Percutaneous closure of two atrial septal defects with individual septal occluder devices

İki adet atriyal septal defekti olan bir olguda ayrı cihazlarla perkütan kapama

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A 20-year-old male patient presented with dyspnea and palpitation. An atrial shunt was detected on transthoracic echocardiography. Transesophageal echocardiography (TEE) showed two secundum atrial septal defects (ASD), 13 mm and 15 mm in size, respectively. There was no other congenital heart disease. During right heart catheterization, pulmonary artery pressure was 40 mmHg and the Qp/Qs ratio was 1.9. His coronary arteries were normal. The patient underwent elective percutaneous ASD closure under general anesthesia and continuous TEE monitoring. The distance between the two defects was 16 mm. Two 25-mm PTS sizing balloon catheters were simultaneously inflated, yielding maximum defect diameters of 13 mm and 15 mm. First the smaller defect, then the larger defect were closed with 15 mm and 18 mm Occlutech Figulla ASD occluders, respectively. Total fluoroscopy time was 25 min, and total procedural time was 95 min. No residual shunt was observed. The patient was discharged the next day without any complication.

Key words: Coronary angiography; heart atria; heart catheterization; heart septal defects, atrial/therapy.

Yirmi yaşında erkek hasta çarpıntı ve nefes darlığı yakınmalarıyla başvurdu. Transtorasik ekokardiyografide atriyal şant görülmesi üzerine hasta transözofageal ekokardiyografi (TÖE) ile değerlendirildi ve 13 mm ve 15 mm boyutlarında iki adet sekundum tip atriyal septal defekt (ASD) saptandı. Hastada başka doğuştan kalp hastalığı yoktu. Sağ kalp kateterizasyonunda pulmoner arter basıncı 40 mmHg ölçüldü, Qp/Qs oranı 1.9 bulundu. Koroner anjiyografide koroner arterler normal bulundu. Hastaya genel anestezi altında ve devamlı TÖE eşliğinde elektif perkütan ASD kapama uygulandı. İki defekt arası mesafe 16 mm ölçüldü. İki adet 25 mm PTS ölçüm balon kateteri aynı anda şişirilerek en yüksek ağız boyutu 13 mm ve 15 mm olarak ölçüldü. Önce küçük defekte 15 mm'lik, sonra büyük defekte 18 mm'lik Occlutech Figulla cihaz yerleştirildi. Toplam floroskopi zamanı 25 dk, toplam işlem süresi 95 dk idi. İşlem sonrasında kaçak gözlenmedi. Hasta ertesi gün komplikasyonsuz olarak taburcu edildi.

Anahtar sözcükler: Koroner anjiyografi; kalp atriyumu; kalp kateterizasyonu; kalp septal defekti, atriyal/tedavi.

Closure of the secundum atrial septal defects (ASD) by percutaneous devices has been practiced since 1976.[1] Transcatheter percutaneous closure is considered an alternative to surgical repair.[2] It is a safe procedure with a success rate of 85% to 98%.[3,4] Successful and safe closure of multiple complex defects with devices has been under consideration in recent years with increases in technological development.[3,5]

In this paper we present a case with two secundum ASDs which were closed with two separate Occlutech Figulla devices.

CASE REPORT

A 20-year-old male patient presented with complaints of palpitation and dyspnea. There was no history of transient ischemia attack, stroke, hypertension, peripheral artery disease, or syncope. Regular heart beats were present on physical examination; there was fixed splitting of S2, a grade I/II systolic murmur at the pulmonary area, and a grade II/VI systolic murmur at the tricuspid area. Electrocardiography revealed right bundle branch block. An atrial shunt was detected on transthoracic echocardiography; the transesophageal

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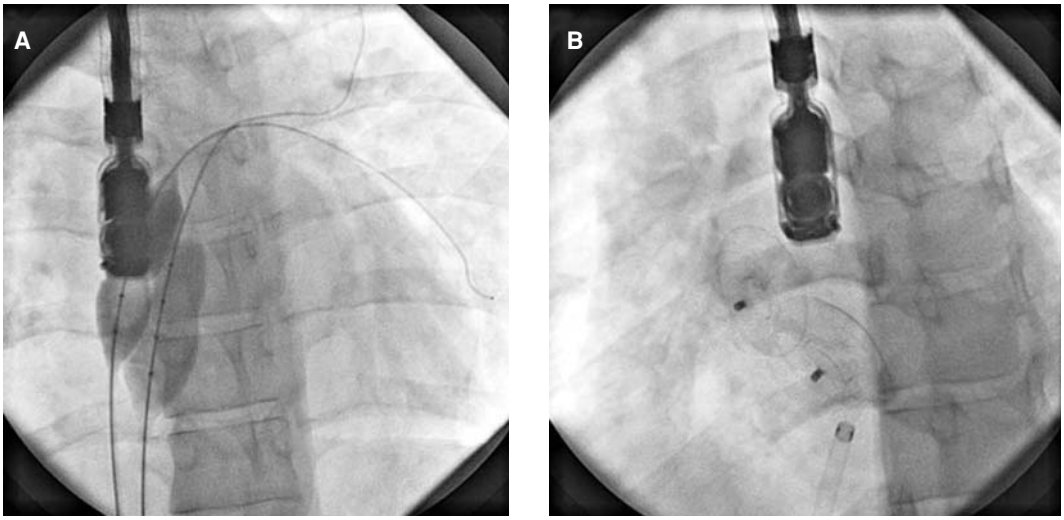

Figure 1. (A) Image of simultaneous balloon sizing of both defects. **(B)** Fluoroscopy view after implantation of occluder devices.

echocardiography (TEE) which was later performed demonstrated two secundum atrial septal defects (ASD) of 13 mm and 15 mm in diameter, respectively. No other congenital heart disease was reported. A pulmonary artery pressure of 40 mmHg and a Qp/Qs ratio of 1.9 were detected on right heart catheterization. The coronary angiography was normal. The patient was scheduled for elective percutaneous ASD closure under general anesthesia and continuous TEE monitoring. The baseline TEE demonstrated normal left atrial and left ventricular diameters, and mildly increased right atrial and right ventricular diameters. There was a second degree leak in the tricuspid valve. Two defects of 13 mm and 15 mm were detected in the interatrial septum. The aortic margin was adequate and the distance between defects was 16 mm. The four pulmonary veins were also observed to be normal. There was no thrombus in the left atrial appendix.

Two 8F sheaths were used to access the right femoral vein. The small defect was crossed with a 6F multipurpose catheter and a 0.035 guide wire, while the lager defect was crossed with a second guide wire. Two 25-mm PTS sizing balloon catheters (Numed Canada Inc, Cornwall, Canada) were simultaneously inflated, yielding maximum defect diameters of 13 mm and 15 mm (Figure 1a). The smaller defect was first closed, followed by the larger defect with 15 mm and 18 mm Occlutech Figulla ASD occluders, (Occlutech GmbH, Jena, Germany) respectively (Figure 1b). The presence of a shunt, device placement area was visualized by TEE; A-V valves, pulmonary veins, coronary sinus, inferior and superior vena cavae were also evaluated. There was no compression on major adjacent structures and valves by the devices; and no residual shunt was observed after the procedure. The total fluoroscopy time was 25 min, and the total procedural time was 95 min. The patient was discharged the next day without any complication following administration of aspirin 300 mg/day (6 months), and clopidogrel 75 mg/day (2 month), for infective endocarditis prophylaxis (6 months).

DISCUSSION

Complex multiple ASDs make up approximately 10% of all ASDs. Closure of secundum ASD by the transcatheter percutaneous route is very successful with a low mortality and complication rate.[6,7] The choice of patients is known to affect success of the procedure. The high risk of residual shunt and complication is an important problem in patients with complex ASDs. As a result surgery used to be recommended in the management of complex ASDs until recently. However, with advances in percutaneous occluder devices and imaging methods, closure of complex ASD by percutaneous route has been under consideration.[4-6] The complex ASD in our patient was closed by two Occlutech Figulla devices consisting of two plane discs covered with 0.082 mm-0.186 mm nitinol wire and a connection body of 4 mm. No shunt or complication was reported.

Awad et al.[6] reported long term results from the closure of complex ASD by the percutaneous route in 33 adults. Complete closure was registered in 15 patients (45.4%) after the procedure, 8 patients (24.3%) were considered hemodynamically insignificant, small residual shunts in 9 patient (27.3) and a large residual shunt in one (3%) patient. On the other hand, no shunt was reported in any of the patients during long term follow-up. The device was closed percutaneously following the development of asymptomatic pulmonary embolism in one patient 24 hours after the procedure. In another patient who complained of discomfort in

the chest and syncope, pericardial effusion developed associate with aortic and left ventricular erosion the device. The device was removed and the defect repaired surgically. The removed device was found to be completely endothelialized.[6]

Bramlet et al.[8] evaluated 15 children after a long term followed-up period after treatment with multiple devices. On the first day of follow-up shunts were observed in five patients (36%), whereas a shunt was observed in only one patient (7%) by the first month. The shunt in this patient also completely closed on the seventh month. There was development of device erosion or embolism in none of the patients; and three devices were found to be intact at autopsy in one patient (7%) who died on day 30. A 200 ml serous fluid was found in the pericardium of this patient; however, no erosion or finding of histological myocardial inflammation was reported.[8] It was reported that the right choice of patients in the two mentioned cases would be safe and effective in closing complex ASDs using multiple devices.[6,8]

The most important factor which helps to increase the success rate and reduce complication risk in patients with complex ASD is the choice patients. Patient choice is important in making a decision about the adequacy of the distance between defects and whether to use one or two devices during closure. It is important for the defect to be distant from important cardiac structures in order to perform percutaneous closure. To avoid overlap of devices during the procedure the distance between defects should be at least 7 mm, when two devices are to be used. Only one device would be used for closure if this distance is closer.[4-6]

Simultaneous inflation of the sizing balloon catheters is necessary if more than one device is to be implanted for multiple ASDs. Adequate measurement of this distance would make it possible to avoid overlap of devices. It is recommended to first implant the small device before the larger device. When one device is to be place above another the larger device should be above the smaller device.[4-6]

After percutaneous implantation of the device, the presence of a residual shunt, compression on adjacent structures by the device, stenosis or regurgitation of A-V valves, coronary sinus, pulmonary veins, inferior and superior vena cavae are evaluated by high quality method such as the three-dimensional echocardiography, or the newly developing intracardiac echocardiography. Inability to perform careful evaluation of the atrial septum in the presence of more than one complex defect, may lead to overlooking of small defects. With the newly developed imaging techniques diagnosis and treatment are facilitated by high-quality imaging, leading to the closure of more than one complex ASD using devices.[3-6]

Despite the high success rate with surgical closure of ASDs, both surgical complications (bleeding, air embolism, infection, cosmetic, pump-related complications, atelectasis, tamponade, etc.) and complications of general anesthesia play important roles in mortality and morbidity. Percutaneous closure is an alternative to surgical repair due to the high success and low complication rates. Until recently, there has been controversy on the use of the percutaneous closure method in patients with complex ASDs. However, the high success rate and low complication observed during management of complex ASDs with percutaneous closure has made it an alternative to surgery.

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