

**CASE REPORT**

Simultaneous Percutaneous Closure of a Patent Foramen Ovale and Left Atrial Appendage

 Zeynep Esra Güner¹,  Regayip Zehir²

¹Clinic of Cardiology, Uzunköprü State Hospital, Edirne, Türkiye

²Clinic of Cardiology, Koşuyolu Yüksek İhtisas Training and Research Hospital, İstanbul, Türkiye

ABSTRACT

Percutaneous closure of the left atrial appendage (LAA) is an alternative treatment for stroke prevention in patients with atrial fibrillation who cannot tolerate oral anticoagulation. The conventional method involves transeptal puncture to access and seal the LAA. However, recent studies have investigated the possibility of performing LAA closure through a patent foramen ovale (PFO) tunnel. This case aims to illustrate the simultaneous closure of both the LAA and PFO using the PFO tunnel as the access route.

Keywords: Interventional cardiology, left atrial appendage, patent foramen ovale, percutaneous closure

INTRODUCTION

Atrial fibrillation (AF) is the most common arrhythmia, with its prevalence increasing with age. Stroke is a frequent complication of non-valvular AF (NVAF). Percutaneous left atrial appendage (LAA) closure is a key treatment for stroke prevention in patients with NVAF, particularly those who cannot tolerate oral anticoagulation.¹ Both the LAA in patients with AF and a patent foramen ovale (PFO) or atrial septal defect (ASD) are major sources of cardioembolic stroke. Combining LAA closure with PFO/ASD closure may offer an optimal approach to stroke prevention. This report describes a case of simultaneous percutaneous closure of a PFO and LAA.

CASE REPORT

A 76-year-old woman with permanent AF, hypertension, diabetes mellitus, and dyslipidemia was referred for transesophageal echocardiography (TOE) and LAA closure. One month earlier, she had been hospitalized for massive gastrointestinal bleeding while on warfarin, requiring a blood transfusion of approximately 14 units. Her CHA₂DS₂-VASc and HAS-BLED scores were both 5. She was switched to apixaban at discharge but subsequently experienced an ischemic stroke while on medication.

Electrocardiography showed AF with a mean heart rate of 90 bpm. Chest radiography was remarkable, and there was no significant family history. Blood tests revealed mildly elevated glucose and cholesterol

levels, along with an increased D-dimer level. Physical examination showed mild swelling in the left leg, and Doppler ultrasonography confirmed deep vein thrombosis in the same leg. Preprocedural TOE identified a small shunt in the interatrial septum, consistent with a PFO (Figure 1A, Video 1). A bubble study demonstrated a significant right-to-left shunt, and the LAA was visualized with no thrombus (Figure 1B, Video 2). Given her medical history and comorbidities, simultaneous PFO and LAA closure was selected to eliminate the need for oral anticoagulation.

Intravenous proton pump inhibitor therapy was initiated, and oral anticoagulation was replaced with subcutaneous low-molecular-weight heparin. The procedure was performed under general anesthesia using right femoral vein access, with fluoroscopic and 2D/3D TOE guidance. A 25-mm Amplatzer Amulet LAA occluder and a 25-mm Amplatzer PFO occluder were selected. Transeptal access was achieved using an SL 1 sheath and Inoue wire, followed by the insertion of a 12 Fr delivery sheath.

The LAA occlusion device was carefully advanced, and its position was confirmed using fluoroscopy and TOE (Figure 1C, Video 3). Deployment was adjusted to ensure optimal placement, with contrast imaging used to verify device position and assess for leakage (Figure 1D, Video 4). The PFO occluder was implanted using the standard technique (Figure 1E, Video 5). Device positioning was evaluated in the left anterior oblique view (Figure 1F). A follow-up TOE performed 45 days later showed no device-related complications, with both the PFO or LAA occluders in stable positions (Figures 1G and 1H).

Address for Correspondence: Zeynep Esra Güner MD, Clinic of Cardiology, Uzunköprü State Hospital, Edirne, Türkiye

E-mail: drzesraguner@gmail.com **ORCID ID:** orcid.org/0000-0003-1263-5989

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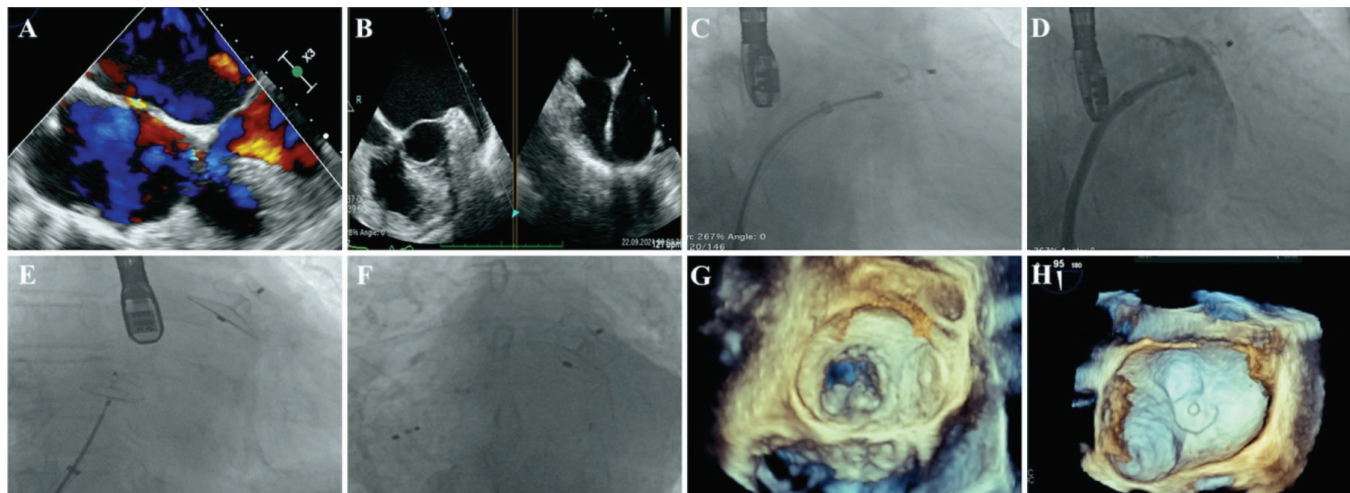


Figure 1. A) Transesophageal echocardiography with color Doppler showing a small shunt in the interatrial septum, consistent with a patent foramen ovale. B) Transesophageal echocardiography confirming the absence of thrombus in the left atrial appendage. C) Optimal positioning of the device was verified. D) Contrast imaging confirmed the absence of leakage. E) Implantation of the patent foramen ovale occlusion device. F) Confirmation of device positions. G, H) Follow-up transesophageal echocardiogram performed 45 days later showed no device-related anomalies in the patent foramen ovale and left atrial appendage positions

DISCUSSION

The PFO was positioned anterosuperiorly, while the LAA was located anterolaterally. Transeptal access via the PFO can be challenging due to the cranioanterior orientation of the LAA. Proper alignment may require external rotation and the assistance of two operators.² Studies have reported high success rates for device implantation, with major complication rates similar to those of standard techniques.³ Long-term outcomes of transeptal access through a PFO or ASD have demonstrated comparable efficacy in stroke prevention and similar safety profiles. Simultaneous PFO/ASD closure did not prolong fluoroscopy time but required a higher contrast volume. Additionally, this approach was associated with a lower incidence of stroke and transient ischemic attacks compared to other methods.

CONCLUSION

Transeptal access via a PFO or ASD allows entry into the left atrium while reducing the risk of complications associated with transeptal puncture, such as perforation of the left atrial free wall or aortic root. Compared to transeptal puncture, utilizing a PFO or ASD for left atrial access is a viable and safe alternative when using Amplatzer systems for LAA closure. Additionally, performing simultaneous PFO or ASD closure may offer further protection against systemic embolization without increasing procedural risk.

Informed Consent: Written consent was obtained from the patient and their relatives for the inclusion of case details and personal information.

Authorship Contributions: Surgical and Medical Practices: Z.E.G., R.Z., Concept: R.Z., Design: R.Z., Data Collection or Processing: Z.E.G., Analysis or Interpretation: R.Z., Literature Search: Z.E.G., Writing: Z.E.G.

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Video 1. Transesophageal echocardiogram visualization of the patent foramen ovale shunt



<https://www.youtube.com/watch?v=VzPj-M19XWs>

Video 2. Confirmation of the absence of thrombus in the left atrial appendage



<https://www.youtube.com/watch?v=3xs9vAAhu2A>

Video 3. Implantation of the Amulet device



<https://www.youtube.com/watch?v=bR83v1cwSEI>

Video 4. Verification of no contrast leakage upon injection



<https://www.youtube.com/shorts/7i3RvkTGoPg>

Video 5. Implantation of the patent foramen ovale occlusion device



<https://www.youtube.com/watch?v=eaV8HPrM6tc>
