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Case report

Percutaneous approach options for embolization of endoleak after iliac artery aneurysm repair: stick the sac or stick the gluteal artery ☆

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ABSTRACT

Internal iliac artery aneurysms (IIAAs), isolated or associated with abdominal aortic aneurysms, are at rupture risk with growth. Treatment is recommended when symptomatic or greater than 3 cm. Surgical or endovascular therapy should exclude the arterial origin and outflow branches. If all outflow branches are not completely embolized, an endoleak can develop, pressurizing the sac leading to growth and rupture. Accessing the arteries involved can be technically challenging and understanding potential targets is critical. We describe two percutaneous approaches for treatment: percutaneously accessing the sac from an anterior trans-iliopsoas approach and percutaneously accessing the gluteal artery from a posterior approach.

Introduction

Internal iliac artery aneurysms (IIAAs) are at increased risk of rupture with growth. Intervention is recommended when they are symptomatic, show rapid growth, or exceed 3 cm in diameter [1]. Endovascular treatment is preferred to open surgical ligation in a number of patients including those with noncompressive symptoms, infected aneurysms, and in patients that are at risk for adverse surgical outcomes [1]. Treatment necessarily includes exclusion of all inflow and outflow branches and can be accomplished with a combination of stent graft coverage of the origin of the internal iliac artery and coil or glue embolization of inflow and outflow branches. If any vessels remain patent following endovascular repair, a type 2 endoleak can develop, resulting in continued pressurization of the aneurysm sac, sac growth, and sac rupture. Accessing such endoleaks for additional embolization can be challenging due

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Fig. 1 – 71-year-old man with prior history of embolization of left internal iliac artery aneurysm with two Amplatzer plugs presented for endovascular treatment of type II endoleak via anterior trans-iliopsoas puncture of the aneurysm sac. (A) Axial CT angiogram of the pelvis shows the inferior aspect of a partially thrombosed left internal iliac artery aneurysm (short arrows). Calipers delineate the planned course of direct trans-iliopsoas puncture of the patent flow channel of the endoleak within the aneurysm sac. (B) 3D volume-rendered image demonstrates a robust collateral arising from the profundal femoris artery (long arrow) and providing inflow into the endoleak through reversal of flow in the obturator artery (arrowhead). Asterisk marks the Amplatzer plugs.

to aneurysm location, often deep in the pelvis. For IIAA endoleaks, access can be achieved either by direct puncture from a percutaneous anterior trans-iliopsoas approach or by percutaneous posterior trans-gluteal artery access approach.

Clinical case 1: Percutaneous anterior trans-iliopsoas puncture of the aneurysm sac

A 71-year-old man with a history of hypertension, diabetes, and benign prostatic hypertrophy was incidentally diagnosed with bilateral internal iliac artery aneurysms measuring 2.8 cm on the right and 5.5 cm on the left. The patient underwent embolization of the left IIAA at an outside hospital with placement of 2 Amplatzer vascular plugs (AGA Medical Corporation, Plymouth, Minnesota). Surveillance imaging over 2 years demonstrated a shift in the configuration of the Amplatzer plugs over time, development of a large type II endoleak, and growth of the left aneurysm sac to 6.0 cm. Given the size of the left sided aneurysm and interval growth, the decision was made to treat the endoleak. As the origin of the left IIAA had previously been embolized, another route of access was needed and the decision was made to pursue direct anterior percutaneous puncture of the aneurysm sac.

The patient was positioned supine on the CT table and a grid was placed in the left lower quadrant. A CT angiogram was then obtained through the pelvis. Under serial CT guidance, a 19-gauge Temno coaxial needle (Merit Medical Systems, South Jordan, Utah) was advanced into the sac (Fig. 1). The stylet was briefly removed to confirm active blood flow. The needle with stylet in place were secured and the patient was transferred to the angiography suite.

An angiogram was performed through the 19-gauge coaxial needle which defined inflow and outflow branches, corresponding to initial CTA (Fig. 1). A Check-Flo hemostatic valve (Cook Medical, Bloomington, Indiana) was attached to the hub of the needle. Under fluoroscopic guidance, a 2.4 French Progreat microcatheter (Terumo, Somerset, New Jersey) and Synchro microwire (Synchro Kalamazoo, Michigan) were inserted through the needle and used to catheterize the internal obturator artery, the inflow artery. Subsequently, coil embolization was performed with multiple Concerto detachable coils (Medtronic, Minneapolis, Minnesota). Subsequently, the superior gluteal artery and inferior gluteal artery were each catheterized and angiography confirmed these branches as the endoleak outflow. Each artery was coil embolized. Next, the catheter was retracted into the main endoleak channel within the aneurysm sac and numerous Nestor pushable coils (Cook Medical, Bloomington, Indiana) were deployed. The coils were then packed with approximately 6 mL of Onyx (Fig. 2) (ev3, Irvine, California). The needle and catheter were then removed.

On 2-month follow-up, the patient reported temporary left buttock claudication that had resolved and imaging showed stable size of the aneurysm sac without residual endoleak.

Clinical case 2: Percutaneous posterior puncture of the superior gluteal artery

An 80-year-old man with history of atherosclerosis underwent endovascular repair of a left IIAA via occlusion of the arterial origin with an Amplatzer vascular plug and placement of a left common iliac-to-external iliac artery covered stent three years prior to presenting to our institution. Surveillance imaging demonstrated an endoleak involving the superior and inferior gluteal arteries (Fig. 3). Aneurysm sac size was initially stable for 18 months but then increased from 5.7 cm to 6.3 cm over 1 year, prompting treatment. The endoleak channel within the aneurysm sac could not be accessed endovascularly or percutaneously, so direct percutaneous puncture of the superior gluteal artery, an outflow artery, from a posterior approach was chosen.

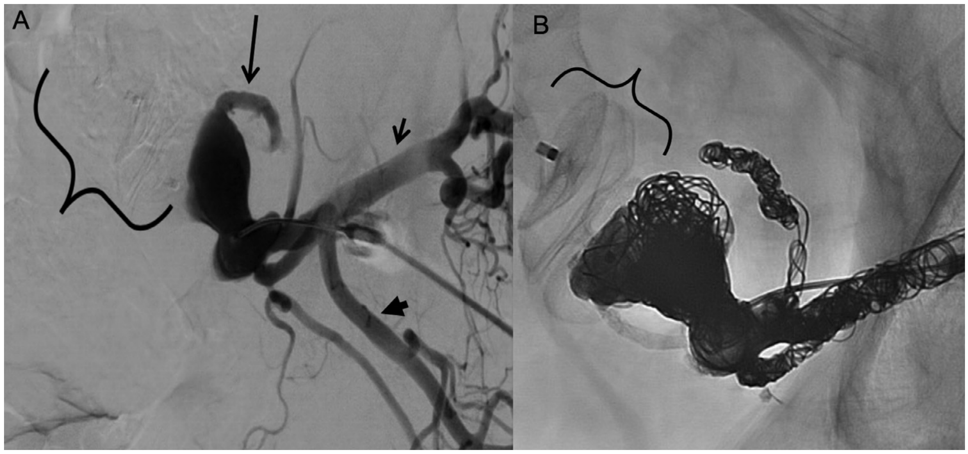

Fig. 2 – Pre and post embolization fluoroscopic images of the Case 1 endoleak and involved arterial branches. (A) Angiography was performed through the side arm of a check flow valve which was placed on the back of a 19-gauge Temno coaxial needle. The brisk injection forces contrast back into the obturator artery inflow (long arrow) and exits through superior (short arrow) and inferior gluteal artery (arrowhead) outflow. (B) The branch vessels seen in Fig. 2A have been coil embolized and the endoleak channel filled with a combination of coils and ethylene vinyl alcohol. The Amplatzer plugs are marked by the brackets.

Fig. 3 – 80-year-old man with prior history of left internal iliac artery aneurysm treated with a common iliac-to-external iliac artery covered stent and an Amplatzer plug presented for endovascular treatment of type II endoleak via direct puncture of the superior gluteal artery. (A) Axial CT angiogram of the pelvis in the prone position shows a partially thrombosed left internal iliac artery aneurysm (arrowhead) and an enlarged left superior gluteal artery with prominent atherosclerotic calcifications (arrow). (B) Ultrasound and CT guided direct puncture of the left superior gluteal artery with a 21-gauge micropuncture needle was aided by prominent calcifications which served as landmarks.

The patient was positioned prone on the CT table. A limited contrast-enhanced CTA of the pelvis was performed which demonstrated the left IIAA endoleak involved an enlarged superior gluteal artery. Non-contrast CT and ultrasound were used to guide a 21-gauge micropuncture needle into the left superior gluteal artery (Fig. 3). A 0.014 inch Transcend microwire (Stryker, Kalamazoo, Michigan) was threaded through the needle into the IIAA sac and the needle was exchanged for the 3 French inner portion of the micropuncture catheter. A Tuohy Borst adapter (Cook Medical, Bloomington, Indiana) was connected to the catheter. The catheter, wire and Tuohy Borst adapter were secured to the skin and the patient was transported to the angiography suite.

Angiography was performed demonstrating a prominent endoleak with inflow from the lateral sacral artery and outflow via an enlarged superior gluteal artery (Fig. 4). An Echelon-10 microcatheter (Medtronic, Minneapolis, Minnesota) was used to deploy multiple Concerto detachable coils into both vessels as well as the endoleak channel in the aneurysm sac. Then, 1.4 mL of Onyx (ev3, Irvine, California) was injected into the arteries and endoleak channel. The catheters were then removed.

On evaluation 1 month after the procedure, the patient reported mild recurrent left thigh and buttock claudication at walking distances of approximately one half of a mile. CT angiography demonstrated no growth in the aneurysm sac or evidence of endoleak.

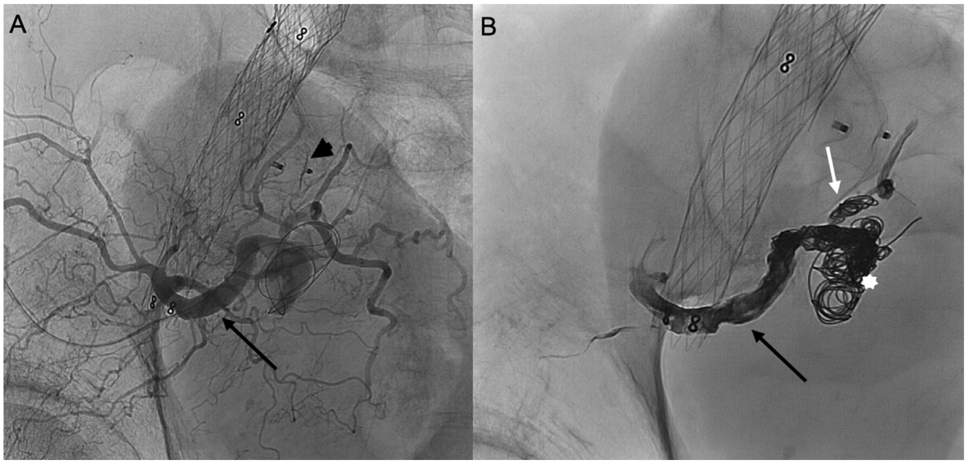

Fig. 4 – Pre and post embolization fluoroscopic images of the Case 2 endoleak and involved arterial branches. (A) Angiography performed through percutaneous puncture of an enlarged superior gluteal artery (black arrow). A covered stent extends from common iliac to external iliac artery with an Amplatzer plug (arrowhead) in the origin of the internal iliac artery. (B) Multiple coils and Onyx fill the lateral sacral artery (white arrow), superior gluteal artery (black arrow) and aneurysm sac (asterisk).

Discussion

While the majority of published data on type II endoleaks, enlarging aneurysm sacs, and risk of aneurysm rupture refer to abdominal aortic aneurysms, this data can be extrapolated to enlarging aneurysms of the iliac arterial system. The risk of rupture increases with the size and rate of growth of the aneurysm sac [2, 3]. Management of untreated and treated iliac artery aneurysms can be approached endovascularly, even in the emergent setting of rupture [4].

Endovascular aneurysm repair has been demonstrated to have reduced morbidity and mortality compared to open surgery [5]. Type II endoleak, however, remains a common issue in up to 20% of endovascular repairs [6]. Treatment of IIAA endoleaks can be technically challenging when anterograde access is excluded during initial treatment. Treatment of the endoleak conceptually mirrors the goal of initial treatment: to exclude the aneurysm sac from circulation. In order to achieve this, all inflow and outflow branches feeding the sac must be excluded. Eliminating flow to the sac will lead to stasis and eventual thrombosis of the sac.

As with any percutaneous endoleak intervention, flexibility in regard to the access approach is necessary. While many abdominal aortic aneurysm endoleaks can be accessed percutaneously from a posterior trans-lumbar approach, the deep pelvic location of IIAAs requires evaluation of alternative access options. The two approaches described in this report, anterior percutaneous trans-iliopsoas direct sac puncture and posterior percutaneous superior gluteal artery puncture, provide access options for most IIAA endoleaks.

Potential complications of IIAA endoleak embolization include vessel injury, buttock claudication, pelvic skin necrosis, and colonic and spinal cord ischemia. The incidence of these complications increases with bilateral treatment. Buttock claudication is usually self-limited as new collaterals develop over time to supply the musculature [1]. Despite these risks, given the high mortality and morbidity associated with aneurysm rupture, treatment of IIAA endoleaks with enlarging sacs is warranted and is feasible through an endovascular approach.

Patient Consent

The authors declare that this report does not contain any patient identifiable information. Written informed consent for publication was obtained from one patient. The other patient was deceased and written informed consent for publication was obtained from his wife.

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