Introduction.

Disturbances of cardio-vascular system functioning in bronchial asthma (BA) in children have certain peculiarities depending on period, disease severity, presence of concomitant pathology, attack period of bronchial asthma and are linked with medications taken. Initial clinical manifestations of cardiac insufficiency in attack period of bronchial asthma in children are absconded by phenomena of bronchial obstruction and respiratory insufficiency; that is why for revealing early myocardial dysfunction of the right heart it is expedient to use Doppler echocardiography (DopplerEchoCG) method. Aim of the investigation was to study development of systolic and diastolic dysfunction of right heart in children in attack period of bronchial asthma depending on disease severity.

Materials and methods.

To assess functional state of the right heart depending on asthma severity with DopplerEchoCG there were examined 42 patients aged 5 – 17 years with persistent BA in attack period. First group included 20 children with moderately-severe BA, second - 22 children with severe BA. Control group included 40 healthy children-peers.

Echometric heart findings and parameters of intra-cardiac hemodynamic were measured by means one- and two-dimension echocardiography, impulse DopplerEchoCG by standard procedure. To assess systolic function of the right ventricle there was calculated time parameter of its isovolumic contraction and Tei-index. Diastolic function of the right ventricle was assessed by findings of velocity of early and late diastolic filling, their ratio, time of slowing down of blood-flow velocity in the phase of early diastolic filling and time of isovolumic relaxation of the right ventricle. Functional state of the right atrium was assessed by the time of its systole; this corresponded to finding of late diastolic filling of the right ventricle. State of pulmonary hemodynamics was assessed by findings of maximal velocity of flow through pulmonary artery valve, time of acceleration, ejection time, their ratio, as well as by the finding of median pressure in pulmonary artery, calculated by A.Kitabatake formula.
Results.

Peculiarities of remodeling of myocardium of the right heart in attack period of BA in children were characterized by the increase of right ventricular cavity, and in case of tricuspid regurgitation of the 1-2 degree – by increase of right atrium cavity. Disturbances of systolic function of the right atrium in assessing time index of late diastolic filling of the right ventricle, which corresponded to duration of right atrium systole, more often were revealed in patients with severe BA (77,3%) and only in every third child with moderate-severe BA. Systolic dysfunction of the right ventricle in attack period of BA in assessing time indices of its isovolumic contraction and Tei-index was revealed in the majority of patients with severe BA (90,9%) and significantly rare in patients with moderately-severe BA (45,0%, p<0,01).

Diastolic dysfunction of the right ventricle of the first type in attack period of BA by time indices of slowing down of blood-flow velocity in the phase of early diastolic filling and time of isovolumic relaxation of the right ventricle was typical for patients with severe BA (90,9%) and was revealed in more than one half of patients (55,0%) with moderately-severe BA. Among findings of tricuspid blood flow which characterized diastolic dysfunction of the right ventricle, depending on BA severity, velocity of late diastolic filling of the right ventricle – toward increase and ratio of velocities of early and late diastolic filling – towards decrease changed more significantly as compared with normal findings. In accordance with revealed deviations of DopplerEchoCG findings, combined systolic-diastolic variant of right ventricle dysfunction developed in 40,0% of patients in attack period of moderately-severe BA and in 95,5% of patients with severe BA (p<0,001).

Individual analysis of median pressure index in pulmonary artery showed that pulmonary hypertension developed more often in attack period of BA in patients with severe BA - 68,2% and 20,0%, correspondingly (p<0,001).

Conclusion.

Performed investigations of intra-cardiac hemodynamics of the right heart in attack period of BA showed presence of disturbances both of systolic and diastolic
function of the right ventricle and right atrium. Combined systolic-diastolic variant of right ventricle dysfunction which developed in 95.5% of cases was typical for attack period of BA. Elevation of pressure in the pulmonary artery was typical and significantly more often developed in case of severe BA attack, herewith pulmonary hypertension of the 2-d degree prevailed (60% of cases).

Key words: right heart ventricle, Doppler echocardiography, bronchial asthma, children