論 文 要 旨

Hemodynamic features underlying pulmonary vein stump thrombus formation after left upper lobectomy: Four-dimensional flow magnetic resonance imaging study

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Background: We previously reported that to-and-fro blood movement near the pulmonary vein stump was particularly prominent after left upper lobectomy compared with other lobectomy, which may be the cause of the high susceptibility of pulmonary vein thrombus after left upper lobectomy. The aim of the present study was to compare the hemodynamics in patients who developed pulmonary vein thrombus after left upper lobectomy with those in patients who did not develop pulmonary vein thrombus using four-dimensional flow magnetic resonance imaging (4D-MRI).

Methods: This was a retrospective evaluation of a prospectively collected clinical and radiological database of 37 patients who underwent 4D MRI 7 days after left upper lobectomy for lung cancer (n=37). We obtained two parameters by 4D MRI: the grade of to-and-fro blood movement and the flow energy loss around the pulmonary vein stump. The length of the pulmonary vein stump, a known risk factor for pulmonary vein thrombus, was also measured.

Results: According to a scatterplot of the grade of to-and-fro blood movement versus the flow energy loss, patients with pulmonary vein thrombus (n=15) were concentrated in an area which appears to be a ‘dangerous’ hemodynamic condition. There were few patients without pulmonary vein thrombus in this ‘dangerous’ area, except for one who unfortunately developed delayed pulmonary vein thrombus and cerebral infarction. We proposed a formula using the 4D MRI-derived parameters based on a stepwise multiple regression analysis that was more closely associated with the development of pulmonary vein thrombus than the length of the pulmonary vein stump (area under the receiver operating characteristics curve: 0.918 vs. 0.705, p=0.0500).

Conclusions: We proposed the existence of a ‘dangerous’ hemodynamic condition responsible for pulmonary vein thrombus formation. 4D MRI before the development of pulmonary vein thrombus may help identify patients requiring preventive therapy against pulmonary vein thrombus and subsequent thromboembolic complications.