



Percutaneous Retrieval of a Large Amplatzer Atrial Septal Occluder Device After Embolization to the Main Pulmonary Artery

Filiz Akyıldız Akçay¹, Sadık Volkan Emren¹, Emre Özdemir¹, Tuncay Kırış¹, Cem Nazlı¹

¹ University of Katip Celebi, Faculty of Medicine, Department of Cardiology, Izmir, Turkey

ABSTRACT

Transcatheter closure of secundum atrial septal defects (sASDs) has become the first choice for treatment when morphology is feasible. However, transcatheter closure may be associated with rare early and late complications. Embolization of the Amplatzer atrial septal occluder (ASO) is one major complication of percutaneous device closure. Although surgical retrieval of an embolized device is widely accepted, percutaneous retrieval of the embolized device is gaining ground as an acceptable alternative method. In this paper, we present a case of embolization of a 38 mm ASO to the main pulmonary artery (MPA) shortly after it was used to close a large complex ASD, and its successful retrieval using a biopsy catheter and an endovascular snare system. To the best of our knowledge, the 38-mm embolized ASO device was the largest one retrieved from the PA with a percutaneous approach.

Key Words: Atrial septal defect; atrial septal occluder; device embolization

Pulmoner Artere Embolize Geniş Amplatzer Septal Oklüder Cihazının Perkütan Yolla Geri Alınması

ÖZET

Sekundum atriyal septal defektlerin (sASD) tedavisinde transkateter cihaz ile kapatma morfoloji uygun olduğunda ilk tercih haline gelmiştir. Bununla birlikte transkateter kapatma, nadir görülen erken ve geç komplikasyonlarla ilişkili olabilir. Perkütan cihazla kapatmanın majör komplikasyonlarından biri atriyal septal oklüder (ASO) cihazının embolizasyonudur. Embolize cihazın, cerrahi yolla alınması geniş ölçüde kabul görmesine rağmen perkütan yolla geri alınması kabul edilebilir bir metot olarak gelişmektedir. Bu raporda, 38 mm çapındaki ASO cihazı ile kapatılan, kısa süre sonra cihazın ana pulmoner artere embolize olduğu ve biyopsi kateteri ve endovasküler snare sistemi yardımıyla başarılı bir şekilde geri alındığı geniş, kompleks sASD olgusunu sunuyoruz. Bilgilerimize göre bu 38 mm'lik ASO cihazı pulmoner arterden perkütan yolla geri alınabilen en büyük cihazdır.

Anahtar Kelimeler: Atriyal septal defekt; atriyal septal oklüder; cihaz embolizasyonu

INTRODUCTION

Secundum atrial septal defect (sASD) accounts for 80% of ASDs. Transcatheter device closure has become the first choice treatment for sASDs when morphology is feasible⁽¹⁾. The Amplatzer atrial septal occluder (ASO) device is the most commonly used device for this.

Percutaneous device closure has several advantages over surgery, including reduced less morbidity, scarring, and shortened duration of hospitalization; however, it is associated with rare early and late complications^(2,3). One major complication is device embolization, which occurs in up to 0.5% of cases, even when experienced interventionalists are involved⁽³⁾. Embolized ASO devices can be retrieved with percutaneous and surgical methods^(2,3). Surgery is generally the preferred method when the embolized device is too large⁽²⁾. We present a case of embolization of a 38 mm ASO device to the main pulmonary artery (MPA) shortly after implantation to close an sASD, and its successful retrieval using a biopsy catheter and an endovascular snare system.

CASE REPORT

A 24 year-old male patient presented with exertional dyspnea. He had a fixed split second heart sound and 3/6 systolic pulmonary flow murmur, sinus rhythm with right bundle

Cite this article as: Akyıldız Akçay F, Emren SV, Özdemir E, Kırış T, Nazlı C. Percutaneous retrieval of a large amplatzer atrial septal occluder device after embolization to the main pulmonary artery. Koşuyolu Heart J 2020;23(1):69-72.

Correspondence

Sadık Volkan Emren

E-mail: vemren@hotmail.com

Submitted: 03.11.2019

Accepted: 08.01.2020

Available Online Date: 30.04.2020

© Copyright 2020 by Koşuyolu Heart Journal. Available on-line at www.kosuyoluheartjournal.com

branch block and right axis deviation on electrocardiogram. Transthoracic echocardiography (TTE) and two-dimensional (2D) transesophageal echocardiography (TEE) showed a large sASD of 36 mm with left to right shunt. Three-dimensional (3D) TEE demonstrated a single, oval, centrally located, isolated secundum ASD of 32.2 mm x 37.4 mm (Figure 1). Aortic rim was almost absent; the other rims were sufficient. Posterior rim and interatrial septum (IAS) were floppy. Total length of the IAS was 62 mm. Right cardiac chambers were dilated and systolic PA pressure was 45 mm Hg. The defect was not located extremely close to cardiac structures. Refusing surgery, the patient underwent percutaneous ASD closure under general anesthesia with fluoroscopic and TEE guidance. Balloon-sizing diameter of the ASD was measured as 34 mm using stop-flow technique. A 38 mm ASO device (AGA Medical Corporation, Golden Valley, MN, USA) was deployed using standard technique (Figure 2A, B).

On the third day after procedure, control TTE revealed a large sASD and the ASO device embolized into the mPA causing

severe pulmonary insufficiency and mild pulmonary stenosis (peak gradient of 34 mmHg) (Figure 2C, D). Since the patient was asymptomatic and hemodynamically stable, percutaneous

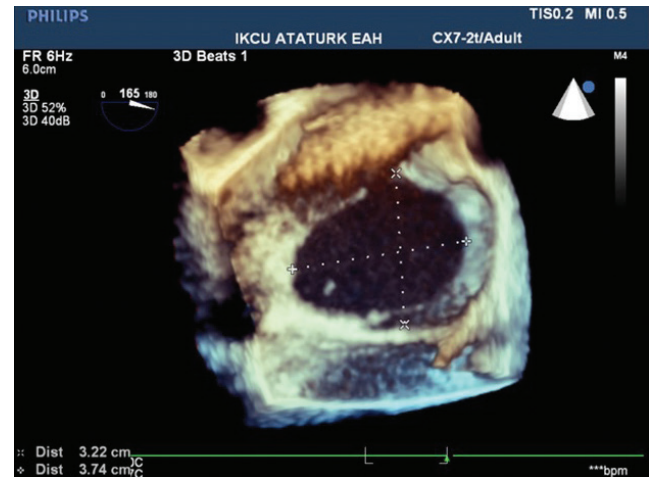


Figure 1. Transesophageal echocardiography demonstrated single, oval, centrally located, isolated secundum atrial septal defect of 32.2 x 37.4 mm.

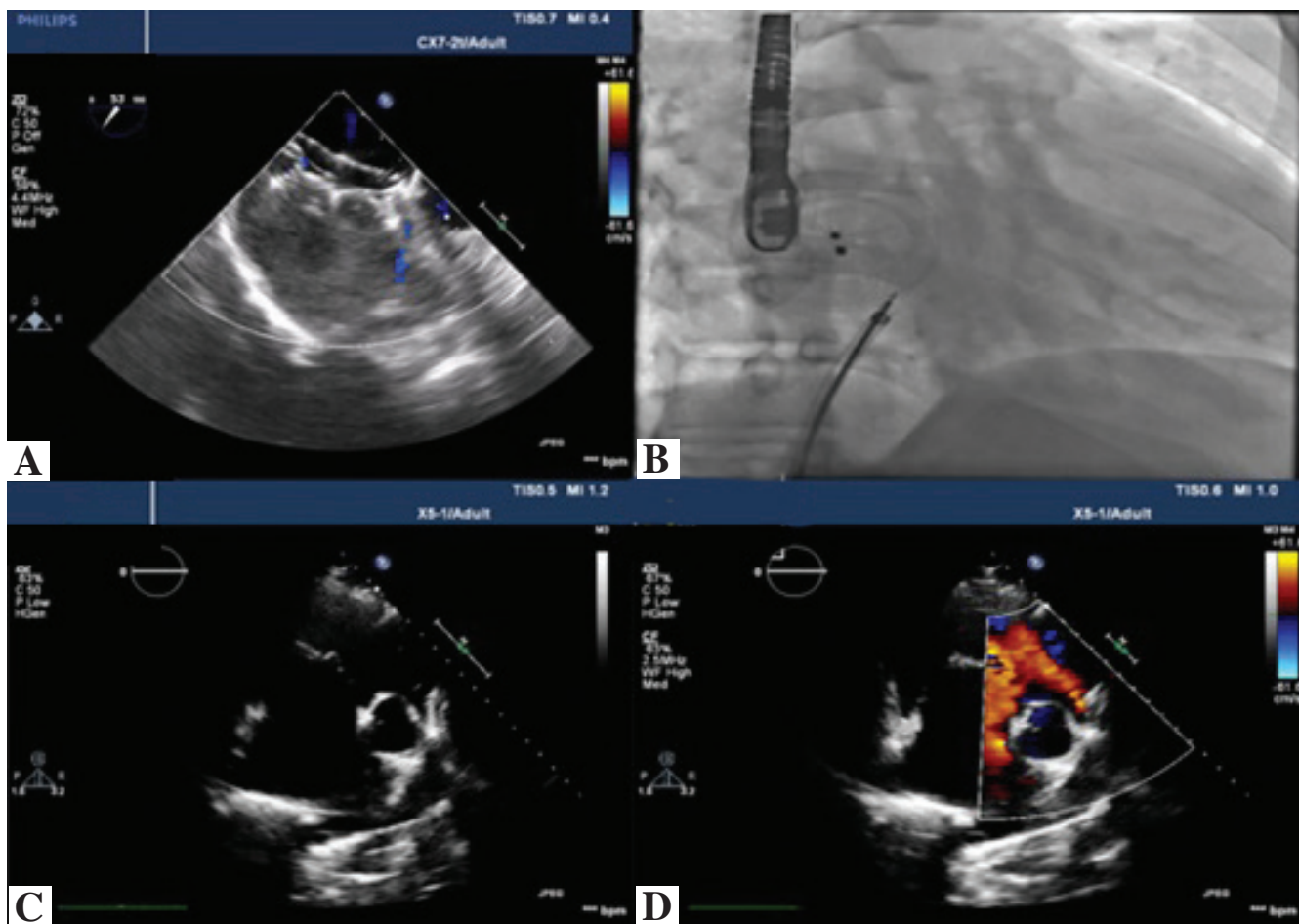


Figure 2. A) Transesophageal echocardiography image of the atrial septal occluder (ASO) device after closing the defect; B) Fluoroscopic image of the device after unlocking the lock of the delivery system; C) The occluder device embolized to the pulmonary artery in the short axis view of transthoracic echocardiography; and D) ASO device in the main pulmonary artery was restricting pulmonary leaflets motion, causing severe pulmonary insufficiency.

retrieval of the device was attempted. Under general anesthesia with fluoroscopic guidance, a 7-F sheath was introduced from the left femoral vein (FV) and a 6-F Judkins right (JR) coronary artery catheter (Boston Scientific, Marlborough, MA, USA) was passed through the PA over a 0.035-inch guide wire through a 12-F Amplatzer® delivery system (St. Jude Medical, Saint Paul, MN, USA). Attempts were made to catch the embolized device by sending a ONE Snare® endovascular snare system (Merit Medical Systems, Inc., South Jordan, UT, USA) with a 30 mm loop through the JR catheter. Despite many attempts, the snare did not catch the device due to improper alignment of the RA disk screw. Then, a Biopal®7

forceps biopsy catheter (Cordis Corp., Hialeah, FL, USA) was introduced from the right FV through the Amplatzer® delivery system. The device was held by the forceps biopsy catheter and pulled back until squeezed into the inferior vena cava at which point it became difficult to pull further down. Then, after a screw of the ASD device was caught tightly by a 30 mm snare through a 6-F JR catheter, the device was pulled out from the right FV (Figure 3A-D). The ASD (5 x 4 cm) was closed electively with a pericardial patch in a standard surgical procedure. The postoperative period was uneventful, and control echocardiography showed no residual shunt. The patient gave his informed consent to share his data.

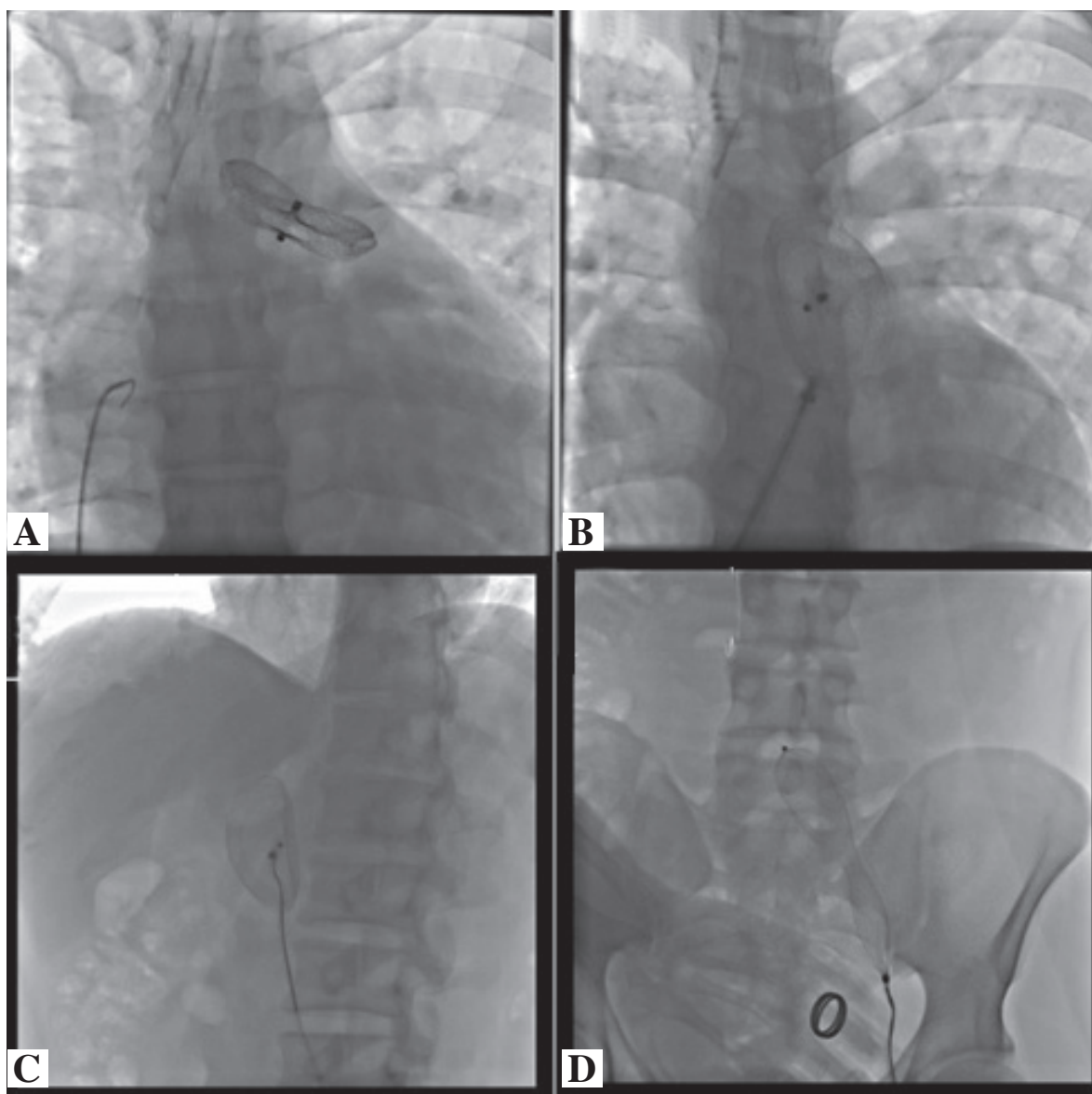


Figure 3. A) Fluoroscopic image of the device that had embolized into the pulmonary artery; B) The atrial septal occluder device caught by the forceps biopsy catheter; C) Capturing of the device in the inferior vena cava; and D) Retrieval of the device by means of snare via the femoral vein.

DISCUSSION

To the best of our best knowledge, the 38 mm embolized ASO device was the largest one retrieved from the PA with a percutaneous approach.

Embolization of the ASO is a major complication of transcatheter device closure^(2,3). Device embolization commonly occurs during the initial hours to within the first 24 hours, but can also occur late after implantation. In a study by Chessa and colleagues, embolization or malpositioning was the most frequent complication of the percutaneous transcatheter ASD closure procedure for devices usually embolized to the MPA (89%)⁽²⁾. There are case reports showing embolization of the ASO device to the right (R) or mPA⁽⁴⁻¹⁰⁾. In our case, a control TEE showed the 38 mm ASO device had embolized to the MPA 72 hours after implantation. The device overridingly had settled on bifurcation of mPA by its waist. Its specific location and larger size had deteriorated pulmonary valve function, causing severe pulmonary regurgitation, and mild pulmonary obstruction.

There are many risk factors associated with device embolization. There are defect-related factors, such as: a large defect; insufficient rims; a floppy IAS; or non-central location. There are small LA and device-related factors, such as: a large device, an undersized, or grossly oversized device or device type. There are also operator-related technical issues, such as: improper placement of the device; postimplantation mobility of the device; or acute change in intracardiac pressure due to physical strain⁽³⁻⁵⁾. In our case, a large defect, insufficient aortic rim, a floppy IAS, and a too large occluder device seemed to be the potential causes of embolization.

Once the device embolizes, two different options are available: (1) retrieving the device by catheter techniques (goose-neck snare, basket catheter, forceps biopsy catheter, etc.); (2) referring the patient to the surgeon⁽²⁾. The last option is indicated when the size of the device is among the largest⁽²⁾ or in cases involving ASD rims inappropriate for a second attempt at percutaneous closure⁽⁴⁾. The surgeon will retrieve the device and close the ASD at the same time⁽²⁾. In the series reported by Chessa et al., of the 15 patients in whom devices embolized or were malpositioned, 10 required surgical retrieval, while the remainder the devices were retrieved by catheter techniques⁽²⁾. A survey of AGA proctors revealed that there were 21 embolizations out of 3824 ASO implantations (0.55 %); of those embolizations, 15 (71.4%) were retrieved using a transcatheter approach and 6 (28.5%) were retrieved surgically. According to the Maude Database, the device was retrieved surgically in 77.2% of cases and with a transcatheter approach in 16.7% of cases⁽³⁾. In some cases, septal occluder devices were retrieved from the RPA using catheter techniques^(6,8,10) or surgical techniques⁽⁵⁾, but larger devices in the mPA were usually removed surgically^(7,9). In our case, the 38-mm ASO device was suc-

cessfully retrieved from the mPA by a forceps biopsy catheter and an endovascular snare system via FV access, followed by surgical ASD closure.

CONCLUSION

Complex sASDs should be evaluated comprehensively for risk of uncommon but potentially fatal complications, such as embolization, before deciding on percutaneous device closure. Large sASD cases, especially those with a floppy IAS and insufficient aortic rim, should be followed-up closely after percutaneous closure 72 hours postprocedurally, for the possibility of embolization, even when patients are asymptomatic. Here it was shown that an ASO device as large as 38 mm that had embolized to the PA could be successfully removed percutaneously using a forceps biopsy catheter and snare system.

Informed Consent: Written informed consent was obtained from the patient who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept/Design – FAA; Analysis/Interpretation – TK; Writing – SVE; Critical Revision – EÖ; Final Approval – CN

Conflict of Interest: The authors have no conflict of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

- Baumgartner H, Bonhoeffer P, De Groot NM, de Haan F, Deanfield JE, Galie N, et al. Task force on the management of grown-up congenital heart disease of the European Society of Cardiology (ESC); Association for European Paediatric Cardiology (AEP); ESC Committee for Practice Guidelines (CPG). ESC Guidelines for the management of grown-up congenital heart disease (new version 2010). *Eur Heart J* 2010;31:2915-57.
- Chessa M, Carminati M, Butera G, Bini RM, Drago M, Rosti L, et al. Early and late complications associated with transcatheter occlusion of secundum atrial septal defect. *J Am Coll Cardiol* 2002;39:1061-5.
- Moore J, Hegde S, El-Said H, Beekman R 3rd, Benson L, Bergersen L, et al.; ACC IMPACT Steering Committee. Transcatheter device closure of atrial septal defects: a safety review. *JACC Cardiovasc Interv* 2013;6:433-42.
- Misra M, Sadiq A, Namboodiri N, Karunakaran J. The 'aortic rim' recount: embolization of interatrial septal occluder into the main pulmonary artery bifurcation after atrial septal defect closure. *Interact Cardiovasc Thorac Surg* 2007;6:384-6.
- Sahin DY, Koc M, Cakir H, Arık OZ, Elbasan Z, Caylı M. A silent and late embolization of atrial septal defect occluder device into the right pulmonary artery: a case report. *Korean Circ J* 2012;42:781-3.
- Her AY, Lim KH, Shin ES. Transcatheter retrieval of embolized atrial septal defect occluder device by waist capture technique. *Int Heart J* 2018;59:226-8.
- Nagré SW. Surgical removal of embolized atrial septal defect device from pulmonary artery. *J Thorac Cardiovasc Surg* 2015;150:55-7.
- Goel PK, Kapoor A, Batra A, Khanna R. Transcatheter retrieval of embolized AMPLATZER Septal Occluder. *Tex Heart Inst J* 2012;39:653-6.
- Boysan E, Cicek OF, Cicek MC, Hamurcu Z, Gurkahraman S. Surgical removal of an atrial septal occluder device embolized to the main pulmonary artery. *Tex Heart Inst J* 2014;41:91-3.
- Manolis AS. Percutaneous retrieval of a dislodged Amplatzer septal occluder device from the pulmonary artery with sole use of a snare and device lassoing. *Hellenic J Cardiol* 2018;59:57-9.