

Stent Implantation to Left Pulmonary Artery Stenosis in Children: A Case Report

Çocuklarda Sol Pulmoner Arter Darlığında Stent İmplantasyonu: Vaka Sunumu

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Introduction

Despite the increased success rates of surgery of congenital heart diseases in the last decades, anatomical complications occur after repair procedures. The correction of these complications by transcatheter therapy has improved the outcomes of these patients and abolished risks due to reoperation (1-3).

Branch pulmonary artery stenosis may occur either congenitally or as a complication of surgery of various congenital heart diseases, as mentioned above. Tetralogy of Fallot (TOF) seems to be the most common cardiac lesion in the series involving transcatheter treatment of branch pulmonary artery stenosis (2, 4).

Transcatheter treatment of stenotic pulmonary arteries via balloon-expandable intravascular stents was first tried by Mullins et al in the late 1980s (5). The aim was to dilate areas of stenoses using angioplasty balloons matched to the appropriate size of the adjacent vessel and to provide a support structure at the area of stenosis to prevent recoil. Since then, the transcatheter technology has improved rapidly enabling correction of most of the stenotic lesions without the need of operation.

In this report, we present a case with TOF who developed stenosis of the left pulmonary artery (LPA) after repair surgery. The stenosis was managed successfully by stent replacement after a trial of balloon angioplasty.

Case Report

A 14-year old male patient who had a repair surgery for TOF 6 years ago was readmitted to our department with the complaints of progressive decrease in the effort capacity and cyanosis. In the physical examination he had a systolic murmur in the mesocardiac area and a diastolic murmur in the pulmonary area. There was neither hepatomegaly nor other signs of venous congestion. The telecardiography showed increased cardiothoracic ratio, loading of the right ventricle (RV) and a decrease in the pulmonary vascularization at the left side. The electrocardiogram (ECG) showed loading of the RV and right atrium. In the echocardiography there were dilatation of the RV, minimal residual shunt through the patch placed on the ventricular septal defect (VSD), dilatation of the main pulmonary artery and stenosis at the point of origin of left pulmonary artery (LPA) through the main pulmonary artery (MPA) with a

36 mm Hg pressure gradient detected in the Doppler study. The color Doppler study showed severe pulmonary regurgitation. The irresponsiveness of the clinical presentation to digoxin and enalapril therapy (which was continued by the patient for 6 years) in addition to these pathological laboratory findings necessitated cardiac catheterization. In the hemodynamic study performed under sedation by using intravenous midazolam and ketamin (after the application of infective endocarditis prophylaxis) the systolic pressure of the RV was found to be 65 mm Hg. A 25 mm Hg pressure gradient was detected between the MPA and LPA. The systemic saturation values were between 87% and 90%. The angiocardiography yielded a dilated RV, a residual shunt to the left ventricle, severe pulmonary regurgitation and dilatation of the main pulmonary artery. Selective pulmonary angiography using 5F multi-track catheters showed stenosis at the origin of LPA (Fig. 1). Balloon-dilatation of the LPA was decided. After applying heparin (50 U/kg), predilatation to the stenotic area was performed under general anesthesia by using a monofoil Tyshak balloon (9 mm in diameter and 3 cm in length, dilated to 3.5 atm pressure) which resulted in insufficient dilatation. Therefore we decided to implant the stent. A balloon expandable Palmaz stent, model P 308 (3 cm length, 2.6 mm nominal diameter expandable to 8-12 mm) was implanted under fluoroscopy using 8F long sheaths for the delivery with monofoil Tyshak balloon (10 mm in diameter and 3 cm in length, dilated to 5 atm pressure) (Fig. 2). In the control angiography, no stenosis was detected (Fig. 3). The heparin therapy was continued for 48 hours and the patient was discharged on 5 mg/kg salicylate therapy without any complication.

During the follow-up period 8 months after the procedure there was significant improvement in the patient's effort capacity and cyanosis. Echocardiography showed significant decrease in the RV size and pulmonary regurgitation. Digoxin therapy was therefore terminated.

Discussion

Branch pulmonary artery stenosis is common in both repaired and unrepaired TOF. It constitutes one of the most common causes for reoperation (6). Besides, in series involving transcatheter treatment of branch pulmonary artery stenosis, TOF seems to be the most common cardiac lesion (2, 4). Over

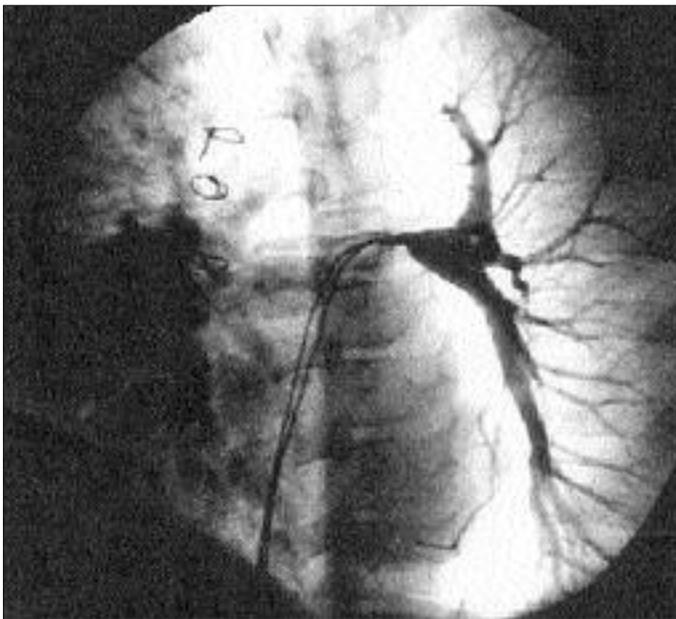


Figure 1. Selective left pulmonary artery angiography shows significant stenosis

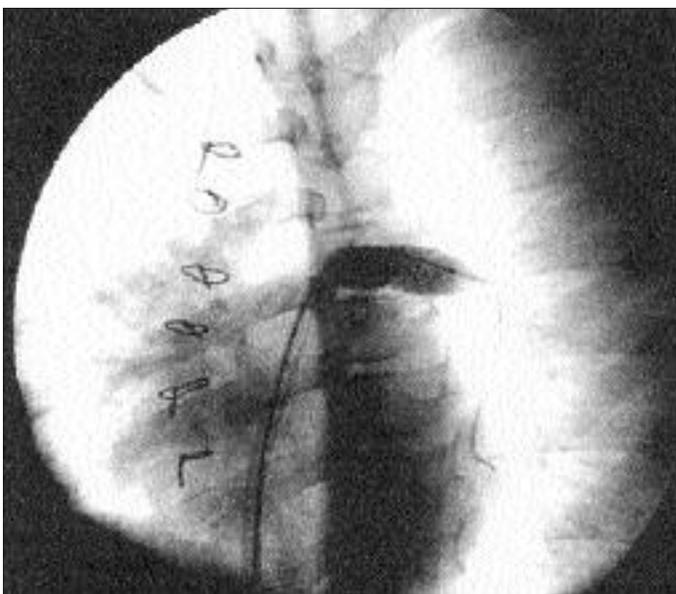


Figure 2. Palmaz stent implantation in the origin of the left pulmonary artery after predilatation with monofoil 10 mm Tyshak balloon

the last decade, transcatheter management by balloon pulmonary angioplasty and/or endovascular stent implantation is generally considered the procedure of choice for most patients since they abolish the risk of reoperation (4, 5). Transcatheter therapy enables management of these stenoses without unnecessary risk of reoperation.

The success rate with balloon angioplasty varies between 50% and 75%. This rate increased to 90% by using transcatheter stents (7-9). Balloon angioplasty is the procedure of choice for small children and infants, for distal stenosis or for stenosis at branching points; while stents are preferred for proximal lesions or lesions resistant to balloon angioplasty. Therefore, for our patient we first tried balloon angioplasty. However since this procedure did not provide enough dilatation, we implanted a stent which enabled enough dilatation and clinical improvement.

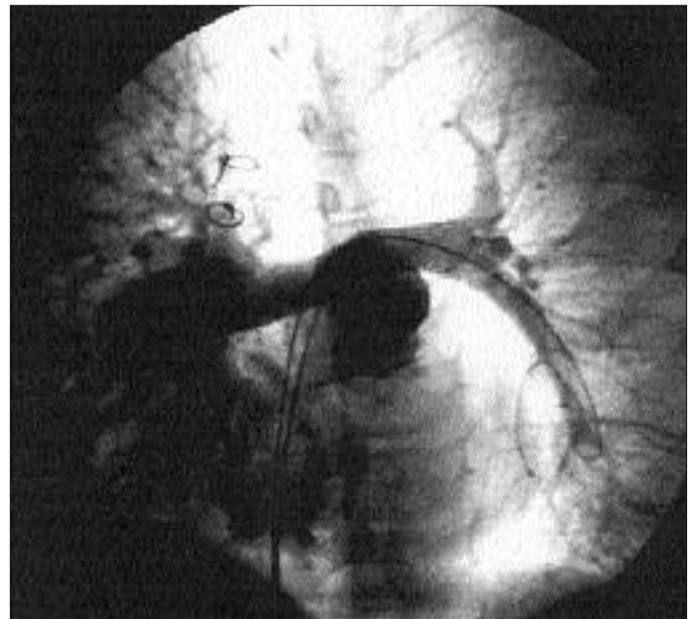


Figure 3. The control selective angiography shows patent left pulmonary artery

The use of stents provides effective treatment with a little risk of complication which generally arises due to technical problems (10). These stents could be delivered to distal branches not accessible surgically or within previously scarred areas of stenosis "from the inside," obviating the need for repeat operation and its associated complications.

As a result, branch pulmonary stenosis can be managed successfully by transcatheter replacement of stents abolishing the reoperation risk to patients with congenital heart diseases.

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