Case Report

Atypical Type 2 Endoleak from an Artery Supplying the Psoas Major Muscle Following Endovascular Repair in a Case of Isolated Common Iliac Artery Aneurysm

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Abstract

In this report, we present a rare case of type 2 endoleak (T2EL) from an artery supplying the psoas major muscle, following an endovascular repair of a common iliac artery aneurysm (CIAA). A 79-year-old male underwent endovascular aneurysm repair (EVAR) for the right isolated CIAA using stent graft, with embolization of the ipsilateral internal iliac artery. The aneurysm was stable for 2 years, after which a follow-up CT revealed a 5 mm increase in the CIAA diameter and an endoleak of unknown origin. Conventional and CT angiographies revealed the source to be a branch from the ipsilateral deep circumflex iliac artery supplying the psoas major muscle that had developed an anastomosis at its terminal end with the vasa vasorum at the CIAA. Transarterial embolization of T2EL using glue was performed successfully, following which the T2EL disappeared.

Key words: Iliac artery aneurysm, Type 2 endoleak, Embolization

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Introduction

In recent times, endovascular aneurysm repair (EVAR) for iliac artery aneurysms has achieved significant technical success and low rates of morbidity [1]. Type 2 endoleak (T2 EL) following EVAR is usually caused by back flow of the blood inside the arterial branches originating at the site of stent graft insertion [2]. However, the incidence of T2EL following EVAR of a common iliac artery aneurysm (CIAA) is rare, and most of the reported origins of the leak are the internal iliac artery (IIA) and its branches [3-6]. In this report, we present a rare case of T2EL of CIAA from an artery supplying the psoas major muscle through the vasa vasorum, which was treated with transarterial embolization.

Case Presentation

A 79 year-old male presented with a right-sided CIAA of 50 mm diameter; the aneurysm involved the entire length of the common iliac artery (CIA) right from the aortic bifurcation to the origin of the internal iliac artery. The patient underwent elective EVAR for the management of this aneurysm, including insertion of a Y-shaped stentgraft (Aorfix, Lombard Medical, Oxfordshire, UK) following embolization of the right internal iliac artery using a vascular plug (Amplatzer Vascular Plug II, ST. JUDE MEDICAL, St. Paul, MN, USA). No endoleak was seen on contrast-enhanced computed tomography (CT) 1 week after the EVAR, and the aneurysm was stable for the next two years. However, one month later, a follow-up contrast-enhanced

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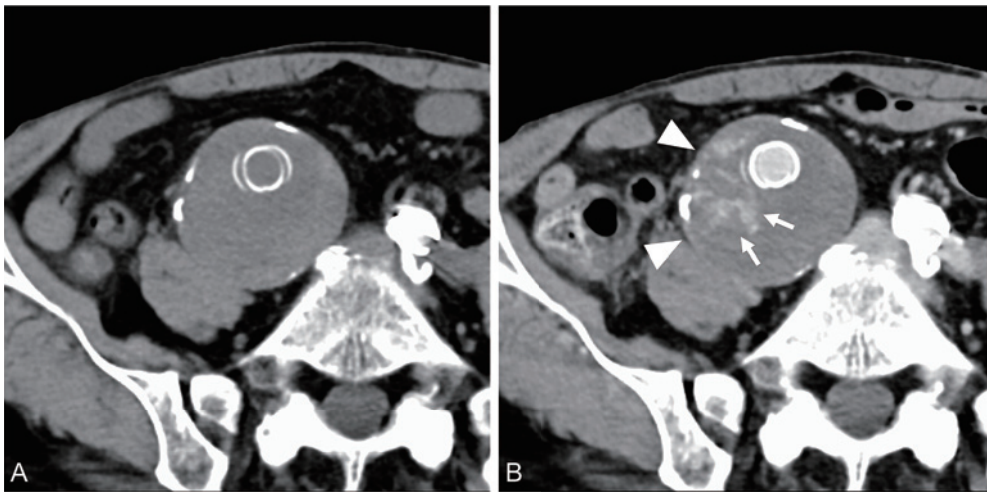

Fig. 1. Plain CT (A) and contrast-enhanced CT (B) before embolization.
Contrast enhanced CT shows an endoleak of unknown origin (arrows) and aneurysmal wall enhancement (arrowheads).

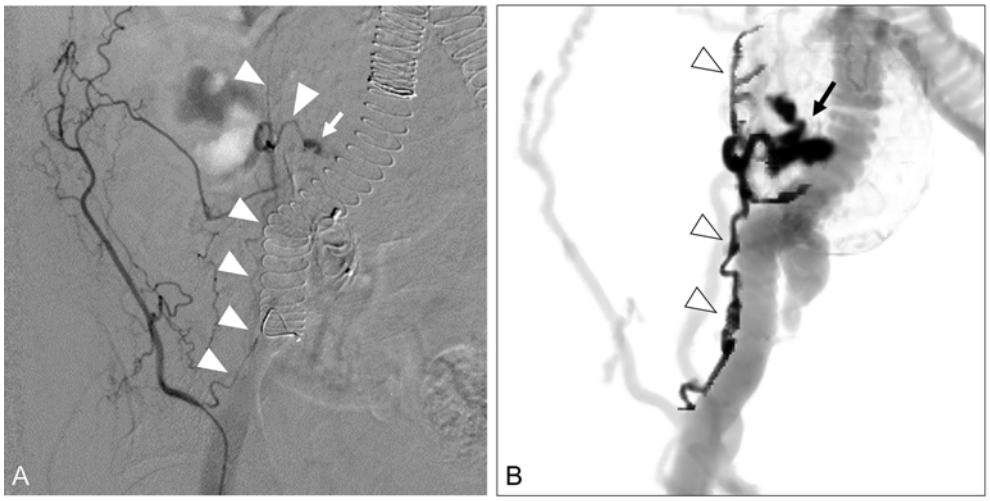

Fig. 2. Selective angiography of the right deep circumflex iliac artery (A) and catheter-directed CT angiography of the right external iliac artery with 3D volume rendering (B).
A branch originating from the proximal deep circumflex iliac artery ascending adjacent to the right external iliac artery and anastomosing with the small reticular arteries (arrowheads). The largest of the small reticular arteries communicated with the sac nidus (arrow).

CT revealed a 5 mm increase in the maximum short diameter of the aneurysm, due to an endoleak of unknown origin with arterial wall enhancement (**Fig. 1**). The patient underwent angiography for diagnosis and treatment of the endoleak. The endoleak was approached through the right common femoral artery and a 4-F short sheath was introduced in a retrograde direction. Selective angiography and catheter-directed CT angiography via the right external iliac artery (EIA) revealed a branch originating from the proximal deep circumflex iliac artery (DCIA) ascending adjacent to the right EIA and anastomosing with small reticular arteries. These reticular arteries were distributed over the aneurysmal wall and the largest of these arteries communicated with the sac nidus distally. The aneurysmal wall and the intrasaccular thrombus adjacent to the wall were enhanced on the delayed phase of CT angiography (**Fig. 2**, **3**). A 1.5-Fr micro catheter (Veloute ultra, Asahi, Aichi, Japan) over a 0.014-inch micro guidewire (CHIKAI, Asahi, Aichi, Japan) was advanced into the ascending branch through a self-made side hole in a 4-Fr cobra-shaped catheter (Medikit, Tokyo, Japan), which was then inserted in the DCIA and advanced until the sac. Then, 1.5 ml of 20% n-butyl-2-cyanoacrylate (NBCA; Histacryl, Braun, Melsungen, Germany) mixed with ethiodized oil (Lipiodol, Andre-Gelbe Laboratories, Paris, France) was used to embolize the sac nidus and the feeding artery. CIA angiography after embolization confirmed flow stagnation in the embolized artery and the disappearance of the T2EL. NBCA cast was seen within the sac, along with

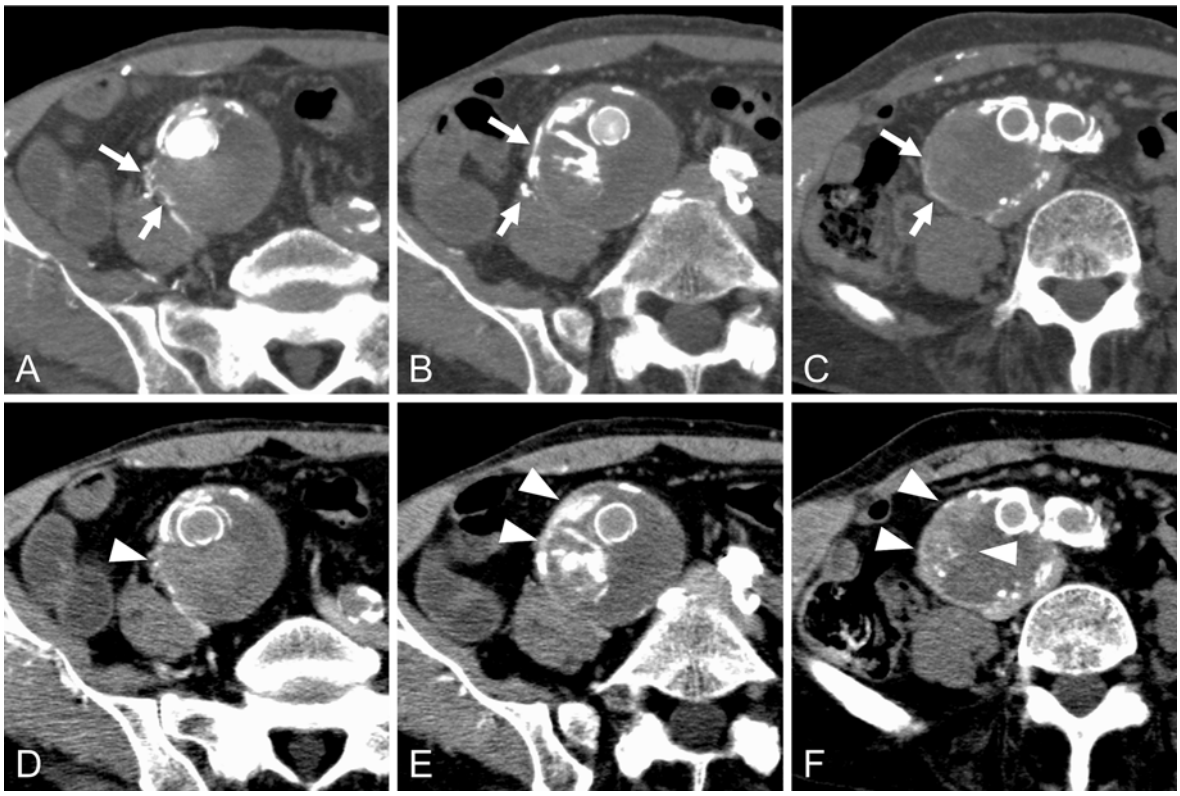

Fig. 3. Early phase (A-C) and delayed phase (D-F) of catheter-directed CT angiography of the right external iliac artery
Small reticular arteries distributed over the aneurysmal wall (arrows). The aneurysmal wall and intrasaccular thrombus adjacent to the wall were enhanced during the delayed phase (arrowheads).

Fig. 4. Fluoroscopic image (A) non-contrast CT (B, C) after embolization.
NBCA cast was seen within the sac, along with the aneurysm wall, the feeding artery, and the ipsilateral psoas muscle (arrowheads).

the aneurysm wall, the feeding artery, and the ipsilateral psoas muscle on fluoroscopic image and CT (**Fig. 4**). The aneurysm showed no increase on CT for nine months after embolization.

Discussion

The distribution of NBCA cast to the psoas muscle on CT demonstrates that the ascending branch from DCIA mainly supplied the ipsilateral psoas major muscle in the present case. This muscle has a complex arterial supply from the lumbar, iliolumbar, obturator, external iliac, and common femoral arteries. Pillet et al reported that blood supply to the psoas major from EIA was not from multiple small branches, but from a single, well-calibrated artery in 75% of the cases in their study, which they named as the 'principal' artery [7]. In our case, we presume that the feeder was the principal artery of the psoas major muscle, which originated from the DCIA instead of the EIA. To the best of our knowledge, T2EL of CIAA from the principal artery of the

psoas major muscle has not been previously reported.

The anastomosis of the principal artery, with a network of small arteries distributed over the wall of the CIAA, led to a T2EL associated with the aneurysmal wall and intra-saccular thrombus enhancement. This network of small arteries meets the description of vasa vasorum: small vessels arising from the proximal trunk of large arteries, which circulate in its adventitia to supply blood to the outer third of the arterial wall [8]. T2EL developing through the vasa vasorum after endovascular repair of an abdominal aortic aneurysm has been reported previously. Stent graft insertion inside an aneurysm can lead to exclusion of the circulation from inside the arterial wall and has been reported to cause hypertrophy of the vasa vasorum and can subsequently lead to T2EL. Visualization of the developed vasa vasorum and heterogeneous and patchy enhancement of the thrombus were reported as imaging findings of T2EL through the vaso vasorum [8]. In the present case, enhancement of the aneurysmal wall and intrasaccular thrombus supported that this endoleak was through the vaso vasorum. The largest of the small arteries that communicated with the sac nidus might not have been the vasa vasorum, but a lateral branch of the CIA anastomosing with the principal artery of the psoas major muscle. el Mamoun et al. mentioned the prevalence of a lateral branch of the CIA that supplied the iliopsoas muscle [9]. However, we think that in our case the artery was not a lateral branch of CIA, but the vasa vasorum itself, because no branches from the CIAA were seen on the contrast-enhanced CT performed before the EVAR. Furthermore, the artery communicated with the sac nidus after running along the arterial wall.

In summary, we presented an atypical case of T2EL from an artery supplying the psoas major muscle, following endovascular repair of CIAA, which was successfully treated with transarterial embolization.

Ethics approval and consent to participate: IRB approval is not needed for this type of submission at our institution.

Consent for publication: IRB approval is not needed for this type of submission at our institution.

Conflict of interest: The authors declare that they have no competing interest.

Authors' contributions: MH was the major contributor in writing the manuscript. TO was the major contributor in creating the project and in performing the endovascular procedure. MY and YG performed the endovascular procedure. KO, KS and TM were involved in revising the manuscript. All authors read and approved the final manuscript.

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References

1. Sahgal A, Veith FJ, Lipsitz E, et al. Diameter changes in isolated iliac artery aneurysms 1 to 6 years after endovascular graft repair. J Vasc Surg. 2001;33(2):289-295. doi:10.1067/mva.2001.112702
2. Gelfand D V, White GH, Wilson SE. Clinical significance of type II endoleak after endovascular repair of abdominal aortic aneurysm. Ann Vasc Surg. 2006;20(1):69-74. doi:10.1007/s10016-005-9382-z
3. Boules TN, Selzer F, Stanziale SF, et al. Endovascular management of isolated iliac artery aneurysms. J Vasc Surg. 2006;44(1):29-37. doi:10.1016/j.jvs.2006.02.055
4. Chemelli A, Hugl B, Klocker J, et al. Endovascular repair of isolated iliac artery aneurysms. J Endovasc Ther. 2010;17(4):492-503. doi:10.1583/10-3047.1
5. Chaer RA, Barbato JE, Lin SC, Zenati M, Kent KC, McKinsey JF. Isolated iliac artery aneurysms: A contemporary comparison of endovascular and open repair. J Vasc Surg. 2008;47(4):708-714. doi:10.1016/j.jvs.2007.11.008
6. Patel NV, Long GW, Cheema ZF, Rimar K, Brown OW, Shanley CJ. Open vs. endovascular repair of isolated iliac artery aneurysms: A 12-year experience. J Vasc Surg. 2009;49(5):1147-1153. doi:10.1016/j.jvs.2008.11.101
7. Pillet J, Chevalier JM, Rasomanana D, et al. The principal artery of the psoas major muscle. Surg Radiol Anat. 1989;11(1):33-36. doi:10.1007/BF02102243
8. Torikai H, Inoue M, Nakatsuka S, et al. Imaging Findings of Atypical Type II Endoleak Through Vasa Vasorum After Abdominal Endovascular Aneurysm Repair. Cardiovasc Intervent Radiol. 2018;41(1):186-190. doi:10.1007/s00270-017-1778-y
9. el Mamoun BA, Demmel U. The lateral branches of the common iliac artery. Surg Radiol Anat. 1988;10(2):161-164. doi:10.1007/BF02307826