Unsuccessful Percutaneous Transcatheter Occlusion of A Patent Ductus Arteriosus and Surgical Treatment


Citation

Abstract
The traditional percutaneous transcatheter approach is not ideal in closing some types of patent ductus arteriosus due to morphological abnormalities. The anatomic changes of the patent ductus arteriosus in adult patients, such as being short or sometimes friable, could complicate its transcatheter occlusion.

In this study, we reported successful surgical closure of our case with patent ductus arteriosus of abnormal morphology under the light of literature who underwent an unsuccessful attempt of transcatheter occlusion.

INTRODUCTION
The ductus arteriosus (DA) is a vascular connection between the main pulmonary artery and the aorta distal to the subclavian artery. During the foetal life, the DA diverts blood away from the pulmonary bed. After birth, it undergoes active constriction and closure. If the DA fails to close completely, a PDA will develop(1). The incidence of PDA is 0.02 to 0.04% with a female predominance(1,2).

Since the first case of transcatheter closure of patent ductus arteriosus (PDA) by Porstmann in 1967, it has been performed by a number of groups employing varying closure techniques(3). Transcatheter occlusion of patent ductus arteriosus (PDA) using various occluding devices and coils is a widely accepted alternative to surgical closure in most pediatric cardiology centers. In spite of these advantages in transcatheter management, the occlusion of the moderate and the large PDA remains a challenge(4). In the literature, 3–11% patients undergoing coil occlusion required second intervention(5).

CASE PRESENTATION
A 20-year-old asymptomatic female was referred to our Cardiology clinic because of an incidentally discovered grade III continuous machinery murmur at the third intercostal space on the left sternal edge. The echocardiography showed the presence of a patent ductus arteriosus (PDA). An aortography confirmed the presence of PDA(Figure 1).

Figure 1
Figure 1: PDA view in her aortogram.

Qp/Qs ratio was 1.7. It was decided to treat it by percutaneous occlusion. But, during this procedure guidewire couldn't be passed into PDA through pulmonary artery and although the guidewire could be passed into PDA through aorta, catheter did not slide over the guidewire. She
was then transferred to our clinic for surgical closure after this unsuccessful attempt. She was operated under endotracheal general anesthesia. Via left posterolateral thoracotomy at the 4th intercostal space, left hemithorax was entered. The left lung was retracted inferoanteriorly. Mediastinal pleura were opened and superior intercostal vein was doubly ligated and transected. Aorta was dissected until its adventitia and PDA was explored. The diameter of PDA was 1 cm and it was dislocated. It was thought that unsuccessful closure attempt might have been related to this anatomical configuration (Figure 2).

**Figure 2**

Figure 2

PDA was freed by a right-angled dissection clamp two cotton tapes were inserted surrounding the PDA. These tapes were ligated. Then, transfixion suture was applied with 4/0 polypropylene suture material (Figure 3).

**Figure 3**

Figure 3

She didn't required inotropic support during early postoperative period. The volume of blood transfused was one unit. The quantity of mediastinal drainage was 250 cc. She was extubated after an intubation duration of 5 hours and stayed in the intensive care for 2 days. The hospital stay was 6 days. Postoperatively an echocardiographic investigation was revealed no residual shunt for the closed PDA. She was followed at our outpatient clinic without additional problem.

**DISCUSSION**

The traditional antegrade wire-guided percutaneous transcatheter approach is not ideal in closing some types of patent ductus arteriosus (PDA) with abnormal morphology. For ductus closure, the following strategy was applied: ADO was used in large ductus: infants and young children weighing < 15 kg with a ductus diameter ≥ 3 mm and in older children or adults with a ductus diameter ≥ 4 mm and coils were employed in patients with small-to-moderate sized ductus.

Koch et al. recommend the use of detachable coils in patients with small ductus (diameter < or = 2 mm) and the Amplatzer duct occluder in those with a larger ductus. Transcatheter closure of the patent ductus arteriosus according to this regimen should achieve occlusion rates above 95%.

A younger age is also associated with a higher failure rate and complication rate in coil closure. However, taking the risk of the embolization of coils, the cost of snare, the need of access of an additional vessel, prolonged...
fluoroscopic and procedure time into consideration, Amplatzer duct occluder (ADO) should be superior to the coil for closure of large ductus (7,10,11).

In conclusion; transcatheter closure of PDA for patients with large ductus remains a problem, because of a relatively higher both failure rate and distal embolization rate (7,9,12).

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