Case Report

Emergent surgical retrieval of an embolized septal occluder from the main pulmonary artery

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ABSTRACT

Surgical closure of ASD has been used for over 50 years and appears to be a safe and effective operation. However, over the past decade, transcatheter closure techniques have been increasingly practiced. We present a case of 51-year old woman with atrial septal defect (ASD). She presented with progressive decrease in exercise tolerance. Echocardiographic examination showed the ASD and a 26mm septal occluder device (Cardio-fix septal occluder) was successfully deployed under fluoroscopic and echocardiographic guidance. However, the patient suddenly complained of palpitation and sustained ventricular tachycardia thirty minutes after the procedure. A repeat echocardiographic examination confirmed embolization of the device into main pulmonary artery. Due to failure of capture of the device via multisnare, the patient was immediately taken to the operating room for removal of the device and surgical closure of the defect. The embolized device was grasped and retrieved from proximal pulmonary artery between index and middle fingers inserted into the main pulmonary artery via the tricuspid and pulmonary valves. The ASD was closed by running nonabsorbable polypropylene suture. Postoperative recovery was uneventful. The patient was discharged home after a total of six days of hospitalization.

KEY WORDS: Embolization, Pulmonary Artery, Atrial Septal Defect.

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INTRODUCTION

Atrial septal defect (ASD) is a common congenital defect for which closure is often indicated. It may frequently be missed in childhood and be discovered in adulthood.[1] Surgical closure of ASD has been used for over 50 years and appears to be a safe and effective open heart operation. However, over the past decade, transcatheter closure by means of the percutaneous deployment of a variety of occluder devices has been increasingly practiced,[2] and for many cardiologists, percutaneous device closure of ASDs is the standard treatment.[3]

Transcatheter closure has the advantage of avoiding the need for median sternotomy or thoracotomy and cardiopulmonary bypass (CPB). However, it can be associated with severe procedural complications. These complications may necessitate immediate surgical intervention, which is highly effective, but is nevertheless associated with higher mortality than primary open heart surgery.[2]

CASE REPORT

An ASD was diagnosed in a 51-year-old female patient. She presented with progressive decrease in exercise tolerance. Physical examination revealed a

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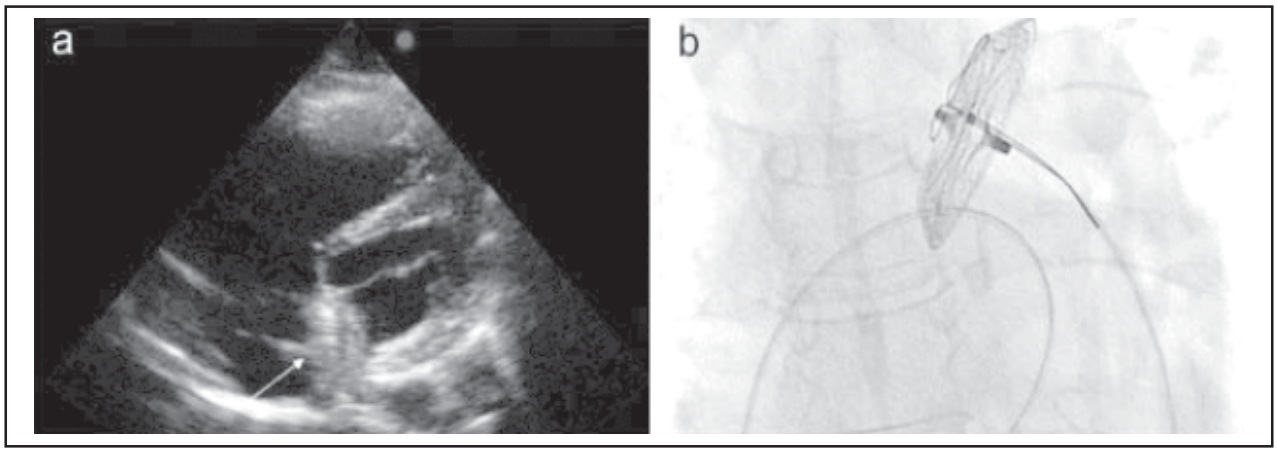

Fig-1a: Echocardiographic view of the implanted septal occluder device.
Fig-1b: Angiographic view of attempts for snaring of embolized device.

3/6 systolic murmur at the pulmonary area. Echocardiographic examination showed the ASD and transcatheter device closure was considered. The procedure was performed under general anesthesia. Right femoral vein approach was used and a 26mm septal occluder device (Cardio-fix septal occluder) was successfully deployed under fluoroscopic and echocardiographic guidance (Figure-1a). However, the patient suddenly complained of palpitation and sustained ventricular tachycardia thirty minutes after the procedure. A repeat echocardiographic examination showed a left to right shunt at the atrial level and confirmed embolization of the device into the main pulmonary artery above the valve, partially occluding the pulmonary flow. Percutaneous removal of the device was unsuccessful because of the orientation of the device in the pulmonary artery, which precluded snaring the device connector (Figure-1b). Surgery was considered owing to failure of the transcatheter retrieval attempts. Cardiothoracic surgeons were alerted. The patient was immediately taken to the operating room. A standard median sternotomy was performed and cardiopulmonary bypass (CPB) was immediately established with an aortic arterial and two separate caval cannulas. Following cardioplegic arrest, right atriotomy was performed on total cardiopulmonary bypass. We encountered an oblong shape secundum-type ASD with deficient anterior rim between the defect and aorta. The device was identified by externally palpation at the main pulmonary artery above the valve. The embolized device was very gently grasped and retrieved from main pulmonary artery between index and middle fingers inserted into the main pulmonary artery via the tricuspid and pulmonary valves. The ASD was closed by running nonabsorbable polypropylene suture. She was weaned uneventfully from CPB. On close examination, the retrieved device was found to be intact with structural integrity without distortion. Also, there were no thrombi on the surface of the device (Figure-2).

Postoperative recovery was uneventful. She was extubated eight hours after the operation without neurological or other organ system deficit. Control echocardiographic examination did not reveal any pulmonary regurgitation or residual shunt. The patient was discharged home after a total of six days of hospitalization.

DISCUSSION

The septal occluder device is easily removed or repositioned prior to detachment from the delivery cable. However, after detachment, retrieval of malpositioned and embolized devices needs percutaneous or surgical intervention.[4]

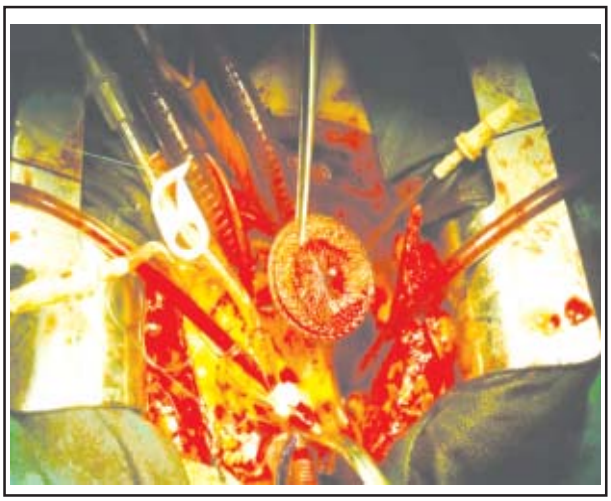

Fig-2: Operative photograph of the explanted septal occluder device.

Nowadays, a percutaneous approach to ASD closure has been used more commonly following the development of several closure devices. It is felt to be relatively safe, but complications are possible. Despite some risks of devices, it remains a viable option for the treatment of secundum ASD.[1] Additionally, continued improvements in device technology (particularly biodegradable devices) and technical expertise should result in further improvements in the safety and efficacy of percutaneous ASD closure.[5] However, despite this improvement of technical skills and miniaturization of tools, transcatheter ASD closure is still burdened by a risk of complications.[6] Therefore, surgical backup for percutaneous ASD closure must be available in the hospital to deal with potentially lethal acute complications.[2]

Reported early complications of septal occluder device use include residual shunt, systemic and pulmonary embolization, and device impingement on superior caval vein, on the right upper pulmonary vein, and on the mitral and tricuspid valves.[7] Late complications include peripheral embolization of thrombus/device, sudden death, aortic arch embolization, erosion of the device into the ascending aorta with associated aortic-to-right atrial fistula formation, deep venous thrombosis, cardiac perforation presenting as cardiogenic shock and infective endocarditis.[8]

The device-based complications may develop both early and late regardless of the size or type of current devices. Therefore, after trans-catheter closure, patients should remain under permanent surveillance to detect potentially serious long-term device-related complications. Conversely, surgical closure does not require specialized long-term follow-up.

Device dislodgement can occur if the size of the defect greatly exceeds the waist diameter of the device or approaches the diameter of the retention discs. On the other hand, closure with a disproportionately large device may result in mushrooming of the retention discs and weakening of the cross-clamping forces against the septal rim, which increases the risk of blood flow behind the discs and may result in incomplete endothelialization.[9]

The embolization rate of the device was about 0.5%. As expected, the majority of embolizations were a function of either undersized devices or of ASDs with inadequate rims.[4] The acceptance of smaller aortic rims, whilst deploying newer self –centering devices may predispose to device embolization or displacement.[8] In our patient, embolization of the device probably occurred due to insufficient aortic rim and oblong shape of the defect, and, therefore, undersized occluder may be implanted.

Surgical removal of ASD occluder has been attemped with pulmonary arteriotomy or via long clamps.[1,8] We couldn't find any article describing the removal of the embolized device by using fingers. Therefore, we expect that removal of the embolized device from the main pulmonary artery using fingers has not been previously reported.

In conclusion, removal of the embolized septal occluder device using fingers could be performed. This procedure prevents requirement of pulmonary arteriotomy or use long clamp blindly for retrieval of the embolized device.

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