Comparison of magnetic resonance enterocolonography indices with clinical activity in Crohn’s disease

Vestina Straksyte1, Irina Gineikiene1, AlgidasBasevicius1, Gediminas Kiudelis2
1 Clinic of Radiology, Lithuanian University of Health Sciences, 2 Clinic of Gastroenterology, Lithuanian University of Health Sciences

Objective
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 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).

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 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 contras media for excitation of bowel peristaltic 20 ml/m2 N-butyl scopolamine (Buscopan, Boehringer, Ingelheim, Germany) was injected intravenously. Two radiologists who were aware of any clinical data evaluated MR-EC images on PACS workstation. The bowel was divided in 7 segments jejunum, proximal ileum, terminal ileum, 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, segmented segment length, ulcers, haustal loss, mesenteric edema, lymph nodes (≥1cm measured in shortest diameter), comb sign (linear densities on the mesenteric side of affected bowel segments), abscess, fistula. 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 * 22 cm²)]. Just before starting MR-EC examination and before injecting contras media for excitation of bowel peristaltic 20 ml/m2 N-butyl scopolamine (Buscopan, Boehringer, Ingelheim, Germany) was injected intravenously. Two radiologists who were aware of any clinical data evaluated MR-EC images on PACS workstation. The bowel was divided in 7 segments jejunum, proximal ileum, terminal ileum, 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, segmented segment length, ulcers, haustal loss, mesenteric edema, lymph nodes (≥1cm measured in shortest diameter), comb sign (linear densities on the mesenteric side of affected bowel segments), abscess, fistula, T2 signal, mesenteric oedema, T1 enhancement and pattern, and haustal 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.

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.

Key words
Crohn disease, magnetic resonance enterocolonography, disease activity indices