

Iatrogenic perforation of atrial appendage and successful closure with Amplatzer Piccolo Occluder, in a 1-year-old patient

Brief Report

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Abstract

We present the successful transcatheter closure of the perforation of the cardiac wall from atrial appendage in a 1-year-old girl. Although open-heart surgical repair has been the primary option, percutaneous device closure should always be considered before surgery.

Perforation of the cardiac wall is a very rare and life-threatening complication during the course of cardiac catheterisation that is commonly characterised by cardiac tamponade and needs to be intervened immediately.¹ Although open-heart surgical repair has been the primary option, percutaneous closure with devices can be possible. Herein, we present the management of a 1.2-year old girl perforated from atrial appendage, achieving a successful closure with The Amplatzer Piccolo™ Occluder (Abbott Structural Heart, Plymouth, MN, USA).

Case report

A 1-year-old girl was referred to our Pediatric Cardiology Department with complaints of growth retardation and uneasiness. Her arterial oxygen saturation was 96%, her weight was 5.5 kg (<3 percentile), and her height was 66 cm (<3 percentile). A murmur grade 2–3 and hepatomegaly 2 cm revealed in her physical examination.

Two-dimensional and Doppler echocardiographic study identified large patent ductus arteriosus and pulmonary hypertension, so that transcatheter closure is planned immediately. A large, 7.9-mm (pulmonary side) aortopulmonary septal defect, type B according to Krichenko classification is detected in cardiac catheterisation. The pulmonary vascular resistance index was 2.8 WU.m², and the mean pulmonary artery pressure was 35 mmHg. We closed the defect with Lifetech Ceraflex (Lifetech Scientific, Shenzhen, China) membranous Ventricular Septal Defect Occluder symmetric 6 mm, without any complication. After the closure, the mean pulmonary artery pressure was 30 mmHg.

After 2.5 months of the closure, the patient was admitted to our hospital with significant tachypnea and dyspnea. Severe residual pulmonary hypertension was detected in the echocardiographic examination. Hence, we decided to withdraw the device and planned to make a percutaneous atrial septostomy with stenting.

Catheterisation was performed. We tried to capture the occluder with different snares from both arterial and venous ways, unsuccessfully. Since the patient got bradycardia during long sheath manipulation to the main pulmonary artery, we gave up the capture procedure. While searching patent foramen ovale in atrial septum for septostomy with 0.021 j-tipped guidewire (AngioFlex[®] pre-coated PTFE (Teflon), fixed core, 3 mm, Middlesex, England) the atrial appendage was perforated and the wire passed into the pericardial cavity (Image 1). She was consulted with cardiovascular surgery immediately; however, we decided to close the perforation with a device and did not pull out the guidewire. Firstly, 4-French sheath (Flexor[®] Check-Flo[®] Introducer, Ansel Modification, Bloomington, USA) was placed, then the delivery sheath was advanced to the right atrium appendage. Meanwhile, her condition rapidly deteriorated with hypotension, metabolic acidosis, and hypoxemia, requiring mechanical ventilation. Under echo monitoring, the increased pericardial effusion was drained with a subcostal approach (a total of 70 ml) and given back again from the femoral vein. Amplatzer Piccolo Occluder 4/6 mm was advanced over the delivery sheath. The waist of the disc is deployed on the outer aspect of the perforated cardiac wall (pericardial cavity) and the second disc to be deployed on the endocardial size of the atrial appendage (Images 2–4). The position of the device was evaluated properly with repeated manual injections. It was observed that the bleeding was not persistent and after the haemodynamic stabilisation achieved, the patient transferred to the ICU.

During the hospital stay, she had no pericardial effusion, and she was discharged with an endothelin receptor antagonist for her persistent pulmonary hypertension. In the 6 months follow-up, the patient is stable without effusion and pulmonary hypertension observed.

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Discussion

To the best of our knowledge, we report the smallest case of successful transcatheter closure with occluder in an iatrogenic perforation, reported in paediatric age.

Iatrogenic perforation of the cardiac wall is a rare and life-threatening complication with an incidence of 1% in large cohort studies of adults.^{2,3} Most of them occur during the catheter ablation procedures, most commonly at the right ventricle outflow tract. Transthoracic echocardiography plays an important role in early detection, and pericardial effusion and right ventricular compression are the first salient findings.^{4,5} Our patient was perforated from the atrial appendage, almost the most dangerous area due to its anatomic structure, which requires surgery always.

The transeptal puncture procedure is a commonly used technique in paediatric cardiology that allows accessing to the left side from the right venous system. But due to the difficulties finding of the localisation of fossa ovalis, complications can occur, for example, perforation of the right atrium and aortic root as in our patient. Interestingly, our patient was perforated despite using a j-tipped and very thin (0.021) guidewire. We think it may have been caused by the flattening of the tip instead of its j shape because of our mistake. Using a hydrophilic-coated catheter was probably more appropriate.

In cases of these life-threatening complications, open-heart surgical intervention has been the primary option in the past.⁶ However, in 2012, Hartono et al⁷ performed the closure of such an iatrogenic aortic root perforation with an Amplatzer Septal Occluder for the first time successfully.

In a scoping study of Kariyanna et al,⁸ the successful rate of percutaneous closure (mostly left ventricle) was 84.3% with a mortality rate of 15.7%. Matteucci et al⁹ reported the average mortality rate of 14% in cardiac wall perforation of the patients who underwent surgery which is still the first preferred procedure. Although there is no serious difference between the mortality rates, in our opinion, percutaneous intervention can have more advantages for long-term follow-up in paediatric age.

Apart from surgery, percutaneous intrapericardial fibrin glue injection and some hybrid protocols are also known as the other less invasive techniques, but not suitable for our patient because of the non-uniform wall thickness and muscle fibre orientation.¹⁰ The smaller and softer required delivery system, the softer shape, and the low-profile retention discs are just some of the reasons of our choice for Amplatzer Piccolo Occluder. However, all the studies in the literature were either case reports or series, so that it is impossible to compare the advantages or disadvantages of these procedures objectively.

Hence, in iatrogenic perforations of the cardiac wall, it is vital to make a decision before removing the catheter, otherwise, the effusion will increase rapidly. Percutaneous device closure should always be considered before surgery.

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Conflict of interest. None.

Ethical standards. The authors assert that all procedures contributing to this work comply with the Helsinki Declaration of 1975, as revised in 2008, and have been approved by the institutional committees (Gaziantep University Ethics Committee for Clinical Studies).

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