

CASE REPORT

PATENT FORAMEN OVALE IN ELDERLY: A CADAVERIC CASE REPORT

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ABSTRACT: Patent foramen ovale is rare in elderly, over the age of 60 years. It is most common form of atrial septal defect. It is experiencing increased clinical interest as a congenital cardiac lesion persisting into adulthood. Knowledge about PFO is very important for its association with various congenital & other valvular heart diseases. In the view of these considerations we are presenting a case report of a patent foramen ovale with length of 1.2 cm in an elderly male cadaver approximately 72 years of age. The person had a normal built up and appeared emaciated. With no other anomalous findings in the heart, it appears that the foramen ovale was probe patent. The present finding belongs to ostium secundum type of PFO. This study will focus on elderly patients with sizeable PFO who do not have other major associated cardiac defects. In the aged a well-defined clinical picture is often present, and may be seen with minimal impairment of cardiac function and no significant cardiac symptoms.

KEYWORDS: Patent foramen ovale (PFO), Atrial septal defect (ASD), Congenital heart disease, Elderly.

INTRODUCTION: Atrial septal defect is one of the most common but least severe congenital heart disease in adult.¹ Congenital heart defects (CHDs) is estimated at 6–8% of live births.² PFO is a hemodynamically insignificant interatrial communication present in >25% of the adult population. Most common form of ASDs is ostium secundum type of PFO, occurs more frequently in females than in males and progressively declines with increasing age.³ There may be dominant inheritance⁴ and racial difference in the frequency of this lesion.⁵

PFO occur during fetal development of the heart. In fetal circulation, there is normally an opening between the two atria, to allow blood to bypass the lungs. This opening usually closes around the time of birth. If PFO persist, blood continues to flow from left to right atria. This is called a shunt. If too much blood moves to the right side of the heart, pressures in the lungs build up. The shunt can be reversed so that blood flows from right to left.

Hoffman et al suggested that an atrial left-to-right shunt resulting from an incompetent foramen ovale may exist in patients without heart disease for more than a year, with eventual closure of the communication. Anatomic patency may occur for several months and 50% of all infants have probe – PFO at the end of 1st year of life. In >25 % of all persons, probably anatomic closure never occur.⁶

When the person has no other congenital defect, symptoms may be absent, particularly in children. Symptoms may begin any time after birth through childhood. If left untreated, the ASD may lead to significant morbidity and mortality.⁷ A murmur heard during physical examination or imaging of the heart with Echocardiogram, Electrocardiogram, Doppler image, Cardiac catheterization, Chest x-ray and/ or MRI of the heart can indicate presence of such foramen ovale in absence of symptoms.⁸

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MATERIAL AND METHODS: Specimen of normal heart were procured from dissection hall during routine teaching of MBBS 1st year students in Department of Anatomy Chhattisgarh Institute of Medical Sciences. A formalin fixed male cadaver aged 72 years was dissected. The built of the cadaver was quite normal. The exact cause of death, medical & family history of the person is not clear, since the source of cadaver is unclaimed body.

We obtained a heart after opening the thoracic cage following classical incision & dissection procedure. We were surprised to see an abnormal foramen on the superior part of fossa ovalis, when interior of right atrium was opened for study. It was a patent foramen ovale (Fig. 1) The PFO was measured by using metal scale. Other chambers were also opened and studied. The procedure of handling of cadaver for teaching & learning were in accordance with ethical standards.

Fig. 1: Patent foramen ovale (PFO) at the upper part of atrial septum surrounded by limbus fossa ovalis.



Fig. 1

Fig. 2: Patent foramen ovale shown in heart of 72-years old male. Right atrium (RA) shows Patent foramen ovale (PFO) between limbus & valve (V) of fossa ovalis. SVC = superior vena cava; PT = pulmonary trunk; IVC = inferior vena cava.

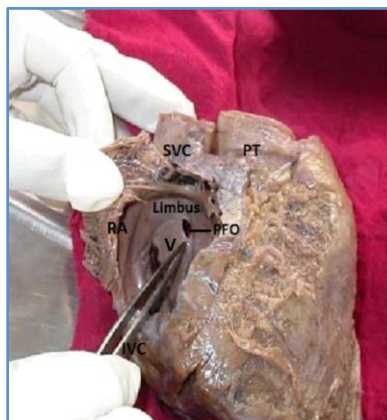


Fig. 2

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RESULTS: On examination of right atrium, the patent foramen ovale was found at the superior part of oval fossa with easy introduction of a probe across the atrial septum. It was a slit like aperture of 1.2 cm into the atrial septal wall surrounded by a rim of tissue, the limbus of the fossa ovalis. The said foramen was 2.3 cm from tricuspid valve, 2.9 cm from superior vena caval opening and 2.3 cm from inferior vena caval opening and 1.2 cm from coronary sinus opening (Fig-2). The maximum diameter of fossa ovalis were 1.1 cm vertically and 0.9 cm horizontally. On the left atrial surface, the foramen ovale resembled flap, 1.3 cm in length and was 1.6 cm from the mitral valve. Vertically the distance between superior and inferior vena caval opening within the right atrial chamber was 7.7 cm and the internal circumference of right atrium was 7.1 cm.

Excepting the patent foramen, the heart was natural. The heart weighed 310 gm was large, soft and lacerable. The maximum circumference was 12.3 cm at the level of coronary sulcus and vertical length was 12 cm from the base to the apex. The pulmonary trunk, pulmonary arteries and aorta had normal opening. The walls of the right ventricle being thinner than usual. The condition of tricuspid and mitral orifices were normal. The patterns of right and left coronary arteries were normal. Moreover, there were no any other anomalies noticed during dissection of other regions.

DISCUSSION: The less obvious diseases occurring in the aged are often overlooked in clinical practice and have been given little mention in medical literature. Incomplete closure of foramen ovale, "probe patency," is common (>25% of adult hearts) and may be regarded as a normal variant rather than an abnormality. The patent foramen ovale is a physiological orifice, which becomes pathological if persist into adulthood.⁹ Patients with a significant shunt experience symptoms over time with effort dyspnoea seen in over 75% of patients by the 5th decade. Complications may include the development of pulmonary hypertension, supraventricular arrhythmias (atrial fibrillation and atrial flutter) and right-sided heart failure from right ventricular volume overload.¹⁰ The increase in life expectancy makes the diagnosis of PFO a possible and easily manageable event in elderly patients.

To understand PFO, we should have basic knowledge about developmental anatomy and physiological changes in circulation taking place after birth. Foramen ovale is a slit like opening in the atrial septum at the site of foramen secundum of the septum primum. The septum secundum surrounds the foramen secundum in a crescentic shape and leaves a slit-like opening which is covered in a valve like manner by the free edge of septum primum. In the intrauterine life, foramen ovale has the important role of transmitting highly oxygenated inferior vena caval blood to the left atrium (LA). High right atrial (RA) pressure in fetal life keeps the valve of foramen ovale open. LA pressure rises shortly after birth and the flap is lightly pushed against the septum secundum and closes the foramen ovale functionally.¹¹ If it does not close, it is called a patent foramen ovale (PFO).

Patent foramen ovale (PFO) is known since the time of Galen. It was first described in 1564 by Italian surgeon Leonard Botali.¹² The patent foramen ovale is the most common form of ASD usually results from abnormal resorption of septum primum during the formation of foramen secundum.¹³ An atrial septal defect is an abnormal opening in the wall between the left and right atria of the heart.

If the hole is large enough, oxygen rich blood from the left atrium flows into the right atrium. This causes more work for the heart. ASDs can be located in different places on the atrial septum, and they can be different sizes. Mayo Clinic autopsy studies revealed that size of PFO increases from a mean of 3.4 mm in 1st decade to 5.8 mm in 10th decade of life, as the valve of fossa ovalis stretches with age. In addition, the prevalence decreased with age (34% in those aged 1-29 years, 25% in those

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30-79 years, and 20% in those aged 80 years or more).¹⁴ In present case report the size of PFO was 1.2 cm in a formalin fixed specimen.

Clinically four significant types of ASDs are described. The ostium secundum ASD accounts for 70% to 80% of all adult ASDs. Other less common forms of adult ASDs include ostium primum ASD (15% of ASDs), sinus venosus ASD (10% of ASDs), and the unroofed coronary sinus (<1% of ASDs).¹⁵

A secundum atrial septal defect is a true defect and the least severe, usually bordered by the edge of the fossa ovalis and the exposed circumference of ostium secundum.¹⁶ The shape of the defect varies from circular to oval. Less often, strands of tissue cross the defect creating a fenestrated appearance that suggests multiple defects. Rarely, a defect can extend posteriorly and inferiorly, approaching the site of inferior vena cava entrance into the right atrium.

Our finding in this study belongs to this type of defect and was slit like. Only Patent Foramen Ovale ie; Atrioseptal defect was observed otherwise rest of the heart was found to be normal. An ostium primum atrial septal defect (ASD), is located in the most anterior and inferior aspect of the atrial septum and often associated with trisomy 21. Coronary sinus atrial septal defects (ASDs) are defects located in the portion of the atrial septum that includes the coronary sinus orifice. They are characterized by the absence of at least a portion of the common wall that separates the coronary sinus and the left atrium. Coronary sinus defects are often associated with a persistent left superior vena cava (SVC) that drains into the coronary sinus; they may also be associated with complex congenital heart lesions.¹⁷

Patients with small shunts may live a normal life span. Large shunts cause disability by age 40 years. Raised pulmonary vascular resistance secondary to pulmonary hypertension rarely occurs in childhood or adult life in secundum defects but is more common in primum defects. After age 40 years, pulmonary hypertension, cardiac arrhythmias (especially atrial fibrillation), and heart failure may occur in secundum defects. Paradoxical systemic arterial embolization is a concern, especially in patients with pulmonary hypertension or venous thrombosis. Paradoxical embolism is an unusual cause of cerebrovascular incidents in the elderly.¹⁸

There are some typical conditions when PFO can worsen hypoxemia such as valvular PS, Ebstein anomaly, RV myocardial infarction, orthodeoxia platypnoea syndrome, chronic obstructive pulmonary diseases, pulmonary hypertension (primary or secondary).¹⁹⁻²² 3 factors which decide the complications arising from PFO are size of PFO, Pressure gradient between RA/LA and Direction of inferior vena cava blood flow.

In some cases of headache – migraine with aura, patient was found to have PFO also, and migraine improved on medical treatment in the form of antiplatelet and anticoagulant drugs or disappeared on the closure of PFO.²³ PFO can lead to fat embolism (Nysten, et al) and bilateral central retinal artery occlusion, thus leading to blindness. It can lead to recurrent stroke or TIA.²⁴ PFO is associated more with decompression sickness. PFO can worsen hypoxaemia in Scuba divers at great depths and can lead to deaths because of nitrogen gas embolism across PFO.²⁵

Recently and with increasing frequency, paradoxically septic embolism through a PFO has been correlated with brain abscesses and transcatheter PFO closure has been suggested as prevention for recurrent brain abscesses.²⁶ In most cases ASDs are diagnosed and treated successfully with few or no complications. Early diagnosis and treatment can help to prevent complication. There are no specific ECG features of PFO. TEE (Trans-esophageal Echo) is better than transthoracic echo in diagnosing PFO.²⁷ Cardiac catheterization can quantitate shunt across PFO.

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There are no risk factors for the development of PFO. It is mostly a benign condition and its incidental finding in asymptomatic patients requires no specific therapy. Moreover, in the elderly many other syndromes than paradoxical stroke mediated by PFO required full assessment. The management of PFO in aged patients should obligatory include the careful evaluation of potential co-morbidities and eventual contraindications, such as severe diastolic dysfunction due to for example to hypertensive cardiomyopathy and coronary heart disease, the main causes of diastolic dysfunction.²⁸

CONCLUSION: Patients with isolated atrial septal defects (ASD) have benefited from important recent advances in the diagnosis, evaluation, & management of their conditions. The study suggests that in an elderly many co-morbidities & severe diastolic dysfunctions mediated by PFO required full assessment to evaluated as therapeutic options in presence of anatomical & functional indications. More studies should be undertaken about unresolved issues to explain the reasons for prolong survival, as PFO is present in >25 % of normal adult population.

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