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Pulmonary artery stenosis shortly after lung transplantation: Successful balloon dilation and stent insertion in one case

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Summary

Background: Pulmonary artery stenosis after lung transplantation is a rare complication. It usually requires surgical correction but even after that the outcome is not favorable.

Case Report: The patient was a 53-years-old woman who was candidate for lung transplantation surgery due to pulmonary fibrosis. After 7 months on waiting list, with severe limitations in daily living activities, she received a single lung transplant in 2007. The surgery was performed without any complication.

One day after surgery and after extubation, the patient needed oxygen supplementation through mask with reservoir bag. In bronchoscopy, black-and-white exudate and black membrane that blocked the main bronchus in the transplanted lung was observed. By bronchial lavage the membrane and exudate were successfully removed and patient received antibiotics for documented Aspergillus infection and Methylprednisolone pulse therapy for evidences of graft rejection. Despite success in treatments of the mentioned complications, the condition of the patient deteriorated and she became totally dependent to supplemental oxygen. Oxygen consumption level had increase and pulmonary artery pressure was increasing gradually.

With suspicion to pulmonary artery stenosis, bronchial CT-Scan with contrast was performed 13 days after transplantation surgery which showed a 50% stenosis. Trans-esophageal echocardiography also showed a stenosis with 40 mmHg gradient. 18 days after transplantation surgery, percutaneous balloon angioplasty was performed which was initially successful but re-stenosis occurred. Seven days later, another balloon angioplasty with stent insertion was performed. After the procedure, the gradient has been removed. Patient was discharged 30 days after transplantation. Follow-up after 10 months revealed not stenosis and the stent was working properly.

Conclusions: Stent angioplasty can be performed with no problem or complication if pulmonary artery stenosis is seen after lung transplantation.

Key words lung transplantation • pulmonary artery stenosis • pulmonary artery

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Background

Lung transplantation is gaining more popularity as the ultimate treatment of end stage pulmonary diseases. Along with such increase in the number of lung transplantations, its complications especially those with lower frequencies become more prominent and proper knowledge about their management seems more and more a necessity.

Vascular complications are among uncommon complications of lung transplantation, compared to other more frequent problems like graft rejection and infection [1]. Pulmonary artery stenosis is among the vascular complications [2]. Due to scant number of reports, there is no stereotype approach to diagnosis and treatment of such complication.

We report here a case of pulmonary artery stenosis shortly after lung transplantation and explain about the diagnostic methods and treatment procedure.

Case Report

Our patient was a 53-years-old woman. She suffered from pulmonary fibrosis with severe limitations in daily living activities. She was placed on lung transplantation waiting list 7 months before receiving the organ. She received a single right lung transplantation from a 52 years-old male swimmer donor who was in brain death status due to head trauma.

The transplantation surgery was performed without any complication. The day after transplantation surgery, patient's oxygen saturation could just be maintained through mask with reservoir mask. Bronchoscopic examination on the day after surgery revealed black-and-white exudates. The main bronchus of the transplanted lung was also blocked by a thin black membrane. We successfully removed the exudates and the membrane with bronchial lavage and patient received antibiotics for positive Aspergillus culture of bronchoalveolar lavage and Methylprednisolone pulse therapy for evidences of graft rejection grade 2–3.

Despite receiving such treatments, the patient's condition deteriorated gradually and the patient was totally dependent to supplemental oxygen. The pulmonary artery pressure was also rising and reached to a systolic pressure of 45 mmHg in day 13 post transplantation, With a suspicion to pulmonary artery stenosis, CT-angiography was performed which revealed a 50% stenosis at the site of arterial anastomosis. Transesophageal echocardiography confirmed the stenosis with a 40 mmHg gradient.

On the day 18th after lung transplantation, the patient underwent percutaneous balloon angioplasty. The result was successful at first but restenosis occurred again 5 days later. On the day 25th post transplantation, another percutaneous balloon angioplasty was performed and a stent was place at the stenosis site. After the procedure, the gradient was removed and the patient's condition improved gradually. The patient was discharged 30 days after transplantation with good condition. Follow-up after 10 months revealed no stenosis and the stent was working properly.

Discussion

Pulmonary artery stenosis is uncommon but potentially lethal after lung transplantation. There is no exact report on its prevalence after lung transplantation and current reports are mainly limited to some case reports. Clark S.C. et al in their single center study reported its prevalence to be 4 in 109 patients (4.6%) and occurring in 1.75% of vascular anastomoses after lung transplantation [2]. They also reported its incidence to be higher in women (8.2% vs. 1.7% in men) but such assumption requires further investigations in larger patient population. It is believed that the rate of such complication is decreasing due to increased knowledge and experience with vascular surgery and lung transplantation [3] but the net

incidence may increase due to an increase in the number of performed lung transplantation. This complication usually occurs early after lung transplantation [2] but there are some reports of PAS occurrence as late as 5 to 6 years after lung transplantation [4,5]. Such late occurrence seems to be solely observed in patients with primary pulmonary hypertension as the cause of lung transplantation. Our patient was a woman and PAS was observed early after transplantation but we believe that any conclusion about the incidence and gender discrepancies needs further studies with sufficient follow-up and better study design.

The cause of PAS after lung transplantation is believed to be arteries' excessive length of the donor and recipient segments, distortion of the anastomosis because of inadequate donor length, technical anastomotic narrowing, twisting of the anastomosis, and intraluminal thrombus formation [6]. Pulmonary artery anastomotis narrowing usually is suspected when there is unexpected respiratory distress or hypoxia associated with a clear transplanted lung radiograph and low pulmonary vascular resistance or when there is persistent pulmonary hypertension in a single-lung transplant performed for pulmonary vascular disease [3,6]. Ventilator dependence and pleural effusion or edema are other reported symptoms [4]. Some experts now perform routine intra and post operative investigations to evaluate the graft circulation [6,7].

In our case, the patient was hypoxic early after the transplantation and remained so with no obvious reason.

Regarding the diagnostic choice, while the gold standard for diagnosis of pulmonary artery stenosis remains to be pulmonary angiography [2], other new and rather noninvasive imaging techniques like transesophageal echocardiography(TEE), intravascular ultrasound [3] multidetector computed tomography (MDCT) [8], magnetic resonance imaging (MRI) [9] and nuclear Scanning [4] proved to be of good diagnostic values. TEE is a sensitive and practical method for detecting PAS and could be used as the first line diagnosis [10].

Its usefulness in prediction of early PAS [11] during transplantation procedure for identifying the possible stenosis [7] has been proved before. Some investigators perform routine post-transplantation perfusion scans [6]. This is while the number of studies which had difficulties in using TEE for diagnosis of PAS is limited [2]. In our experience, contrast CT-Scan and TEE proved to be useful and reliable yet practical diagnostic tools for diagnosis of PAS. We had no difficulties visualizing the pulmonary artery and detecting its stenosis.

There are four proposed treatments for PAS: conservative management, reoperation, balloon expansion and intra vascular stent insertion. Griffith B.P. et al. reported two patients who were conservatively managed and had a short term beneficial outcomes [6]. Such treatment approach did not gain much popularity among the experts and after such advances in micro-invasive techniques. In their report whether the status of the patients was not severely compromised or they regarded the intervention to be difficult. Also, the long term outcome of the patients is not clear. Reoperation is another choice of treatment. The benefit of performing surgery is good visualization of the vessels to perform any necessary procedure. However, successful outcome seems to be largely affected by proper protection of the transplanted lung from ischemia using cardiopulmonary bypass and protective cold blood flush [3,12], which add to complications and complexity of the procedure. There are also concerns about developing bronchiolitis obliterans after surgery [13] and narrowing recurrence because of patch scarring and shrinkage [14].

Along with recent advances in minimally invasive procedure, conservative and surgical correction of PAS are losing their popularity and physicians are more and more attracted to take the advantages of such procedures [14]. Balloon angioplasty seems to be the first choice of treatment in the current era. Despite the relatively low success rate of 35 to 58 percent [15,16] compared to 90% success in stenting [17] due to excessive elasticity and recoil of the stenotic artery and small diameter of balloon [18]. It is wise to try simple ballooning first to ensure that the lesion is dilatable and to be sure that stenting is really required [14]. Serial ballooning had also been recommended in postoperative stenosis to avoid fatal pulmonary artery rupture due to extensive fibrosis around the vessel [14]. Angioplasty using stent insertion is becoming the standard therapy for PAS [13,19–22]. Previous experiments in treatment of congenital and post-operative PAS showed both short and long term success [17,22,23]. Complications including balloon rupture prior to full stent expansion, distal migration of the stent, tethering of the stent to the balloon, stent embolisation and pulmonary ar-

tery rupture are infrequent and much of them are correctable [14,22]. This method also shows significant cost effectiveness over surgery and balloon angioplasty [17].

CONCLUSIONS

In our patient, balloon angioplasty showed initial success but soon, re-stenosis occurred. We then tried stent angioplasty which was performed with no practical problem or complication. Midterm follow up of the patients was also favorable.

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