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Interrelationship of endothelial function parameters in children with bronchial asthma

The endothelium plays an important role in the development of the local inflammatory process in the pathology of various organs and systems.

Objective: To determine the endothelial function status in children with bronchial asthma (BA) and evaluate its role in the disease formation.

Materials and Methods: 60 children aged from 6 to 17 years with persistent BA in exacerbation were examined. Groups depending on the severity was formed: 1st group - patients with mild persistent BA (n=29), 2nd group - with moderate persistent (n=21) and 3rd group - with severe persistent (n=10). The control group included 15 healthy children. Ultrasonography has been used for investigation of the intima-media thickness (I-M) complex and for calculation of the percentage increase of flow-mediate dilatation (FMD%). The serum levels of S-nitrosothiols were determined spectrophotometrically. The serum levels of soluble Vascular Cell Adhesion Molecule-1 (sVCAM-1) was determined with enzyme-linked immunosorbent assay (ELISA, catalog #BMS232, Austria). Statistical analysis was performed with StatSoft STATISTICA Version 8 (Tulsa, OK). Non-parametric variables are given as median (interquartile range). Differences between groups were tested using Mann-Whitney test.

Results: The thickness of I-M complex was significantly increased in the patients of the 3rd group (1,2 (0,1; 1,3))mm, compared with children of the 1st (0,9 (0,8; 1,0)mm, $p_{1-3}=0,0000$), 2nd (1,0 (1,0; 1,2)mm, $p_{2-3}=0,0004$) groups and controls (0,6 (0,5; 0,7)mm, $p_{c-3}=0,0000$). The indices of FMD% were significantly diminished in the patients of the 1st, 2nd and 3rd groups, compared with controls (respectively 7,31 (6,38; 8,64)%, 6,40 (6,12; 6,98)% and 5,57 (4,81; 5,86)% compared with 19,35 (17,00;21,00) %, $p<0,001$). The serum S-nitrosothiol levels were significantly diminished in the patients of the 1st (0,17 (0,15; 0,22)) mmol/l; in the patients of the 2nd (0,14 (0,12; 0,15)) mmol/l and in the patients of the 3rd (0,11 (0,08;0,11)) mmol/l, compared with controls (0,33 (0,28;0,37) mmol/l, $p_{c-1}=0,000$, $p_{c-2}=0,0002$). The serum sVCAM-1 was significantly increased in the patients of the 1st, 2nd and 3rd groups, compared with controls (respectively 1000,41 (850,24; 1100,32) ng/ml; 1180,62 (1070,09; 1300,72) ng/ml; 1630,92 (1510,45; 1870,84) ng/ml, compared with 745,60 (690,82; 790,19) ng/ml, $p<0,001$). It was proved levels of S-nitrosothiol ($H=41,29$, $p=0,0000$), FMD% ($H=44,52$, $p=0,0000$) and sVCAM-1 ($H=56,63$ $p=0,0004$) depend on BA severity. The correlation between levels of S-nitrosothiol and FMD% ($r=+0,81$, $p=0,0001$) and sVCAM-1 and I-M complex ($r=+0,80$, $p=0,0003$) were determined. It was show that the endothelial dysfunction degree depends on the asthma severity.

Conclusions: in children with asthma there are endothelial dysfunction signs and their extent depend on the severity of the disease.