Title

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Journal

Proceedings of the UCLA Department of Medicine, 19(1)

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Publication Date

2015-08-27

CLINICAL VIGNETTE

To Close or Not to Close? Recurrent Neurologic Deficits in the Setting of a Patent Foramen Ovale and an Atrial Septal Aneurysm

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Abstract

Controversy exists regarding the optimal management of atrial septal abnormalities in the setting of transient neurologic deficits. While the relationship between stroke or TIA and migraine headaches with visual aura and patent foramen ovale has been previously investigated,[1-3] the presence of either in the setting of an atrial septal aneurysm has not been as well established. Our case illustrates the management of a patient who presented with a transient neurologic deficit and was found to have a patent foramen ovale associated with an atrial septal aneurysm with a right to left shunt. The patient was medically managed with thienopyridine therapy; however after suffering a second neurologic event, the decision was made to close her defect using a 25 mm Gore Helex Septal Occluder device. Six months after closure, the patient was free of any further recurrent neurologic events. Patients presenting with an atrial septal abnormality associated with an atrial septal aneurysm represent a higher risk subgroup and may preferentially benefit from defect closure versus medial therapy for transient neurologic events.

Background

Atrial septal aneurysms (ASA) are defined as mobile inter-atrial septal tissue in the region of the fossa ovalis with a cyclical respiratory excursion of greater than 10 mm into either the left or right atrium.[4] They are often accompanied by other congenital abnormalities, including patent foramen ovale (PFO), atrial septal defects (ASD), mitral or tricuspid prolapse, Marfan syndrome, sinus of valsalva aneurysms, and aortic dissection.[5] Previous studies have linked the presence of ASA with an increased incidence of cryptogenic stroke and atrial arrhythmias.[6,7] There remains a paucity of data supporting the optimal management of these patients.

Case Presentation

A 43-year-old woman with a past medical history significant for migraine headaches and two miscarriages presented to the emergency department with transient neurologic symptoms. She described acute onset numbness and weakness in her left hand that spread to her upper arm and resolved after several hours. She had no palpitations, confusion, headaches, visual deficits, or other neurologic symptoms during this episode, and she did not have any residual deficits. She also described increasing migraine headaches occurring once every two weeks over the past six months. She underwent a transthoracic echocardiogram that showed an ASA associated with a right-to-left shunt (Figure 1A). A transesophageal echocardiogram showed a PFO associated with the aneurysm (Figure 1B). A right heart catheterization showed evidence of a right-to-left shunt with a Qp:Qs ratio calculated to be 0.8 (Table 1), prompting medical management with clopidogrel on discharge. An outpatient 30-day event monitor did not reveal evidence of atrial arrhythmias.

Three months later, the patient presented to the emergency department with acute onset, severe right-sided headache, and right-sided facial numbness that resolved within two hours. Magnetic resonance imaging was not concerning for an acute stroke. The patient was subsequently discharged the following day with follow-up with both her stroke neurologist and cardiologist.

Due to the second presentation with acute, transient neurologic symptoms, a decision was made by both neurology and cardiology to move forward with closure of the PFO. As the patient described a previous nickel allergy, a Gore Helex Septal Occluder device was chosen for the closure with complete resolution of the aneurysm and the shunt on follow-up surface echocardiogram (Figure 2). At six months follow-up, the patient did not report recurrent neurologic events and has been migraine-free.

Discussion

Whether closing a PFO closure is effective in preventing recurrent neurologic events versus medical therapy remains controversial. Several recent studies and meta-analyses have shown clinical equipoise between the two treatment strategies. The recent publication of the RESPECT and PC Trial showed that closure of PFOs in patients with cryptogenic thromboembolism prevented subsequent adverse events by a per-protocol analysis but not by an intention-to treat analysis.[8,9] However, patients with atrial septal abnormalities in the setting of atrial septal aneurysms may represent a higher risk cohort. Additionally, the degree of atrial septal excursion may be a predictor of increased events as greater bowing of the septum may be related to a greater degree of shunting and increase the risk of stroke or recurrent neurologic events.

The French PFO/ASA study, a prospective, multi-center randomized trial, showed a four-fold increase in recurrent stroke associated with a PFO and ASA versus a PFO alone in patients treated with aspirin therapy.[10] In the Patent Foramen Ovale in Cryptogenic Stroke Study (PICSS), a prospective study randomizing patients with a cryptogenic stroke and PFO or ASA to warfarin or aspirin, patients with an ASA were more likely to have had a cryptogenic stroke, to have disability from their stroke, and less likely to have diabetes, hypertension, or sedentary lifestyle.[11] The RESPECT trial showed that closure of a PFO in the setting of an ASA was associated with a five-fold reduction in the primary endpoint of nonfatal ischemic stroke, fatal ischemic stroke, or early death (hazard ratio 0.19, 95% CI 0.04-0.87, p = 0.02).

Our patient also presented with a nickel allergy, influencing our choice of closure device. Nickel toxicity has been well described in patients undergoing interatrial shunt closure with the Amplatzer device due to its nitinol frame. Reddy[12] assessed outcomes in ninety-five consecutive patients undergoing percutaneous interatrial defect closure. Of those patients, six had skin-test positive nickel allergies. None of the nickel allergic patients treated with the Helex device developed allergic reactions, possibly due to the encasing of the Helex device in ePTFE material and electropolishing of the nitinol surface (imparting a titanium oxide passivation layer).[12]

The diagnosis of a patient presenting with a transient neurologic deficit can be challenging as TIAs are often clinically indistinguishable from a migraine with aura. Migraines associated with visual aura have also been identified in up to 50-60% of patients with right-to-left shunting.[13] Controversy exists regarding the optimal management of patients with transient neurologic events (whether they be TIA or migraine with aura) and inter-atrial abnormalities. We highlight a case of a patient presenting with recurrent neurologic events and a PFO with right-to-left shunt associated with an ASA. Subset analysis from existing clinical trials has shown that this subset of patients presents with a higher risk for recurrent stroke or TIA and preferentially benefit from percutaneous defect closure over medical therapy. We await the results of the PREMIUM trial, a large, randomized, controlled trial investigating whether percutaneous closure of PFO versus medical therapy can also lessen neurologic events secondary to migraine headaches.

Figures and Tables

Figure 1. Yellow double arrow outlining a 23 mm inter-atrial aneurysm with 14 mm excursion length marked by the red double arrow, and a positive bubble study representing right-to-left shunt (A). Color Doppler flow on transesophageal echocardiogram shows evidence of a patent foramen ovale (B). RV: Right Ventricle, LV: Left ventricle, RA: Right atrium, LA: Left atrium, IVC: Inferior vena cava, SVC: Superior vena cava.

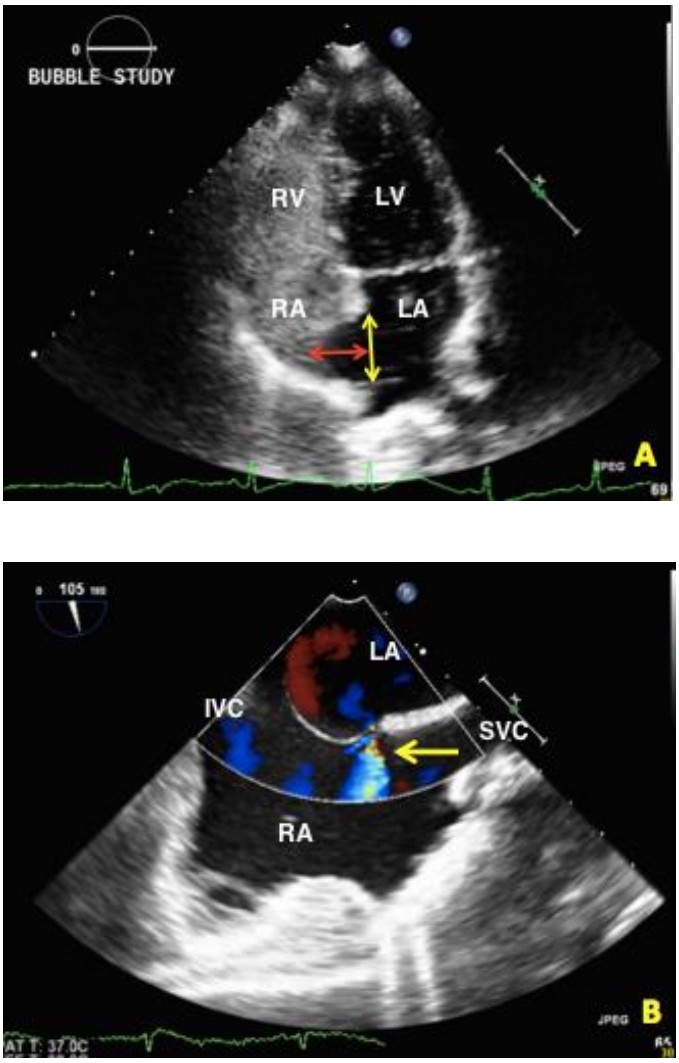
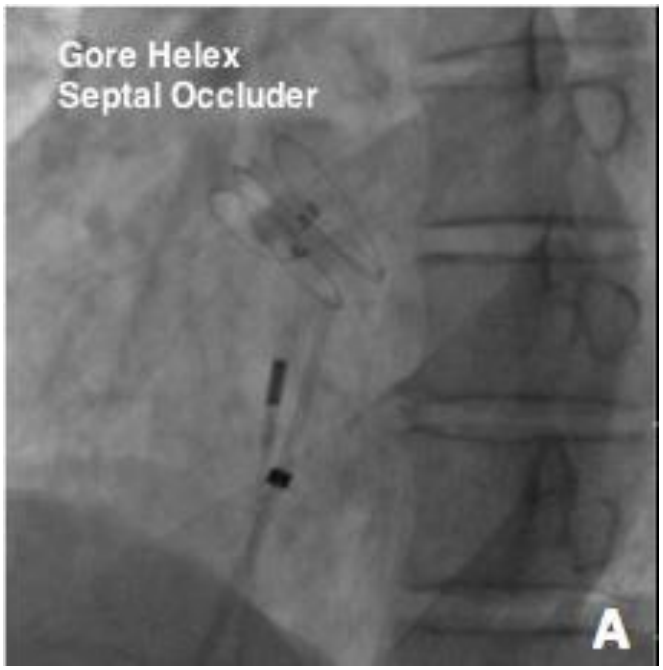


Figure 2. Fluoroscopic image showing 25mm Gore Helex Device after deployment (A). Transthoracic echocardiogram showing resolution of atrial septal aneurysm as well as right-to-left shunt. Red arrow points to the septal occluder device (B). RV: Right Ventricle, LV: Left ventricle, RA: Right atrium, LA: Left atrium.



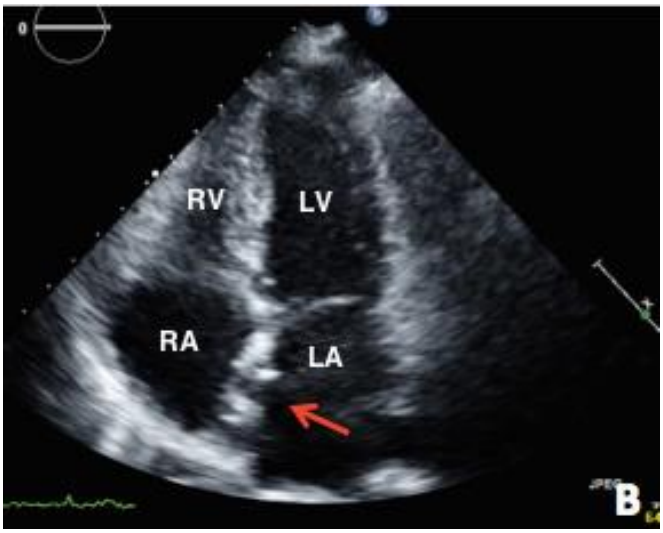


Table 1. Right heart catheterization.

	Peak Systolic (mm Hg)	End Diastolic (mm Hg)	Mean (mm Hg)
Right atrial			3
Right ventricular	29	1	3
Pulmonary arterial	22	5	12
Pulmonary arterial wedge pressure			5
Cardiac output (thermodilution/Fick) L/min			5.2/5.5
Pulmonary artery saturation			77%
Femoral artery saturation			98%
Left atrial saturation			99%
Qp:Qs			0.8

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Submitted August 27, 2015