Changes of Free Radicals in Early Progression of Multiple Sclerosis

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Background: Several factors can compromise the endogens protective system of organism and accelerate the induction of free radicals that may influence the course of MS.

Study purposed to investigate the role of several possible risk factors in secondary progression of MS.

Methods: We investigated smoking, dietary patterns, alcohol intake, severe and chronic stress in 60 secondary progressive MS (SPMS) patients, 33 (first group) from refuges, 27 from general population (second group). Age at disease onset, disease duration, number of relapses, length of period until the secondary progression of disease and the Kurtzke Expanded Disability Status Scale (EDSS) scores were collected. Control comprised 15 healthy volunteers. Brain was visualized by Magnetic Resonance Tomography (MRT-1.5-Tesla). Mood examined by Beck Depression Inventory (BDI-II). Blood free radicals detected by Electron Paramagnetic Resonance Method (EPR). Statistics was performed by SPSS-11.0.

The whole volume of brain demyelization lesions was calculated. Depression was examined by Beck Depression Inventory (BDI-II).
Depression considered when (BDI> 9/10). Age at disease onset, disease duration, number of relapses, and length of period until the secondary progression of disease were collected in clinical groups.
Smoking, Alcohol intake, Cholesterol intake, Severe stress, Chronic stress were studied in all Groups.
Kurtzke Expanded Disability Status Scale (EDSS) scores were made in clinical groups.

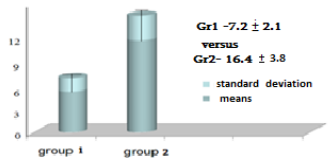
Free Radical Assays:

- Blood free toxic radicals: Lypoperoxiradical (LOO-) and superoxide anion (O^{2-}) were detected by Electron Paramagnetic Resonance Method (EPR).
- Low temperature EPR measurements using ESR-231 (X-band, Germany) were carried out for direct free radical detection in each group and 50mM DMPO (5.5-dimethyl-l-pirrolyne- N-oxide, SIGMA) was added to the blood samples.
- EPR signals were measured in arbitrary units (signal intensity in millimeters was accounted on milliliter blood matter).

Statistics: Performed by computer software SPSS-11.0.Normally distributed continues variables - by one- way ANOVA.

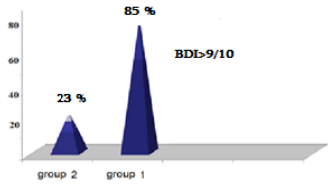
Results: First group developed SPMS in a shorter period compared to second group (7.2 ± 2.1 versus 16.4 ± 3.8, *p<0.05*). Multiple logistic regression found the significance of smoking and depression for development of SPMS (p<0.05). Depression was found in 85% of first - and in 23% of second group (BDI> 9/10). Lypoperoxyradical (LOO^{-}) and superoxide anion (O^{2-}) were increased in first group as compared to second group and control. Positive correlation was established between BDI index and LOO- and O^{2-} data (r=+0.33 and r=+0.19, *p<0.05*).

Comparison of the time period needed for SPMS development in different groups of patients



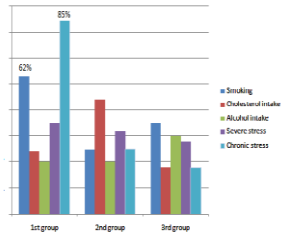
In 1st group MS progression to SPMS developed in a significantly shorter

Frequency of depression in different groups of patients



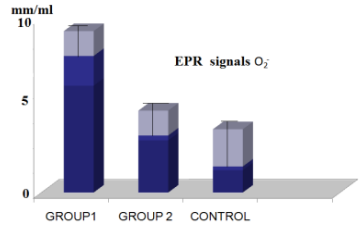
Depression was found in 23% of the of 2nd group and in 85 % of the 1st group

Dispersion analysis



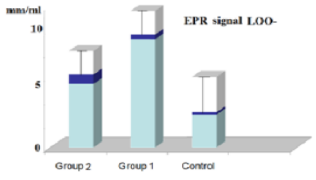
found the significance smoking and depression for development of SPMS (p<0.05)

Comparison of reactive oxygen EPR signal intensity in different groups and control



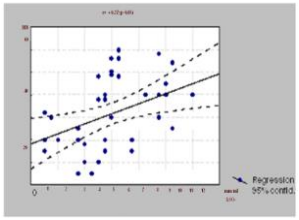
Blood EPR specters of reactive oxygen (O_2^{-}) was increased in 1st group compared to 2nd group and control(8.6 ± 06. versus 4.2 ± 0.4 versus 1.8 ± 0.4)

Comparison of the LOO- EPR signal intensity in different groups and control



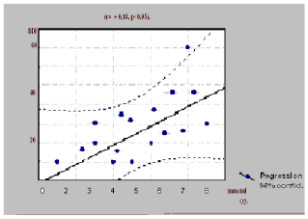
Blood EPR Specters of Lipoperoxidal (LOO-) was increased in 1st group compared to group 2nd and control (9.2 ± 0.4 versus 5.4 ± 0.8 versus 2.8 ± 0.2)

Relation of BDI to the blood LOO- in MS patients (Linear Regression Analysis)

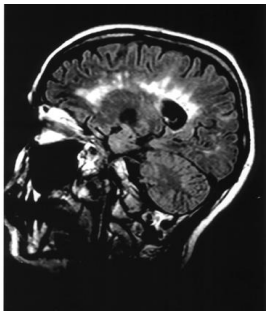


positive correlation was established between BDI index and LOO- data (r= + 0.33; p<0.05)

Relation of BDI to the blood in MS patients (Linear Regression Analysis)



Positive correlation was established between BDI index and O_2^{-} data (r= + 0.19, p<0.05)



Conclusion: Smoking and depression due to chronic social stress may contribute to the promotion of free radical pathology in MS and thus, can stimulate the neurodegeneration.