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## CLOSURE OF CARDIAC SEPTAL DEFECTS BY MEANS OF VARIOUS ENDOVASCULAR DEVICES

**Abstract.** The endovascular technique of closing interventricular and interatrial septal defects by means of Amplatzer system was studied. The aim was to study the methods of diagnosing the septal defects. To date, in more than 90% of patients, the defect of the interatrial septum may be eliminated by endovascular surgery. At the same time there are some contraindications. These are huge defects without edges, which makes it impossible to fix an occlude reliably, other heart anomalies in the patient (often an abnormal drainage of one or more pulmonary veins) requiring a surgical correction.

**Keywords:** congenital heart defect, children, occluder.

**Introduction.** Interventricular defect is the most common heart failure. According to various authors, it is found in 15-25% of children with heart defects, or in three children per 1000 births. The defect of the interatrial septum occurs in 8% of cases in the range of congenital heart disease [1-4].

**Objective** was to study the endovascular technique of closing interventricular and interatrial septal defects by means of Amplatzer system. To study the methods of diagnosing the septal defects.

**Materials and methods.** An occluder of Amplatzer system looks like a patch. «The patch» has two interconnected wire disks made of nickel-titanium alloy. This alloy does not react with blood and is not rejected by the body. The wire disks are covered with dacryon fiber from the inside, which is widely used to sew the defects of IAS (interatrial septums) in classical operations on the heart and takes roots well in the body. Both discs are connected by a "neck", which automatically centers the "patch" in the septum. The mechanical properties of the wire base allow "to pack" it into a catheter with a diameter of 2.5 mm.

In this case, the material from which the occluder is made has a "memory", that is, after being pulled out of the catheter "the patch" takes the form that it was given during its production (fig. 1). Endovascular intervention is performed under X-ray conditions. Before the operation of the endovascular closure of the defect of the interatrial septum, all patients undergo a transesophageal ultrasound test of the heart (ultrasound scan). Such an ultrasound test gives complete information on the anatomy of the defect. The first in the world endovascular operation of a patient with DIAS (defect of interatrial septum) using the Amplatzer system was performed in the cardiology center of the children's university clinic in Bratislava by Professor K. Amplatzer, and associate professor J. Mashur in september 1995. To date, more than 300,000 implantations of the Amplatzer system have been developed in cardiology centers around the world with a size of the secondary DIAS from 6 to 36 mm and with 0.02% of complications. Treatment of DIAS with this system is carried out in 48 countries, including Ukraine.

**Discussion.** During the operation, a balloon is

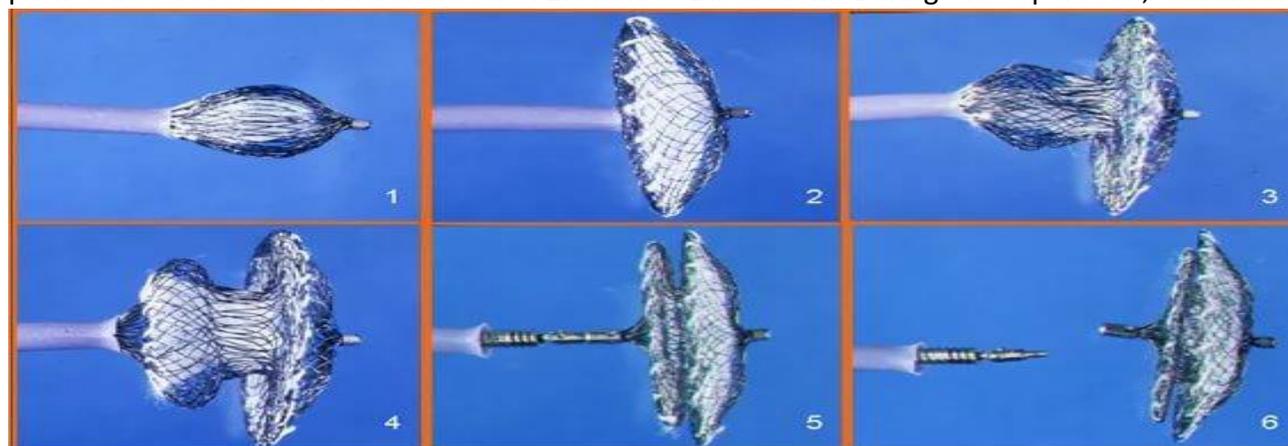


Fig. 1. Amplatzer system

introduced through the patient's femoral vein to measure the size of the defect and then a special delivery catheter, which is later introduced into the left atrium (LA) through the hole in the IAS (fig. 2). After that the Amplatzer system is introduced through the catheter. In the course of the operation, after the introduction of the catheter into the LA, the left part of the "patch" is disengaged from it and tightened to the septum so that it covers the opening. After that, the catheter is pulled back and already in the right atrium, free the right part of the "patch" (fig. 3a). Each of the disks comes to be on the opposite side of the IAS, thus closing the hole on both sides. Then, the correct installation is controlled by means of echocardiogram, after which the fixing "patch" of the catheter is disconnected and removed (fig. 3b). The procedure, including the preparation of the patient, takes 1 hour.

The site of the catheter introduction into the vessel must be covered with a sterile bandage for a while. Some time after the procedure, the patient will feel discomfort in the throat, due to the introduction of the sensor through the esophagus. A day after the operation a control test is performed and the patient is discharged.

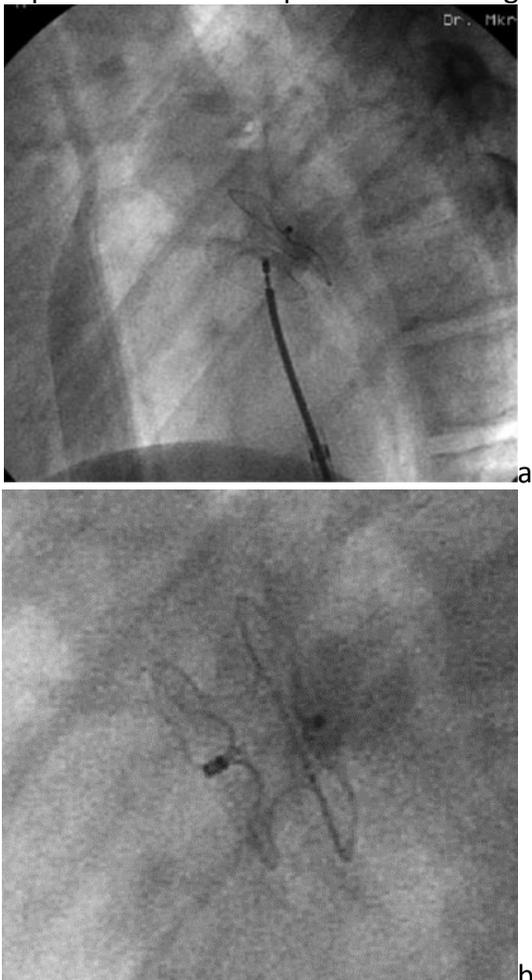


Fig. 3. Stages of an occluder installation

After the discharge, the patient is under the supervision of a cardiac surgeon, echocardiography is performed to monitor the position of the occluder and the tightness of the interatrial septum every month and later every three months. Within 6 months after surgery, you must take aspirin to prevent thrombotic events and, in the case of colds, to carry out antibiotic prophylaxis of infective endocarditis. Within one month after the procedure it is necessary to limit physical activity. 6 months after the operation, the occluder is completely covered with your own cells of the heart, that is it endothelializes. Until this time, patients should refrain from scheduled vaccination and pregnancy planning. After 6 months, the patient can lead their habitual way of life.

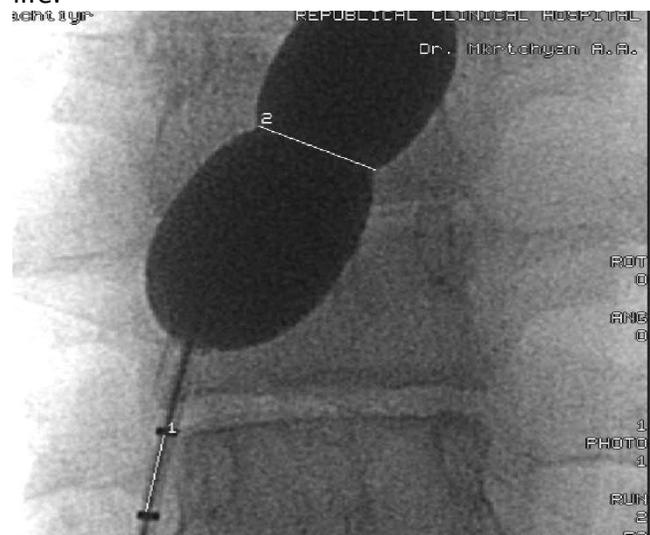


Fig. 2. Measuring the size of a defect in IAS by means of a balloon.

**Conclusion.** To date, in more than 90% of patients, the defect of the interatrial septum may be eliminated by endovascular surgery. At the same time there are some contraindications. These are huge defects without edges, which makes it impossible to fix an occlude reliably, other heart anomalies in the patient (often an abnormal drainage of one or more pulmonary veins) requiring a surgical correction. The absence of the aortic edge or aneurysm of the septum is not a contraindication to endovascular treatment of defects. Only an experienced ultrasound specialist or endovascular surgeon can determine exactly the ability to close the defect with an occluder after conducting a transesophageal echocardiography. One can only conditionally orientate on findings of the conventional transthoracic echocardiogram.

**Prospects for further research.** An in-depth study of endovascular methods of closure of defects of the interventricular and interatrial

septa will allow improving the technique and reducing the mortality during the surgery.

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