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CASE REPORT

Novel transcatheter closure of internal iliac arteriovenous malformation

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Abstract Arteriovenous malformations arising from iliac arteries are rare anomalies. Percutaneous embolization of such malformations is an established therapeutic option. In this paper, we will describe a case, wherein the internal iliac artery feeding a giant arteriovenous fistula was closed using a patent ductus arteriosus (PDA) duct occluder percutaneously. The PDA duct occluder is a versatile device that can be used as an alternative to vascular plugs.

Keywords Arteriovenous malformation · Internal iliac artery · Embolization

Introduction

Arteriovenous malformations (AVM) arising from iliac arteries are uncommon and produce symptoms depending on their site and size [1]. Large AVM can manifest as high output heart failure, which warrants closure of the malformation either surgically or by percutaneous intervention [2]. In this paper we will report a case of giant pelvic AVM arising from the internal iliac artery, which was embolized using a patent ductus arteriosus (PDA) duct occluder.

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Case report

A 30-year-old male presented with a history of breathlessness on exertion and lower abdominal discomfort of 6 months duration. There was no history of abdominal angina or ischemic symptoms of the limb. On examination there was sinus tachycardia with hyperdynamic precordium. The abdomen was soft with diffuse tenderness in the lower quadrant without any bruit. His 2D echocardiography revealed mildly dilated cardiac chambers with adequate systolic function. The calculated cardiac output by echocardiography was 9 l/min and the mixed venous oxygen saturation was 80%. The provisional diagnosis was high output heart failure and he was started on diuretic therapy. Contrast computed tomogram (CT) scan of the abdomen revealed a large pelvic AVM arising from the right internal iliac artery (Fig. 1a, b). There was no evidence of AVM, elsewhere in the body on CT imaging. We took an iliac artery angiogram to delineate the anatomy and possible endovascular management. We obtained bilateral femoral artery access. The coronary angiogram revealed normal coronary arteries. The selective right internal iliac artery angiogram demonstrated the large AVM arising from the internal iliac artery and draining through the pelvic venous system (Fig. 2a, b) (Video: 1). There were no feeder arteries from the left iliac system. The plan was therapeutic embolization of the internal iliac artery using an Amplatzer vascular plug (AGA Medical Corp, Golden Valley, Minn). The internal iliac artery was 16 mm in diameter on quantitative assessment. Since a vascular plug of a suitable size was not available, we decided to occlude the internal iliac artery with a PDA duct occluder, which was readily available.

The right internal iliac artery was cannulated with a 0.032 in. Terumo guide wire (Terumo Medical Corp;

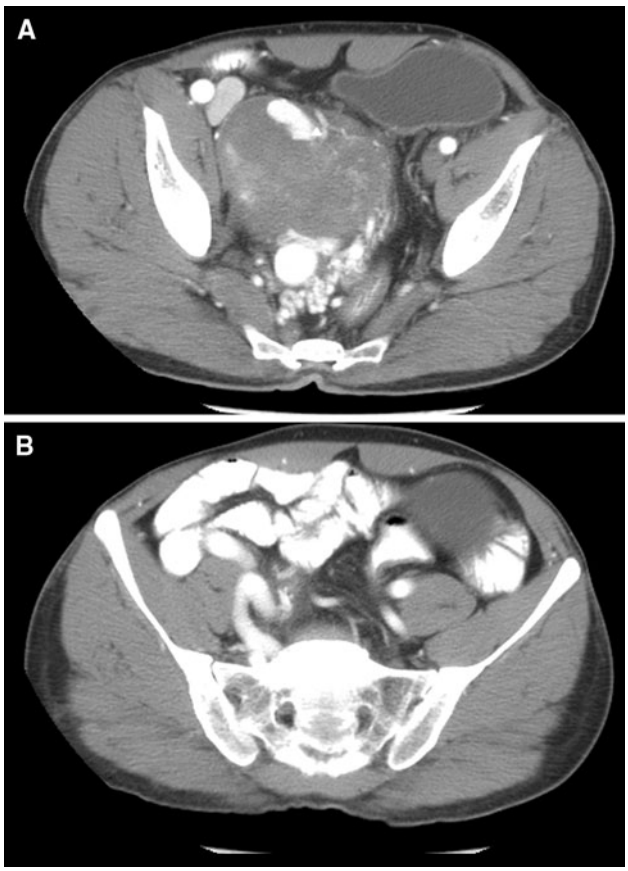

Fig. 1 **a** Contrast enhanced computed tomographic scan showing a large contrast enhancing pelvic mass. Multiple, tortuous contrast filled arteries can be seen within the mass, suggestive of arteriovenous malformation. **b** Contrast enhanced computed tomographic scan showing the right internal iliac artery feeding the arteriovenous malformation

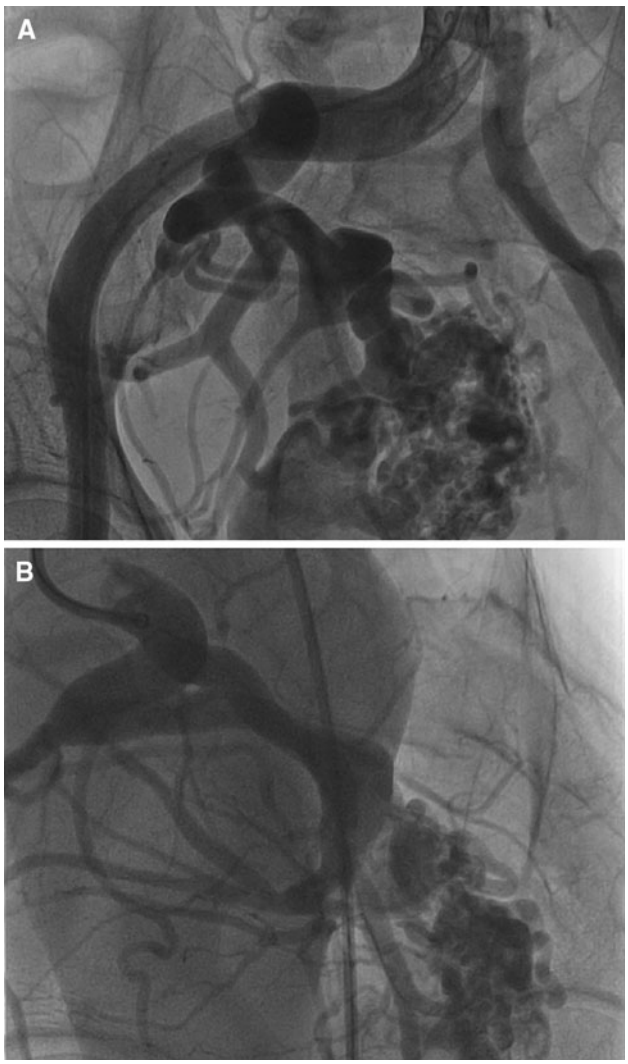

Fig. 2 **a** Angiogram done in the anteroposterior plane with contrast injection in the aorta just before bifurcation reveals a large arteriovenous malformation in the pelvis with the largest feeder artery from the right internal iliac artery. **b** Angiogram done in the 40′ LAO plane demonstrating the giant arteriovenous malformation

Somerset, NJ, USA) through the left femoral artery with the support of an 80 cm, 8F crossover sheath (Cook Inc. Bloomington, IN, USA) (Fig. 3a). The Terumo wire was exchanged for a 0.035 in. exchange length Amplatzer extra stiff guide wire. A 16 × 18 mm Lifetech PDA occluder (Lifetech Scientific Inc, China) was deployed in the proximal portion of the right internal iliac artery through a 10F COOK delivery system (Cooks Inc. Bloomington, IN, USA) (Fig. 3b). A check angiogram carried out after 10 min showed complete occlusion of the artery with trivial shunting and there was no unintended thrombus formation (Fig. 3c, d) (Video: 2). There was no migration of the device, as the diameter of the internal iliac artery was tapering distal to the site of device deployment. He became free of heart failure symptoms within 24 h and is asymptomatic at the end of 4 months of follow-up. A Contrast CT imaging has been planned at the 1 year follow-up.

Discussion

Arteriovenous malformations arising from iliac arteries are uncommon and are believed to arise from the primitive early embryonic capillary plexus [1]. Clinically, AVM may remain asymptomatic or produce pressure effects or high output heart failure. Treatment options include observation, surgical ligation or percutaneous embolization. The indications for intervention are listed in Table 1. Percutaneous embolization has emerged as the treatment of choice for AVM, where feasible [2]. The embolic agents used include polyvinyl alcohol (PVA) particles, gelfoam, stainless steel coil, isobutyl cyanoacrylate, covered stent and vascular plugs. Utilizing PVA particles, gelfoam, stainless steel coil

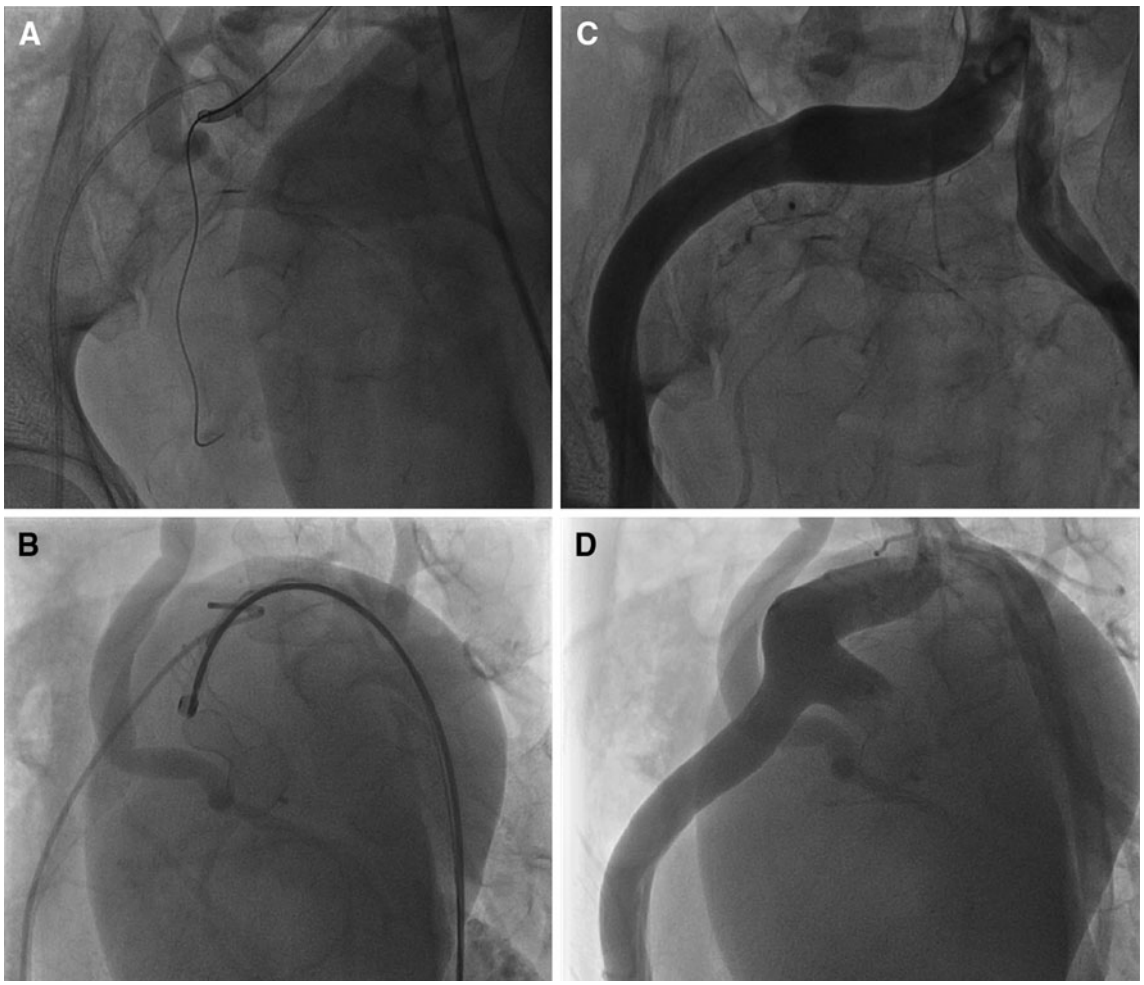

Fig. 3 **a** LAO 40′ view showing the cannulation of the right internal iliac artery with 0.018 in. Terumo guide wire with the support of an 80 cm crossover sheath from the left femoral artery. **b** LAO 40′ view showing deployment of a 16 × 18 mm PDA duct occluder in the right internal iliac artery. The device sat snuggly in the proximal portion of the artery. Positioning was confirmed by contrast injection through a pigtail catheter introduced through the right femoral artery. **c** Angiogram done in the anteroposterior plane after device deployment showing near total occlusion of the right internal iliac artery. **d** Angiogram done in the LAO 40′ plane showing the device in situ. The absence of opacification of the arteriovenous malformation is clearly demonstrated

and cyanoacrylate in a large caliber vessel like the internal iliac artery can be cumbersome and may also be associated with significant residual shunt [3–5]. Though covered stents are a useful therapeutic option in this scenario, they are expensive and a suitable size may not be readily available. The Amplatzer vascular plug is a useful embolization device for large caliber vessels and comes in sizes of 4–16 mm, with 2 mm increments [6–8]. The manufacturer recommends the selection of a device 30–50% larger than the diameter of the vessel to be occluded. In our case the internal iliac artery measured 16 mm in diameter and this warranted a vascular plug with a diameter of at least 20 mm. Since a vascular plug of a suitable size was not available, we opted to close the AVM with a PDA duct occluder [9]. The size of the largest available PDA occluder is 18 × 20 mm and results in more than 99% occlusion of the vessel within 6 months, with most of the occlusion occurring within 24 h [10]. The polyester fabric sewn into the duct occluder induces thrombosis and closes the communication. This also serves as a foundation for subsequent endothelization of the device. The PDA occluder is easy to deploy, has good maneuverability and can be retrieved before deployment. Besides its utility in closing patent ductus arteriosus, the PDA occluder had

Table 1 Indications for occlusion of arteriovenous malformations

Heart failure
Pressure effects
Rupture
Disabling pain
Functional impairment
Lesion at a life threatening region
Cosmetically severe deformity

been used successfully for closure of paravalvular leaks [11], the left ventricle to descending aorta conduit [12], aberrant arteries [13], the aortico left ventricle tunnel [14], aortocaval fistula [15], major aortopulmonary collaterals, the aortopulmonary window, ruptured sinus of the valsalva aneurysm, ventricular septal defects, pseudo aneurysm of the main pulmonary artery, persistent left superior vena cava, coronary artery fistula and the subclavian artery to innominate vein fistula. The PDA duct occluder is an effective alternative for vascular plugs, for closure of internal iliac arteriovenous malformation. Further studies are warranted to establish the safety and effectiveness of duct occluders in the peripheral arteries.

Conclusion

Arteriovenous malformations arising from iliac arteries are rare anomalies. Percutaneous embolization of such malformations is an established therapeutic option. The PDA duct occluder is a versatile device that can be used as an alternative to the vascular plug.

Conflict of interest There is no conflict of interest of authors and financial disclosures. This case has not been presented elsewhere.

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