Transcatheter Closure of Patent Foramen Ovale during a Radiofrequency Ablation Procedure

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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.

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. 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, and the device was fully released by unscrewing the shaft. The position was rechecked with contrast injection. The patient tolerated the procedure well.
Contrast echocardiography, either transthoracic and/or transesophageal, and/or a transthoracic 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.

**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 paradoxic embolism, platypnea-orthodeoxia, decompression or transient ischemic attack (TIA) in young patients due to suggesting right to left atrial shunts such as cryptogenic stroke 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 paradoxic embolism, platypnea-orthodeoxia, decompression or transient ischemic attack (TIA) in young patients due to 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.

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![Image](78x571 to 246x710)

**Fig. 1** Left anterior oblique view with a cranial tilt showing the PFO occluder (Amplatzer device) in place. PFO = patent foramen ovale.
TABLE I Ongoing randomized controlled trials comparing percutaneous patent foramen ovale closure with anticoagulation in patients with cryptogenic stroke/transient ischemic attack or migraine

<table>
<thead>
<tr>
<th>Trial (Place)</th>
<th>No. of patients</th>
<th>Closure device</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC-Trial (Global)</td>
<td>450</td>
<td>Amplatzer</td>
<td>2008</td>
</tr>
<tr>
<td>RESPECT PFO Trial (USA)</td>
<td>500</td>
<td>Amplatzer</td>
<td>2008</td>
</tr>
<tr>
<td>PEPISIS (Germany)</td>
<td>600</td>
<td>Various devices</td>
<td>Trial stopped</td>
</tr>
<tr>
<td>CLOSURE I (USA &amp; Canada)</td>
<td>1,600</td>
<td>StarFlex</td>
<td>2009</td>
</tr>
<tr>
<td>CARDIA PFO Trial (USA)</td>
<td>300</td>
<td>Cardia PFO occluder</td>
<td>2008</td>
</tr>
<tr>
<td>CLOSEUP (Global)</td>
<td>67</td>
<td>Premere</td>
<td>2008</td>
</tr>
</tbody>
</table>

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, PEPISIS = 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, RE-SPECT = Randomized Evaluation of Recurrent Stroke comparing PFO Closure to Established Current Standard of Care Treatment.

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).

References

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12. Meier B: Patent foramen ovale, guilty but only as a gang member and for a lesser crime. J Am Coll Cardiol 2006;47:446–448