Aorta to Left Atrial Fistula Following Transcatheter Closure of Atrial Septal Defect

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Abstract:

Surgical repair is the gold standard for treatment of a secundum type of atrial septal defect (ASD). Recently major advances have been made in device closure of ASDs. Although percutaneous transcatheter ASD closure provides superior cosmetics it is not completely risk free. In this article we have reported a late fistula formation between aorta and left atrium following transcatheter closure of secundum type ASD. Review of similar complications shows that lifelong follow-up of patients whose ASD is closed by devices seems mandatory to detect potentially serious late device-related complications.

Key words:atrial septal defect, amplatzer septal occluder, catheterization, complications

Introduction:

Surgical repair is the gold standard for treatment of a secundum type of atrial septal defect (ASD). Morbidity and mortality are extremely low, and long-term follow-up has demonstrated excellent survival and functional capacity 1. Recently major advances have been made in device closure of ASDs. Percutaneous transcatheter ASD closure provides superior cosmetics, is less invasive and allows for shorter hospital stays. Even so, transcatheter ASD closure is not completely risk free and the seriousness of the device-related complications has not been adequately described 2-22. The most frequently cited complications are: embolisation (i.e., complete dislodgement of the ASD device into any part of the cardiovascular system), thrombosis (formation of thrombus on the device), thromboembolism (i.e., embolisation of thrombotic material originating on the ASD device), transient cerebral ischemia or stroke, incomplete ASD closure with significant residual shunt, atrial and/or aortic injury or erosion, device impingement on caval veins on the right upper pulmonary vein, and on the mitral and tricuspid valves, complete atrioventricular block, haemopericardium with tamponade, aortic or mitral valve injury, endocarditis and sudden death 2,23,24. Correction of many of these complications warrants open surgery. We have tried to report a case with late fistula formation between aorta and left atrium following transcatheter closure of secundum type ASD.

Case Presentation:

A16-year-old boy, a known case of ASD since he was 3 years old, was planned for interventional closure of ASD. His ASD diameter was 2.4 cm with a left to right shunt. His left ventricular ejection fraction was 65%. Pulmonary artery was di-

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lated (4 cm) and 2 + pulmonary valve regurgitation and 1 + tricuspid regurgitation were detected. His ASD was closed using no. 26 amplatzer septal occluder and early transthoracic (TTE) echocardiography showed no residual ASD. After the procedure he became anemic. Other findings were new transient mild jaundice, palpitation and mild dyspnea on exertion. His new anemia was assessed and approached as a hemolytic anemia.

Four years later, when he was 20 years old, his heart was evaluated again because of his complaints. TTE reported a small residual ASD (< 1cm) and angiography mentioned 3 + aortic regurgitation. (Figure 1) So, transesophageal echocardiography (TEE) was recommended which helped us the most. TEE report was a high gradient (100 mg) fistula between aorta and left atrium. (Figure 2)

Figure 1- Aortic regurgitation reported in angiographic image.

Figure 2-Transesophageal echocardiography showed aorta to left atrial fistula

The patient was scheduled for elective operation. Midsternotomy was done. Left atrial and left ventricular enlargement was noticed. Cardiopulmonary bypass was established. Aorta was opened and direct antegrade cardioplegia was given. A 3 mm round orifice was detected in noncoronary sinus 1 cm above the aortic annulus. (Figure 3) Right atrium was opened. The atrial septal occluder (ASO) device was firmly adhering to the atrial septum, and it was well endothelialized with no residual ASD. The right atrial arm of the device was removed with sharp dissection, followed by entry into the left atrium and removal of the left atrial disk (figure 4). The other end of fistula was detected in anterosuperior part of ASD in left atrial roof by passing a probe through the aortic orifice. (Figure 5) Both fistulae ends were closed using 4/0 separate pledgetted sutures. (Figure 6) ASD was closed with pericardial patch. Came off cardiopulmonary bypass easily and a post-bypass TEE showed no residual ASD or fistula and no aortic insufficiency. His postoperative course was smooth and he was discharged from hospital on day 7.

figure 3. A 3 mm round orifice in noncoronary sinus of aorta.

figure 4. Amplatzer septal occluder removed from interatrial septum.

figure 5. A probe was passed through the aortic abnormal orifice into the roof of left atrium.

Discussion:

Surgical repair of all types of atrial septal defects (ASDs) has been practiced since the dawn of cardiac surgery in the 1950s with a large accumulated experience documenting nearly 100% efficacy, near zero mortality, minimal and only short-term morbidity, and, with the introduction of less invasive surgical techniques, improved cosmetic results 25, 26 In 1976 King and Mills 27 reported the feasibility of percutaneous closure of ASD. Latson et al 28 in 1991 reported successful closure of ASDs in 500 patients with Bard clamshell device. Percutaneous closure of ASD is gaining popularity because of the short learning curve, cosmetic benefits, reduced pain and reduced hospital stay. It also obviates an open cardiac procedure and many reports document high success rates and low morbidity 29-31. However, there are increasingly more frequent reports of serious complications of device ASD closures, including fatalities or major events necessitating surgical intervention 6-22. According to the report of Chessa et al, the overall incidence of complications after the interventional occlusion of an ASD was 8.6% 24.

European Association of Cardio-thoracic Surgery Congenital Database has been reviewed for 10 years and 56 patients were reported to need early or late surgical repair after interventional closure of ASD23. The median time interval between device implantation and late surgery has been 3 years (12 days to 8 years) 23. Complications leading to surgery included embolisation (n = 29), thrombosis/thrombombolism/cerebral ischemia or stroke (n = 12), significant residual shunt (n = 12), aortic or atrial perforation or erosion (n = 9), haemopericardium with tamponade (n = 5), aortic or mitral valve injury (n = 2) and endocarditis (n = 1) 23. Of these complications, the most worrisome were cardiac erosion or perforation, both of which may culminate in circulatory collapse. Fistula formation has different causes which one of the usual causes is deficient retroaortic rim. Although it is presumed that an oversized amplatzer may induce atrial erosion or a fistulous connection between the aorta and the atrium14, 32, serious complications may happen regardless of the size or type of current devices 23.

In this case the aortic to left atrial fistula was detected 4 years after percutaneous implantation of atrial septal occluder while his new hemolytic anemia was under pharmacologic treatment. Although transthoracic echocardiography and angiography were not so accurate, the precise report of TEE helped us a lot in detecting the exact pathology. Operation was done successfully in this case but patients needing surgical repair of complicated percutaneous closure of ASD are reported to have considerable mortality (5.4%) 23. There are two points which we may get out of this case: First, tranesophageal echocardiography could be considered as a helpful method of detecting complications of percutaneous closure of ASD; Second, and more important, comparing with patients who have undergone surgical closure of ASD and are considered cured, lifelong follow-up of patients whose ASD is closed by devices seems mandatory to detect potentially serious late device-related complications.

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