Cardiology in the Young

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Transcatheter closure of main pulmonary artery pseudoaneurysm using atrial septal occluder device in an infant

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Brief Report

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Abstract

We present a case of percutaneous closure of main pulmonary artery pseudoaneurysm using an atrial septal occluder device in a seven-month-old infant. The infant had tetralogy of Fallot repair followed by transcatheter left pulmonary artery stenting. The occlusion of the wide neck of the pseudoaneurysm was performed successfully using the atrial septal occluder with no detected complications in his six-month follow-up post-catheterisation.

Pulmonary artery pseudoaneurysm is considered one of the uncommon, life-threatening lesions, especially in infancy. It can enlarge to a considerable size and may rupture, leading to inevitable death.[1] Few paediatric cases have been reported with such a rare finding in the literature.[2–4] In the current work, we report successful transcatheter closure of main pulmonary artery pseudoaneurysm with the utilisation of an atrial septal occluder device in an infant with repaired Fallot tetralogy and with no immediate hazards.

Case report

A seven-month-old male infant 6.8 kg in weight underwent a complete surgical repair for tetralogy of Fallot with hypoplastic left pulmonary artery using a transannular patch to augment the annulus and an autologous pericardial patch for left pulmonary artery angioplasty. One week post-operative, the patient was unweanable from the ventilator, so transcatheter stenting of the left pulmonary artery was mandatory as a limited flow was seen across the left pulmonary artery with high right ventricular pressure. The stenting of the left pulmonary artery was performed successfully using a premounted Palmaz-Genesis stent (Cordis, Johnson, and Johnson, Miami, FL) with no immediate complications and no pseudoaneurysm detected in the main pulmonary angiogram after stent placement. Although the patient was clinically improving and weaned off the ventilator after two days, the patient was tachycardic and distressed on the 5th day post-intervention without documented fever and no rise in C-reactive protein or changes in partial septic work-up; excluding possible infections. A suspected significant anterior pericardial effusion was proved by CT angiogram to be a considerable pseudoaneurysm connected to the main pulmonary artery with no evidence of compression of any vital structures. Then, the patient was taken to the catheterisation laboratory for further assessment. On the right ventricular angiogram, a large pseudoaneurysm was seen originating from the main pulmonary artery with the blood swirling inside (Fig 1a). A 4-F Judkins right catheter was introduced across the neck of the pseudoaneurysm for a selective angiogram. The pseudoaneurysm anatomy was clearly delineated with an ostium diameter of about 5 mm (Fig 1b & 1c; Video 1). After obtaining the parents' consent for transcatheter closure, a surgical backup was arranged for emergencies such as possible rupture. Amplatzer atrial septal occluder device 9 mm (AGA Medical Corporation, Golden Valley, Minnesota, USA) was deployed across the pseudoaneurysm neck with the proximal disc on the main pulmonary artery side and the distal (usual left atrial disc) on the pseudoaneurysm side (Fig 1d to 1h, Video 2). Pulmonary angiogram after device deployment demonstrated limited flow across to the pseudoaneurysm with no evidence of main pulmonary artery obstruction. After the procedure, haemostasis was achieved with no complications. The patient was kept on the anti-platelet medication clopidogrel. Echocardiography one week after the intervention showed the device in place with no flow across it with thrombosis of the pseudoaneurysm. Moreover, the patient was discharged home and was stable after 6 months of follow-up.

Discussion

Pulmonary artery pseudoaneurysm is a rare, potentially fatal disorder with only a few cases reported in the paediatric age group.[2–4] It could result from variable aetiologies, for instance,

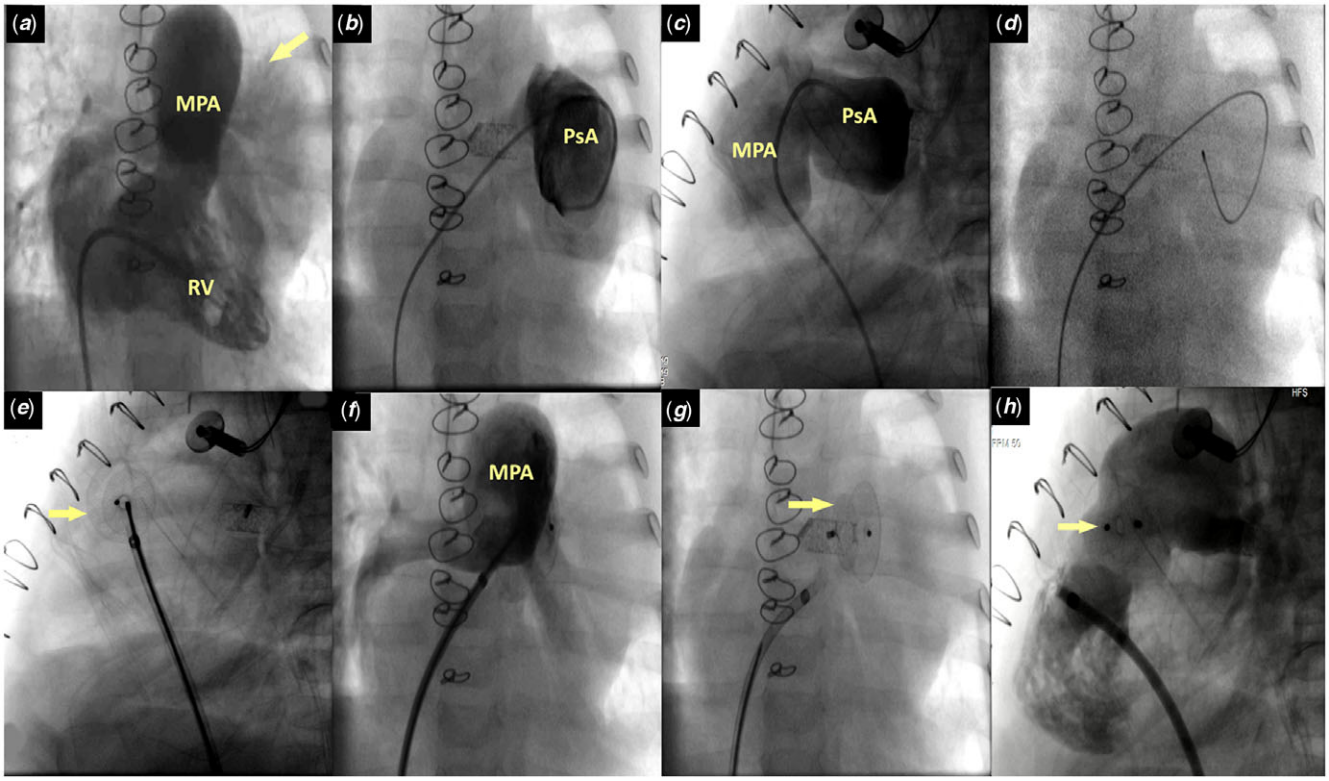

Figure 1. ***(a)*** Right ventricular angiogram in anteroposterior view showing a faint flow towards the left side of the main pulmonary artery to the pseudoaneurysm marked by a yellow arrow. (***b*** and ***c***) Anteroposterior and lateral views of selective angiogram inside the giant pseudoaneurysm. (***d***) Guidewire is seen inside the pseudoaneurysm. (***e***) Atrial septal occluder device is deployed across the pseudoaneurysm mouth. (***f***) Pulmonary angiogram after device deployment. (***g*** and ***h***) Device in place after successful release in anteroposterior and lateral views. MPA: main pulmonary artery, PsA: pseudoaneurysm, RV: right ventricle, Arrow: points to the atrial septal occluder device.

infection, major trauma, vasculitis, malignancy, iatrogenic in interventional procedures on the pulmonary artery, but infrequently for unknown factors.[1] In our case, the suspected cause may be an iatrogenic injury during the preceding intervention. We are not sure which step of stenting caused the injury as the intervention went so smooth with no apparent immediate leaks. Nevertheless, it is suggested that the introduction of the guiding wire in a recently operated on pulmonary artery might be the cause of the minute tear that leaked slowly over days. Slow, delicate manipulation of catheters and guidewires might be preventive for such minor injuries in early post-operative catheterisation.

Although the surgery was an established therapeutic option for pulmonary artery pseudoaneurysms, percutaneous techniques have been tried with reasonable success whenever possible. Multiple methods of transcatheter occlusion of the pseudoaneurysm feeding mouth have been reported, such as patent ductus arteriosus occluders, vascular plugs, covered stents, and coils.[1–4] Until now, there are no available guidelines to direct the choice of the most suitable device. Hence, the final decision is often made based on the size of the false aneurysm, its feeding ostium, the operator's experience, and the availability of devices. Therefore, in our patient, the significant size of the pseudoaneurysm and its opening in relation to the young age and size of the patient were challenging factors in the selection process. The chosen device was the appropriate available device at the time of procedure in our catheterisation laboratory with sufficient size discs that can be introduced on a smaller sheath size than equivalent ventricular septal defect occluder, as the patient is an infant. Moreover, the atrial septal occluder device is better than the muscular ventricular septal occluder device because the 3 mm waist thickness of the atrial septal occluder better matches the short connection between the main pulmonary artery and the pseudoaneurysm

The atrial septal occluder was reported before in managing aortic pseudoaneurysm in a nine-year-old child with no documented complications.[5] In addition, atrial septal occluder was reported in the closure of a right ventricular aneurysm in a 25-year-old male patient with the complete repair of pulmonary atresia and ventricular septal defect.[6] Nevertheless, to the best of our knowledge, the current case is the first successful utilisation of atrial septal occluder in a main pulmonary artery huge pseudoaneurysm in infancy.

However, despite being a successful intervention, it is a high-risk procedure to perform with a high potential of rupture and haemorrhage. Moreover, further follow-up is required to assess the long-term outcome and safety.

Conclusion

The atrial septal occluder device can be considered in the transcatheter closure of pulmonary artery pseudoaneurysm. It is a technically feasible approach for managing such a rare risky lesion specially in an infant.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/S1047951122002281

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Conflicts of interest. None.

Ethical standards. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national guidelines on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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