Mobile interatrial septum definition

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The salient features of the anatomical variations seen in adults undergoing transcatheter closure has been summarized and used to produce a practical list of pre-procedural control. It is known that the patent foramen ovale (PFO) occurs with greater prevalence in those with the blow crittogenico.1 3 This association is more pronounced in giovane.4 These observations support the role of a PFO as a channel for the embolism paradoxically, a mechanism for cerebral ischemic events. Transcatheter closure of PFO is shown in this setting, which is not found any other cause including cardiovascular risk factors and it is thought that a PFO is a likely contribution. This technique is associated with a high success rate, a low rate of procedural complications and hospital stay, and excellent results on the follow-up long-termine.5 - 7th Prerequisite of procedural success is achieving complete closure of the shunt. Studies have shown a degree of closure of variable shunt successful in the intermediate term to longer, ranging from 865-100% 73.6 78.8 .7 However, the cause of the residual shunt is not clear from the literature. A higher incidence of post-residual vector step has been reported in those with concomitant aneurysm Atrial Septal Aneurysm.9,10 that we've reported before on the morphological characteristics of the PFO, 11 but there are no publications on detailed evaluations of of the post-implant device. In our experience, residual shunts are usually the result of a mismatch between the shape of the device and the PFO anatomy. Echocardiography transonalefageo three-dimensional (3D Tee) has revolutionized our ability to understand the anatomy of the atrial septum and the PFO morphology in real time. In this article, we examine the characteristics of the PFO and their surrounding structures transonalesofagea three-dimensional view from echocardiography in patients undergoing transcatheter closure and refer to these variations of the morphology of anatomical specimens for a better appreciation of their suitability for devices of closure. Anatomy atrial septal and patent foramen ovale PFO is the persistence of fetal interatrice notified in the ostium secundum embryo. In fetal life, the blood of the inferior vena cavalluce is directed preferentially to the foramen ovale from the eustachian valve. The septum primum (primary septum), which forms the floor of the oval fossa is like a flap which is large enough to overlap the edge (or limbus) formed by the septum of the septum (secondary septum). The latter is one of the atrial wall pane on the right atrial side that gives to the pit a raised margin. Therefore, the right atrial septal aspect is characterized by the edge, Missing on the left atrial side (Figure 1). The overlap of the flap against the circle allows the oval of the foramen to the birth to the rise of the left atrial pressure. Shortly thereafter, there is grip of the flap valve at the edge and usually accession is complete within the first year of life with consequent total obliteration of fetal communication. Though, though, though, gap, the PFO, persists in the antero-superior to 25 bis 35% margin of hearts examined in autopsy.12 routine © Because of the flapper valve is greater than the pit, the length of the overlap can be considerable, resulting in a tunnel- as PFO, especially if the channel width is narrow (figure 1). Our small series of cardiac samples showed a length of 1 to 6 mm and 13 mm widths 5A along the curve of the rim.11 Taking the PFO be of tunnel configuration, the right atrial input is bounded by the Circle of anterosuperior 'company of the pit, which is the muscle crease while the rear edge is the thin and flexible flap valve. His left atrial entrance is marked by the growing edge of the halyard Primum embryonic septum. The opening is located near the antero-superior wall of the left atrium (Figure 1b). This proximity should be kept in mind, especially when you try to negotiate a catheter through a long and narrow tunnel which, moreover, could be meander. The risk to get out of the heart is particularly relevant because © this part of the atrial wall can be exceptionally sottile.13,14 Open in New TabDownload Lodownload Slidelong Tunnel Tunnel Patment Foramen Ovale. (A) and (b) are views of the right atrial and left aspect of the septum of the same heart showing a patent foramen oval (open arrow). The right atrial aspect is characterized by muscle edge (black arrows), while the left atrial aspect is flat with an opening closcenziale (between asterisks). The Eustachian valve (EV), the Eustachian ridge (ER) and the mound aortic (AM) are right atrium features. The broken line corresponds to the muscular border around the fossa on the right atrial side. (C) Image of three-dimensional echocardiography transinoesofofageo left atrium showing a enface view of the atrial septum. The asterisks show the oval opening of the patent forage into the left atrium. Red arrow shows the course of foramen ovale tunnel starting from the upper face of the fossa ovalis (FO) looking right atrial and running upwards and the opening in the roof of the left atrium. (D) This cross-sectional view of the tunnel of the patent foramen ovale shows atrial septum (red arrow) passing between the folding (triangle) of the right atrial wall (septum secundum) and the flap valve of the pit (septum primum). MV, mitral valve; RUPV, right superior pulmonary vein; TV, tricuspid valve. For general approach to Atrial septal seen looking right atrial septum appears large at first glance. In fact, the true septum is the oval pit floor and his muscular rim note immediato.15 to the interventionist is the large front margin, which includes the aortic mound above the aortic root on the side epicardico.16 The dimensions and Della Fossa position Ovalis varies from heart cuore.17 also rivenenza his circle varies. A mixing flat edge with the flap pit occurs in almost 20% of cuori.18 The flap valve is usually a fibro-muscular thin sheet, 0.5 Ã ¢ â ¬ "1.5 mm thick, rather tense against the margin of the pit. Occasionally, there are one or more fenestri in the flap. it is the septum primum deficiencies or oval pit defects, rather than the so-called defects of the septum of the septum secondum. the entire flap may also be redundant and aneurysm with a tendency to be associated with a large pit. the edge invatto epicardiali is full of fat for different thicknesses. in young adults â â upper limit of normal fat storage is defined as 1 , 5 cm in transverse dimension, not to be mistaken for hypertrophy of the septum lipomatosa.19 the orifice of the inferior vena cavalluce is situated inferiorly and posteriorly with respect to the pit. it is guarded by the Eustachian valve, which usually is Like a growing flap of variable heights. The medial insertion of the Eustacho valve towards the cardiac septum is for the ridge of Eustachio (sinus septum) which, in turn, continues to the prior-lower edge of the pit. So, it is conceivable that an eustachio of a prominent prominent flap and the ridge can guideflow toward the foramen ovale. In approximately 2% of hearts, the Eustachian valve is large and windowed. Rarely, it is a vast network Chiari. Although not easily viewed on imaging, the network can be caught during the catheter maneuvers. PFO anatomy important assessment considerations for closing the device description of the anatomy is necessary so that a clear perception of the defect is then possible. This will allow the operator to understand how the defect will be or is likely to behave once the closure device percutaneous is distributed through it. There are different types of devices available and each has its own range of formats (including AmplatzerÂ ® PFO Occluder (AGA Medical Corporation), HelixÃ ® septal occluder (WL Gore and Associates, Inc.), BioSTARÃ ® (NMT Medical, Inc.), Solysafe deviceÃ ® (SwissimplantÃ ®) and closing system ¢ Â ¢ Press a PFO (St Judes)). The aim is to achieve complete closure of the defect so that no right to remain maneuver left. The complexity of the anatomy PFO can result in a position of the device which in fact determines the â â defect to remain patent and shunt may even be greater prior to placement of the device. If the first anatomical description can be understood precisely, it is our belief that such a failure procedure could be detailed avoided.A PFO evaluation is performed with transesophageal echocardiography.20 This evaluation is crucial for deciding the suitability of the defect for the closure device. As our clinical experience in imaging PFO and atrial septal 3D TEE grows, previous indefinite anatomical variations become apparent. In fact, real-time 3D TEE has brought with self © a new era, in which, in life, with a heart that beats full of blood are appreciated the reality of the atrial septum and its neighboring structures. As what affects the shape of the defect and issues surrounding its closure, with a percutaneous device, it becomes evident, in a manner not previously appreciated. So, what is needed now is a detailed understanding of the variation in the types of anatomy. This is best achieved by categorizing these differences. The types of possible defects can be broadly grouped into simple and complex. A simple PFO usually can be closed with the majority of standard devices. Essentially a PFO falls into this group by excluding specific characteristics which, if present, are considered Complexa Ã ¢ and require special consideration of the most suitable type and size of the device required to obtain a long-term closure. TableA 1 summarizes these characteristics. TableA 1Categories of patent foramen ovale category PFO anatomical features .A .A 1. anatomy SimpleA standard, ie none of the belowÃ 2. length of Complexa long tunnel (A Ã ¥ 8 mm) A multiple openings in the left atrial septal atriumÃ Aneurysma hybrid defectÃ Thick secondary septum (Ã ¥ 10 mm) valve Ã ridgeÃ Eustachio Eustachio or Chiari NetworkA Define the morphological phenotypes in the context of fitness simple PFO closing device This is a standard length of the PFO 8 mm Length of a PFO tunnel, if greater than or equal to 8 mm usually causes a device with a short life (ie Most device types) to sit in the partially deployed defect. This is the case in particular if the tunnel is tight as well as being long. Even when the tunnel is wide but with relatively rigid margins, ie the primary septum (septum primum) of the ovalis pit is not aneurismatic, so its length becomes important in choosing the device device For Ã ¢ â ¬ Å neurysmalÃ ¢ â ¬ â ¢ mean a thin fabric, excessively mobile, and redundant where the valve can be superimposed fabric Ã ¢ â ¬ Ã Å "up", then not necessarily causing this problem. Open in new tabDownload slipidetimenti of a patent foramen oval. Picture of three-dimensional echocardiography transonalesofagea QLab using 3D software, Philips Healthcare (right panel, D1 "3). D1, Opening of the oval patents vertex in the left atrium, 10 mm. D2, Opening of the Patent Foramen oval appearance of the right atrium, located higher in the appearance of Fossa Ovalis, 9 mm. D3, length of the PFO tunnel, 11 mm. Most of PFO openings on the left atrial side we observed a number of PFO, which have more openings (of PFO) in the left atrium. This is created by a wire fabric of the main septum which is Ã ¢ â ¬ Ã ustuck Down â ¢ â ¢ (or tethered) to the secondary septum to the point of its opening into the left atrium, causing two separate orifices (figure 3). The morphology is not easily appreciated on imaging 2D TEE. It becomes relevant if it must be ensured that both the orifices have been covered by a device placed through one of the openings and the defect (s) is completely sealed. Open in New TabDownload SLIDEDUCKOUCE ORAFICE BRETAMENT TARAMEN OVAL. (A) view three-dimensional echocardiography transonalefagea the atrial septum from the left atrium. There are two openings of the patent foramen ovale into the left atrium, delineated by the dotted black line. The main septum (septum primum) is attached to the secondary septum (settum secindum) in the middle of the opening of the patented oval foramen on the left atrial side creating two orifices. The red lines represent the passage of two separate Guali, each passing through the two orifices. The location of the oval fossa on the right atrial side is shown by the dashed white line. (B) a cardiac specimen with the corresponding oval morphology of the patented foramen displayed in the same orientation. MV, mitral valve and rupv, right superior pulmonary valve. Aneurysm of the atrial septum The Aneurysm of the atrial septum is essentially a description of the size and mobility of the fossa ovalis fabric, ie the main septum. This mobility is arbitrarily been described in the literature as an oscillation of the septum in both directions from the midline of> 10 mm, by means of ecocardiografia.21 This description can be further refined by describing the aneurysm margins. This usually involves the description of the fabric proportion occupied dall'ovali pit as a percentage of the entire atrial septum. The purpose is to create an understanding of the fragility of the septum at the time of placement of a device, and then the risk of movement of the device, ie the amount of available Ã ¢ â ¬ Å MIMS "to securely anchor the device. This information helps to decide the size of the device to be used. the term defect Hybrid Ã ¢ â ¬ Å Herybrid DefectÃ Â »is used herein to describe the occurrence of a PFO with concomitant additional defects on Ovalis pit. They can be in the form of smaller discrete defects or defects either single or multiple (figure 4). They can occur anywhere within the fossa ovalis. Identify this type of anatomy becomes extremely relevant in setting the presumed paradoxical embolism. All defects must be included within the device cover (s). Otherwise, it may remain a clinically significant shunt. Open in new defect Skinybrid TabDownload. (A) ECOC ardiografia transoesofagea Enface three-dimensional view of the atrial septum seen from the left atrium and (b) two-dimensional image transonalefagea echocardiography. The Ovalis Fossa (bordered by white line) has woven redundant aneuriale, a guide wire (dotted red arrow) is entered Left through a small fenestration, of which there are several, in the ovalis pit. A PFO is also present, its opening in the left atrium is bordered in (a) from the dotted black line and in (b) from white arrows. (C) This left atrial aspect of an aneurysmatic pit valve shows the PFO opening (black arrow) and another defect (red arrow). LA LA, lobby; MV, mitral valve; RA, fair atrium. Excessive thickening of the secondary septum (SECTUM secindum) The thickness of the secondary septum (little isolated fabric) varies between individuals. The degree of thickness is due to the quantity of extra-heart tissue, usually the adipose tissue contained inside this tight tissue (figure 5). This has an important bearing on how a device can sit through a PFO. The disks of a device may not be able to sit flush against the ovalis pit if the surrounding secondary septum is excessively bulky. In our experience a thickness of 10 mm or more can cause problems with the position of the device. Usually a small size or more soft device is considered. The softer type device, such as BiostarÂ® (NMT Medical, Inc.) is able to comply with the change in the septum shape from the subtle flap valve to the excessively bulky secondary septum. Open in the new Slidethick secondary septum tab. (A) The image of two-dimensional transoxophageal echocardiography shows a thickened secondary septum (SS), measuring 11 mm. (B) A heart section in similar orientation shows the fatty tissues that fills the ss pane. Fo, ovalis fosse; The left atrium; RA, fair atrium. Presence of a crest of Eustachio more and more, is recognized that the presence of a large cummer crest of Eustachi (ER) can be problems with the positioning of the device (Figure 6). This ridge limits the space available on pit ovals on the right atrial side and can cause sitting a PFO device away from ditch ovalism. The disc can rest on the oustache crest and the outcome of the PFO tunnel that is kept open and a remaining residual shunt. Furthermore, the primary septum attachment on the left atrial side can be under tension (alleged to be the result of the period that pulls the atrial septum septum) such that is held away from the secondary septum with a persistently opened PFO. It is necessary a very careful assessment on the 4D teegeeging tee if 3D Tee is not available. In our experience it is necessary to accurately evaluate the way this structure will have an impact on the choice and size of the device. Open in New TabDownload SlideEustachian Ridge. (A) Image of three-dimensional transonefagee echocardiography, atrial septum view seen from the right atrium. A large creek of Eustachi (ER, Black Dopd Line) is seen to extend from the IVC or emitry and go to the upper aspect of the Ovalis fosse (FO). Fo is bordered by the white line. The dotted white line shows the rest of the fo that is hidden behind the emergency room. (B) A tilted heart specimen in comparable orientation shows the continuation of the ER in the edge of the fo. In this heart there are depressions between the FO and the ER. (C) image of three-dimensional transonefagee echocardiography, left atrial septic view. The red dotted line delimits the opening of the PFO. The red asterisk shows the concave recess formed by tension on the septum by ER. (D) Image of three-dimensional transonium echocardiography, dotted red line shows the pfo opening from above, directly examining the PFO from the left atrium. CS, coronary breast orifice; AO, Aorta; SVC, Superior Vena Cava; RA, fair atrium; MV, mitral valve; Rupv, upper right pulmonary vein; PS, primary septum. Presence of Eustacho valve (or clear network) The redundant fabric may stick to the crest of Eustachio and protect the lower orifice vein Cava (IVC). This valve Eustachio has the potential to interfere with the positioning of the device. Passing guide could be difficult. The Eustachio valve can be captured in the device during distribution and this could interfere with the of the device or represent an embolic risk if drawn through the septum in the left atrium. A clear network, although rare, usually is broader and will present similar concerns. Pre-procedural checklist The practical approach to describe the characteristics of the atrial septum for the suitability when closing the device is suggested below, see also figure 2. Essentially we propose a pre-procedural checklist. Input measurements (right atrium) Right) Output (left atrium) of the PFO and its tunnel length can be performed with extreme precision using real-time 3D tee image data sets. The software is available online (QLAB 3DQ, Philips Healthcare), which allows rapid analysis of 3D data sets. If the aneurysmatic atrial septum therefore any measurements made of the length of the PFO tunnel and openings (left and right) may not be sufficient alone. Some operators prefer the defect balloon size at the time of closure. Dimensions of the left atrial opening (performed with 3D Tee, see figures, 2) .Size of the right atrial opening (performed with 3D Tee, see figures, 2) .total length of the PFO tunnel, from right to left atrial opening (see Figures, 2) .Presence of other defects, usually within the pit openings Ovalis.multiple of the PFO in the left Atrium.astrial septum aneurysm, mobilization and margins.thickness of the secondary septum (septed secundum) crest .Eustachian, amplitude, and location valve .Eustachian (or clear network) Presence, extension and location. Conclusion We presented a new approach to characterize PFO morphology, which combines 3D imaging with anatomical finds. To achieve successful procedure with PFO closure Complete understanding of the PFO fault form is necessary to be part of how a particular device will be implemented once. The salient features of the anatomical variations seen in adults underguarding transcateter device have been summarized and used to produce a practical pre-procedural checklist.conflist of interest: none declared. 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