

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Transseptal occluder migration after transcatheter atrial septal aneurysm and double secondary septal defect correction: A case report ☆☆☆

Valentin V. Guryev, MD^{a,b}, Dmitriy A. Zverev, MD, PhD^b, Anton A. Khilchuk, MD^{a,c,*}, Sergey G. Shcherbak, MD^c

^a Department of Interventional Radiology, City Hospital №40, 197706, Borisova str. 9, Sestroretsk, Saint-Petersburg, Russian Federation

^b Department of Interventional Cardiology, Almazov National Medical Research Centre, Saint-Petersburg, Russian Federation

^c Medical Faculty, Saint-Petersburg State University, Saint-Petersburg, Russian Federation

ARTICLE INFO

Article history:

Received 10 May 2020

Revised 18 May 2020

Accepted 19 May 2020

Keywords:

Atrial septal defect

Atrial septal aneurysm

Transcatheter occlusion

Occluder

Migration

Atrial septal rupture

ABSTRACT

We present a case of secondary atrial septal defect transcatheter correction attempt in a 72 years old male, complicated by the device migration. The occluder was captured, pulled down to the common femoral artery and retrieved through the arteriotomy site. Second attempt was successfully performed using combination of transesophageal echo (TEE) and sizing balloon to accurately measure the defect diameter. This case underscores the importance of TEE ultrasound, sizing balloon, and contrast fluoroscopy combination to achieve accurate device sizing. Our calculation approach significantly increased the success rate of the septal defect closure procedure and potentially reduced the risk of immediate and mid-term complications. Combination of measuring methods should be used in order to accurately assess the device diameter.

© 2020 The Authors. Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license.

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Introduction

Percutaneous transcatheter interventions in congenital heart disease, particularly secondary atrial septal defect (ASD) occlusion, has a more than 30-year history of successful usage

[1,2]. ASD occlusion is recognized as reasonable alternative to open surgical repair, especially in frail and vulnerable patients - children or elderly [3,4]. However, like any other type of intervention, it has its possible drawbacks and complications [5]. Device migration towards right heart chambers is the most frequent short-term complication of ASD occlusion. However,

☆ Conflicts of Interest: The authors report no conflict of interest.

☆☆ Acknowledgments: This manuscript has not been previously published and not under consideration in the same of similar form in any other peer-reviewed media. All authors listed have contributed sufficiently to the project to be included as authors.

* Corresponding author.

E-mail address: anton.khilchuk@gmail.com (A.A. Khilchuk).

<https://doi.org/10.1016/j.radcr.2020.05.042>

1930-0433/© 2020 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license. (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

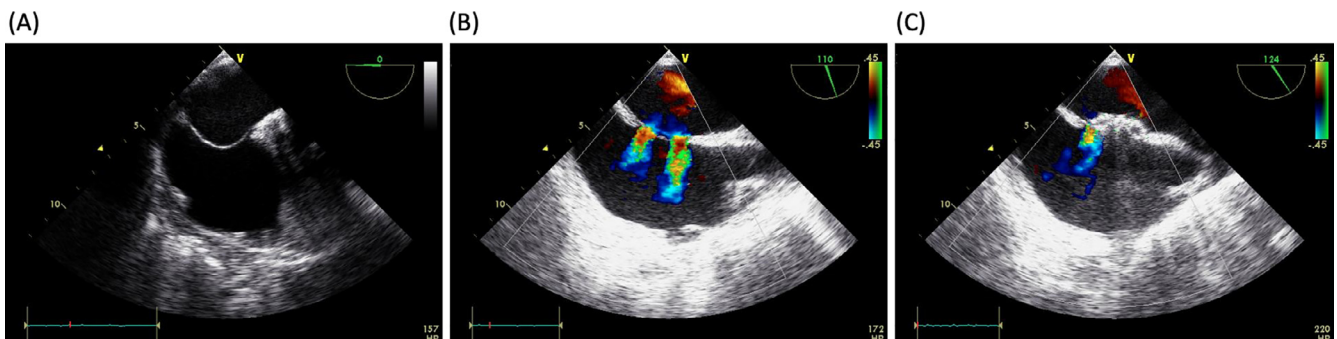


Fig. 1 – TEE before and after ASD closure. (A) Atrial septal aneurysm; (B) two ASDs with left to right shunt; (C) larger ASD closed with 12 mm ASO. TEE, transesophageal echocardiogram; ASD, atrial septal defect; ASO, Amplatzer Septal Occluder.

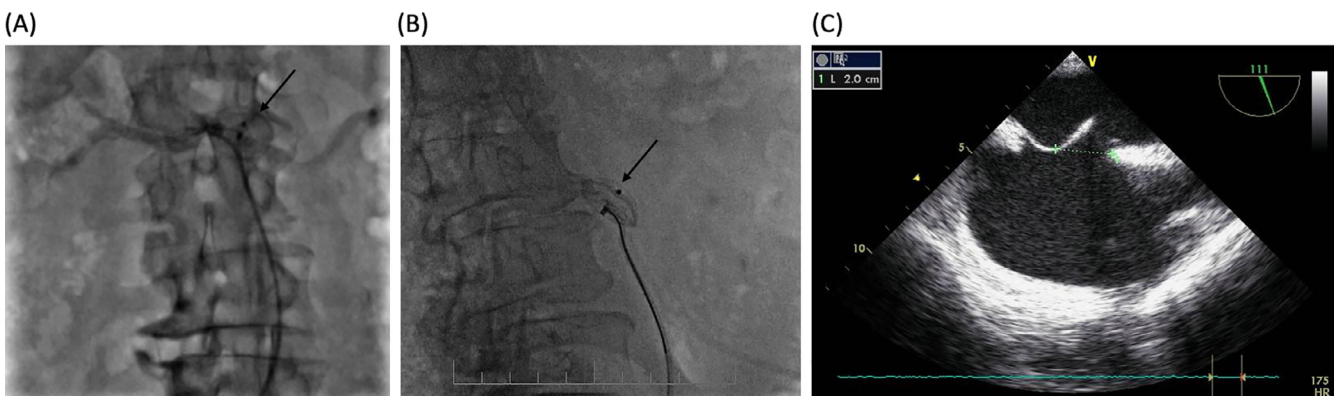


Fig. 2 – Fluoroscopy and TEE after the first ASD closure. (A) ASO in abdominal aorta (arrow); (B) ASO captured with Amplatzer Goose Neck (arrow); (C) ruptured atrial septum, large ASD present. TEE, transesophageal echocardiogram; ASD, atrial septal defect; ASO, Amplatzer Septal Occluder.

migration to the left heart chambers or aorta is extremely rare with up to 1.1% occurrence [6]. Transesophageal echocardiography (TEE) is the most sensitive method of atrial defect sizing compared to transthoracic echocardiography (TTE) [7].

Case report

A 72 years old male was admitted with worsening dyspnea and rapid progression of exercise intolerance. He had a 13 years history of tricuspid infective endocarditis, managed conservatively without recurrence and secondary ASD revealed at this time. In 12 months before hospitalization he noted gradual decrease in exercise tolerance, dyspnea during daily activities and moderate lower extremities edema. His WHO Quality of Life scale score was 75.

ASD hemodynamic significance was assessed during preoperative TTE and simultaneous correction of 2 congenital anomalies, atrial septal aneurysm and double ASD, was scheduled. We performed direct heart chambers manometry and calculated the significance of the atrial shunt through the right common femoral vein access: mean left atrial pressure was 10 mmHg, right atrium (RA) pressure - 9 mmHg, systolic

pulmonary artery pressure - 32 mmHg and Qp/Qs was 1,8:1 (N = 1:1).

Intraoperative TEE showed thinned atrial septum with 12 mm prolapse and two oval-shaped ASD defects - 7 × 13 mm and 4 × 7 mm (Fig. 1). Edges of the septum were: upper - 15 mm, lower - 14 mm, antero-superior (aortic) margin - 4 mm, postero-inferior - 17 mm, antero-inferior - 9 mm, postero-superior - 23 mm.

Patient's treatment strategy was discussed ad hoc together with the attending cardiothoracic surgeon and attending interventional radiologist: endovascular occlusion of only larger ASD was recommended.

12 mm Amplatzer Septal Occluder (ASO; St. Jude Medical) was delivered through the 9F guiding catheter and opened by catheter traction. Intraoperative TEE control showed fixed septum device with no valvular obstructions and remaining moderate anteroposterior edge flow, probably associated with the second defect (Fig. 1). However, 48 hours control TTE showed no device in the septum.

The patient was taken to the cathlab for emergent thorax, abdomen and extremities fluoroscopy. The ASO device was found in the juxtarenal abdominal aorta fixed at the level of the second lumbar vertebra (Fig. 2). Through the open right common femoral artery access we captured the occluder right disk (delivery system fixation part) and removed the device

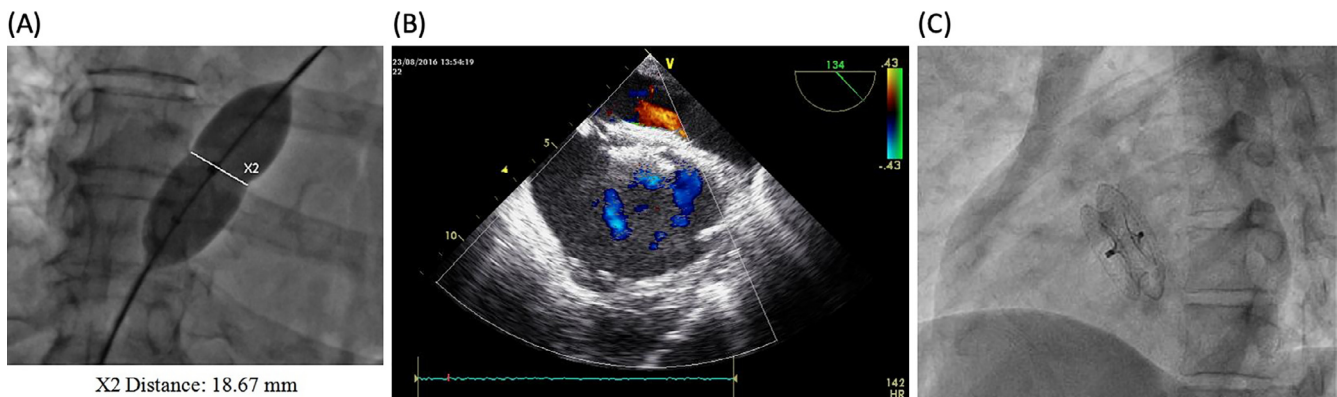


Fig. 3 – Fluoroscopy and TEE during the second ASD closure. (A) sizing balloon measurement; (B) ASD is closed with 22 mm ASO; (C) ASO on fluoroscopy in AP projection. TEE, transesophageal echocardiogram; ASD atrial septal defect; ASO, Amplatzer Septal Occluder; AP, anterior posterior.

through the arteriotomy site using 15 mm Amplatz Goose Neck Snare (Medtronic; Fig. 2). Intraoperative TEE showed septal rupture: freely floating antero-superior septal part at the aneurysm site, which probably caused the device migration. Also, a single irregular 20 × 17 mm defect was confirmed by duplex ultrasound (Fig. 2).

Through the right common femoral vein access we measured the present defect using a 34 mm Amplatzer Sizing Balloon (St. Jude Medical) (Fig. 3) - the ASD diameter along the balloon "waist" was 21 mm. Then a 22 mm ASO (St. Jude Medical) was delivered through the 9F sheath and implanted by standard technique after performing fixation tests under fluoroscopic and TEE control. Intraoperative and 24 hours TEE showed fixed atrial septal occlude with no significant flow through the disks (Fig. 3).

The patient was discharged on the 10th day postop for outpatient monitoring. 4-month control TTE showed fixed septal device with no residual trans-septal flow, systolic pulmonary artery pressure decreased from 32 mmHg to 20 mmHg. At 6-month telephone call follow-up the patient noted a significant improvement in his quality of life (WHO Quality of Life scale score 87) and dramatically increased exercise tolerance.

Discussion

Percutaneous transcatheter ASD occlusion currently constitutes an alternative to open surgical treatment [8]. Early post-operative complications develop as a result of improper patient selection, incorrect defect anatomy assessment or device measuring errors. In our case the size of the first ASO was based only on TEE measurements, which ultimately led to its migration. Since secondary ASDs rarely have an ideally round shape, in some cases it is difficult to visualize and accurately measure the largest diameter of the defect, even with TEE control. Additionally, factors such as defects' edge density or excess tissue around the defect, in example septal aneurysm, affect the device fixation [9]. Septal prolapse or aneurysm are seen in 2%-3% of congenital heart disease patients and are associated with multiple ASDs presence and

significantly increased mobility of septal tissue [7]. Thus, for transcatheter correction of secondary ASD, associated with septal aneurysm, it is recommended to choose larger device to stabilize the septum.

In case of complex ASD with or without septal aneurysm it is recommended to measure the defect, sizes using a special sizing balloon [5]. In our case, however, primary balloon defect sizing was not performed, since the septum was aneurysmatically altered and thinned - possible mechanical impact on the septum would potentially lead to iatrogenic septum rupture.

Evidence on ASD measurement by sizing balloon is ambiguous. Amin and Daufors [10] concluded that sizing balloon usage is not routinely required to close secondary ASDs, however Helgason et al. showed that the patients with ASDs, measured by sizing balloon, had significantly larger devices than from TEE sizing and had lower complication rate [5].

Conclusion

The presence of multiple ASDs in combination with septal aneurysm can be the cause of septal tissue breakdown, poor device fixation and its subsequent short-term migration.

This case underscores the importance of TEE ultrasound, sizing balloon, and contrast fluoroscopy combination to achieve the most accurate device sizing. Our calculation approach significantly increased the success rate of the septal defect closure procedure and potentially reduced the risk of immediate and mid-term complications.

Combination of measuring methods should be used in order to accurately assess the device diameter.

REFERENCES

- [1] King TD, Thompson SL, Steiner C, Mills NL. Secundum atrial septal defect: nonoperative closure during cardiac catheterization. *JAMA* 1976(235):2506–9. <https://doi.org/10.1001/jama.235.23.2506>.

- [2] Sideris EB, Zeinaloo A, Zanjani K, Borisova N, Pursanov M. Atrial septal defect occlusion using an immediate release patch method: early clinical experience. *JACC* 2010;55(10A):212. [https://doi.org/10.1016/s0735-1097\(10\)62004-9](https://doi.org/10.1016/s0735-1097(10)62004-9).
- [3] Sabanayagam A, Cavus O, Williams J, Bradley E. Management of heart failure in adult congenital heart disease. *Heart Failure Clin* 2018;14(4):569–77. <https://doi.org/10.1016/j.hfc.2018.06.005>.
- [4] Kim JJ, Hijazi ZM. Clinical outcomes and costs of Amplatzer transcatheter closure as compared with surgical closure of ostium secundum atrial septal defects. *JACC* 2002(39):437–438. [https://doi.org/10.1016/s0735-1097\(02\)81965-9](https://doi.org/10.1016/s0735-1097(02)81965-9).
- [5] Helgason H, Johansson M, Söderberg B, Eriksson P. Sizing of atrial septal defects in adults. *Cardiology* 2005(104):1–5. <https://doi.org/10.1159/000086045>.
- [6] Rodríguez-González F, Martínez-Quintana E. Risks factors for atrial septal defect occlusion device migration. *Int J Angiol* 2016;25(5):63–5. <https://doi.org/10.1055/s-0034-1395976>.
- [7] Silvestry FE, Cohen MS, Armsby LB, Lang RM, Rome JJ, Wang Y, et al. Guidelines for the echocardiographic assessment of atrial septal defect and patent foramen ovale: from the American Society of Echocardiography and Society for Cardiac Angiography and Interventions. *J Am Soc Echocardiograph* 2015;28(8):910–58. <https://doi.org/10.1016/j.echo.2015.05>.
- [8] Van Riel ACMJ, Schuurin MJ, van Hessen ID, Zwinderman AH, Cozijnsen L, Reichert CLA, et al. Contemporary prevalence of pulmonary arterial hypertension in adult congenital heart disease following the updated clinical classification. *Int J Cardiol* 2014;174(2):299–305. <https://doi.org/10.1016/j.ijcard.2014.04.072>.
- [9] Levi DS, Moore JW. Embolization and retrieval of the Amplatzer septal occluder. *Catheter Cardiovasc Intervent* 2004(61):543–7. <https://doi.org/10.1002/ccd.20011>.
- [10] Amin Z, Daufors DA. Balloon sizing is not necessary for closure of secundum atrial septal defects. *JACC* 2005;45(1A):317. <https://doi.org/10.1016/j.jacc.2004.12.040>.