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Title: Efficiency of multi-slice spiral computed tomography (MSCT) with 3D-volumetry at the estimation of lungs inflation in bronchial asthma

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Body: Background: The possibilities of MSCT in revealing of lung hyperinflation in patients with bronchial asthma (BA) are not fully appreciated. Aim: to estimate the degree of lung hyperinflation by MSCT with 3D-volumetry in asthmatics. Methods: The air volume in lungs after maximal inspiration and expiration was measured in 105 BA patients by MSCT with the help of 3D-visualization software and further quantitative estimation within densitometric diapason from -850 HU and below as compared with bodyplethysmography. Results: The patients were divided into three groups according to BA severity: the 1st (43 patients with mild BA), the 2nd (52 patients with moderate BA) and the 3rd group (10 patients with severe BA). The increase of residual volume (RV) was registered in 24 patients with mild, 48 patients with moderate and all of 10 patients with severe BA. According to the results of 3D-volumetry the RV was 54.4 ± 15.6 ml in the 1st group, 483.1 ± 69.6 ml in the 2nd group, and 1956.8 ± 277.7 ml in the 3rd group; the ratio of the RV to the volume at the level of maximal inspiration was 3 ± 1 , 16 ± 2 and $39 \pm 5\%$ respectively ($p < 0.001$). By the results of bodyplethysmography the mean RV was $93.8 \pm 8.2\%$ from referent value in the 1st, $125.1 \pm 8.6\%$ in the 2nd, and $142.8 \pm 11.6\%$ in the 3rd group. RV/TLC was 25 ± 2 ($89.3 \pm 6.9\%$ from refernt value), 35 ± 2 ($113.7 \pm 6.5\%$) and 42 ± 3 ($124.2 \pm 7.9\%$) respectively ($p < 0.05 \div 0.001$). A direct correlation was found between the RV/TLC obtained by bodyplethysmography and MSCT in the patients with moderate to severe BA ($r = 0.47$; $p < 0.05$). Conclusion: MSCT 3D-volumetry is an effective method of quantitative assessment of lung hyperinflation in BA.