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Detection of Pulmonary Artery Stenosis After Single-Lung Transplantation by Quantitative Pulmonary Perfusion Scintigraphy

Quantitative pulmonary perfusion scintigraphy (QPPS) has few indications for evaluation of pre- and post-lung transplantation. QPPS is useful for preoperative regional assessment of pulmonary function. Post-transplantation lung scintigraphy has a prognostic value in detecting chronic rejection. Here we report the clinical implication of QPPS in a 36-year-old man with post-alveolar microlithiasis complicated lung-transplantation. The pulmonary function tests and repeat thoracotomy excluded corresponding ventilatory problems and surgical complications. Doppler echocardiography suggested elevated pulmonary artery (PA) pressure. QPPS revealed decreased perfusion of transplanted lung (geometric mean: 46.8%) compared to contra-lateral lung affected by severe alveolar microlithiasis indicating post-transplant pulmonary artery stenosis; the diagnosis was confirmed by pulmonary CT-angiography. The patient underwent a successful balloon angioplasty. Post-revascularization perfusion scintigraphy documented increasing graft blood flow (geometric mean: 51%). We conclude that QPPS may play a significant role in the assessment and follow-up of patients with complicated lung transplantation, including pulmonary artery stenosis.

Keywords: Lung Transplantation, Alveolar Microlithiasis, Quantitative Evaluation, Radionuclide Imaging

Introduction

The value of quantitative pulmonary perfusion scintigraphy (QPPS) has been proven to evaluate regional pulmonary blood flow before lung resection surgeries.[1] The prognostic value of post-transplant QPPS is also documented for the prediction of chronic graft rejection.[2] However, according to our knowledge, the implication of lung perfusion scintigraphy for the diagnosis of acute defective pulmonary blood flow of transplanted lung and for the follow-up evaluation of graft perfusion has not been mentioned so far. We found an exclusive case report of the clinical use of QPPS in the management of post transplantation pulmonary artery stenosis.[3] Alternatively, the assistive role of scintigraphy of the bronchial artery system before and after bronchial artery revascularization has also been shown previously.[4] In this case presentation, we report a patient who underwent lung transplantation because of respiratory insufficiency secondary to alveolar microlithiasis and developed post-transplant dyspnea. Alveolar microlithiasis[5] and post-lung-transplant pulmonary artery stenosis[6] are both fairly rare conditions; furthermore, successful lung transplantation, pulmonary angioplasty revascularization and diagnostic pulmonary CT-angiography are also reasonably novel procedures in Iran as a developing country.

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Case Presentation

A 36-year-old man developed hemoptysis and experienced deterioration of respiratory indices two days after single lung transplantation (SLT). The patient underwent SLT of the left lung because of lung failure, secondary to alveolar microlithiasis. The cardiothoracic surgeon performed a repeat thoracotomy with the impression of mediastinitis and failed to notice any major technical drawback. The next day, the patient's body temperature increased and pseudomonas species grew in microbial cultures of intraoperative samples of the mediastinum. The patient was treated with imipenem and clindamycin, which resulted in clinical improvement. Subsequently, the patient was transferred from the intensive care unit to the surgical ward with progression in the general condition. Ten days after SLT, the patient again developed respiratory distress without significant evidence of ventilatory changes in the plethysmogram. Doppler echocardiographic examination revealed an increased right ventricular size. In addition, the right and left pulmonary arteries were patent (2.0 and 1.8 cm, respectively); however, a suspicious proximal stenosis was mentioned beyond the origin of the left pulmonary artery. The patient's respiratory function and arterial blood gas profile deteriorated during the next three days when we performed a Tc-99m-labeled macroaggregate albumin (MAA) QPPS. The overall diminished perfusion of the left lung was visualized with a 46.8% geometric mean tracer activity, indicating global reduced perfusion abnormality in the transplanted left lung, suggesting left pulmonary artery stenosis in the QPPS study (Fig. 1A). On the same day, a pulmonary CT angiography was obtained, which documented a significant proximal anastomotic stenosis of the left pulmonary artery (Fig. 2). The next day, a balloon angioplasty of the left pulmonary artery was performed. The improvement in the clinical situation of the patient confirmed the efficacy of the treatment. A follow-up QPPS was obtained 3 days post-angiography to ensure the patency of the left pulmonary artery. Uniform and almost symmetrical radiotracer activity of both lung fields and increased relative left lung tracer accumulation (geometric mean: 51%) confirmed an adequate pulmonary blood supply of the transplanted organ (Fig. 1B). Three months after the transplantation, the patient is well and has completed his rehabilitation program.

Discussion

Alveolar microlithiasis[5] and post-lung-transplant

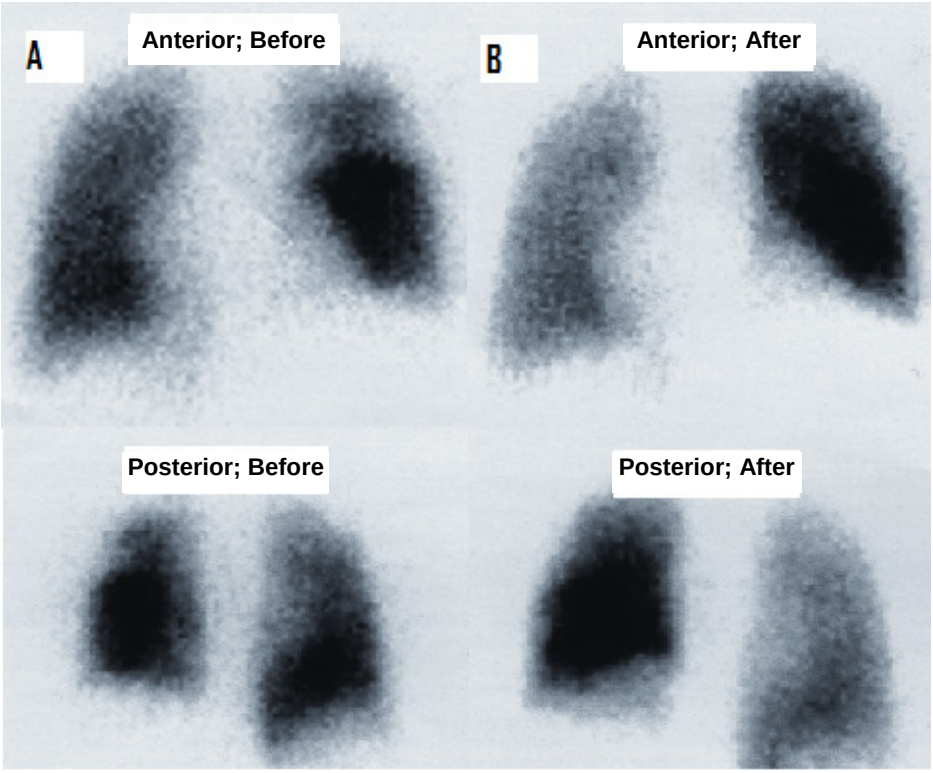

Fig. 1. A 36-year-old man with hemoptysis and dyspnea after left lung transplant.
A. Quantitative lung perfusion scintigraphy (QLPS) before pulmonary artery revascularization, indicating hypoperfusion of the transplanted lung compared to the right lung, damaged by alveolar microlithiasis (right lung geometric mean: 53.2%; left: 46.8%).
B. QPS after pulmonary artery revascularization demonstrating improved perfusion (right lung geometric mean: 49%; left: 51%).

Fig. 2. CT-angiography demonstrating left pulmonary artery anastomotic stenosis in the same patient.

pulmonary artery stenosis[6] are both fairly rare. QPPS may provide the physician with reassuring information about perfusion of the graft, which in particular may prohibit other unnecessary diagnostic procedures including CT-angiography of the pulmonary artery. Limitations of CT-angiography include cost, radiation and accessibility which is a significant consideration, especially in developing countries.[7,8] Defective graft perfusions would justify the definitive diagnostic and therapeutic procedures. QPPS may also provide prognostic information about chronic rejection[2] or late pulmonary artery stenosis.[9]

Overall, we suggest that QPPS may be considered as a useful adjunct in the assessment of the pulmonary blood flow of the grafted lung. Also for the follow-up purposes, QPPS may be preferred to pulmonary CT angiography which is currently more expensive, not always available, and has a potential for much higher radiation.

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