Case Reports

Surgical Removal of an Atrial Septal Occluder Device

Embolized to the Main Pulmonary Artery

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Percutaneous closure of atrial septal defects in adults has emerged as an alternative to surgery. We report a sequela of such closure in a 16-year-old boy: embolization of the atrial septal defect occluder into the main pulmonary artery when the patient experienced an episode of intense coughing immediately after device deployment. We removed the device surgically and closed the atrial septal defect in a standard manner, with an autologous pericardial patch. ***(Tex Heart Inst J 2014;41(1):91-3)***

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Percutaneous occlusion of atrial septal defect (ASD) in adults has emerged as an alternative to surgery.[1] Percutaneous closure is associated with less surgical morbidity, avoidance of a scar, and shorter hospital stay.[1] However, its increased use has brought recognition of several fairly frequent sequelae. One sequela associated with the procedure is embolization of the device into the pulmonary artery (PA).[2] We describe the case of a teenager in whom this occurred.

Case Report

In September 2012, a 16-year-old boy was evaluated by transthoracic echocardiography (TTE) and found to have an ostium secundum ASD. Transesophageal echocardiography (TEE), performed in order to learn whether the defect was suitable for percutaneous closure, revealed that the ostium secundum ASD had a diameter of 20 mm and rim margins of 20 mm (superior), 11 mm (inferior), 14 mm (superior vena cava), 12 mm (inferior vena cava), and 4 mm (aortic). The patient was referred for percutaneous ASD closure with an Occlutech Figulla® Flex occluder device (Occlutech International AB; Helsingborg, Sweden).

Using standard techniques, we deployed a 24-mm device under fluoroscopic and TEE guidance. The postinterventional TEE showed accurate positioning of the device and no relevant shunting. In the recovery room after extubation, the patient began to cough repeatedly. Although he was hemodynamically stable, we performed a TTE after his coughing episode, in order to eliminate any doubts about the location of the device. This TTE showed absence of the device in the atrial septum; it was instead lodged in the main PA. Fluoroscopy confirmed this dislocation (Fig. 1), so emergency surgery was undertaken via a full median sternotomy through a small skin incision. After aortobicaval cannulation and aortic cross-clamping, we arrested the heart by antegrade administration of cold-blood cardioplegic solution. The right atrium was opened with the patient on total cardiopulmonary bypass, and the ostium secundum ASD was indeed seen to have a diameter of approximately 20 mm. The embolized occluder was palpable externally at the pulmonary trunk and was withdrawn from there via a small incision in the main PA (Fig. 2). The ASD was closed in a standard manner, with an autologous pericardial patch. The postoperative period was uneventful, and the follow-up echocardiograms showed no residual shunt or valvular regurgitation.

Discussion

Both the design of the occluder device and the implantation technique have improved since King and colleagues[3] reported the first percutaneous transcatheter closure

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of ASD in 1976. As the numbers of catheter-based interventions steadily increase, so do the numbers of reported complications. Chessa and colleagues[2] reported that embolization or malposition was the most frequent sequela of this procedure. Devices usually embolize into the main PA, and most of these instances necessitate surgical intervention.

Mashman and associates[4] reported 2 cases of septal occluder embolization to the PA. Both of those devices needed surgical retrieval. Lysitsas and associates[5] reported the embolization of a septal occluder to the main PA after 2 years of implantation. Their patient had been admitted with symptoms of acute right-sided heart failure, and closure of the secundum ASD was performed, together with surgical retrieval of the device. Amanullah and co-authors[6] reported that, from October 2002 through December 2010, device embolization occurred in 2 of 284 cases of device closure performed for secundum ASD. One occluder embolized into the right ventricle and the other into the ascending aorta. The devices were retrieved and the defects closed by surgical intervention.

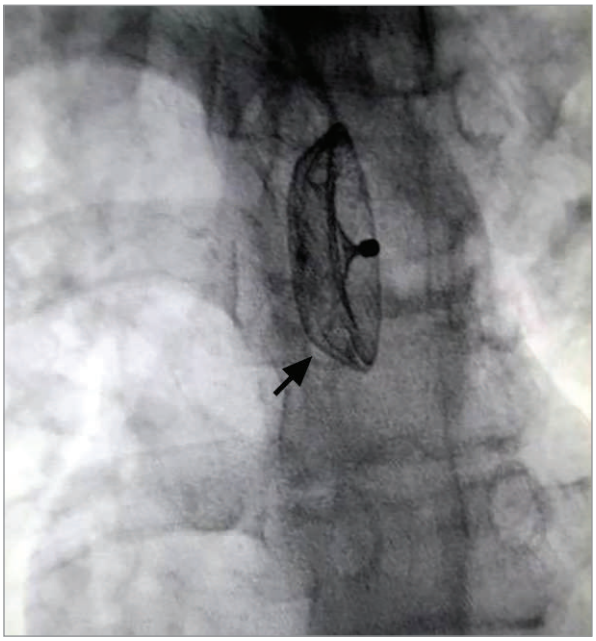

Fig. 1 *Fluoroscopy shows the occluder device (arrow) in the main pulmonary artery.*

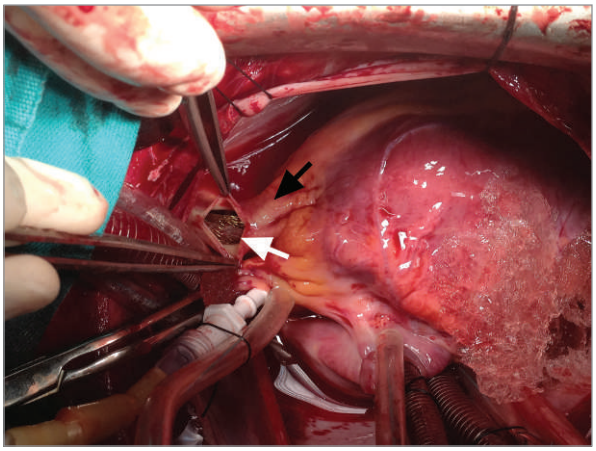

Fig. 2 *Intraoperative photograph shows the embolized occluder device (white arrow) during its extraction from the main pulmonary artery (black arrow).*

Another way of removing embolized devices is percutaneous retrieval. Balbi and colleagues[7] reported that they successfully retrieved a device from a left ventricle by using a modified snare technique. Then too, Chan and coworkers[8] managed to retrieve an embolized device percutaneously, from a right ventricle. They suggested attempting percutaneous retrieval first, in an effort to save the patient from an unplanned emergency open-heart operation. On the other hand, we found no report of successful percutaneous retrieval of an embolized device from the PA, and we believe that percutaneous retrieval should be attempted only in rare and evidently suitable cases.

Inadequate rims (especially deficient aortic rims) and the use of a very oversized occluder device are the most common reasons for device embolization after an apparently successful deployment.[9] In our patient, postinterventional TEE showed perfect device positioning after release, so we did not expect clinical problems. We speculate that the patient's intensive coughing in the recovery room caused intra-abdominal pressure overload and consequent right atrial pressure overload, which dislocated the occluder. Our patient's aortic rim margin was 4 mm, sufficient to meet the criteria for percutaneous closure, but still short enough (in our judgment) to promote device dislocation. In addition, the grossly oversized occluder could have led to the erosion of this rim. Interventionalists tend to grossly oversize these devices to avoid their embolization, but the problem, paradoxically, can be worsened by this practice.[10] Both of these factors are important in the management of patients undergoing percutaneous ASD occlusion.

Stricter selection criteria governing both the adequacy of the aortic rim and the size of the occluder might reduce the incidence of sequelae after percutaneous device closure of an ASD. We should never forget that surgical closure also achieves 100% closure with low morbidity and mortality rates,[11] and the cosmetic results are excellent if the approach is minimally invasive.

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