

# Echocardiographic detection of intraluminal catheter thrombosis during percutaneous atrial septal defect closure

Błażej Michalski<sup>1</sup>, Jarosław D Kasprzak<sup>1</sup>, Armanda Wojtasińska<sup>1</sup>, Ewa Szymczyk<sup>1</sup>, Adam Śmiałowski<sup>2</sup>, Jan Z Peruga<sup>1</sup>, Piotr Lipiec<sup>1</sup>

<sup>1</sup>Department of Cardiology Medical University of Lodz, Łódź, Poland

<sup>2</sup>Department of Endocrinology and Metabolic Diseases, Research Institute, Polish Mother's Memorial Hospital, Medical University of Lodz, Łódź, Poland

## Correspondence to:

Błażej Michalski, MD PhD  
1<sup>st</sup> Department of Cardiology,  
Medical University of Lodz,  
Bieganski Specialty Hospital,  
Kniaziewiczza 1/5, 91–347 Łódź,  
Poland,  
phone: +48 42 251 62 16,  
e-mail: bwmichalski@op.pl

Copyright by the Author(s), 2024

DOI: 10.33963/v.phj.99500

## Received:

December 23, 2023

## Accepted:

February 22, 2024

## Early publication date:

March 20, 2024

Atrial septal defect (ASD) is the most common congenital heart defect detected in adults. Transcatheter closure is safe and has become the standard treatment for the majority of patients but may lead to severe procedural complications [1]. We report an unusual scenario where intraprocedural transesophageal echocardiographic monitoring prevented a potential stroke during atrial septal occluder implantation.

A 62-year-old female with hypertension, atrial fibrillation, and type 2 ASD (16 × 14 mm) was admitted to our hospital. Transthoracic echocardiography (TTE) confirmed significant right ventricular and right atrial volume overload with secondary severe tricuspid regurgitation. Transvascular implantation of 18 mm nitinol atrial septal occluder was initiated with standard premedication of 300 mg of acetylsalicylic acid, and 300 mg of clopidogrel, along with administration of unfractionated heparin during the procedure.

Immediately before occluder delivery, an unusual echogenicity within the catheter lumen was noted suggesting intraluminal thrombosis (Figure 1A–B; Supplementary material, Video S1). Immediate catheter withdrawal and intense aspiration resulted in the extraction of a long thrombus. The dose of heparin was increased due to subtherapeutic activated clotting time of 187 s (Figure 1C). The delivery system was retracted and carefully flushed, followed by reinitiation and successful completion of the procedure (Figure 1D). The patient did not suffer from any complications.

Following the procedure, coagulopathy was excluded. Dual antiplatelet therapy was recommended for 6 months with lifelong

continuation of low-dose aspirin, which resulted in uncomplicated 24 months of follow-up. This corresponds with the results of the EACVI study, in which most participating centers recommended dual antiplatelet therapy for an initial 6 months and suggested lifetime single-antiplatelet therapy in only 42% of centers, while others limit it to 6 more months (36%) or for 5 years from the closure (12%) [2].

The rate of peri-procedural major complications in ASD closure is reported from 0% to 9.4%. The second most frequent major complication is device thrombosis (1.2%) [3]. In the pathogenesis of catheter-related thrombosis, several factors can be identified. The most common one is mechanical trauma. Others include concomitant infection, use of cytostatics, steroids, and antibiotics, enteral nutrition, and a positive family history of coagulopathies (thrombophilia) [4].

To conclude, this case demonstrates how crucial for patient safety and the optimal effect of the procedure is vigilant real-time monitoring of echocardiographic images during ASD closure. The thrombus formation may occur despite proper peri-procedural treatment, and without its early detection, the patient is at risk of life-threatening complications [5].

## Supplementary material

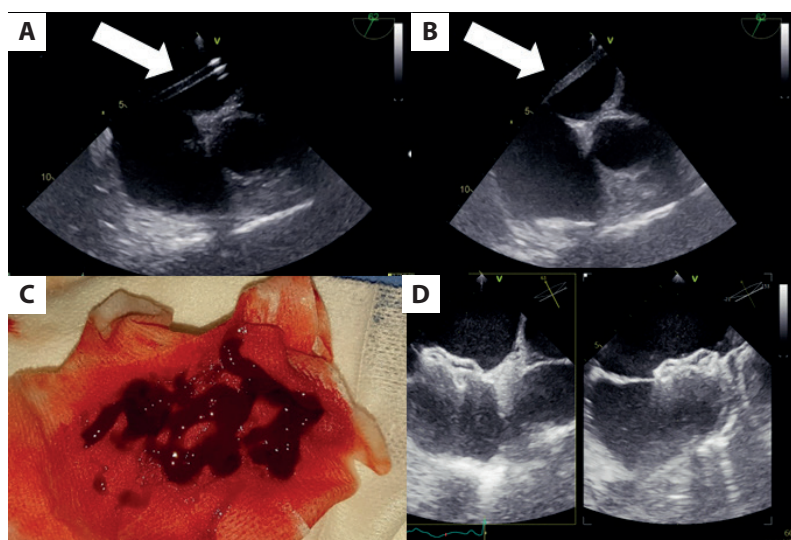
Supplementary material is available at [https://journals.viamedica.pl/polish\\_heart\\_journal](https://journals.viamedica.pl/polish_heart_journal).

## Article information

**Conflict of interest:** None declared.

**Funding:** None.

**Open access:** This article is available in open access under Creative Common Attribution-Non-Commer-



**Figure 1.** A. Transesophageal intraprocedural monitoring shows the patent catheter crossing the atrial septum (white arrow) — note the normal echogenicity of the blood within the lumen of the catheter. B. Transesophageal intraprocedural monitoring shows the catheter crossing the atrial septum with a suspected thrombus inside (white arrow). C. Thrombus removed from the catheter. D. Postprocedural transesophageal biplane view showing the proper position of the occluder

cial-No Derivatives 4.0 International (CC BY-NC-ND 4.0) license, which allows downloading and sharing articles with others as long as they credit the authors and the publisher, but without permission to change them in any way or use them commercially. For commercial use, please contact the journal office at [polishheartjournal@ptkardio.pl](mailto:polishheartjournal@ptkardio.pl)

## REFERENCES

1. Pristipino C, Sievert H, D'Ascenzo F, et al. Evidence Synthesis Team, Eapci Scientific Documents and Initiatives Committee, International Experts. European position paper on the management of patients with patent foramen ovale. General approach and left circulation thromboembolism. *Eur Heart J*. 2019; 40(38): 3182–3195, doi: [10.1093/eurheartj/ehy649](https://doi.org/10.1093/eurheartj/ehy649), indexed in Pubmed: [30358849](https://pubmed.ncbi.nlm.nih.gov/30358849/).
2. D'Andrea A, Dweck MR, Holte E, et al. EACVI survey on the management of patients with patent foramen ovale and cryptogenic stroke. *Eur Heart J Cardiovasc Imaging*. 2021; 22(2): 135–141, doi: [10.1093/ehjci/jeaa318](https://doi.org/10.1093/ehjci/jeaa318), indexed in Pubmed: [33346351](https://pubmed.ncbi.nlm.nih.gov/33346351/).
3. Abaci A, Unlu S, Alsancak Y, et al. Short and long term complications of device closure of atrial septal defect and patent foramen ovale: meta-analysis of 28,142 patients from 203 studies. *Catheter Cardiovasc Interv*. 2013; 82(7): 1123–1138, doi: [10.1002/ccd.24875](https://doi.org/10.1002/ccd.24875), indexed in Pubmed: [23412921](https://pubmed.ncbi.nlm.nih.gov/23412921/).
4. Tomaszewski M, Kosiak W, Irga N, et al. Ultrasound assessment of thrombotic complications in pediatric patients with tunneled central venous catheters. *J Ultrason*. 2013; 13(55): 451–459, doi: [10.15557/JoU.2013.0049](https://doi.org/10.15557/JoU.2013.0049), indexed in Pubmed: [26673005](https://pubmed.ncbi.nlm.nih.gov/26673005/).
5. Yorgun H, Canpolat U, Kaya EB, et al. Thrombus formation during percutaneous closure of an atrial septal defect with an Amplatzer septal occluder. *Tex Heart Inst J*. 2011; 38(4): 427–430, indexed in Pubmed: [21841876](https://pubmed.ncbi.nlm.nih.gov/21841876/).