Summary

Relation between the reperfusion of pulmonary arteries after acute pulmonary embolism to the development of chronic thromboembolic pulmonary hypertension

Incomplete resolution of thromboemboli following acute pulmonary embolism (PE) is a key factor in development of chronic thromboembolic pulmonary hypertension (CTEPH). In our study, we evaluated the incidence, risk factors and clinical impact of incomplete reperfusion after acute PE.

Study population and methods: 85 patients after the first acute PE were assessed clinically and by pulmonary scintigraphy and echocardiography at month 6, 12 and 24 after an acute PE.

Results: Incomplete reperfusion was detected in 23.5 % of patients after 6 months, in 24.9 % of patients after 12 months and in 18.6 % of patients after 24 months. At month 6, patients with incomplete reperfusion were more obese when compared with patients with normal reperfusion BMI 30.8 vs 28.3 kg/m^2; p=0.012) and their initial hemoglobin levels were higher (143.0 vs 136.0 g/l; p=0.012). Similar results were observed at month 12 – patients with residual perfusion defects were more obese (BMI 31.1 vs 28.5; p=0.016) with higher initial hemoglobin levels (144.0 vs 136.0; p=0.007). Patients with incomplete reperfusion at month 24 were significantly older (67.7 vs 55.0 years; p=0.02), their initial hemoglobin levels were higher (144.5 vs 136.0; p= 0.031) and their PE was more frequently of intermediate or high risk (85.7 vs 47.5%; p=0.026). It was associated with larger diameter of the right ventricle (36.5 vs 32.5 mm; p=0.044) and more significant tricuspid regurgitation (2.0 vs 1.5; p= 0.018) during the initial echocardiography examination. The estimated pulmonary arterial systolic pressure was elevated in patients with perfusion defects persisting at month 24 after the acute PE in comparison with remaining patients (30.0 vs 22.5 mmHg). CTEPH was diagnosed in 3 patients (3.5%) from our cohort.

From the acquired data, we created a clinical risk prediction score for persistence of perfusion defects based on two parameters – hemoglobin levels and age. This prediction score classifies our cohort into 3 groups according to the risk of persistence of perfusion defects.

In the lowest risk group (hemoglobin <140 g/l), a complete reperfusion was achieved in 94% after 24 months; in the intermediate risk group (hemoglobin level >140 g/l and age <65 years), reperfusion was achieved in 75%; and in the high risk group (hemoglobin level >140 g/l and age >65 years), reperfusion was achieved only in 66% of cases. The risk of

persisting perfusion defects after 24 months was therefore 9.4 times higher in patients in the highest risk group than the in the lowest risk group.

Conclusions: During the 24 months of observation after an acute PE, incomplete reperfusion was detected in 18.6 % of patients. Higher risk of incomplete reperfusion was associated with higher age, higher BMI, higher initial hemoglobin levels and with intermediate or high risk acute PE. It is possible to predict the low, medium or high risk of persisting perfusion defects at each patient according the hemoglobin level and the age at initial examination.