CLINICAL VIGNETTE

Patent Foramen Ovale: A Common Cardiovascular Finding in The Adult Population

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Case Report

The patient is a 51-year-old male with a history of CVA in 2012, hyperlipidemia, and kidney stones who presented recently to establish as a new patient. He reports that in August 2012, he noticed some difficulties in speech associated with right arm clumsiness and headache. These symptoms resolved but a few hours later the symptoms recurred in association with visual symptoms including diplopia. He was eventually taken to the emergency room where an MRI noted a left temporal/occipital CVA. Work-up eventually revealed a patent foramen ovale on transesophageal echo with bubble study. He is being followed closely by a neurologist and cardiologist.

Past medical history includes:

1. CVA involving the temporal/occipital cortex. MRI/MRA of the head and neck were negative except for the CVA.
2. Patent foramen ovale measured at 6 mm in size. 24 hour holter monitor was negative.
3. Migraine
4. Kidney stones
5. Appendectomy

Medications include atorvastatin 20 mg daily, clopidogrel 75 mg daily. No known medication allergies other than GI intolerance to aspirin.

The patient is a non-smoking writer who drinks socially, averaging about 3-4 drinks per week.

Family history is significant for migraines and hyperlipidemia but no coronary artery disease or cancer.

His physical examination revealed a height of 5 foot 6 inches, weight 142 pounds, BP 110/60, pulse 76 and regular, and temperature 97.8 F. Physical exam was noncontributory with a normal neurological examination except for slight difficult with speech (difficulty finding words) and a normal cardiovascular examination.

Laboratory evaluation revealed a normal CBC, chemistries, thyroid function, and lipid panel. Hypercoagulability work-up was negative.

General Discussion and Epidemiology

A patent foramen ovale is a congenital opening between the right and left atria persisting after the age of 1 year and which can be associated with various conditions including paradoxical embolic strokes[1]. A PFO is present in approximately 10-15% of patients although it is much more common on autopsy studies where it can be found in 20-25% of patients[2]. Nearly 50% of patients with crytogenic strokes are noted to have a PFO on echocardiogram[3]. Males and females tend to have approximately equal risk of having a PFO[3]. PFO's were first described by Leonardi Botali in Italy in the 16th century whereas embolic events related to PFO's were first described three hundred years later[4]. Fortunately, most patients with patent foramen ovale's remain asymptomatic during their lifetime although there is an increased incidence of various conditions including CVA, TIA, and migraines[5]. There is also an increased incidence of fat embolism, right atrial tumors, and myocardial infarction[6].

Etiology and Pathophysiology

The foramen ovale is an opening between the atrial septa primum and the atrial septal secundum that has the appearance of a flap and usually closes by the age of two. Early in life, the foramen ovale serves a physiologic function but typically closes shortly after birth (most by age two) as normal pulmonary and circulatory pathways are established[7]. In some patients, the foramen ovale does not close properly and remains open and can facilitate right to left shunting of blood through the heart. Genetic and environmental factors appear to play a part in the pathogenesis of patent foramen ovale although genetics appears to be a significant factor in female patients[8]. The size of the PFO can increase over time

with the mean during the first decade of life being about 3.4 mm while the mean during the 10th decade being about 5.8 mm[1]. A patent foramen ovale, along with increased right atrial pressure, can predispose to clot formation and embolic strokes[9].

Clinical Symptoms

Most patients with PFO are asymptomatic although there is an increased incidence of migraines, embolic CVA, carcinoid syndrome, and MI. PFO's are also associated with other cardiac conditions such as atrial septal aneurisms, Chiari network, Ebstein anomaly, and Eustachian valve disorders[10,11]. Although migraines appear to be more common in patients with a patent foramen ovale, screening for PFO's is not recommended in the management of migraines[12]. PFO's are also an issue for scuba divers where air embolism through the patent foramen ovale can be problematic[13]. The risk is increased with increasing size of the PFO and if patients travel within 48 hours of scuba diving[13].

Diagnosis and Testing

Various methods can be used to detect a patent foramen ovale. Color flow Doppler imaging with a transthoracic echocardiogram can sometimes detect a small signal in the region of the atrial septum[14]. Transthoracic echocardiography, transesophageal echocardiography, transcranial Doppler, and transmitral Doppler have been used to diagnose PFO's usually in conjunction with agitated saline contrast[15]. This is often referred to as a "bubble test" where a bolus of injected saline is injected and appears in the left atrium as microbubbles within three cardiac cycles[15]. Transesophageal echo-cardiography (with or without contrast) can often provide an excellent visualization of the atrial septum and surrounding structures and is generally a more sensitive test than transthoracic echocardiography[15]. Transmitral Doppler appears to be an effective diagnostic tool although clinical experience is limited[16]. Transcranial Doppler also appears to be a useful test although experience is also limited[17]. Laboratory and EKG findings are usually normal in patients with an uncomplicated situations and patent foramen ovales do not usually cause a murmur. It is important to remember that patent foramen ovales are generally common so finding a PFO doesn't always prove a causal relationship to an embolic event. Imaging of the lower extremities should also be considered as part of the work-up for an embolic CVA especially in the context of a known PFO.

Treatment

Most patients with a patent foramen ovale without an associated event require no further medical or surgical treatment[9]. Patients with PFO's who suffer an otherwise unexplained cardiovascular or neurologic event are considered for antiplatelet therapy[18]. Warfarin is sometimes also used in high-risk patients with a goal international normalized ratio (INR) of 2-3[1]. Other cardiovascular risk factors (hyperlipidemia, hypertension, etc.) should be addressed and treated appropriately. Closure of the PFO is considered in patients whose course has been complicated by an associated event[19]. Typically this is considered for patients with a known PFO in the setting of a presumed embolic CVA, presumed coronary embolism, contraindications to medical management, posttraumatic fat embolism syndrome with cerebral embolism, and/or a concomitant hypercoagulability state[20]. PFO's can be closed either percutaneously or surgically[18]. Surgical closure is usually preferred if the PFO is larger than 2.5 cm, if percutaneous efforts have failed, or if the defect appears more amenable to surgical techniques[19]. Percutaneous repair typically requires at least six months of post-procedure anti-coagulation[20].

Clinical Course and Follow-Up

The patient has continued to do well on medical management with anti-platelet therapy and a statin. At the current time, he is considering surgical and percutaneous options.

Teaching Pearls

1. A patent foramen ovale is common in the general population being found in approximately 10-25% of patients.
2. PFO's are even more common in patients with cryptogenic strokes being found in approximately 50% of such patients.
3. Most patients with a PFO are asymptomatic.
4. Patients noted to have a cerebral ischemic event should be considered for PFO screening.
5. Screening is usually performed with transesophageal or transthoracic echocardiography with "bubble study".

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Submitted on July 30, 2013