raised above his head, removing them from the main field of view. The scan field covered the lungs upper side to the diaphragm sinuses area.

Results and Conclusions
The study has shown great advance of optimisation process performing CT exams. Average exposure parameters were: DLP 142,7 mSv×cm (standard deviation (st.d.) 78,7), CTDI 4,2 mSv (st.d. 2,3), voltage 109,4 kV (st.d. 10,3) noise index 20,6 (st.d. 1,1), mean anatomical BMI 24,8 kg/m² (st.d. 3,8). Dose reduction has not influenced the radiologist’s evaluation. All exams have shown clear results with acceptable image quality. This study shown possibilities to perform dose reduction techniques in daily work. For further investigation, the chest CT protocol for dynamical following of lung nodules has been chosen.

MRI protocol optimization of the pathological musculoskeletal joints at 1.5T.
Evelina Šeduikytė, Supervisor of the research – Zita Sakalauskiienė
Kaunas University

Magnetic resonance imaging (MRI) is a diagnostic exam that uses a combination of a large magnet, radiofrequencies and a computer to produce detailed images of internal organs soft tissues and their pathological changes. MRI may be used to examine bones, joints, and soft tissues such as cartilage, muscles, and tendons for injuries or the presence of structural abnormalities or certain other conditions, such as tumours, inflammatory disease, congenital abnormalities, osteonecrosis, bone marrow disease. Specialized MRI array coils, which are part of the MRI modality, are used to create high-resolution images.
Musculoskeletal conditions are prevalent and their impact is pervasive. They are the most common cause of severe long-term pain and physical disability, and they affect hundreds of millions of people around the world. According to prevalence, the musculoskeletal diseases are in the third place among all diseases, e.g. about 24% the world's population has a pathology of musculoskeletal system. Lithuanian Health Statistics data (2016) shows, that at the
age group of 18-64 years old the incidence of musculoskeletal and connective tissue diseases in Lithuania was 184.2 out of 1 000 people. In the elderly age (over 65 years), musculoskeletal and connective tissue diseases (260/1000 inhabitants) were diagnosed.

World Health Organization says, that if long-term preventive actions are not planned and are not being taken now, the further global spread of musculoskeletal and connective tissue diseases are unavoidable. According to the data of the Lithuanian elderly lifestyle survey conducted in 2011, only 20.1 % the lifestyle of elderly people is active. Physical passivity, overweight, genetic factors, stress are possible risk factors for musculoskeletal joint disorders.

As the patient's illness increases, the number of MR tests performed in the diagnosis of joint pathology is also increasing. MRI examinations are performed according to the protocols purchased by the institution and according to the primary pathology, discussing with a radiologist. Sometimes, due to the clinical situation of the patient (e.g. severe pain syndrome), it is necessary to find a compromise by choosing faster scanning protocols that allows additional processing of images. In this case, the time of the scanning is shortened, and the informativeness of the received images remains the same.

Aims and Objectives
The aim was to optimize MRI protocols of musculoskeletal joints pathologies at 1.5T. To achieve this objective, we needed to solve the following tasks:
1. Theoretically describe the MRI scan protocols of the MSK joints.
2. To assess joints examinations of the MRI (SIEMENS, 1.5 T.) according to different indications, radiofrequency flexible array coil, parameters and sequences.
3. To assess joints examinations of the MRI (SIEMENS, 1.5 T.) according to different indications, radiofrequency phased array coil, parameters and sequences.

Materials and methods
1. Scientific literature analysis. The scientific works of foreign and lithuanian authors were analysed.
2. Data Collection in Qualitative Research. Qualitative research method – observation, to collect the data.
3. The descriptive data analysis to compare the data.

Results
Age of patients, who had MRI examination of the joint, were between 17 and 85 years, including 46 men (71 %) and 19 women (29 %). The length of the exam depends on the joint type of study being performed. MRI of the joints mostly takes 20-60 minutes. For five MRI joints studies, that were performed with a flexible coil, sequence repetition was required, due to motion artefacts. The researcher has found that fat-suppressed proton-density weighted MR imaging sequence are well-suited for the visualization of joints in three different planes.

Conclusions
Irrespective of the pathology (trauma, degenerative disease, tumours) fat-suppressed proton density weighted MR imaging sequence are used for the joints visualization in three planes: sagittal, coronal and axial. 2. The joint exam of MRI can be optimised by using radiofrequency (RF) phased coil in order to create better quality scan. 3. The joint exam of MRI acquired with radiofrequency flexible coil sometimes does not obtain a good quality scans (e.g. due to movement artefacts), then sequence repeats are performed.

Radiation protection in coronary angiography; scattering and protection
Henner Anja1, Anttonen Risto2, Kakko Tanja2, Karjalainen Katja1, Mäkelä Timo2, Orenius Antti1, Simpura Sari2, Paalimäki-Paakki Karoliina1
1. Oulu University of Applied Sciences
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Introduction
Cardiovascular diseases are the most common cause of death in Finland. The use of interventional cardiology has increased significantly during the 21st century. Fluoroscopy is applied in coronary angiography together with the use of contrast agent. During coronary angiography personnel of the operating room are exposed to scattered radiation. Scattered radiation is formed as a result of physical interactions between the primary X-ray beam and the body of the patient.
Purpose
The purpose of this study was first of all to develop radiation safety culture. The aim of this study was first to describe the direction and amount of scattered radiation in simulated coronary angiography and secondly to describe the radiation exposure of the personnel and observe how personnel use radiation protection shields.

Materials and methods
In this quantitative study all information about scattered radiation was gathered using RaySafe i2 dosimeters which record radiation and dose rate every second. The first collected data was used to create maps with radiation scatter intensity and areas shown with numeric values and colorized areas. Eight of these dosimeters were placed around CIRS ATOM phantom (model 701-D) which represents the patient in this simulated coronary angiography. The measurement height of dosimeter was not specified. Measurements were taken from distances of one meter, two meters and three meters around the phantom and the X-Ray equipment. The fluoroscopy equipment used in this study was a single tube C-arm: Philips Allura Clarity FD 10. The measurements were done with and without the removable radiation shields available in the operating room.

Results
Twelve scattering maps were created as a result of the measurements. In these maps it was shown that backscatter was intense near the X-Ray tube which was placed under the examination table. There were more scattered radiation visible in maps which were done on the basis of more oblique projection which was the LAO 30° / CAUD 30° compared to the LAO 40° / 0° which did not have caudal angulation and therefore was less oblique than the aforementioned projection.

In measurements of 12 coronary angiography examinations radiation doses of the staff were low. Cardiologists and the nurses observing the patient had the highest doses. The most significant factor affecting cardiologists’ radiation doses was using the overhead lead shield correctly. The distance to the source of radiation while using the x-ray affected most the doses of the nurses. The staff used radiation protection devices very carefully.

Conclusions
The scattering maps indicated that the radiation shielding is very useful in reducing the dose rate near the area where the cardiologist would be situated during real coronary angiography done to a real patient. Correct use of lead shields and personal aprons and thyroid shields and keeping distance to the source of radiation as long as possible makes it possible to decrease radiation doses at low level also in interventional procedures.

Metallic artifact reduction in Magnetic Resonance
Solé Jerez, Albert; Luque de la Roza, Rosa María; Macías Checa, Sonia; Perales Sugrañes, Aina; Labata Alonso, Álvaro; Peralbo Santaella, Francisco
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Introduction
The introduction of a metallic object in a magnetic field creates a distortion in its uniformity. This distortion, in the case of the IRM, is shown in the images as a metallic artefact. These artefacts appear curving the images and the metallic object (prosthesis or arthrodesis material) creates a signal void.

Aims and Objectives
To show how we can minimize these metallic artefacts and signal void knowing the modifiable parameters of each sequence and to know which sequence avoid and how we can substitute it.

Materials and methods
The study was performed with two IRM machines of 1,5T (one G.E. and the other SIEMENS). We modified the parameters of the different sequences (i.e. slice thickness, file of view, phase direction, image resolution...) in order to elucidate the combination that lead to a visible metallic artefact reduction.
Results
Good knowledge of IRM physics, understanding of the different modifiable parameters of each sequence and knowledge of which sequence to avoid for invalid images are essential for the Radiographer to provide good diagnostic images to the Radiologist.

Radiology technologists opinion about their health and the connection to the factors of the working environment
Rytis Jarušaitis, Dr. Aurika Vanckavičienė

Kauno kolegija: University of Applied Sciences

Introduction
The changing nature of work has greatly reduced the number of "traditional” occupational diseases, but a new problem has arisen - the prevalence of work-related pathologies - these include bone and muscular disorders, stress-induced diseases, and occupational oncololgical diseases. Failure to meet the requirements of the working environment may weaken and exacerbate the already existing non-occupational disease or cause of illness. Radiographers work is difficult, endlessly useful and requiring a lot of experience. However, this work has to deal with issues such as long hours of work, poor wages, and inadequate work conditions that affects work stress. From the work environment, depends the health of each working person, so this study is aimed to assess symptom complaints among radiographers, personal exposure levels to ionizing radiation and visual assessment of the working environment.

Aims and Objectives
Aim: to reveal the opinion of radiology technologists about their health and the connection with the factors of the working environment
Objectives:
1. To discuss the risk factors of the working environment of radiology technologists
2. Identify the main complaints of radiology technologists in health, based on their opinion
3. To reveal the factors of the work environment of the radiology technologists and the main health complaints interfaces

Materials and methods
Radiographers were interviewed using a questionnaire about symptoms experienced during working hours, about stress, lifestyle and work environment.
Questionnaires were distributed among Kaunas hospitals, in various departments, to 100 technicians. Despite their age, sex, working place, work experience, working shifts

Results
Results are currently counted

Conclusions
The most common risk factors of the working environment of radiology technologists is ergonomic risks, which can occur because of the profile of tasks which requires constant static work where the user adopts inappropriate postures and performs strength against gravity, remaining in that position for long periods, as well as an exhaustive workload demanding high levels of responsibility. Also we can't deny the damage that ionizing radiation do, which can cause a lot of health problems, dusts in the workplace, night shifts.

Based on radiographers opinion the main complaints in health was headache, coughing, weakness, lumbar spine pain, shortness of breath, insomnia, weakness of vision, pain of extremities, runny nose.

Because of the bad posture, and workload radiographers get lumbar, neck spine pain, pain of extremities which causes discomft in work. Also because of the damage that ionizing radiation does, radiographers have bad taste in the mouth, sinuses problems, nasal discharge, catarrh, unexpected fatigue, painful joints and numb extremities. Wrong work with computer can provoke cataract, weakness of vision and also the headache.
Profiles and service paths of the cardiac patients
Henner Anja, Rauhala Heidi, Koivunen Kirsi
Oulu University of Applied Sciences

Introduction
Cardiovascular diseases are one of the most predominant national diseases in Finland. They burdened health care and costs millions of euros per year. The most typically case is coronary heart disease, and most common symptom is chest pain. Chest pain itself, can be a scary and distressing experience and because of that, is often the reason for seeking treatment. However, all chest pain is not coming from the heart, be dangerous or life-threatening. In any case, the causes of chest pain, should always be resolved, because the costs of non-cardiac chest pain may rise even higher than the costs of coronary heart disease.

Aims and Objectives
The purpose of this study was to describe profiles and service paths of the patients, which have been made coronary angiography at University Hospital in 2016, but who did not have coronary artery disease

Materials and methods
This is a retrospective register study. The data was collected from the cardiology patient registry and patient information system in University Hospital. Descriptive data analyzes were performed by SPSS -statistics program.

Results
Four patient profiles were produced. Most of the patients, who had been in coronary angiography and had not diagnosed coronary artery disease, was found atypical symptoms of coronary artery disease. Patient service path were mainly (65 %) through healthcare center or emergency to a ECG-stress study. Because of the symptoms, 35 % of the patients, came directly to emergency room of the University Hospital and to 12,5 % of them coronary angiography was performed directly and 22,5 % went to the ward to wait further examination.

Conclusions
Differential diagnosis of non-cardiac chest pain and cardiac chest pain and/or other symptoms is challenging and the existing resources are not sufficiently developed. Many different information systems and inadequate information flow, complicates patients comprehensively evaluate and, choose research method to investigate patient symptoms

NecroCT 3D, a useful tool to help the forensic doctor to identify critical damages in cases of death by firearms.
Luque de la Roza, Rosa María; Solé Jerez, Albert; Peralbo Santaella, Francisco; Domingo Castello, Àngels; Perales Sugrañes, Aina; Labata Alonso, Álvaro
Institut de Diagnòstic per la Imatge (IDI) Hospital Universitari Joan XXIII de Tarragona

Introduction
In many cases, radiological imaging of human corpses that have perished due to the impact of firearm projectiles is needed. These images are useful for the forensic doctor and/or the police investigation to determine the causes of death. Three-dimensional images that can be developed from helix images can help in the determination of the cause of death.

Aims and Objectives
With a multi-slice CT we can obtain images of the whole corpse using a fine helix before its necropsy. These images must be worked in the Work Station and reconstructed in the ideal MIPs. The aim of our study is to describe how to work with helix images and turn them into useful images.

Materials and methods
Using a fine helix with high voltage (mAs) we obtain the necessary primary raw data to create the mean axial images. These high definition axial images are sent to the work station where, with specific software, we can build three-dimensional reconstructions and multiplane images which may be helpful for the forensic report.
Results
The injuries caused by the projectiles in the anatomical structures of the corpses are perfectly visible in the images as well as its paths. Also we can detect the presence of haemorrhages, bone fractures and organ damage.

Conclusions
Three-dimensional images and MIP reconstructions may be helpful tools for assisting in the accurate diagnostic of death causes, specially for the study of human bodies dead by firearm projectiles.

mpMRT of prostate on East-Tallinn Hospital example
Kristiina Reinfeldt
East-Tallinn Central Hospital

Introduction
Multiparametric-magnetic resonance imaging (mpMRI) has shown good results in diagnosing, localization and staging prostate cancer by combining of T2 weighted imaging, diffusion imaging and dynamic contrast enhanced imaging. mpMRI reveals prostate anatomy and anything unusual within and around it. Since July 2016 we are preforming mpMRI of prostate that urologist could use it after to take biopsy. Our hospital is nor specialized on urogenital diseases, but prostate mpMRI is part of our everyday practice.

Aims and Objectives
The aim of this presentation is to introduce the technique and protocol that we use to perform mpMRI of the prostate.
   1. Patient preparation before mpMRI of prostate
   2. Overview of the protocol

Materials and methods
Our own experience in our everyday practice.

Results
mpMRI scan before a prostate biopsy can radically improve the accuracy of the diagnostic process for prostate cancer. While performing mpMRI of prostate, patients are not ideal and therefor need proper preparation. Despite of MRI machine you use, there are few suggestions how to improve the outcome of the examination which is useful to clinician and patient.

Conclusions
With more availability and improvment of MRI machines more patients are undergoing mpMRI. Expectations of mpMRI scans of prostate are high, but there are some contraindication and obsticles to do it.

Collimation in coronary angiography: how often do we do it?
Ewa Pasieka
University Hospital in Bialystok

Introduction
Coronary angiography (CA) is a radiographic visualization of the coronary vessels after the injection of radiopaque contrast media. The most common indication is coronary artery disease (CAD), including stable angina (SA) and acute coronary syndrome (ACS). ACS includes unstable angina (UA), ST-elevation myocardial infarction (STEMI), and non-ST-elevation myocardial infarction (NSTEMI). Since diagnostics are performed using X-rays, various ways of minimizing radiation risk during the CA are required. One of them is collimation, i.e. the limitation of the primary beam of X rays, the use of which affects not only a reduction of the dose received by the patient but also an improvement in image quality. The principle is that the apertures do not limit the interpretation of the coronary artery image.

Aim and Objectives
The aim of the study was to assess the frequency and influence of selected variables in the use of collimation during coronary angiography.
Materials and methods
A further retrospective assessment of the use of collimation was made for 157 CAs. The tests were carried out in the period from 1 July 2017 to 31 March 2018 in the Cath-Lab of the Provincial Hospital in Bialystok. The study included only procedures without extension of the diagnosis with a ventriculography, aortography and bypassgraphy. Statistical analysis was performed using MS Excel 2007 and the chi-square test (http://www.quantpsy.org/chisq/chisq.htm), with a significance level of p<0.05.

Results
Age of patients 28-89 (Me=68): 84. Men 28-88 (Me=65) and 73 women 44-89 (Me=71). Most often, the study was performed due to SA (77; 49%), followed by NSTEMI (62; 39.5%) and STEMI (18; 11.5%). The number of projections in the analyzed material 4-14 (Me=7), taking into account the indication: SA 4-14 (Me=7), NSTEMI 4-13 (Me=7), STEMI 5-13 (Me=8). In the STEMI group without collimation, 2 (11%) CAs were performed, whereas NSTEMI 5 (8%) and SA 1 (5.5%). All studies without collimation were for patients who had procedures performed on an emergency basis. A relationship between the use of collimation and work during normal hospital hours (Mn-Fr: 08.00-15.00) was demonstrated (p=0.00005944).

Conclusions
The small percentage of coronary angiographies were performed without collimation. All studies were for patients who had procedures performed on an emergency basis.

MRI protocol optimization of the pathological musculoskeletal joints at 1.5T
Evelina Šeduikytė, Supervisor of the research – Zita Sakalauskienė
Kaunas University

Magnetic resonance imaging (MRI) is a diagnostic exam that uses a combination of a large magnet, radiofrequencies and a computer to produce detailed images of internal organs soft tissues and their pathological changes. MRI may be used to examine bones, joints, and soft tissues such as cartilage, muscles, and tendons for injuries or the presence of structural abnormalities or certain other conditions, such as tumours, inflammatory disease, congenital abnormalities, osteonecrosis, bone marrow disease. Specialized MRI array coils, which are part of the MRI modality, are used to create high-resolution images.

Musculoskeletal conditions are prevalent and their impact is pervasive. They are the most common cause of severe long-term pain and physical disability, and they affect hundreds of millions of people around the world. According to prevalence, the musculoskeletal diseases are in the third place among all diseases, e.g. about 24% the world's population has a pathology of musculoskeletal system. Lithuanian Health Statistics data (2016) shows, that at the age group of 18-64 years old the incidence of musculoskeletal and connective tissue diseases in Lithuania was 184.2 out of 1 000 people. In the elderly age (over 65 years), musculoskeletal and connective tissue diseases (260/1000 inhabitants) were diagnosed.

World Health Organization says, that if long-term preventive actions are not planned and are not being taken now, the further global spread of musculoskeletal and connective tissue diseases are unavoidable. According to the data of the Lithuanian elderly lifestyle survey conducted in 2011, only 20.1 % the lifestyle of elderly people is active. Physical passivity, overweight, genetic factors, stress are possible risk factors for musculoskeletal joint disorders.

As the patient's illness increases, the number of MR tests performed in the diagnosis of joint pathology is also increasing. MRI examinations are performed according to the protocols purchased by the institution and according to the primary pathology, discussing with a radiologist. Sometimes, due to the clinical situation of the patient (e.g. severe pain syndrome), it is necessary to find a compromise by choosing faster scanning protocols that allows additional processing of images. In this case, the time of the scanning is shortened, and the informativeness of the received images remains the same.

Aims and Objectives
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2. To assess joints examinations of the MRI (SIEMENS, 1.5 T.) according to different indications, radiofrequency flexible array coil, parameters and sequences.
3. To assess joints examinations of the MRI (SIEMENS, 1.5 T.) according to different indications, radiofrequency phased array coil, parameters and sequences.
Materials and methods
1. Scientific literature analysis. The scientific works of foreign and Lithuanian authors were analysed.
2. Data Collection in Qualitative Research. Qualitative research method – observation, to collect the data.
3. The descriptive data analysis to compare the data.

Results
Age of patients, who had MRI examination of the joint, were between 17 and 85 years, including 46 men (71 %) and 19 women (29 %). The length of the exam depends on the joint type of study being performed. MRI of the joints mostly takes 20-60 minutes. For five MRI joints studies, that were performed with a flexible coil, sequence repetition was required, due to motion artefacts. The researcher has found that fat-suppressed proton-density weighted MR imaging sequence are well-suited for the visualization of joints in three different planes.

Conclusions
Irrespective of the pathology (trauma, degenerative disease, tumours) fat-suppressed proton density weighted MR imaging sequence are used for the joints visualization in three planes: sagittal, coronal and axial. 2. The joint exam of MRI can be optimised by using radiofrequency (RF) phased coil in order to create better quality scan. 3. The joint exam of MRI acquired with radiofrequency flexible coil sometimes does not obtain a good quality scans (e.g. due to movement artefacts), then sequence repeats are performed.

RADIATION EXPOSURE OPTIMIZATION USING ADDITIONAL X-RAY BEAM FILTRATION AND DOSAGE DEPENDENCE UPON PATIENT’S BMI FOR CHEST X-RAY EXAMS

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Introduction
In modern world of medicine not only has the conventional radiography evolved, but it has secured its place as the one of the most informative, non-invasive tests for solving a variety of clinical problems. However, besides being such a beneficial exam, conventional radiography has also been known to be associated with 10-20 % of collective radiation exposure for patients. People are exposed to natural sources of ionizing radiation as well as human-made sources, such as medical exposure, on a daily basis. Despite the fact that ionizing radiation has many beneficial applications, it can have varying hazardous effects, depending upon given dosage. It is important not to underestimate the influence, it could have on a human body. For the purpose of dose optimization, many implications must be made to fulfil and to reach the radiation dose to be as low as reasonably achievable without the loss of image quality. The copper filtration was introduced and the radiographic parameters ought to be chosen. We ratified the dose reduction effect using a digital radiography system equipped with an indirect-type CsI detector and an automatic Cu filter insertion. The copper filter was used to selectively attenuate and block out the low-energy rays, thus relatively lessen the risk of radiation effect on the patient. Despite that, the radiographic parameters were highlighted to implicate how the radiation exposure is dependent upon patient’s BMI (body mass index) and how significant it is to choose the parameters accordingly to the estimated BMI of the patient.

Aims and Objectives
The purpose of this study was to evaluate how radiation dose and image quality are dependent on using additional x-ray beam filtration and how does the patient’s BMI affect the radiation exposure while using different radiographic parameters. It is aimed to compare the results before and after optimization process in terms of DAP (dose-area product) and effective dose values and establish the guidelines how to choose best radiographic parameters to reduce patient dose without the loss of image quality in particular examinations.

Materials and methods
For the average-sized adult chest simulation acrylic slabs were used, so that the response of AEC (automatic exposure system control) would be similar to that of a standard PA (posterior – anterior) chest roentgenography. The phantom was exposed using different tube voltage, without and with copper filtration from 0.1 to 0.3 mm thickness respectively. Other radiographic parameters were not changed. Imaging parameters (kVp, mAs, exposure time and DAP) were recorded to estimate patient effective dose as the common measure unit of radiation exposure.
The conversion coefficient relating effective dose to DAP of 0.16 mSv/(Gy x cm$^2$) was used. This coefficient provided useful information for deriving effective dose estimated for adult patient from DAP measurements. Admitted to calculated result, the staff of hospital who underwent annual healthcare check-up were examined. Patient specific parameters (age, height, weight, BMI) were recorded before the first examination. Using higher or lower tube voltage, dependent on patient’s BMI, and Cu filtration of 0.3 mm, dependent upon previous chest x-ray protocol and the results of phantom filming, we calculated how radiation dose to the patient was reduced because of the modified protocol – using 0.3 mm Cu filter. Therefore, all the images were assessed by radiologists who managed to evaluate the quality of each pair of images with different parameters using a questionnaire revised by “European guidelines on quality criteria for diagnostic radiographic images”.

Results
The mean DAP and effective dose of protocol with Cu filtration of 0.3 mm and 125 kV was significantly lower compared to previous standard protocol without Cu filtration ($p<0.05$). The mean DAP without filters was 0.093 (Gy x cm$^2$), effective dose was 0.015 mSv, with Cu filter: 0.054 (Gy x cm$^2$), effective dose 0.009 mSv. Additionally, the mean DAP was also notably lower with Cu filter of 0.3 mm and 133 kV for patient’s with BMI over 25, mean DAP was 0.045 (Gy x cm$^2$), effective dose 0.0072 mSv, in comparison to mean DAP of 0.057 (Gy x cm$^2$), effective dose 0.009 mSv, for the same BMI group but with the kilovoltage of 125 kV. There was also a significant relation between DAP growth dependent on patient’s BMI ($p<0.05$). The mean of patient’s BMI was 27.5. The mean time of exposure was 2.7s. The exposure time was significantly higher with the addition filter ($p=0.00$) and was related to the DAP value, as it grows dependent on procedure time ($p<0.01$).

Conclusions
We studied the conventional radiography digital system with regard to the importance of Cu filtration and determined how important is it to correctly choose the radiographic parameters according to the patient’s BMI. This study have concluded, that one of the most important factors in reducing patient’s radiation exposure is significantly related to chosen parameters and the mechanical attenuation of the rays.

Severe cranial trauma with a sharp weapon (axe) and its evolution over a one year follow up (case report)
Luque de la Roza, Rosa María, Solé Jerez, Albert; Labata Alonso, Álvaro; Perales Sugrañes, Aina
Institut de Diagnòstic per la Imatge (IDI) Hospital Universitari Joan XXIII de Tarragona

We present the case of a patient who arrives to our Radiology Department with severe cranial trauma and an open wound being assaulted with a sharp weapon in the street.

Aims and Objectives
The main aims of the study were 1) To describe the patient’s evolution with CT images from his arrival to the Emergency Department to one year after the incident. 2) To show images of conventional radiology of other lesions derived from the aggression he suffered.

Materials and methods
During this one-year period, 9 CT were performed on our case patient. The CT images show the clinical state of the patient at his arrival to Emergency Department and the control after the surgery performed on the same day. Subsequent controls show the different complications that the patient presented that were secondary to the open cranial fracture: Cranial compression due to intraparenchymal hematoma, anatomical changes due to decompressive craniotomy, herniation and prolapse of the cerebral mass by the wound.

Results
Follow-up of an interesting case of open cranial wound during one year through the images made in 9 CT
THORACIC RADIOLOGY

Endovascular treatment of pulmonary AVF in patient with Osler-Weber-Rendu Syndrome. Case report
Alīna Pugačova1, Sanita Ponomarjova2
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2. Riga Stradins University, Department of Radiology. Riga East University Hospital, clinical center Gailezers, Department of Interventional radiology

Introduction
Pulmonary AVF is uncommon vascular pathology of the lungs [1]. Approximately 80% of cases are congenital and 70% are associated with hereditary haemorrhagic telangiectasia (HHT), also known as Osler-Weber-Rendu syndrome [2]. Up to 20% of patients with HHT have brain AVM, ~33% - liver AVM [2]. These lesions may present with sequelae of paradoxical thromboembolism, such as stroke or brain abscess, transient ischemic attacks and peripheral arterial emboli. Also initial presentation may be caused by right to left shunting, causing hypoxemia, dyspnoea, chest pain. The frequency of fatal complications is significant in pulmonary AVF, including rupture, haemorrhage and endocarditis [3]. Treatment options are transcatheter embolization, using different embolization materials, or surgery. Long-term follow-up is required due to high risk of AVF recanalization, up to 20% [1].

Aims and Objectives
Aim of the report is to show rare case of Osler-Weber-Rendu syndrome with pulmonary AVF, distal cerebral abscess and hypoxemia, treated by endovascular embolization.

Materials and methods
Retrospective analysis of clinical case was performed.
22 years old female patient was admitted to Riga East University Hospital “Gailezers” Emergency Department with complaints of headache, nausea and progressive neurological symptoms. On admission blood tests showed high levels of inflammation markers. More than 10 years ago patient had clipping of multiple cerebral aneurysms. Head radiological examinations (CT and MRI) showed brain abscess in the right basal ganglia region, connecting with ventricular system, accompanying ventriculitis and meningitis, as well as signs of hydrocephaly. Cerebral AVM in the right temporal lobe and right cerebellar lobe was identified. On chest X-ray inhomogeneous consolidation in the middle zone of the left lung was detected which required additional examination. Chest CTA showed large pulmonary AVF in the left lower lobe. Patient additionally had hyposaturation with oxygen level ~80%. Regarding possible abscess formation as a complication from pulmonary AVF with oxygen hyposaturation a decision was made to occlude the AVF. Because of the neurological decompensation, increase of hydrocephaly and cerebral oedema, prior to embolization, patient twice went for ventriculostomy procedure with a ventriculo-peritoneal shunt.

Results
Catheterization of the v.cava inferior through the right femoral vein was made with pulmonary angiography of left pulmonary artery, which showed AVF of the 8th segment artery. Super selective catheterization of the AVF’s feeding arteries was performed with subsequent veno-arterial embolization using vascular microcoils. Embolization was performed in retrograde manner from AVF’s venous to arterial entity, embolizing feeding arteries at the end with purpose to reduce the risk of recanalization. Control phlebography showed full occlusion of the AVF. Right after the procedure blood oxygen saturation normalized (100%). Control chest CT after 24 days showed post-embolization metal coils in the left lower lobe without any signs of consolidation. Additional abdominal CT was made, which showed no signs of intraabdominal vascular malformations.

Conclusion
Endovascular embolization of pulmonary AVF, using vascular microcoils, appears to be safe and effective treatment method. Mechanically detachable coils allow better control of positioning or choosing the appropriate size. Veno-arterial embolization technique should be used to reduce the risk of recanalization. Patients with brain abscess of unknown origin and hypoxemia should be checked for the pulmonary AVF.
Evaluation of right heart geometry and function in PH patients: Correlation between echocardiographic and CMR data
Grytė Galnaitienė1, Aušra Krivickienė2, Lina Padervinskienė1, Paulius Šimkus1, Skaidrius Miliauskas3, Tomas Bernatavičius4, Eglė Ereminienė1
1. Lithuanian University of Health Sciences – 1Department of Radiology
2. Department of Cardiology
3. Department of Pulmonology
4. Faculty of Medicine

Introduction
Assessment of the right heart geometry and function is essential for patients with pulmonary hypertension (PH) since right ventricle (RV) dysfunction has a prognostic value. Cardiac magnetic resonance (CMR) is an accurate method for evaluation of RV structure and function. However, transthoracic 2D echocardiography (TTE) is often used clinically for patients with PH and the accuracy of echocardiographic evaluation of RV remain controversial.

Aims and Objectives
The objectives were to analyze the value of echocardiographic right heart indices: RV end-diastolic diameter (RVEDD), RV velocity of the tricuspid annular systolic motion (RV S’), tricuspid annular plane systolic excursion (TAPSE), RV fractional area change (FAC) and right atrium diameter (RAD) and CMR derived parameters: RV end-diastolic volume (RVEDV), RV ejection fraction (RVEF) and right atrium area (RAA) and determine the relation between echocardiographic and CMR derived right heart parameters in patients with precapillary PH.

Materials and methods
A total of 35 patients with confirmed precapillary PH on right heart catheterization (mean pulmonary artery pressure 55.91 ± 15.87 mmHg, pulmonary capillary wedge pressure <15 mmHg) were included into analysis. CMR and TTE images were retrospectively reviewed. RVEDD, RV systolic function parameters (RV S’, TAPSE and FAC) and RAD were evaluated using TTE and RVEDV, RVEF, RAA - using conventional CMR software (syngo.via; Siemens Healthcare). Pearson correlation and linear regression analysis were performed.

Results
The average age of the patients was 57 ± 14 years with a majority of women (69%). Echocardiographic measures were as follows: mean RVEDD 45.43 ± 7.75 (range from 24 to 70) mm, RV S’ 10.16 ± 2.37 (6 to 14) cm/s, TAPSE 17.65 ± 3.59 (10 to 24) mm, FAC 31.81 ± 9.69 (range from 14.3 to 58.7) % and RAD 50.29 ± 7.27 (38 to 65) mm. The averages of CMR measures were as follows: RVEDV 80.8 ± 29.72 (range from 38 to 186) ml, RVEF 40.43 ± 11.19 (19 to 65) % and RAA 29.69 ± 8.35 (15 to 50) cm².

There was a significant correlation between TTE and CMR derived parameters: RVEDD (TTE) and RVEDV (CMR), r=0.69, p<0.001; RV S’ (TTE) and RVEF (CMR), r=0.39, p=0.026; TAPSE (TTE) and RVEF (CMR), r=0.34, p=0.046; FAC (TTE) and RVEF (CMR), r=0.75, p<0.001; RAD (TTE) and RAA (CMR), r=0.76, p<0.001. Linear regression equations were as follows: RVEDV=2.64RVEDA–39.29 (R²=0.48, p<0.001), RVEF=23.09+1.76RVS’ (R²=0.15, p=0.026), RVEF=21.74+1.06TAPSE (R²=0.12, p=0.046), RVEF=12.99+0.86FAC (R²=0.56, p<0.001), RAA=0.87RAD–14.38 (R²=0.58, p<0.001).

Conclusions
Transthoracic 2D echocardiography provides clinically useful and accurate measures of right heart chambers (RV and RA) geometry in patients with precapillary PH. Estimation of global RV systolic function (RV FAC) offer good approximation of RV function by TTE and is more accurate than longitudinal RV function (RV S’ or TAPSE) evaluation.
Determination of patient’s profile using high-risk coronary artery plaque
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2. Dept of Cardiology, Lithuanian University of Health Sciences

Introduction
Cardiac computed tomography angiography (CCTA) is believed to be a golden standard to noninvasively detect morphology and composition of coronary artery disease (CAD), including the features of high-risk plaque. High-risk coronary artery plaque (CAP) is associated with acute coronary events and worse prognosis.

Aims and Objectives
The present study aimed to investigate the prevalence of comorbidities, laboratory data and CCTA results in patients presenting with high-risk CAP.

Materials and methods
This retrospective observational study, performed in 2017, included 254 consecutive subjects (47% males) referred for testing due to suspected coronary artery disease. Data for comorbidities was collected, laboratory and CCTA tests were performed. High-risk CAP features (positive remodeling, low attenuation, spotty calcification) were qualitatively assessed with CCTA. Data were analyzed using Chi-square and Kruskal-Wallis tests. P-value <0.05 was considered statistically significant.

Results
Subjects with high risk CAP were more likely to be male (38% vs 55% , p=0.007). Age did not differ between the groups (62±10 vs 63±10, p=0.244). Presence of dyslipidemia was equal among the groups (65% vs 65%, p=1.000). Clinical characteristics and CCTA test results in subjects with and without high-risk CAP features are shown in Table 1 and Table 2 respectively.

<table>
<thead>
<tr>
<th>Table 1. Clinical characteristics in subjects with and without high-risk CAP features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients without high-risk CAP N=124</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Diabetes mellitus, %</td>
</tr>
<tr>
<td>History of arterial hypertension, %</td>
</tr>
<tr>
<td>Obesity, %</td>
</tr>
<tr>
<td>Statins, %</td>
</tr>
<tr>
<td>Aspirin, %</td>
</tr>
<tr>
<td>Systolic blood pressure, mmHg</td>
</tr>
<tr>
<td>Body mass index, kg/m²</td>
</tr>
<tr>
<td>Glomerular filtration rate, mL/min/1.73m²</td>
</tr>
</tbody>
</table>
Table 2. CCTA test results in subjects with and without high-risk CAP features

<table>
<thead>
<tr>
<th></th>
<th>Patients without high-risk CAP N=124</th>
<th>Patients with high-risk CAP N=124</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atherosclerotic coronary artery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None, %</td>
<td>51</td>
<td>37</td>
<td>0.027</td>
</tr>
<tr>
<td>One-vessel, %</td>
<td>20</td>
<td>38</td>
<td>0.002</td>
</tr>
<tr>
<td>Two-vessel, %</td>
<td>15</td>
<td>15</td>
<td>0.932</td>
</tr>
<tr>
<td>Three-vessel, %</td>
<td>15</td>
<td>11</td>
<td>0.359</td>
</tr>
<tr>
<td>CAD-RAD class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0, %</td>
<td>29</td>
<td>1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>1-2, %</td>
<td>51</td>
<td>40</td>
<td>0.111</td>
</tr>
<tr>
<td>3-4, %</td>
<td>20</td>
<td>59</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Agatston score, units</td>
<td>136±354</td>
<td>199±520</td>
<td>0.014</td>
</tr>
<tr>
<td>Aortic valve calcification, %</td>
<td>17</td>
<td>15</td>
<td>0.722</td>
</tr>
<tr>
<td>Calcification of descending aorta, %</td>
<td>14</td>
<td>27</td>
<td>0.018</td>
</tr>
</tbody>
</table>

Conclusions
Patients with high-risk coronary artery plaque measured by computed tomography were more likely to be male, have a history of hypertension and use statins with aspirin. The computed tomography test reveals that patients with high-risk coronary artery plaque were most likely to have one-vessel atherosclerotic coronary artery, belong to higher CAD-RAD class and have calcification of descending aorta.

Comparison of coronary artery disease detected on multi-slice computer tomography coronary angiography among FH and non-FH patients in specific age and gender groups.
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2. Latvian Institute of Cardiology and Regenerative Medicine, University of Latvia, Riga, Latvia
3. Paul Stradins Clinical University Hospital, Riga, Latvia

Introduction
Familial hypercholesterolemia is an autosomal dominant genetic disorder with prevalence 1:250, characterised by premature atherosclerosis in arteries due to life-long exposure to high levels of low-density cholesterol in blood serum, being poorly recognised in general medicine, including radiology.

Aim and objectives
To compare severity of atherosclerotic lesion in coronary arteries in FH and non-FH patients within specific age and gender groups.

Materials and methods
From February 2015 to January 2018 four-hundred and thirty-nine patients were included in Latvian Registry of Familial hypercholesterolemia (LRFH), out of them 193 (44%) were clinical FH patients. During this period 107 (25%) patients had undergone MS-CT coronary angiography (57 (53%) FH patients and 50 (47%) non-FH patients, respectively). Atherosclerotic changes were compared among 3 age groups: before age of 40 in men and 45 in women, in the age group between 40 and 55 in men and 45 until 60 in women, and in the age group above 55 in men and 60 in women.
## Results

Prevalence and severity of atherosclerotic lesion in coronary arteries is shown in table below.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Atherosclerotic changes</th>
<th>&lt; 40 y.o. (&lt;45 y.o. in women)</th>
<th>40 – 55 y.o. (45 – 60 y.o. in women)</th>
<th>&gt; 55 y.o. (&gt;60 y.o. in women)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men (n=48)</td>
<td>FH (n=9)</td>
<td>Non-FH (n=7)</td>
<td>FH (n=14)</td>
<td>Non-FH (n=12)</td>
</tr>
<tr>
<td>Stenosis ≥ 40%</td>
<td>4 (45%)</td>
<td>1 (14%)</td>
<td>9 (65%)</td>
<td>6 (50%)</td>
</tr>
<tr>
<td>Initial atherosclerotic changes</td>
<td>2 (22%)</td>
<td>1 (14%)</td>
<td>2 (14%)</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>No AS changes</td>
<td>3 (33%)</td>
<td>5 (72%)</td>
<td>3 (21%)</td>
<td>5 (42%)</td>
</tr>
<tr>
<td>Women (n=59)</td>
<td>FH (n=5)</td>
<td>Non-FH (n=3)</td>
<td>FH (n=18)</td>
<td>Non-FH (n=19)</td>
</tr>
<tr>
<td>Stenosis ≥ 40%</td>
<td>1 (20%)</td>
<td>-</td>
<td>10 (56%)</td>
<td>7 (36%)</td>
</tr>
<tr>
<td>Initial atherosclerotic changes</td>
<td>1 (20%)</td>
<td>-</td>
<td>4 (22%)</td>
<td>2 (11%)</td>
</tr>
<tr>
<td>No AS changes</td>
<td>3 (60%)</td>
<td>3(100%)</td>
<td>4 (22%)</td>
<td>10 (53%)</td>
</tr>
</tbody>
</table>

Out of 57 FH patients only 13 (23%) patients had no atherosclerotic lesion, none of these patients belonged to the oldest group of age. In the youngest age group 60% of women and only 33% of men with established FH revealed no atherosclerotic lesion in comparison to 100% and 72% in non-FH group. In the middle age group the results are 21% and 22% in comparison to 42% and 53%, respectively.

Analyzing the severity of coronary lesion, stenosis above 40% was found in 57% of FH male patients in age group before 55 years and 48% of female patients in the age group before 60 years in comparison to 36% and 35% in non-FH group.

The results reveal higher prevalence of premature (before age of 55 in men and 60 in women) coronary artery disease in FH patient group (p=0.427).

### Conclusions

In comparison to similar age and gender non-FH group, FH patients have considerably higher prevalence of premature coronary artery disease with higher incidence in men group.

Radiological imaging perspectives in non-small cell lung cancer staging
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Hospital of Lithuanian University of Health Sciences Kaunas Clinics

Introduction
Clinical stage of the lung cancer has potential impact on patients’ treatment and prognosis. To determine lung cancer stage computed tomography (CT) is usually performed. In Lithuania, the application of positron emission tomography combined with CT (PET-CT) is limited by the Ministry of Health approved indications. The stage determined by CT and PET-CT may differ because of the different technology, scanning field, time period between the studies. PET-CT has lesser specificity in tuberculosis endemic regions.

Aims and Objectives
Aim. To compare CT and PET-CT in evaluating the spread of non-small cell lung cancer (NSCLC).
Objectives:
1. To determine CT and PET-CT possibilities in evaluating the spread of the lung cancer.
2. To evaluate the differences of T, N, M and the clinical stage assessed by the CT and PET-CT.
3. To estimate CT and PET-CT evaluated stage differences connection with the time between the studies and underlying diseases.

Materials and methods
Retrospective analysis was performed with medical documentation and 80 patients that meet the criteria were selected. Data about the dates and results of CT, PET-CT and histological investigation, the spread of the NSCLC (T, N, M, stage) and underlying diseases were collected. Period of time between CT and PET-CT was counted. Based on T, N, M and clinical stage changes after performing PET/CT patients sample was divided into the groups: T n/d/i (accordingly did not change, decreased, increased), N n/d/i, M i/n and 1st group (clinical stage did not change or decreased), 2nd group (clinical stage increased). Staging of the NSCLC was based on the 7th TNM classification. Mann-Whitney U or Kruskal-Wallis test was used for quantitative variables comparison. χ², Fisher exact test was used for qualitative variables comparison. Qualitative data were described by giving median (minimum - maximum), quantitative data by giving relative frequencies.

Results
Of all cases lung cancer stage was estimated 100 % (n=80) by CT and 91 % (n=73) by PET-CT. Further analysis was performed only on 73 patient’s data. After PET-CT, T and N have changed for almost 50 %, M for 16 % and clinical stage for 58 % of the patients. In PET-CT was more often evaluated bigger T (54 %), N (64), M (16 %) and clinical (69 %) stage. Time median between the scans was 43 (9 - 104) days. Time period median between CT and PET-CT in Nn group – 40 (10-104) days (mean - 39,5 d.), Nd – 41 (9-93) days (mean – 41 d.), Ni – 49 (24-104) days (mean – 51 d.) (p=0,045). In Tn group time median 41,5 (13-104) d., Td group – 43 (9-52) d., Ti – 43 (10-104) d. (p=0,248). In Mn group time median 42 (9-104) d., Mi group - 45 (28-104) d. (p=0,234). In 1st group (n=44) period of time median was 40,5 (9 – 104) d., in the 2nd group (n=29) – 46 (14 – 104) d. (p=0,234). After PET-CT N increased more often in patients that have had tuberculosis (TB) during their life time in comparison to those who have never had TB (71 %, n=5 versus 24 %, n=18, p=0,039). M more often increased in group of patients who have been diagnosed with other neoplastic disease in contrast with patients that only have had lung cancer (36 %, n=5 versus 12 %, n=7, p=0,046). In patients that had atelectasis on CT images, in PET-CT decrease of T was found more often than in those patients with no atelectasis (n=11, 37 % versus n=4, 9 %, p=0,008).

Conclusions
1. CT and PET-CT are both informative diagnostic methods in evaluating the spread of the lung cancer. However, tumor morphology and underlying diseases had more impact on PET-CT.
2. There were differences between CT and PET-CT cancer stages - in PET-CT was more often evaluated bigger T, N, M and clinical stage.
3. Time between CT and PET-CT had an impact on lung cancer stage differences. Statistically significant relation was found between PET-CT determined bigger N stage and longer time between CT and PET-CT. There was a tendency of increasing M and clinical stage when the time duration was longer.
4. PET-CT evaluated smaller T stage in atelectasis group, larger N stage in tuberculosis group, bigger M stage in concomitant oncological disease group.
Ventricular functional and morphologic features in heart failure patients: CMR study
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1. Department of Radiology
2. Department of Cardiology
3. Medical Academy, Lithuanian University of Health Sciences

Introduction
Heart failure (HF) is a complex condition, representing the end point of many heart diseases and the incidence of HF is increasing. Usually left ventricle (LV) dysfunction dominates in HF patients. In clinical practice, transthoracic 2D echocardiography (TEE) is the most commonly used modality for LV function evaluation. However, cardiovascular magnetic resonance (CMR), despite gold standard ventricular function and volumetric evaluation, has a role in the non-invasive cardiac morphology assessment. In addition, some studies show that dysfunction of the LV could affect function of the right ventricle (RV) and the CMR is the most robust technique to evaluate RV. However, mechanisms of interaction between ventricles in HF patients are complex and not well characterized.

Aim and Objectives
To determine interaction between RV and LV and to compare RV functional parameters with type of late gadolinium enhancement in patients with HF with reduced LV EF.

Materials and methods
We retrospectively enrolled 50 patients with left-sided HF (severely reduced LV EF<35%) referred to CMR for HF origin evaluation form 2012 to 2017 in the Hospital of Lithuanian University of Health Sciences Kaunas Clinics. CMR was performed using 1.5T whole body system. End-diastolic volume (EDV), End-systolic volume (ESV) and EF of the ventricles were calculated in standard cine images using MR analysis software system. Indices of the ventricles volumes (end-diastolic volume index (EDVI) and end-systolic volume index (ESVI) were calculated based on body surface area. Late gadolinium enhancement (LGE) assessed. According to LGE pattern patient were divided into four groups: ischemic, non-ischemic, mixed and without LGE. Relation between variables was assessed using Spearman correlation coefficient. ANOVA test was used to compare means between groups. Two-tailed probability values at p<0.05 were considered statistically significant.

Results
The average age of the patients was 58.66±9.74 years with majority of men (88%). CMR measures were as follow: mean RVEF 34.12±14.11%, RVEDVI 81.28±21.66ml/m2, RVESVI 55.42±23.39ml/m2, LVEF 23.54±6.45%, LVEDVI 154.85±49.07ml/m2, LVESVI 120.03±44.47ml/m2. There were found significant correlations between CMR based RV and LV parameters: RVEF with LVEF (r=0.43, p=0.002), RVEDVI with LVEDVI (r=0.379, p=0.007) and with LVESVI (r=0.384, p=0.006), RVESVI with LVEF (r=−0.401, p=0.004), LVEDVI (r=0.286, p=0.044) and with LVESVI (r=0.33, p=0.006). LGE was found in 39 (78%) patients (32% ischemic, 30% non-ischemic and 16% - mixed origin of LGE). The mean RVEF was decreased, RVEDVI and RVESVI were increased in ischemic, non-ischemic and mixed LGE pattern groups, but had no significant differences between these groups (34.5±16.69 vs 33.8±13.16 vs 35.13±15.8%, respectively, p=0.979; 80.13±18.58 vs 88.47±18.99 vs 70.63±18.5ml/m2, respectively, p=0.102; 54.88±23.46 vs 60.47±22.79 vs 46.38±19.76ml/m2, respectively, p=0.369).

Conclusions
Evaluation of the RV performance represents that that it is often affected in LV HF patients and CMR RV parameters demonstrate significant relation with LV HF. There were no statistically significant differences of RV volumes and EF between ischemic, non-ischemic and combined types of LGE in analyzed sample, although tendency of RV larger volumes in non-ischemic LGE type was observed.
**Pulmonary Edema – Who is the Culprit?**

João Maria Veigas Abrantes; Maria Clara Pablo Fernandes; João Manuel Oliveira Neves Granadeiro  
*Centro Hospitalar Barreiro Montijo, E.P.E.*

**Introduction**

Pulmonary edema is a common finding in the current clinical practice, and there are multiple causes of cardiogenic and non-cardiogenic type that can be responsible for the presence of increased extravascular fluid in the lungs.

The radiologist should play a key role in the work-up of the imaging findings, necessitating a thorough knowledge of the clinical, pathophysiological and imaging characteristics of the multiples causes of pulmonary edema.

**Aims and Objectives**

Present the clinical, pathophysiological and radiological characteristics of cardiogenic and non-cardiogenic causes of pulmonary edema to allow for a systematic approach to patients with emphasis on the similarities and differences of the most common etiologies.

**Materials and methods**

Pictorial review of representative cases of different causes of pulmonary edema, with a description of their characteristics in the various imaging modalities.

**Results**

The present work details the diagnostic approach to pulmonary edema and findings that radiologists should be aware of when dealing with this condition. There is substantial overlap in the radiological appearance of the various causes of pulmonary edema, therefore the accurate diagnosis of these disorders requires an approach that correlates clinical, radiologic, and pathologic features.

**Conclusions**

Understanding the multiple causes of cardiogenic and non-cardiogenic pulmonary edema and their characteristics in the various imaging modalities is a helpful knowledge both for the radiologist and the clinician, allowing for a better patient care.

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**Malignant chest and abdomen lymphoma: computed tomography and magnetic resonance imaging application in follow-up after treatment**

Laima Dobrovolskiene, Arnas Urbonavicius  
*LUHS Medical Academy Department of Radiology*

**Introduction**

Lymphoma - the malignancy of lymphatic system, which consists of lymph nodes, spleen and bone marrow. Most of the illnesses are young and people of working age, which indicates that not only overall survival but also the quality of life after the application of the chemotherapy treatment is important. Although this is a malignant disease that causes adverse changes in the body's systems, these patients are usually dying not from direct lymphoma but from complications caused by toxic chemotherapy. In this regard, one of the main goals of the treatment is to assess the precise estimation of the lymphoma and the progression of visual research in order to avoid the additional and unnecessary course of chemotherapy treatment. Evaluation CT images before and after treatment, changes in the size of lymphoproliferative lesions can be observed in dynamics, magnetic resonance imaging (MRI) with calculation the diffusion coefficient (ADC) can to be an indicator reflecting changes in tumor tissue at the cellular level.

**Aims and Objectives**

The aims were to evaluate the CT size and MRI signal intensities in different sequences VIBE, T2_HASTE, DWI ADC values of the lymphoproliferative abnormalities before and after treatment determining the changes in response to treatment.

**Materials and methods**

A retrospective analysis of LUHS Kaunas Hospital radiology department investigated patients with malignant chest and abdomen lymphoma CT and MRI was performed with the following data collected: lymphoproliferative abnormalities localization, size, ADC value, gender, age, complaints, histological form and treatment. The data was...
analyzed using Microsoft Excel and IBM SPSS programs. Information was analyzed using a regression model and various descriptive statistics: averages, modes, medians, respective data graphs were provided. The results of the regression were considered statistically significant when the statistical significance reflective p was <0.05.

Results
On CT images supradiaphragm lymph node (l/n) abnormalities were noticed in 87.70%, subdiaphragm – 52,46% of all cases (usually paraaortic – 40,98%). Supraclavicular l/n abnormalities – 13,11%, armpits – 43,44%, mediastinum – 80.33%. Intranodal abnormalities were registered in 96.72% (mostly paratracheal – 63,27%), extranodal – in 19.67% of patient cases (mostly spleen – 8,20%). The average size of lymphoproliferative abnormalities before treatment – 2,35±0,8 x 2,01±0,6; after treatment – 1,32±0,38 x 0,97±0,25; the decrease in size – 39%±10%.

In MRI diffusion weighted images HL and NHL ADC values before treatment were : 1,33±0,04 x 10^{-3} and 0,78±0,02 x 10^{-3}, after – 0,73±0,03 x 10^{-3} and 1,38±0,05 x 10^{-3}. ADC changes: HL – decreased 44,47±3,1%, NHL – increased 77,29±2,8%.

Conclusions
Lymphoproliferative abnormalities most frequently were located in the mediastinum, intranodal – in paratracheal l/n, extranodal – in the spleen. Supradiaphragm changes were observed to be more frequent than subdiaphragm ones. On average, after treatment lymphoproliferative abnormalities decreased in size by 39%±10%, whereas MRI ADC in HL decreased 44,47±3,1%, NHL – increased 77,29±2,8%.

Impaired left ventricular myocardial mechanics in precapillary pulmonary hypertension patients with preserved LV function: CMR feature tracking study
Paulius Simkus1, Lina Padervinskiene1, Ausra Krivickiene2, Skaidrius Miliauskas3, Deimante Hoppenot3, Algidas Basevicius1, Antanas Jankauskas1, Egle Ereminiene2
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Introduction
Pulmonary hypertension (PH) – is a progressive disease with substantial mortality. Right ventricular (RV) systolic dysfunction is a main cause of morbidity and death, though through ventricular interdependence left ventricle (LV) is also affected. Several studies demonstrated that LV dysfunction has negative impact on prognosis in PH patients. Cardiac magnetic resonance (CMR) feature tracking (FT) is a novel method to determine impaired myocardial deformation that helps to detect early changes of LV function before deterioration of LV ejection fraction (EF).

Aims and Objectives
The aim of the study was to define the changes of LV segmental and global strain parameters in precapillary PH patients with preserved LV EF and to evaluate the relation with RV enlargement and function.

Materials and methods
The prospective study was carried out at the Hospital of Lithuanian University of Health Sciences Kaunas Clinics. 30 PH patients with preserved LV systolic function (LV EF> 50%) and 16 control patients without echocardiographic signs of PH we investigated. RV and LV volumes and function were measured by CMR (syngo.via; Siemens Healthcare). LV regional and global circumferential and longitudinal strains were quantified by CMR derived cine images using FT software (Medis Suite QStrain 2.0). Due to small study population non-parametric Mann-Whitney U test has been used to evaluate the differences between the groups. The Spearman rank test was used to assess relationships between variables. Statistical significance was assumed when P <0.05.

Results
The distribution of age and gender did not differ between PH and control group patients. Global LV longitudinal and circumferential strain values were significantly lower in PH group patients when compared with control group (-19.37±4.19% vs -24.74±5.48%, p<0.05 and -34.18±6.98% vs -39.26±7.21%, respectively p<0.05). Decreased segmental circumferential strain values were determined in basal inferoseptal segment (-21.81±9.76% vs -35.89±5.95%, p<0.001), middle inferoseptal segment (-24.41±12.76% vs -34.79±9.43%, p<0.05), apical segment (-43.56±13.58% vs -51.36±11.02%, p<0.05) and in apical anterior segment (-43.56±13.58% vs -
MRI role in pulmonary lesions diagnostics - first Lithuanian experience
Julija Joksaite, Laima Dobrovolskiene  
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Introduction
Trachea, bronchus and lung cancer takes leading places among causes of cancer deaths both in Lithuania and the world. In order to reduce these numbers, early and accurate diagnosis, as well as timely treatment is extremely important. Chest MRI in Lithuania is a modern and new valuable diagnostic tool: it can not only replace conventional methods (radiography, CT) when exposure to ionizing radiation is undesirable or contraindicated, but also may be important in early diagnosis of asymptomatic lung cancer, differentiating malignant and benign parenchymal lesions, or in young patients, especially those who require frequent follow-up examinations (e.g., every 3-6 months). Dynamic CE, SSFS without CE and DWI MRI sequences are modalities of great accuracy which may be equal to other ionizing cross-sectional radiological methods (CT, PET, PET/CT) in characterization of lung lesions. MRI DWI provides useful information when there is unclear diagnosis after standard examinations or when the precise evaluation of chest wall and mediastinum invasion is needed, also it helps in planning the patients’ treatment.

Aims and Objectives
Aim. To estimate magnetic resonance imaging diagnostic possibilities in differentiating benign and malignant pulmonary lesions using LUHS Hospital Kaunas Clinics patients’ medical investigation and documentation.  
Objectives: 1. Evaluate and compare size of benign and malignant pulmonary lesions in magnetic resonance images. 2. Evaluate and compare accumulation of contrast agent in benign and malignant pulmonary lesions in contrast-enhanced MRI. 3. Evaluate and compare ADC values of benign and malignant pulmonary lesions in DW MRI.

Materials and methods
Profiles of radiological tests and medical documentation of 21 patients, who had their chest MRI examination done in LUHS Hospital Kaunas Clinics Radiology Clinic in 2013-2016, have been reviewed. Final diagnosis was confirmed with histologic examination and/or observation using radiologic imaging (CT, MRI, PET/CT). The size of pulmonary lesions, accumulation of contrast agent in the lesions in VIBE sequence and ADC values of the lesions in diffusion-weighted imaging were evaluated. Statistical analysis was performed using MS Excel 2016 and IBM SPSS Statistics 22.0 programs.

Results
The average size of benign pulmonary lesions was statistically smaller than that of malignant tumors (2.40 ± 0.39 cm and 4.97 ± 0.58 cm, respectively) (p=0.001). Average signal intensity (SI) in native images of benign lesions

51.36±11.02%, p<0.05) in PH patients when compared with control group. LV segmental longitudinal strain was reduced in apical septal segment (-23.4±11.1% vs -31.68±11.85%, p<0.05), apical segment (-32.0±8.28% vs -37.4±11.9%, p<0.05), and in basal anterolateral segment (-26.6±7.76% vs -32.1± 9.16%, p<0.05). Parameters of circumferential and longitudinal LV strain values did not differ between groups in other LV segments. There were no significant differences comparing CMR parameters of LV size and function between PH and control groups: LV end diastolic volume index (EDVI) (64.93±20.33ml/m² vs 71.56±16.1 ml/m², p>0.05), LV end systolic volume index (ESVI) (26.20±10.73 ml/m² vs 26.81±10.95 ml/m², p>0.05) and LV EF (61.23±7.42% vs 63.63±8.94%, p>0.05). However, RV EDVI and RV ESVI were significantly higher in PH patients (83.5±23.77 ml/m² vs 58.13±14.61ml/m², p<0.001 and 48.4±19.8 ml/m² vs 23.13± 9.43 ml/m², p<0.001) and RV EF was lower in PH patients (43.07±11.49% vs 60.7± 8.94%, p<0.001). Global LV longitudinal strain had positive correlation with RV volumes: RV EDVI (r=0.309, p<0.05), RV ESVI (r=0.43, p<0.05) and negative correlation with RV EF (r=−0.508, p<0.001), as well as global LV circumferential strain showed positive correlation with both RV EDVI (r=0.324, p<0.05) and RV ESVI (r=0.426, p<0.05) and negative correlation with RV EF (r=−0.46, p<0.001).

Conclusions
The interdependence between both ventricles is demonstrated by LV global circumferential and longitudinal strain values association with RV volumes and RV function. LV global circumferential and longitudinal strain parameters are affected in precapillary PH with preserved LV systolic function with greatest abnormalities in the septum segments. Therefore CMR FT can help to detect early changes of LV deformation indices in patients with precapillary PH prior to LV systolic dysfunction.
was $136.93 \pm 12.14$, average SI of malignant lesions was $131.44 \pm 15.64$ ($p=0.784$). After 25 s after administration of contrast agent the average SI of benign lesions was $298.67 \pm 36.81$, the average SI of malignant lesions was $370.44 \pm 17.12$ ($p=0.163$). However, after 5 min after administration of contrast agent the average SI of benign lesions was significantly lower than that of malignant tumors ($193.40 \pm 23.76$ and $384.33 \pm 28.71$, respectively) ($p<0.001$). Mean ADC value in benign pulmonary lesions was $1.67x10^{-3}\pm 0.20$ mm$^2$/s, and it was statistically higher ($p=0.046$) than that of malignant tumors ($1.06x10^{-3} \pm 0.17$ mm$^2$/s).

Conclusions
Mean size of benign pulmonary lesions is significantly smaller than of malignant tumors; average SI in contrast MRI in benign lesions is significantly lower than in malignant tumors; ADC value in benign lesions is significantly higher than in malignant lesions.

The influence of iterative image reconstruction on radiation dose and image quality for CT coronary artery calcium score
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Introduction
Coronary artery calcium score (CACS) is considered as reliable non-invasive technique for screening risk of future cardiac events, because of significant correlation between the risk of coronary heart disease-related events and the grade of coronary artery calcifications. The popularity of this imaging test has increased over the past years, since its inclusion in guidelines for risk assessment in asymptomatic adults at low-to intermediate and intermediate cardiovascular risk. Moreover, CACS commonly as a part of cardiac CT study, is performed before CT angiography (CTA). With the rise of the amount of CACS scans, the concern regarding the radiation dose from cardiac CT has increased, which led to development of new techniques, including iterative reconstruction (IR), allowing to reduce radiation dose compared to filtered back projection (FBP) reconstruction protocol. This noise suppressing technique is expected to reduce radiation dose, while maintaining image quality, allowing to reduce tube parameters, therefore it was included in a new CT procedural protocol at our institution.

Aims and Objectives
The aim of this study is to evaluate the impact of iterative reconstruction on the density of anatomic structures, noise level and radiation dose for CACS scan.

Materials and methods
A retrospective analysis of 99 patients, who underwent CACS and CTA examinations during 2017 in LUHS Kaunas Clinics, was performed with Toshiba Aquilion One scanner. Patients were divided into two groups: group 1 included patients, who underwent CT scans using IR protocol and in group 2 CT scans were performed using FBP reconstruction protocol. The analysis included radiation doses received during CTA and CACS examinations, mean density and its standard deviation (HU) in descending aorta and lateral wall of left ventricle in CACS images. The effective doses of the radiation in the procedures were counted by using a coefficient, confirmed by National Radiological Protection Board. Statistical analysis was performed using SPSS statistical software.

Results
There were 56 women with the mean age of 61 years and 43 men with the mean age of 55 years. Group 1 contained 49 patients, and group 2 – 50 patients. Mean age of the patients, who underwent CTA and CACS, was $59.99\pm7.96$ years and the mean weight was $86.57\pm18.73$kg, there was no statistically significant difference of age and weight between the patients in the group 1 and group 2. In group 1 the median total radiation dose was 3.08 ($0.81 \sim 16.65$) mSv, the median CTA dose was 2.49 ($0.54 \sim 13.93$) mSv and the median CACS dose was 0.59 ($0.26 \sim 2.72$) mSv, which accounted for median 21.03 ($6 \sim 33$) % of the total radiation dose. In group 2 the median total radiation dose was 4.49 ($1.57 \sim 10.27$) mSv, the median CTA dose was 2.42 ($0.87 \sim 7.8$) mSv, while the median CACS dose was 2.09 ($0.47 \sim 2.47$) mSv that accounted for median 45.01 ($20 \sim 57$) % of the total radiation dose. The radiation dose of CACS was significantly ($p<0.001$) lower in the group 1, the median CACS radiation dose for men was 1.61 ($0.3 \sim 2.72$) mSv and it did not have a statistically significant difference compared to women ($1.09 \sim 2.11$) mSv.
Median aortic average density in CACS images using the filtered back projection reconstruction protocol was 45.63 HU (31.76 – 70.41) and median standard deviation (SD) of the average density was 20.46 HU (14.81 – 41.91) while using the iterative reconstruction protocol median aortic average density was 45.85 HU (32.88 – 77.97) and median SD of the average density was 20.28 HU (15.59 – 27.22). There was no statistically significant difference between the average aortic density when using different protocols (p=0.847). Additionally, SD was observed to be indistinctive when comparing these two protocols (p=0.823). Median density of the myocardium was 45.6 HU (31.87 – 58.83) and median SD of the myocardium was 19.54 HU (11.74 – 31.34) with the FBP protocol, whereas median density of the myocardium was 48.43 HU (33.05 – 70.72) and median SD of the myocardium was 19.2 HU (13.26 – 25.62) using the IR protocol. There was no statistically significant difference between the average density of the myocardium while using different protocols (p=0.072). Secondly, SD was observed to be indistinctive when comparing the two protocols (p=0.943).

Conclusions
The radiation dose, received during CACS, using IR protocol is significantly lower than using FBP mode and this resulted in significant decrease of total radiation dose (CACS plus CTA). Objective parameters of CACS images quality was similar between IR and FBP protocols.

**Accuracy of coronary computed tomography angiography in detecting anatomically relevant coronary lesions compared to invasive angiography**

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Introduction
Coronary artery disease (CAD) is the most common chronic non-infectious disease in Lithuania. It can be asymptomatic or present with symptoms, typically – chest pain or discomfort, that gets worse with physical exercise. Early diagnosis and treatment of CAD prevents irreversible myocardial damage and CAD complications.

Aims and Objectives
To compare the accuracy of computed tomography angiography (CTA) in detecting anatomically significant (>50%) stenosis compared to interventional angiography (IA). To describe clinical profile of this patients group.

Materials and methods
A retrospective analysis included 137 patients who underwent CTA scan followed by IA scan no more than 50 days later. Results of the scans were classified as anatomically insignificant (<50%) and significant (≥50%). We use modified 18 segment coronary segmentation scheme. The extent of disease was estimated for each patient.

Results
There were 94 men (68,6%) and 43 women (31,4%) with the average age of 61,35 years. Eighty-two (59,85%) had typical angina symptoms, 22 (16,05%) had atypical pain and 33 (24,08%) expressed other symptoms. Most common risk factor was primary arterial hypertension (n=120, 87,6%) followed by diabetes mellitus (n=21, 15,32%). Elevated cholesterol (n=55, 40,1%), triglycerides (n=11, 8%) and low-density lipoprotein cholesterol (n=58, 42%) levels were also common. Comparing CTA and IA results, most common stenosis was found in anterior interventricular branch of left coronary artery (n=53), CTA showed more severe stenosis in 14 cases, IA – in 5 cases (p=0,039). The number of damaged vessels in CTA and IA coincided in 60 (44,12%) cases, CTA showed more advanced disease in 42 (30,88%), IA – in 34 (25%) cases (p=0,219).

Conclusions
Results of the study show that in a substantial number of patients (44,12%) anatomically significant coronary lesions (≥50%) in CTA were confirmed in IA, but CTA tends to overestimate coronary stenosis compared to IA.
Comparision of coronary calcium score between patients with and without familial hypercholesterolemia.
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Introduction
Accumulation of calcium in atherosclerotic lesions of diseased coronary arteries demonstrates the prolonged chronic inflammation in atherosclerotic plaque. In familial hypercholesterolemia (FH) patients calcium accumulation is the result of mainly life-long exposure to high concentration low-density lipoprotein cholesterol in blood serum, the process being enhanced by presence of other cardiovascular risk factors. Based on total coronary calcium (CAC) score coronary artery disease (CAD) is graded: no evidence of CAD (0 calcium score), minimal (1-10), mild (11-100), moderate (101-400) and severe (>400). CAC is considered an independent predictor of CAD.

Aim and objectives
To compare CAD severity using calcium score in FH patients in comparison to non-FH patients.

Materials and methods
One hundred and seven patients from Latvian Registry of familial hypercholesterolemia underwent MS-CT coronary angiography (57 patients with FH and 50 without), CAC was calculated with Agatston score. Mean age of investigated patients was 50 years (23 years old the youngest and 84 – the oldest patient).

Results
In FH group in patients with coronary artery stenosis above 50% (n=10) median calcium score was Me(IQR) 451 [272-1071] and in group with stenosis between 10% and 50 % (n=21) median calcium score was Me(IQR) 114 [0-477], in group, where only initial atherosclerotic changes were found (n=12) median calcium score was Me(IQR) 12 [0-83], p=0.05.

In non-FH group in patients with coronary artery stenosis above 50% (n=6) median calcium score was only Me(IQR) 42 [11-162], in group with stenosis between 10% and 50 % (n=16) median calcium score was Me(IQR) 113 [23-227], in group, where only initial atherosclerotic changes were found (n=6) median calcium score was Me(IQR) 33 [2-161], p=0.05.

In the age group before 55 years, in patients with coronary stenosis above 50% there was significant difference of calcium score between FH and non-FH individuals (Me(IQR) 515 [206-1137] and 72 [6-182] Agatson units, respectively, p=0.038), but there was no significant difference in patients with coronary stenosis between 10% and 50% and those with initial CAD.

Conclusions
There is no significant difference of CAC score between FH and non-FH patients with initial stenosis, though with stenosis above 50% FH patients has greatly higher CAC score than non-FH patients. In the group of premature CAD with stenosis above 50% FH patients have considerably higher CAC than in non-FH patients, which confirms the need of clinical suspicion for FH in young patient with stenosis above 50% and high CAC.

Acknowledgement
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ULTRASOUND

Evaluation of liver fibrosis using shear wave elastography
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Introduction
Chronic liver disease promotes hepatic inflammation and fibrosis. When diagnosing and treating hepatic diseases such as chronic hepatitis C, it is important to evaluate the degree of liver fibrosis.
Aims and Objectives
Our aim was to determine diagnostic capabilities of shear wave elastography (SWE) in patients with liver disease.

Materials and methods
Hepatic stiffness, size of liver and spleen, portal vein flow velocity, portal vein diameter and flow pattern of hepatic veins were evaluated in 24 patients with diagnosed liver disease and in 15 healthy subjects. All measurements were performed using Philips ElastPQ SWE. The hepatic stiffness was expressed in kilopascals (kPa).

Results
The mean liver stiffness value was 4.18±1.15 kPa in control group and 16.19±12.31 kPa in patient group (p<0.001). An optimal SWE cut-off value of 5.51 kPa had predicted 88% sensitivity and 93% specificity for detecting liver fibrosis. The liver stiffness was positively correlated with portal vein diameter and flow pattern of hepatic veins (r=0.4, P<0.008), no significant correlation between liver stiffness and the sizes of liver, spleen and portal vein flow velocity was found.

Conclusions
Liver is stiffer in subjects with diagnosed liver disease than in those who are apparently healthy. Sensitivity of SWE is 88%, specificity 93% with cut-off value of 5.51 kPa. Greater hepatic stiffness is associated with increased portal vein diameter, monophasic and biphasic flow patterns of hepatic veins.

Medullary vs papillary: is there a sonographic difference between these two thyroid cancer types?
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Introduction
Thyroid cancer has increased in incidence over the years, most likely due to improved imaging studies. In 2017 American College of Radiology proposed a scoring system – Thyroid Imaging, Reporting and Data System (TI-RADS) for identifying clinically significant malignancies using thyroid ultrasound. However, this system was developed with papillary thyroid carcinoma (PTC) in mind because it is the most common. Medullary thyroid carcinoma (MTC) is much rarer but it is more aggressive. Therefore, we decided to determine the sonographic differences between papillary and medullary thyroid cancer types using TI-RADS

Aims and Objectives
Aim of the study is to determine the sonographic differences between papillary and medullary thyroid cancer types using TI-RADS.
1. To determine if distribution of sonographic features suggesting malignancy is different between PTC and MTC cases.
2. To evaluate differences of total TI-RADS scores awarded for sonographic features of thyroid nodules between PTC and MTC cases.
3. To evaluate the relation between thyroid nodule size and total TI-RADS score in PTC and MTC cases.

Materials and methods
A total of 76 MTC cases from 2004 to 2017 and 62 PTC cases from 2014 to 2017 were analyzed in Lithuanian University of Health Sciences Kaunas Clinics. Patients’ age, gender, sonographic features of thyroid nodules (echogenicity, shape, composition, margin, echogenic foci and nodule size) were assessed. The nodules were scored (0-3) as suggested by 2017 ACR TI-RADS. The results were compared between PTC and MTC. In all cases definite diagnosis was verified by histological evaluation of surgical specimen. Statistical analysis was performed with “IBM SPSS Statistics 17.0“. Student’s t-test was used to compare the means of two variables and Spearman’s rank correlation coefficient (r_s) was used to evaluate the correlation between two variables. Results were considered statistically significant with p values of 0.05 and lower.

Results
Out of 76 MTC cases 25 (32.9%) patients were male and 51 (67.1%) female, out of 62 PTC cases – 5 (8.1%) and 57 (91.%) respectively. Male patients made up a larger part in MTC cases compared to PTC (p < 0.001). There was
no significant difference between mean age of patients diagnosed with MTC (53.4 ± 1.7) and PTC (52.9 ± 2.3). Mean scores for individual sonographic feature categories: composition (PTC – 1.5 ± 0.5, MTC – 1.9 ± 0.4 pts) and shape (PTC – 0.5 ± 1.1, MTC – 1.6 ± 1.5 pts), were significantly lower in PTC compared to MTC cases (p < 0.001). Mean score for echogenicity (PTC – 2.1 ± 0.5, MTC – 1.8 ± 0.6 pts) was higher among thyroid nodules established as PTC, p = 0.02. No significant difference was found in points awarded for nodule margin (PTC – 1.5 ± 1.4, MTC – 1.7 ± 1.3 pts) and echogenic foci (PTC – 1.3 ± 0.9, MTC – 1.6 ± 1.3 pts) between MTC and PTC. Total score from all categories was higher in MTC (8.6 ± 2.6) compared to PTC cases (6.8 ± 2.2 pts), p < 0.001. Mean thyroid nodule size of PTC and MTC was 1.46 ± 2.3 and 2.74 ± 2.3 cm respectively, with nodules in case of MTC being significantly larger (p < 0.001). Positive correlation of medium strength ($r_s = 0.458$, p < 0.001) was found only between MTC nodule size and total score from all categories.

Conclusions
1. In cases of medullary thyroid cancer more TI-RADS points were awarded for sonographic categories: composition and shape, but lower for echogenicity compared to cases of papillary thyroid cancer.
2. Total TI-RADS score awarded for all sonographic categories was higher in MTC cases compared to PTC, indicating that TI-RADS can be used to predict malignancy in cases of MTC as well as PTC.
3. Thyroid nodule size was found to have a relation to sonographic features suggesting malignancy in cases of MTC – higher TI-RADS score was found in larger nodules.
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