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INTERVENTIONS FOR VALVULAR DISEASE AND HEART FAILURE

Intracardiac ultrasound-guided endovascular ASD closure

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AIMS
Transthoracal echocardiography has disadvantages, such as an insufficient vision. Transoesophageal echocardiography is an option, but has limitations too. The aim is to evaluate the benefits of intracardiac echo guidance in closure procedures.

METHODS AND RESULTS
Procedures were performed in the Philips Allura cathlab with a local or general anaesthesia, depending on age. To perform an intracadiac ultrasound guidance we used the iLab device by Boston Scientific and the "ULTRA-ICE" probe in 29 patients, including 4 males. The average age was 14.6±9.6 years old.

Two planes of the fossa ovals are necessary to select the appropriate occluder device. The first plane was taken when the probe enters the superior vena cava and was directed down manually, scanning the cardiac structure. The optimal movement speed is 0.2–0.5 cm per second. Most cardiac structures, including valves, can be analysed in the axial views: great vessels, superior vena cava, right atrium, aortic valve, cavotricuspid isthmus. Two specific landmarks are: 1) the crista terminalis, a thick structure located at the junction between the posterior smooth part and the anterolateral trabeculated portion of the RA; 2) the right atrial appendage which is a nose-like structure.

The second plane, the long-axis view, was obtained with a 55° precurved introducer sheath advanced up to the septal defect and turned posterior and leftward, to longitudinally scan the atrial septum. On this plane, it is possible to visualise the both atria, both atrial auricles, tricuspid and mitral valves. Moreover, the atrial septum is longitudinally scanned and the fossa ovalis with its inferior–anterior and superior–posterior rims can be well estimated.

The systolic and diastolic longitudinal atrial septal diameters, the dimensions of the defect and the fossa ovalis, the fossa ovalis distances to the inlet of the inferior vena cava (postero-inferior rim) as well as the coronary sinus or atrioventricular junction (antero-inferior rim) have been measured accurately. The occluder size can be calculated by Onorato formula, were size of the device is square root of multiplied two “muscular to muscular” defect sizes in planes defined above. Device sizes were 9 to 24 mm with mean 17.9±6.1.

The iLab internal software allows adjusting virtually occluder size to the septum. After this check was performed the final stage of the occluder implantation was made. Device stability verification with the pull and push test was done under intracardiac ultrasound. In these specific views it is easy and less dependent of other imaging doctor presence.

No complications occurred in the early postoperative period. Patients were in good clinical conditions and 6 months follow-up showed the absence of residual shunting through the atrial septum in most all cases. One patient with multiple defects had 4 mm residual shunt. No major complications (death, device embolization or need for surgery) occurred.

CONCLUSIONS
Intracardiac guidance has benefits such as: 1. Appropriate selection of the device type and size and possible without balloon sizing; 2. Optimal monitoring of device deployment, because of its ability to provide 360° view from inside; 3. Procedure can be performed with local anaesthesia with minimum

patient’s discomfort for a relatively prolonged time period; 4. It is easy to use technique by the single interventional cardiologist, who have possibility to perform the closure the ASD and navigation by himself; 5. Learning curve is 15 procedures.