Case Report

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Amplatzer atrial septal defect occluder device embolisation to right pulmonary artery

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Abstract

Atrial septal defect is a common congenital acyanotic heart disease which is treated with either surgical closure or transcatheter closure. Although surgical closure is gold standard, transcatheter device closure is gaining popularity worldwide and in Nepal due to favourable outcome in selected patients. Device migration following transvenous closure of atrial septal defect is a common problem but its lodgment in right pulmonary artery is a rarely encountered and reported clinical scenario. Here, the authors report a case of 42-year-old female who had an embolisation of Amplatzer septal occluder to right pulmonary artery requiring urgent surgical intervention to retrieve the device.

Key words: Atrial septal defect; Device migration; Septal occluder.

INTRODUCTION

Atrial septal defect (ASD) was successfully closed for the first time in 1953 by John Gibbon with the use of cardiopulmonary bypass. More than 67 years have passed and surgical closure has remained the standard therapy for ASD. Transcatheter device closure of ASD is becoming popular in selected cases with avoidance of complications related to surgery. Amplatzer septal occluder is one of such devices used worldwide extensively.[1] However, improperly positioned undersized device in ASD with inadequate rims is prone to dislodgement. Migration of device to great vessels of heart increases morbidity and mortality and warrants an urgent rescue surgical procedure.

CASE REPORT

A 42-year-old obese lady with a body mass index of 30 kg/m^2, presenting with complaints of exertional shortness of breath for four months duration was diagnosed to have a 12 mm ostium secundum ASD in transthoracic echocardiogram (TTE). Transesophageal echocardiogram (TEE) revealed the maximum size of ASD to be 16 mm with adequate venacaval, superior and inferior rims, and a slightly smaller aortic rim. The patient underwent a percutaneous transcatheter ASD closure under general anaesthesia by a 20 mm Amplatzer™ Septal Occluder (Abbott Medical, Plymouth, Minnesota, USA) (Figure 1) via a 10 Fr delivery system.

The procedure was uneventful and the recovery of the patient was smooth. After five hours of the procedure, she complained of having frequent coughs and palpitations and her electrocardiogram revealed ventricular premature contractions (VPCs). Her blood pressure was normal. Her chest X-ray revealed the migration of device into the right ventricular area (Figure 2). The TTE confirmed the absence of occluder in ASD (Figure 3). She was taken back to the catheterisation

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suite where the device was found to have lodged in right pulmonary artery (RPA) (Figure 4). Multiple transcatheter attempts to snare and retrieve the occluder into the delivery sheath failed (Figure 5).

So, she was taken to the Operation Theater where she underwent median sternotomy, aorto-bicaval cannulation and cardiopulmonary bypass (CPB). Right atriotomy revealed a 16 mm ostium secundum ASD with a torn, flimsy inferior vena cava (IVC) rim. Right atrium, ventricle and pulmonary artery were dilated. Device could be palpated in the right pulmonary artery between aorta and superior vena cava. Right pulmonary arteriotomy was performed to retrieve the device (Figure 6. a-c).

The ASD was closed using autologous pericardial patch and CPB was weaned off uneventfully. The aortic cross clamp time was 37 minutes and CPB time was 50 minutes. She did well in the post-operative period and was discharged from hospital in a week. At one week follow-up, she was dyspneic and her TTE showed a large pericardial effusion which was drained by sub-xiphoid approach. She also developed left sided pleural effusion during hospital stay which was managed with tube thoracostomy. Her superficial surgical site infection was managed with intravenous antibiotics. She was discharged from hospital in two weeks. TTE at discharge revealed an intact ASD patch without residual leak and normal biventricular function. She was doing well in two months follow-up visit.

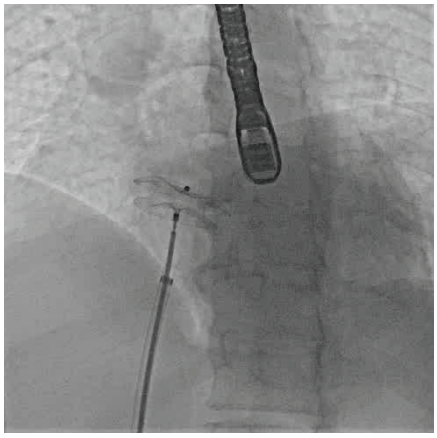

Figure 1: Transcatheter device closure of atrial septal defect

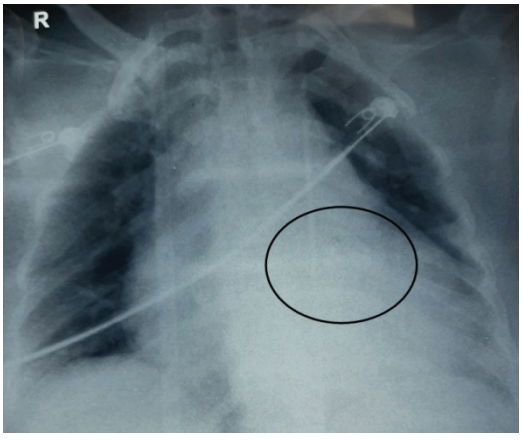

Figure 2: Chest x-ray showing migrated device in right ventricle (within the circle)

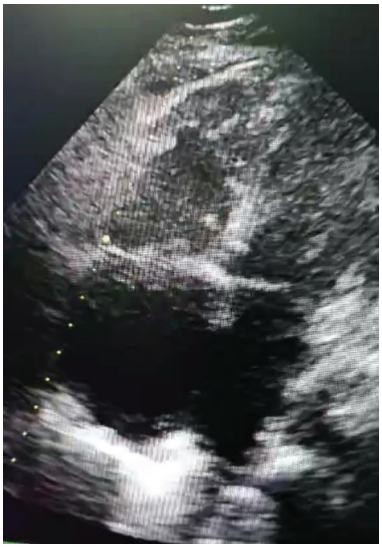

Figure 3: Transthoracic echocardiogram images showing absence of device in atrial septal defect

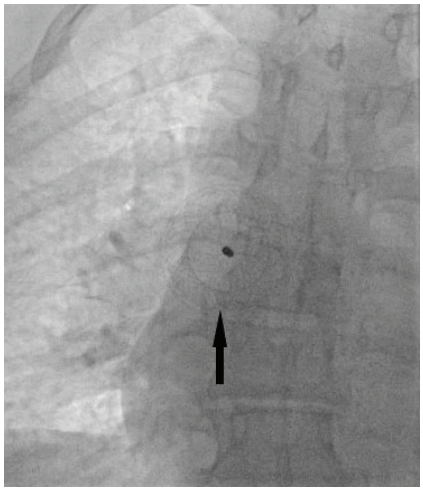

Figure 4: Arrow showing the migrated device in right pulmonary artery

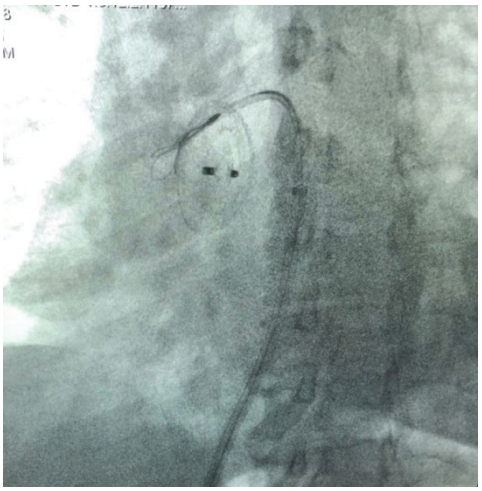

Figure 5: Transcatheter device retrieval attempt

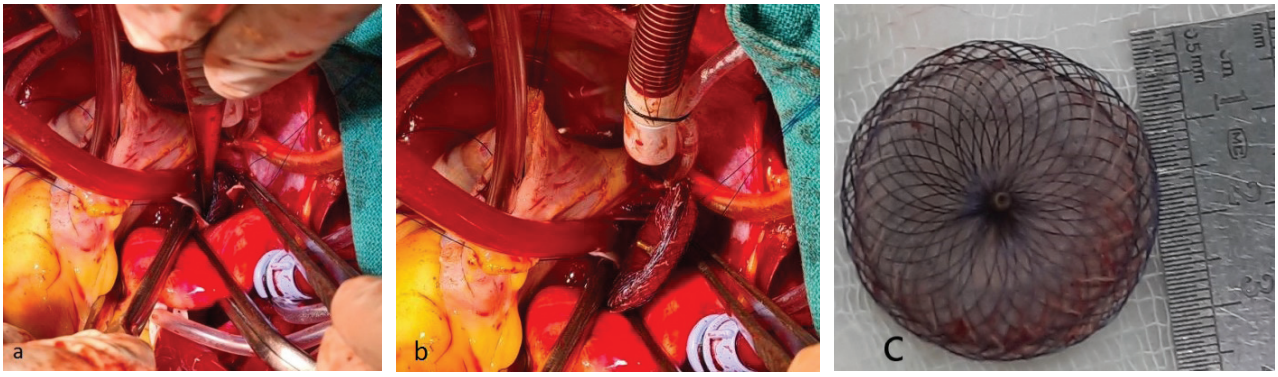

Figure 6 (a-c): Intraoperative images, extraction of the device from right pulmonary artery

DISCUSSION

The ASD is a common congenital heart disease in adults with an incidence of 1 in 1500 live births and its closure, either surgical or device, is one of the commonly performed procedures worldwide. Surgical closure is the gold standard for treating all types of ASDs, irrespective of their number, size and location. Although, surgical closure is a safe procedure, complications like bleeding and arrhythmia can occur. Since Kings and Mills performed the initial experimental transcatheter ASD closure in dogs in 1972, there has been a lot of significant developments in the field of transvenous device closure of ASD. In appropriately selected ASDs, device closure reduces morbidity, hospital stay and avoids surgical scar. Amplatzer septal occluder device, developed by Dr. Kurt Amplatz, has been in extensive use following the first clinical trial in 1997 by Masura et al.[1] In spite of having a procedural success rate of 95-98%, Amplatzer septal occluder devices can have complications like device embolisation, arrhythmia, tamponade, and cerebral embolism.[2] Although the embolisation rate has been higher in the past, it is now reported to be as low as 0.55%.[3] The device can migrate to any of the four cardiac chambers, aorta and main pulmonary artery, mostly within the first 24 hours.[4] Delayed migration to descending thoracic aorta has also been reported.[5] However migration of the device to the right pulmonary artery (RPA), as in our patient, is less frequently encountered and reported. In case of a dilated main pulmonary artery (MPA) and its branches, a dislocated device can lodge in MPA, bifurcation or its branches. Since, left pulmonary artery (LPA) is more of a direct continuation of main pulmonary artery and right pulmonary artery branches at a right angle, the device is less likely to migrate to RPA. The causes for device migration include inadequate or floppy rims, under-sizing of ASD, large ASDs and less experienced operators. Regarding the adequacy of rims, aortic rim was considered to be less important and 40% of patients with deficient aortic rim were reported to undergo

device closure.[6] However, inadequate aortic rim has been associated with device migration requiring surgical intervention. Our patient had an ostium secundum ASD which was 16 mm in size and a 20 mm device was used to occlude the ASD. The device could have displaced due to smaller aortic rim and a thin IVC rim which was found to be torn during surgery. Mostly, the patients with device embolisation remain asymptomatic, but they can have severe ventricular arrhythmia if the device is located in right ventricle.[7] This patient also had episodes of VPCs as the device passed through the right ventricle. Percutaneous transcatheter retrieval of the migrated device is possible in 50% of cases with the use of goose neck snares and a larger sheath.[8] Surgical re-intervention for device migration has been reported in 1-1.9% cases and the mortality has been found to be 20 times higher with rescue operations.[9] A median sternotomy is the preferred approach, but surgical device retrieval using a right anterior minithoracotomy with good cosmetic and surgical results has also been reported by Wadhawa et al.[10] Since the transcatheter retrieval of the device failed, this patient had to undergo a median sternotomy, aorto-bicaval cannulation, cardiopulmonary bypass and surgical extraction of the device and ASD closure with an autologous pericardial patch. The aortic cross clamp and bypass times were comparable to other study.[10] The patient was fortunate to survive an emergency surgery, an eventful perioperative period with repeated longer hospital admission, large pericardial effusion requiring sub-xiphoid drainage and left pleural effusion requiring tube thoracostomy.

CONCLUSION

Inadequate aortic rim and flimsy IVC rim increase the risk of septal occluder migration. A careful monitoring of patient and electrocardiogram, chest X-ray and echocardiogram following the ASD device closure will facilitate early diagnosis of device migration. Failure of transcatheter device retrieval from right pulmonary artery necessitates emergency surgical removal via a median sternotomy.

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