Transgluteal echo-guided arterial access: an unusual approach to treat type II endoleak following endovascular repair of an aortic and internal iliac artery aneurysm.

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Learning objectives

The purpose of the educational exhibit is:

- to discuss the limits of traditional treatment options of type II endoleak after endovascular aneurysms repair (EVAR);

- to present transcatheter direct puncture of the superior gluteal artery as a novel approach to treat the type II endoleaks.
Endovascular treatment of abdominal aortic aneurysms (EVAR) involves placement of an endoluminal graft inside the aneurysmal sac in order to exclude it from blood circulation and thereby prevent the risk of aneurysmal sac rupture. A possible complication is endoleak, due to persistence of blood flow outside the lumen of the endograft into the aneurysmal sac.

There are five different types of endoleaks, classified based on the source of vessels that causes the inflow into the aneurysm sac.

Type II endoleak is defined as a retrograde flow through collateral vessels (lumbar artery, inferior mesenteric artery, hypogastric artery and accessory renal artery) into the aneurismal sac.

Management of type II endoleaks is controversial because they are generally low pressure, but need lifelong surveillance. The main indicator of hemodynamic significance of type II endoleak is the increasing size of the aneurismal sac during the follow-up, because it implies high-pressure blood flow and high long-term risk of rupture.

Mininvasive management options include endovascular approach, direct percutaneous puncture of the aneurysm sac via the translumbar (left side) or transcaval (right side) approaches.

The endovascular approach includes the retrograde catheterization of the ascending lumbar arteries via the hypogastric artery or the IMA via the superior mesenteric artery (middle ascending left colic arcade or arc of Riolan). When the microcatheter is into the aneurysm sac, coil embolization of the sac itself and the major feeding artery can be performed. Glue or Onyx embolization is used to treat the secondary feeding vessels and to complete the sac embolization.

Another possible endovascular approach is to reach the aneurismal sac with an angiographic catheter by passing between the arterial wall and the endoprosthesis, and to perform the embolization of the sac and feeding vessels.

Direct percutaneous puncture of the aneurysmal sac can be performed via translumbar or trans-abdominal approach and consists of embolization of the endoleak itself to prevent communication between different aortic branch vessels and the aneurysm sac.
Direct percutaneous puncture of the aneurysm sac can be performed under CT, fluoroscopic or US guidance. With the patient prone, a sheath needle is directed toward the anterolateral aspect of the vertebral body until the needle enters into the aneurysm sac. Correct positioning of the catheter into the endoleak cavity is signaled by pulsatile return of blood and opacification of lumbar arteries or IMA on manual injection of contrast.

Contrast injection can confirm needle placement into the sac and often demonstrates the feeding vessels.

Coils and glue are then deployed until there is no further blood return.

In transperitoneal puncture, the needle passes through the peritoneal cavity and has at increased risk of viscus perforation and infection.

When conventional endovascular treatment is not possible, an alternative method of effectively treating the type II endoleak can be attempted.

The internal iliac artery divides into superior and inferior gluteal arteries, which traverse through the pelvic cavity to the buttock. Catheter-based access to the internal iliac artery can therefore be gained via the superior and inferior gluteal arteries in a retrograde manner.
Findings and procedure details

A 75-year-old male patient was previously treated for an aortic and right hypogastric aneurysm with the positioning of an aortobisiliac endoprosthesis (Anaconda™ AAA Stent Graft System - Vascutek) and embolization of the right hypogastric artery with Amplatzer® vascular plug. (Fig 1).

A postoperative computed tomographic (CT) angiogram performed 1 year after the initial placement of the endograft showed the presence of contrast within the aneurysm sac. (Fig. 2)

During the postoperative follow-up 18 months later, CT examination demonstrated an increase in aneurysm diameter (87 mm vs 72 mm) (Fig. 3). The patient also presented a history of constipation and urinary symptoms suggesting an extrinsic compression of bladder and rectal colon.

The aneurysm sac resulted from collateral retrograde flow from the gluteal arteries, not pre-emptive embolized prior to stent-graft insertion, resulting in a type II endoleak.

No conventional treatment options were possible because of anatomical site and previous endovascular treatment:

- transarterial approach with retrograde catheterization of the ascending lumbar arteries via the hypogastric artery or through a virtual cavity between the distal attachment site of the graft and the arterial wall were prevented by the presence of the Amplatzer vascular plug.

- translumbar and transperitoneal direct puncture were not possible because of the deep position of the sac with high risk of viscus perforation.

A novel method of treating type II endoleaks with direct puncture of a superior gluteal artery out of great sciatic foramen was then planned.

The patient was placed face down and direct puncture of a muscular branch of the superior gluteal artery was obtained under US guidance with a single-entry arterial needle (21 g x 11 cm). Manual iodine contrast injection confirmed the correct positioning of the needle after the third tentative.

0.018-inch Nitinol wire guide (platinum tip) was used to incannulate the superior gluteal artery (Fig. 4) and the 5F outer catheter was employed to change the wire (0.035-inch Amplatz super Stiff wire); a 4F vascular introducer was then placed.
Under fluoroscopic guidance, coaxial technique was used to catheterize the superior gluteal artery and to reach the aneurismal sac.

Arteriogram of the endoleak sac showed an afferent blood flow during the systolic phase and an efferent blood flow during diastole. Multiple coils (coil diameter up to 20-40% over the arterial diameter) were released into the aneurismal sac, into the major feeding artery (a common arterial trunk with 8 mm diameter) and into the inferior gluteal artery to improve the coil stability.

Complete resolution of the endoleak with absence of blood flow and successful exclusion of the aneurysm sac were confirmed on completion angiography. (Fig. 5)

After embolization, the puncture tract was embolized with the release of two coils, in order to reduce the amount and velocity of blood flow. Injection of a mixture of N-butyl cyanoacrylate liquid adhesive and iodized oil 1:2 (Glubran/Lipiodol) was performed. (Fig. 6)

No complications after procedure occurred and the patient was dismissed 48 hours later.

One-month follow-up with ultrasonography demonstrated complete occlusion of the endoleak with no flow in the aneurysm sac. (Fig. 7)

CT scan performed 1 year later showed the recurrence of the endoleak because of coils dislocation into the aneurismal sac. (Fig. 8, Fig. 9)
Fig. 1: 3D CT scan showing the aortobisiliac endoprosthesis and the right hypogastric vascular plug.

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Fig. 2: Type II endoleak after endovascular aneurysm repair. CT scan demonstrates contrast within the aneurysm sac.

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Fig. 3: CT scan performed 18 months later shows the increase in aneurysm size (diameter 87 mm vs 72 mm).

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Fig. 4: 0.018-inch Nitinol wire guide incannulating the superior gluteal artery.

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Fig. 5: Coils released into the aneurismal sac, the major feeding artery and the inferior gluteal artery.

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**Fig. 6:** Post-embolization image shows coils in endoleak sac and Glubran/Lipiodol in distal branches of superior gluteal artery.

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Fig. 7: 1 month US follow-up shows diffuse hyperechogenic areas into the aneurismal sac and absence of blood flow.

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Fig. 8: CT scan performed 1 year later showed the recurrence of the endoleak.

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Fig. 9: CT scan performed 1 year later showed the coils dislocation into the aneurismal sac.

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Conclusion

Endovascular aneurysm repair (EVAR) is complicated by endoleaks in 20 to 25% of patients. [1,2]

Type II endoleak is the most commonly identified endoleak and it is characterized by retrograde flow into the aneurysmal sac from patent side branches. [3]

In this case, the patient was previously treated for an aortic and right hypogastric aneurysm with the positioning of an aortobisiliac endoprosthesis and embolization of the proximal tract of the right hypogastric artery with Amplatzer vascular plug.

The collateral retrograde flow from the gluteal arteries, not pre-emptive embolized prior to stent-graft insertion, prevented the thrombosis of the aneurysmal sac, resulting in a type II endoleak.

A minimvasive endovascular approach was the therapy of choice because of the age of patient and the deep site of the aneurysmal sac, but in this case, no conventional treatment options were possible because of the previous endovascular treatment.

Transfemoral retrograde catheterization using microcatheters with occlusion by coiling or embolic materials has been shown to have technical success in the range of 65% to 100%. [4]

Type II IMA endoleaks are treated by selecting the middle colic artery through the superior mesenteric artery and retrograde access to the IMA through the marginal artery.

Type II lumbar endoleaks are accessed through retrograde cannulation of the iliolumbar arteries from the internal iliac arteries.

In this case, the major feeding vessels were the gluteal arteries and the transfemoral retrograde catheterization could not be performed because of the absence of viable collateral pathways.

Another technique described in literature is the embolization via a lateral approach through a virtual cavity between the distal attachment site of the graft and the arterial wall. The success of this technique depends on the anatomical variants and in this case was prevented by the presence of Amplatzer vascular plug.

Many authors affirm that the effectiveness of the direct puncture of aneurysmal sac is similar to that of trans-arterial technique. [5, 6]
The limit of this approach in our case was due to the deep position of the sac within the pelvis and to the high risk of viscus perforation (bladder and bowel) and of nerves and vessels injuries.

A novel method of treating type II endoleaks with direct puncture of a superior gluteal artery out of great sciatic foramen was then performed.

The direct puncture of an extrapelvic muscular branch of the superior gluteal artery was obtained under US guidance. The target vessel was not detectable on B-mode images with a linear high-frequencies probe (7.5-13 MHz) because of the deep position. The direct puncture was then obtained using a convex-array traducer (3.5-7 MHz) and the color-Doppler mode. The correct positioning of the needle was reached after the third tentative and a 5F catheter was positioned.

The planning of haemostasis played an important role in the choice of the arterial access: the direct puncture of the superior gluteal artery was easy because of its large diameter, but the intrapelvic position was at high risk of retroperitoneal hematoma in case of procedure complications.

Arteriogram of the endoleak sac showed the presence of a single feeding artery. Multiple coils (coil diameter up to 20-40% over the arterial diameter) were released into the major feeding artery and into the inferior gluteal artery to improve the coil stability.

Complete procedural success was confirmed on 1-month US follow up.

The recurrence of endoleak 12 months after treatment suggests that large endoleaks are at risk of late coil displacement even if the success is complete immediately after the procedure. In these cases, the positioning of vascular plugs or extensive coil embolization of the sac should be recommended.

To our knowledge, no other cases of direct puncture of superior gluteal artery were reported in literature at the time of the procedure.

Patel et al. described a similar case of superior gluteal artery embolization to treat a ruptured internal iliac artery aneurism secondary a type II endoleak, but no mention of haemostatic technique was made. [7]

Manual compression for haemostasis and the use of arterial closure devises (Angioseal) were not possible in our case because of the deep position and the size of artery.

Coil and glue embolization of the artery was performed respectively in the proximal and distal tract near the puncture size to prevent the hematoma formation.
The increasing size of the aneurismal sac during the follow-up suggests that endoleaks are at high risk of long-term rupture. In these cases, endovascular treatment should be the first-line technique of treatment of type II endoleak.

Direct puncture of a superior gluteal branch is a safe, relatively straightforward, and effective and alternative method to manage hypogastric endoleaks when conventional endovascular methods have failed.
References


