Use of lung planar scintigraphy in pulmonary perfusion analysis in patients with HLHS after Fontan operation and stent implantation.


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Introduction: Fontan operation results in low pulsatile pulmonary blood inflow that affects blood distribution in lungs. Moreover, left pulmonary artery (LPA) stenosis is a common complication in patients with hypoplastic left heart syndrome (HLHS).

Aim: Assessment of lung perfusion in HLHS patients after Fontan operation using planar lung perfusion scintigraphy.

Material and Methods: The study was performed in 56 patients (37 boys and 19 girls) aged from 4 years 3 months to 18 years 7 months (mean 8 years); 39 pts. (70%) had stent implantation due to LPA stenosis prior to Fontan operation.

All patients underwent planar lung perfusion scintigraphy (AP and PA projection) after peripheral injection of 99mTc – MAA (macroaggregated albumin) with activity calculated by Webster's formula. Lung perfusion studies were performed with Hawkeye hybrid gamma camera; studies were processed on Xeleris workstation. Percentage share of every lobe in a global lung perfusion has been calculated after averaging of counts in anterior and posterior projection - geometric mean. The presence of pulmonary arteriovenous fistulas (PAVF) was assessed by radionuclide activity in kidneys and brain.

Results: Mean left and right lung contribution to global lung perfusion were 47% (upper lobe 19%; lower lobe 28%) and 53% (upper lobe 13%; middle lobe 23%, lower lobe 17%) respectively. Normal left lung perfusion was observed in 30 patients (53,6%), normal right lung perfusion in 21 cases (37,5%).

Severe lung hypoperfusion defined as percentage ≤ 30% of global lung perfusion was noted in 9 patients for the left and in 10 patients for the right lung. The most common finding was hypoperfusion of middle and lower lobes of right lung - 16 patients (28,6%).

Postoperative diaphragmatic paralysis resulting in decrease of the size of one lung was noted in 7 patients (12%).

Radionuclide activity in kidneys and brain suggesting PAVF was noted in 4 cases (7%).

Conclusions:
1. Patients with HLHS have pulmonary perfusion abnormalities due to non-physiological pulmonary flow, pulmonary artery narrowing, or postoperative diaphragmatic paralysis.
2. Planar lung perfusion scintigraphy seems to be reliable in postoperative evaluation of patients after the Fontan procedure.