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Migration of amplatzer device in the aortic arch due to failed closure of atrial septal defect by interventionism, removal of device and closure of interatrial communication by surgical technique: A case report

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ABSTRACT

We present the case of a 3-year-old female, who had an ostium secundum type atrial septal defect and who had been scheduled for interventional closure with an amplatzer occluder device. Pediatric hemodynamics service notified us of the device migration and her hemodynamic instability due to the failed attempt to recapture the device with an umbrella technique and its consequent migration to the aortic arch. Urgent surgery is performed through conventional medial (median full) sternotomy, dissection by planes, opening and marsupialization (opening) of anterior pericardium with 0 silk, placement of reins with 1-0 silk, purse-string like suture on aorta with 3-0 ethibond, and in the right atrium and the inferior vena cava 3-0 prolene suture. Administration of 200 units of heparin, placement of arterial cannula and venous cannula in both superior and inferior vena cava, partial occlusion of cavas, dissection of the transverse aorta up to aortic arch until visualization of left subclavian artery and ductus arteriosus occupied with stent. Reins are placed with 1-0 silk in the brachiocephalic trunk, carotid artery and left subclavian artery in an individualized manner, and an amplatzer type device is evidenced and palpated in the zone between the left subclavian artery and the ductus arteriosus, a purse-string like suture is made with 4-0 prolene, a 5 mm incision is made with a scalpel, and with 3 mosquito clamps and a traction- countertraction maneuver complete removal of the amplatzer device is obtained. Posterior closure of the purse-string like suture is performed without complications and without evidence of active bleeding in the incision area. Aortic clamping is performed, cardiopulmonary bypass, and the administration of 300cc of custodiol solution until the visualization of the heart´s electromechanical stop, temperature drop to 28 degrees, right atrium opening, inspection of ostium secundum type of interatrial communication of approximately 5-6 mm in diameter, placement of reins in right atrium with closure of interatrial communication. A bovine pericardium patch is made and placed with 5-0 prolene continuous suture, the absence of leaks is verified, closure of right atrium, increase of temperature to normothermia and partial occlusion of cavas removed, the right atrium is purged, hemostasis is verified without complications. Extracorporeal circulation is stopped on the first attempt with output to sinus rhythm , pacemaker cables are placed with exteriorization by counter opening, removal of inferior venous cannula first and then superior venous cannula, purging of the root and removal of arterial cannula, administration of 300 IU of protamine is started, complete textile count is verified and a 19 Fr mediastinal tube is placed, verification of hemostasis, sternal closure with one no 5 wire in manubrium in an x style knot and two in the middle and lower third with 2-0 ethibond suture, hemostasis is verified and subcutaneous cellular tissue is closed with 1-0 vycril suture, skin is closed with 3-0 monocryl suture, and the surgical event is concluded.

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Case Presentation

This is a 3-year-old patient with a history of a persistent conical ductus arteriosus, with a report of an aortic root with a diameter of 9.9 mm and length of 9.2 mm, left pulmonary artery with a diameter of 3.3 mm with a left-to-right shunt. Maximum gradient of 75 mmHg, in addition to presenting an ostium secundum typo of interatrial communication of 7.2 mm (bicaval diameter) x 7.7 mm (longitudinal diameter) with a left-to-right shunt with edges of SVC (superior vena cava): 6 mm, IVC (inferior vena cava): 16.4 mm with a lax tip, aortic: 2.7 mm, counter aortic: 8.2 mm, mitral: 8 mm, counter mitral: 5.2 mm. The patient is scheduled and intervened by the hemodynamics service for closure of the atrial communication with an amplatzer device + closure of the ductus arteriosus with a stent. Migrations of the amplatzer device occurs in the area of the aortic arch and supraortic trunks. Emergency intervention is performed by the cardiovascular surgery service and its congenital heart disease surgeon Dr. Joaquín Zepeda, together with Dr. José Luis Aceves Chimal, and third-year resident Dr. Jorge Rodríguez Delgado (Figures 1-8).

Figure 1. Pre-surgical transesophageal echocardiogram with a 4-chamber projection showing (blue arrow) an ostium secundum interatrial communication

Figure 2. Coronary angiography of supraortic trunks and aortic arch, diameters of the patent ductus arteriosus for closure by stent placement

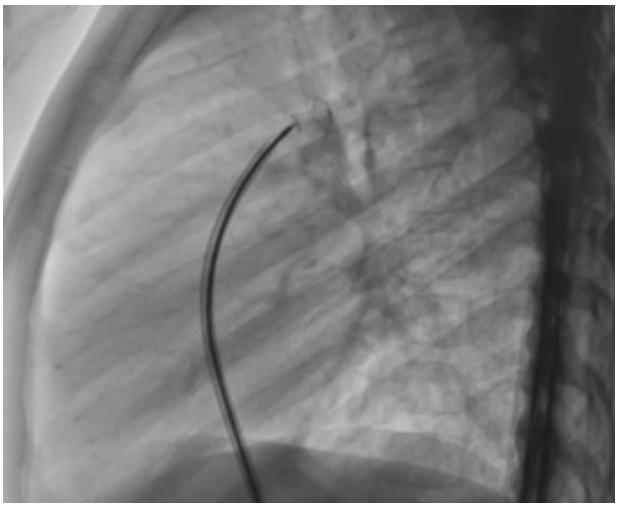

Figure 3. Patent ductus arteriosus for closure by stent placement

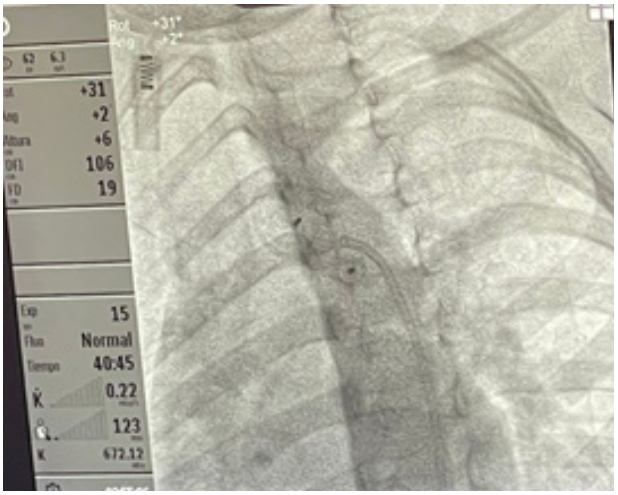

Figure 4. Migration of the amplatzer-type atrial septal defect occluder device to the supraortic trunks and aortic arch

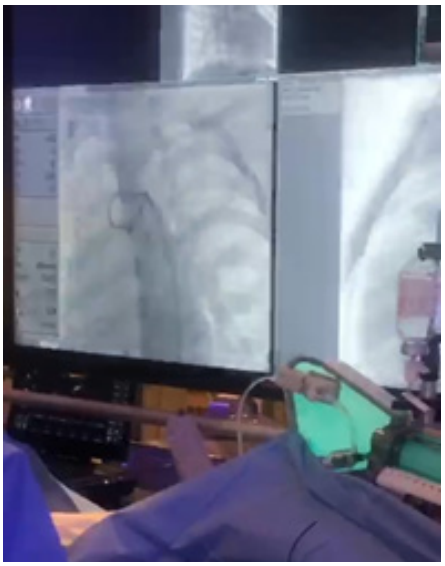

Figure 5. Failed attempt to collect the amplatzer device by interventionism using the umbrella technique

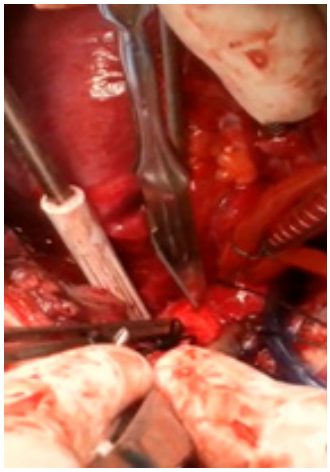

Figure 6. Median sternotomy, aortic cannulation and bicaval cannulation are performed to achieve exploration, search and removal of the amplatzer device migrated to the aortic arch. Once in extracorporeal circulation, dissection from the transverse aorta to the aortic arch is performed until the left subclavian artery and ductus arteriosus are visualized and confirmed. Amplatzer device is palpated between the previous mentioned areas, fixed stent in the ductus arteriosus, a purse-string like suture was made with 4-0 prolene suture to ensure bleeding control and closure after opening and an incision is made with a 5.0 mm scalpel

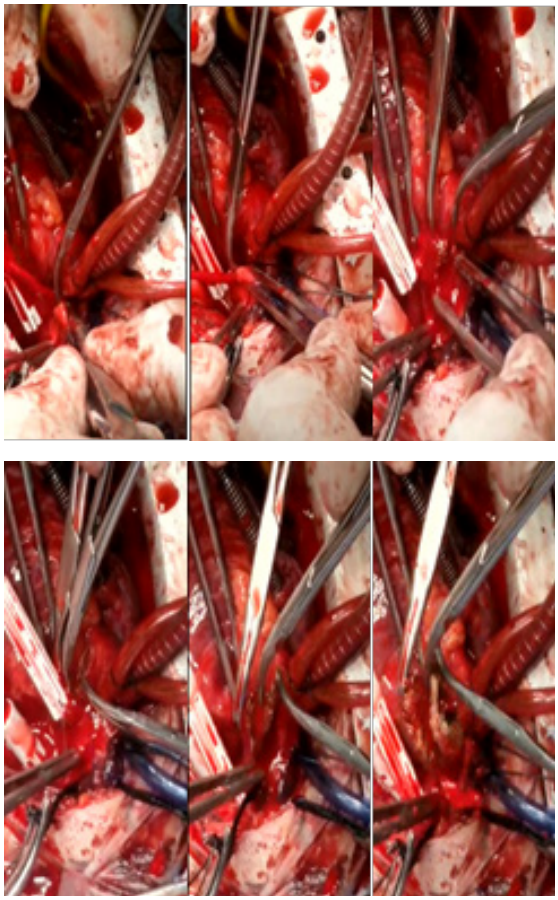

Figure 7. Prior to aortic and right atrium cannulation, a 1 mm diameter incision is made in the transverse aorta to extract the migrated amplatzer device

Figure 8. AMPLATZER occluder device with a diameter of 2x2 mm was completely removed without complications

Discussion

The migration of intracardiac devices to the aorta is a rare but well-documented complication in medical literature (1-5). This migration can occur due to several factors, including technical problems during the closure procedure, the lack of adequate anchorage of the device, the unusual anatomy of the patient, and the surrounding tissue-response variability to the device. In this case, the failed closure of the atrial septal defect by interventionism seems to have been the triggering factor for the migration of the device towards the aortic arch.

The migration of a device towards the aorta carries significant risks, as it can cause blood flow obstruction, aortic embolization, aortic perforation and other life-threatening complications. Therefore, it is crucial to address this situation quickly and effectively. In this case, we opted for surgical removal of the migrated device and the successful closure of the interatrial communication using a surgical technique.

The decision to address this complication with a surgical technique rather than another interventional attempt should be based on a careful evaluation of the risks and benefits. In situations

where the device has migrated to an anatomically critical area, such as the aortic arch, surgery may be the safest and most effective option. The surgical technique must be performed by a medical team experienced in cardiac surgery, as precise handling is required to prevent further complications.

Conclusion

In conclusion, the migration of intracardiac devices to anatomically critical areas, such as the aortic arch, is a serious complication that requires careful evaluation and approach. In this case, the migration of an Amplatzer device to the aortic arch after a failed interventional interatrial communication closure was successfully treated by surgical removal of the device and closure of the IAC using a surgical technique. Communication by the interventional pediatric cardiology service and the decision and surgical approach by the cardiac surgery service is essential to achieve the best results in cases of complications that, although not common, have a high mortality rate due to failure in achieving effective treatment. The case that we present was carried out successfully, with a 6- and 12-month follow-up without complications leading to a normal life.

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