Cadaveric study of fossa ovalis

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INTRODUCTION

The interatrial septum of heart presents the fossa ovale, an oval depression above and to the left of the orifice of the inferior vena cava. Its floor is formed by primary atrial septum (septum primum). The prominent rim of the fossa represents the edge of the septum secundum known as limbus fossa ovalis, in reality it is merely the infolded walls of the atrial chambers. It is most distinct above and in front of the fossa, and is usually deficient inferiorly. A small slit is sometimes found at the upper margin of the fossa, ascending beneath the rim to communicate with the left atrium. This represents failure of obliteration of the foramen ovale, which remains patent in up to one-third of all normal hearts [1].

Congenital heart defects are estimated at 6–8% of live births [1]. Atrial septal defect is one of the most common but least severe congenital heart disease in adult [2]. Most common form of atrial septal defect is ostium secundum type of patent foramen ovale, occurs more frequently in females and progressively declines with increasing age [3]. There may be dominant inheritance and racial difference in the frequency of this lesion [4, 5].

MATERIAL AND METHOD

This cross sectional study was conducted on 40 cadavers with age range of 60 to 80 years at the dissection laboratory. Prior permission of Heads of Anatomy department was obtained for the study.

The cadavers were embalmed through carotid arterial perfusion or femoral arterial perfusion with formaldehyde solution, spirit, water, glycerine, phenol crystal and eosin and then preserved in weak formalin solution before dissection.

Standard dissection method was employed for this study. Costal cartilages on both sides of sternum were cut. Anterior thoracic wall with sternum, costal cartilage and structures of intercostal spaces were removed and thoracic cavity open up. Heart was removed by cutting fibrous pericardium and all major vessels which were opening or coming out of chambers of heart. Right atrium was opened from lateral border at sulcus terminalis and then fossa ovalis was observed.

RESULT

Out of the 40 hearts studied the fossa ovalis occupied the middle of the interatrial wall in 23, displaced to the mouth of the inferior caval vein in 13 and displaced towards the mouth of the superior caval vein in 04. In 33 hearts the fossa was oval and in 07 hearts the fossa was round.

The floor of the foramen ovale was very thick and muscular in 19, moderately thick in 13 and thin in 08. Two foramen ovale had fenestrated floors (fig 1) and in both the cases the defect found to open posteriorly towards the back of the atria.

The shape of the rims of the fossa also varied as shown in Fig, 2, 3 & 4. The rim was well marked all around the fossa in 18 hearts. It was well marked anterosuperiorly and flat posteroinferior border in 17. In 05 hearts the border was flat without any obvious rim.

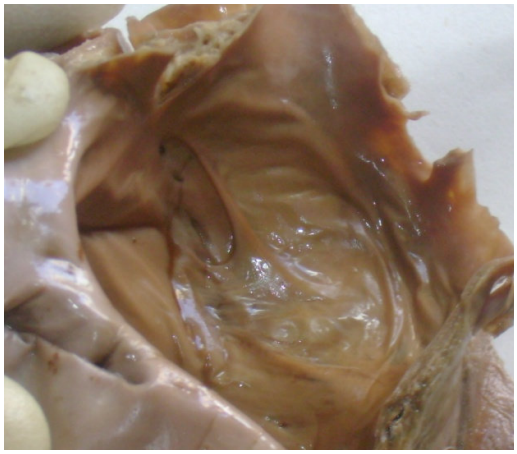

Fig. 1 - Fenestrated floor of fossa ovalis

Fig.2 Rim well delineated all around the fossa

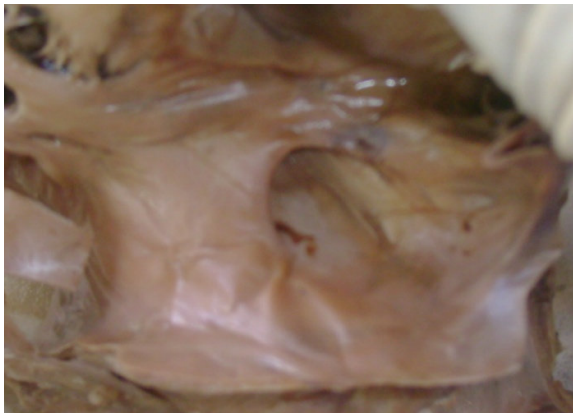

Fig.3 Rim well delineated anterosuperiorly and flat posteroinferior border

Fig. 4 -All the border was flat without any obvious rim

DISCUSSION

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[6]. 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 [7].

Interventional cardiology has made it possible to close atrial septal defects in selected patients with devices inserted through catheters. A better understanding of the types of defects in the oval fossa that would be suitable for closure and those in which such attempted

closure may be contra-indicated, depends on a full understanding of the anatomy of the oval fossa and the surrounding tissue. While others have examined the anatomy of the rim of the oval fossa and also its proximity to vital structures within the atria, the anatomical variability of these structures has rarely been considered [8,9]. We carefully examined 40 heart specimens and noted the shape and variability of deficiencies of the oval fossa in each. From the right atrial aspect the atrial wall extends from the superior and inferior vena caval orifice to the attachment of the septal leaflet of the tricuspid valve. Within this extensive area only the oval fossa and its immediate rims separate the cavities of the two atrial chambers. Any hole outside this area is not, by definition, an atrial septal defect but rather an interatrial communication [10].

The results of our study suggest that the some anatomical arrangements are not amenable to transcatheter repair. The location of the oval fossa was grossly abnormal, situated directly in front of the mouth of the inferior caval vein. Not only would this position make it difficult to distinguish the defect from an interatrial communication of the inferior sinus venosus type, but such holes would also be difficult to close without impeding flow from the inferior caval vein. In these cases, the posteroinferior rim may be too small to anchor the device satisfactorily without leaving a residual shunt. This was also true for the specimens in which the oval fossa was situated adjacent to the entrance of the superior caval vein. Some studies have highlighted inadequacy of a muscular rim around the defect as a cause of embolisation of the device [09].

Clinical experience has shown that the diameter of the device used for attempted closure must be 10 to 15 mm greater than the area of the septal deficiency [11] or at least 1 -6 times the diameter of the defect as determined by sizing with balloons at catheterisation. Apart from the major considerations discussed above, other minor impediments can prevent successful closure by a transcatheter technique. Thus the size, thickness, and proximity of the septal insertion of the Eustachian valve may cause it to be "caught" by a device. We noted that the very thin floors of the oval fossa could have been torn by traction on the sheath.

CONCLUSION

Patients with isolated atrial septal defects (ASD) have benefited from important recent advances in the diagnosis, evaluation, & management of their conditions. More studies are necessary to address several unresolved issues related to patent foramen ovale for benefit of patients.

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