

Short Communication

Transcatheter Closure of Patent Foramen Ovale during a Radiofrequency Ablation Procedure

ANTONIS S. MANOLIS, M.D., FACC, FESC, FHRS, GEORGE ANDRIKOPOULOS, M.D., FESC, VASSILIKI TSAGOU, M.D., JOHN PYRROS, M.D., ATHANASIOS KRANIDIS, M.D.

First Department of Cardiology, Evagelismos General Hospital of Athens, Athens, Greece

Summary: A 43-year-old woman was undergoing radiofrequency catheter ablation of a symptomatic supraventricular tachycardia when a patent foramen ovale (PFO) was detected with passage of the diagnostic electrocatheter into the left atrium. Prior echocardiographic studies had been unrevealing. Upon questioning during the procedure, the patient now admitted to frequent and disabling daily migraine attacks, while her family described two recent brief episodes of disorientation and dysarthria, consistent with transient ischemic attacks. The patient was informed of the option of future closure of the PFO, but she insisted on having this done concurrently with her ablation procedure. After successful ablation of the slow pathway considered responsible for the supraventricular tachycardia, an Amplatzer closure device was utilized and the PFO was successfully closed during the same procedure. A postprocedural transesophageal echocardiogram showed complete sealing of the PFO, while over the ensuing 10 months the patient reported virtual elimination of her daily attacks of migrainous headaches, limited to a single episode the day after the procedure and none thereafter.

Key words: patent foramen ovale, migraine, transient ischemic attacks, radiofrequency ablation, closure devices

Introduction

While the prevalence of a patent foramen ovale (PFO) averages ~25%,^{1,2} it is much higher in patients with cryptogenic

stroke (~50%) and patients with migraine (40–50%).³ Dramatic reduction of migraine attacks has been reported after transcatheter closure of a PFO.^{3–6} The diagnosis of a PFO is usually made with transesophageal contrast echocardiography.^{1,2} We report a case in which the diagnosis of a PFO was made during a catheter ablation procedure and percutaneous PFO closure was performed during the same session in a patient afflicted by both tachycardia episodes and incapacitating daily migrainous attacks.

Case Report

In a 43-year-old woman undergoing radiofrequency catheter ablation of a symptomatic supraventricular tachycardia, a PFO was detected with passage of the diagnostic electrocatheter into the left atrium. Prior transthoracic echocardiographic studies had been unrevealing. Upon questioning during the procedure, the patient admitted to frequent and disabling daily migraine attacks. Her family described two recent brief episodes of disorientation and dysarthria, consistent with transient ischemic attacks. The patient was informed of the option of future closure of the PFO, but she insisted on having this done concurrently with her ablation procedure.

After successful ablation of the slow pathway of the atrioventricular node considered responsible for the supraventricular tachycardia, an Amplatzer closure device was utilized and the PFO was successfully closed during the same procedure (Fig. 1); this was accomplished via the right femoral vein. The PFO was traversed with a long guidewire, over which a #9 French long sheath was introduced in the left atrium. A 25-mm Amplatzer PFO occluder device was then prepared, introduced into the sheath, and advanced into the left atrium. Under fluoroscopic guidance, the distal portion of the device was released into the left atrium. Sheath and device were then pulled back until resistance was felt from the device snagging into the interatrial septum. Under continuous gentle tension on the device, the proximal portion of the umbrella was deployed into the right atrium. The correct position of the device was confirmed fluoroscopically and with contrast injection through the sheath; then the device was fully released by unscrewing the shaft, and the position was rechecked with contrast injection. The patient tolerated the procedure well

Address for reprints:

Antonis S. Manolis, M.D.
Professor & Director of Cardiology
Kourempa 41
Agiou Dimitrios 173 43
Athens, Greece
e-mail: asmanol@otenet.gr

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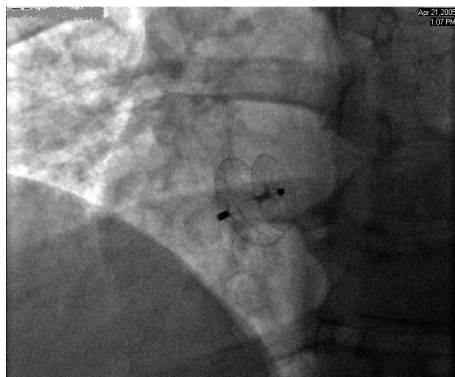


FIG. 1 Left anterior oblique view with a cranial tilt showing the PFO occluder (Amplatzer device) in place. PFO = patent foramen ovale.

with no complications. Prophylactic antibiotic therapy with vancomycin was used, with one dose given during the procedure and two doses afterward.

A postprocedural transesophageal echocardiogram showed complete sealing of the PFO, albeit with suspicion of a small and thin echogenic mass entrapped in the closure device, for which she was placed on oral anticoagulation (acenocoumarol) to be received for 6 months. The patient had only one episode of migraine the day after the procedure. She was discharged home on acenocoumarol, aspirin, and clopidogrel. Over the ensuing 10 months, the patient reported total abolition of her daily attacks of migrainous headaches. At 6 months, a repeat transesophageal echocardiogram disclosed no residual shunt or mass, while a brain magnetic resonance imaging (MRI) scan was abnormal, showing old cerebral infarcts despite the clinical absence of any focal neurological signs.

Discussion

The presence of a PFO may elude detection, as most PFOs are clinically silent. They have no hemodynamic effect and cardiac examination is normal, hence their presence is not recognized or suspected until other symptoms or events develop, suggesting right to left atrial shunts such as cryptogenic stroke or transient ischemic attack (TIA) in young patients due to paradoxical embolism, platypnea-orthodoxia, decompression illness, or migraine.^{1,2} Migraine headaches affect ~10% of the general population; in young women, this prevalence can be as high as 25%. Although other mechanisms may be responsible for migrainous episodes, recent studies provide a strong association between migraine and PFO, at least for patients with large atrial shunts that permit venous blood to bypass the lungs where vasoactive chemicals (like serotonin) and microemboli are filtered.²⁻⁷ Furthermore, individuals afflicted by migraine have an increased risk of abnormal MRI brain scans.⁷ Closure of atrial shunts has been shown to be effective in preventing recurrent cerebrovascular events in patients with cryptogenic stroke and cure or significantly improve migraine in recent, albeit nonrandomized, series.³⁻¹¹

Contrast echocardiography, either transthoracic and/or transesophageal, and/or a transcranial Doppler study have been used to confirm the diagnosis of a PFO with an atrial shunt.^{1,2} Often, while positioning and manipulating intracardiac electrode catheters during electrophysiologic studies and radiofrequency ablation procedures, the electrophysiologist may detect a PFO from catheter passage into the left atrium. In the case of a left heart ablation procedure, this is a welcome finding since it facilitates catheter passage and obviates the need for a transseptal puncture. In the present case, the accidental passage of the diagnostic catheter into the left atrium confirmed the presence of a PFO, but what followed was an unexpected development. When the patient was questioned about symptoms possibly related to an atrial shunt, she and her family confirmed a most interesting history, which she had not initially volunteered. She admitted to prolonged daily episodes of incapacitating migraine, while her family stated that the patient had sustained two recent transient episodes of disorientation, slurred speech, and amnesia, suggestive of transient global amnesia or cerebral TIA. These were all unrelated to the episodes of palpitations caused by her cardiac arrhythmia. She subsequently consented to PFO closure during the ablation session. This was then successfully accomplished with use of the Amplatzer device (Fig. 1) at the end of the ablation procedure, adding only an extra 15 min to the duration of the whole procedure. The PFO closure was performed with use of a simplified technique under fluoroscopic guidance without the use of transesophageal echocardiography. The follow-up of the patient, albeit short, was most rewarding since it apparently resulted in curing the patient's migraine. Although the effect of antithrombotic or anticoagulant therapy on migraine remains unknown, sustained relief of symptoms has been reported after discontinuation of such therapy in patients who have had PFO closure.⁴

Cryptogenic stroke accounts for approximately 40% of all ischemic strokes.^{8,9} In these patients there is increased prevalence of a PFO. The stroke/TIA recurrence rate remains high at 4–20% per year in patients treated medically with antiplatelet or anticoagulant therapy. Percutaneous PFO closure has been reported to decrease the combined stroke/TIA annual recurrence rate to <4%. Nonrandomized comparative studies of PFO closure indicate a stroke recurrence rate of 1.9 versus 5.4% with medical therapy;^{8,9} however, this important issue will only be settled when the results of ongoing randomized controlled studies become available (Table I).^{8,9} Similarly, in patients with migraine there is also an increased incidence of PFO, almost as high as that in young patients with cryptogenic stroke, suggesting a common biologic link.⁶ Percutaneous PFO closure has been shown in a large proportion of patients to ameliorate migraine attacks significantly (42%) or to abolish them completely (55%), suggesting further benefit in addition to a placebo effect.^{3-6,10,11} However, here again we rely on data that emanate from nonrandomized studies with their inherent disadvantages, considering the subjective nature of migraine headaches and significant risk of bias and confounding factors among such patients. Thus, we are in dire need of the results of ongoing randomized controlled studies

TABLE 1 Ongoing randomized controlled trials comparing percutaneous patent foramen ovale closure with anticoagulation in patients with cryptogenic stroke/transient ischemic attack or migraine

Trial (Place)	Cryptogenic stroke		
	No. of patients	Closure device	Results
PC-Trial (Global)	450	Amplatzer	2008
RESPECT PFO Trial (USA)	500	Amplatzer	?2008
PEPSIS (Germany)	600	Various devices	Trial stopped
CLOSURE I (USA & Canada)	1,600	StarFlex	?2009
CARDIA PFO Trial (USA)	300	Cardia PFO occluder	?2008
CLOSEUP (Global)	67	Premere	?2008
		Migraine	
MIST-1 (UK)	147	StarFlex	ACC Meeting 2006 ^a
MIST-2 (USA)	600	StarFlex	2007
ESCAPE (USA)	> 500	Premere	2007
FORMAT (Holland & Belgium)	?	Intrasept	?2007
PREMIUM (USA)	466	Amplatzer	2007

^a This trial finally randomized 147 patients with migraine to PFO closure with the StarFlex device (n = 74) or to a sham procedure (control group; n = 73). Preliminary results at 6 months showed no difference between groups in the primary endpoint of complete cessation of migraines (only 3 patients in each group had elimination of migraine). However, headache reduction by at least 50% occurred more frequently in the PFO closure group (42 vs. 23%, p = 0.038).

Abbreviations: ACC = American College of Cardiology, CARDIA = Coronary Artery Risk Development In young Adults, CLOSEUP = Closure Using Premere, CLOSURE = randomized trial comparing best medical therapy with the StarFlex Septal Closure System, ESCAPE = Effect of Septal Closure of Atrial PFO on Events of Migraine with Premere, FORMAT = Patent Foramen Ovale Closure to Reduce Migraine Attacks, MIST = Migraine Intervention with Starflex Technology, PC-Trial = percutaneous (PFO and Cryptogenic Embolism) Trial, PEPSIS = Paradoxical Embolism Prevention Study in Ischemic Stroke, PFO = patent foramen ovale, PREMIUM = Prospective Randomized Investigation to Evaluate Incidence of Headache Reduction In Subjects with Migraine & PFO Using the Amplatzer PFO Occluder Compared to Medical Management, RESPECT = Randomized Evaluation of Recurrent Stroke comparing PFO Closure to Established Current Standard of Care Treatment.

comparing PFO closure with medical therapy in patients with migraine (Table I).

To our knowledge, this is the first report of a percutaneous PFO closure performed during a procedure of radiofrequency ablation. It not only demonstrates that it is feasible for an electrophysiologist to perform such a procedure, but also that it behooves us to take seriously the information from the recent literature regarding the clinical significance of a PFO in patients scheduled for an ablation procedure. A detailed relevant history is of paramount importance and should be explored prior to the procedure. This could also lead to the availability of a preprocedural diagnosis via performance of contrast transesophageal echocardiography. Preprocedural diagnosis of a preexisting PFO would also facilitate better planning of the ablation procedure, as one may modify one's strategy in approaching left-sided ablation targets and/or consider anticoagulation or antithrombotic measures for right-sided procedures for fear of paradoxical embolism during the procedure. Finally, if a decision is made to have the PFO closed, this can be scheduled for after the ablation procedure, either during the same session, as in the present case, or at a future session.

Finally, this case illustrates how the incidental detection of a PFO during an electrophysiology procedure, not an uncommon finding, may no longer be considered an innocent, or even convenient, curiosity. This is especially true in view of the recent compelling data of the literature regarding the potential harm incurred by a PFO, at least in certain patients, particularly in the presence of associated high-risk abnormalities, such as atrial septal aneurysm or thrombophilia.¹² In such cases of

incidental PFO detection, a detailed history possibly followed by contrast echocardiography and/or transcranial Doppler study, or even a brain MRI scan, would be in order.

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