

Percutaneous closure of multiple atrial septal defects and patent ductus arteriosus during the same session

Çoklu atriyal septal defekt ve patent duktus arteriyozusun perkütan yolla aynı seansta kapatılması

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Summary– An alternative to the surgical repair of secundum type atrial septal defects (ASD) and of patent ductus arteriosus (PDA) is transcatheter closure. However, there is limited information about the efficacy of using percutaneous devices to close multiple ASDs. An 8-year-old female patient was admitted to our hospital with a cardiac murmur. A large secundum multi-fenestrated ASD (17 mm, 4.5 mm, 3 mm) and PDA (3 mm) were diagnosed upon echocardiographic examination. During cardiac catheterization, the PDA was closed with an Amplatzer Duct Occluder (6x4 mm) followed by the closure of the ASD with an Amplatzer septal occluder (22 mm) with no residual shunting. The percutaneous closure of multi-fenestrated ASD with PDA in pediatric patients may be considered as a first-choice treatment with minimal complications.

Özet– Sekundum tipi atriyal septal defekt (ASD) ve patent duktus arteriozusun (PDA) kateter yoluyla kapatılması cerrahi tamire seçenек bir tedavi yöntemidir. Ancak çoklu ASD'lerin perkütan cihaz kullanılarak kapatılmasıyla ilgili bilgilerimiz sınırlıdır. Sekiz yaşında kız çocuğu kalpte üfürüm duyulması nedeniyle kliniğimize getirildi. Ekokardiyografisinde çok delikli ASD (17.5 mm, 4.5 mm, 3 mm) ve PDA (3 mm) saptandı. Kalp kateterizasyonu sırasında aynı seansta ilk olarak PDA'sı Amplatzer Duct Occluder (6x4 mm) ve çok delikli ASD'si Amplatzer septal tıkayıcı cihaz (22 mm) kullanılarak açık kalmadan kapatıldı. Çocuk hastalarda çok delikli ASD ve PDA'nın perkütan olarak kapatılması ilk tedavi seçeneği olarak düşünülebilir.

The transcatheter closure of single secundum type atrial septal defects (ASDs) was first described by King et al. in 1976.^[1,2] ASDs account for approximately 7% of all congenital heart disease cases, are typically asymptomatic in children, and have a 2:1 female predominance.^[3] The transcatheter closure of secundum ASD and patent ductus arteriosus (PDA) is now widely accepted as an alternative to surgical closure since it is feasible, efficient, and associated with positive outcomes.^[2]

Abbreviations:

ASD Atrial septal defects
PDA Patent ductus arteriosus

In this report, we present a pediatric patient that underwent percutaneous closure of three separate ASDs with a septal occluder and of PDA with a duct occluder in a single session.

CASE REPORT

An 8-year-old female patient was referred to our clinic for further evaluation of a cardiac murmur. While her laboratory evaluations and chest X-ray were normal, a physical examination revealed a systolic ejection murmur and a fixed splitting of the second heart sound at the left upper sternal border. Electrocardiography showed a QRS axis of 70° with a ventricular rate of 80 bpm and findings of right ventricular hypertrophy. A multi-fenestrated atrial septum and PDA were revealed via transthoracic echocardiography. The right ventricle was large, with an end-diastolic dimension of 31 mm. The patient underwent cardiac catheterization under general anesthesia with the guidance of

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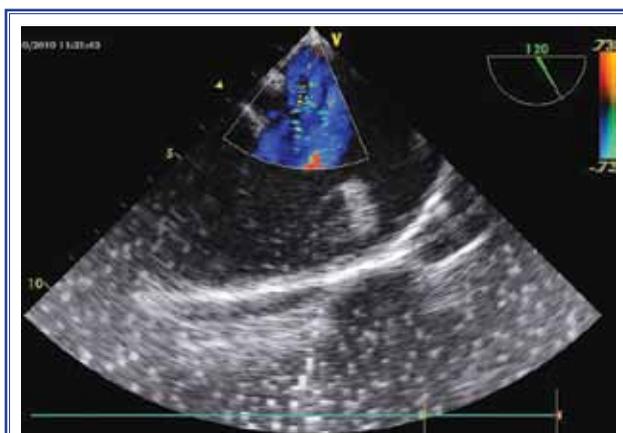


Figure 1. Transesophageal echocardiography shows a left-to-right shunt through three separate atrial septal defects.

transesophageal echocardiography, which revealed three separate ASDs measuring 17.5 mm, 4.5 mm, and 3 mm in diameter, with less than 5 mm between each (Fig. 1).

The heart was accessed through the right femoral vein with a 6 French sheath (Cordis Corp.) and through the right femoral artery with a 5 French sheath followed by the administration of heparin (50 U/kg) and cefazolin (30 mg/kg). Right heart catheterization revealed a Qp:Qs ratio of 2:1. A 5 French marker pigtail catheter (Cordis Corp.) was inserted into the descending aorta via the femoral artery until the duct was reached. After the contrast dye was injected with the patient in a 90° lateral position, the smallest measurements of the PDA's duct, ampulla, and length were recorded to be 3 mm, 10 mm, and 11.6 mm, respectively. A 6 French multipurpose catheter (Cordis Corp.) was passed through the right atrium and ventricle into the pulmonary artery, and then through the PDA into the descending aorta. An Amplatzer stiff (Cook Medical Corp.) exchange guidewire was used to advance the long sheath through the descending aorta. An Amplatzer Duct Occluder (AGA Medical Corp., Golden Valley, MN, USA) (6 mm x 4 mm) was advanced within the sheath to the tip of the catheter. The distal disc was deployed by withdrawing the sheath, and a control angiogram was performed before releasing the occluder.

Following the closure of the PDA, the largest ASD was accessed through the left superior pulmonary vein with a 6 French multipurpose catheter with a 0.035" guidewire. Next, the sheath was exchanged

for a 9 French long sheath that was advanced into the left atrium through the defects. A 22 mm Amplatzer septal occluder (AGA Medical Corp., Golden Valley, MN, USA) device was placed in the largest defect, and covered all three (Fig. 2). No residual shunt or complications were observed. The total time for the procedure was 75 min, and the fluoroscopy time was 15.4 min. The patient received an antiplatelet agent for at least six months following the procedure to prevent thromboembolic events.

DISCUSSION

Multi-fenestrated ASDs of different sizes have been observed in about 10-13% of ASD cases.^[2] Reports on the efficacy of using percutaneous devices to close multiple atrial septal defects are limited. Although their central location makes secundum defects ideal for device closure, there is considerable morphological variation in the size and location of the defects. Echocardiographic evaluation, including transesophageal echocardiography prior to the procedure, is helpful in identifying multiple defects. Even with careful planning, the closure of multiple defects can prolong the time of the procedure. As patient cooperation is crucial to the accurate placement of the closure devices, some form of sedation should be considered.^[4]

In most patients, a single defect can be closed with a single device. However, a small portion of ASDs



Figure 2. Image of the devices in the anterior-posterior view.

have multiple fenestrations and are often considered unsuitable for device closure.^[5] In less common cases with multiple or complex, fenestrated defects, a single device can be placed through one defect so that it overlaps and closes a second defect. In our case, we were able to close three defects with a single device because of the short distance between them. Devices designed to cover a large part of the septum, such as the CardioSEAL, STARFlex, and Amplatzer fenestrated devices, may be helpful in these cases. In our case, we used an Amplatzer device for closure. In patients with multiple defects, the potential interaction between the devices as well as the anatomic relationship between the defects and the surrounding structures, such as the mitral and tricuspid valves, coronary sinus ostium, aorta, and vena cava, must be considered. The use of large or multiple devices increases the risk of disrupting these structures.^[4] Cao et al.^[6] suggested that two devices may be used if there is a tissue rim higher than 7 mm present between the defects. However, since it is often difficult to see both defects simultaneously, it may not be possible to obtain these measurements. In our case, we were able to measure the distances between the septal defects, which were small enough to enable us to close all three defects with a single device.

In conclusion, we have shown that using a single septal occluder to close multiple ASDs is safe and effective. The percutaneous closure of multi-fenestrated ASD with PDA causes minimal complications, and can be used as a first-choice treatment in children as opposed to surgical repair.

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Key words: Child; ductus arteriosus, patent/therapy; heart catheterization.

Anahtar sözcükler: Çocuk; duktus arteriyozus açıklığı/tedavi; kalp kateterizasyonu.