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Title: Quantitative CT-estimation of total and regional lung inflation in patients with bronchial asthma (BA)

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Body: Background: Functional abnormalities are often the first and the only symptoms in BA. Spirometry do not allow lung inflation. Aim: To estimate the potential of CT in identification of total and regional lung hyperinflation in BA patients. Methods: 70 BA patients were examined compared with 20 healthy persons. The method of two stage multispiral CT by Activion 16 (Toshiba) with the further 3D-reconstruction and volumetry (-850 HU and lower) was used. The quantitative densitometric estimation at axial scanning in fixed upper, middle and lower lung zones was also done. Bronchodilation test with salbutamol inhalation was used. Results: The lung dysfunction was registered in 66 patients. By 3D-volumetry, lung inflation at maximal expiration against inspiration in mild BA was 3.8±2.46% (in healthy people - 0.3±0.55%, $p<0.001$), in moderate BA - 16.2±5.27% ($p<0.05$ to mild BA) and in severe BA - 30.0±7.46% ($p<0.05$ to moderate BA). By densitometry the mean expiration to inspiration ratio of density in mild BA was 80.0±3.14% (in healthy people - 76.7±5.37%, $p<0.01$), in moderate BA - 85.0±3.48% ($p<0.05$ to mild BA), in severe BA - 91.5±4.19% ($p<0.05$ to moderate BA). After salbutamol inhalation patients with mild BA had a decrease of “air traps” volume: before the test the expiration to inspiration ratio of lung inflation was 7.3%, after the test - 2.3%; the quantity of voxels before the test was 3772 at inspiration, 276 at expiration, after the test - 4772 and 110, respectively). Conclusion: By 3D-volumetry and densimetric analysis the conclusions about the lung inflation abnormality and the volume of “air traps” in BA patients can be drawn, which considerably supplements the spirometry.