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SHORT REPORT

# Ultrasound Assisted On-Table Management of Type III Endoleak at Endovascular Repair of Isolated Giant Common Iliac Aneurysm

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**Objectives:** This report presents the endovascular treatment of a large isolated common iliac artery aneurysm, focusing on the use of on table ultrasonography to characterise and treat an early endoleak that could not be defined by angiography alone.

**Report:** A 58 year old man presented with an asymptomatic, large (13cm) left common iliac artery aneurysm (LCIAA) whilst being investigated for change in bowel habit. This was treated successfully via a percutaneous approach using left internal iliac embolisation followed by endovascular aneurysm repair (EVAR) with deployment of an aorto-uni-iliac converter system from the LCIA origin to the external iliac artery. A non-characterised endoleak at the end of the procedure was shown to be a type IIIb endoleak by application of immediate on table ultrasonography, allowing immediate supplementary targeted stent graft deployment to cover the leaking segment.

**Discussion:** The patient was discharged uneventfully and will remain on follow up. On table ultrasonography allowed both localisation and characterisation of an immediate intra-procedural endoleak and confirmed cessation of the endoleak with supplementary stent grafting and thrombosis within the sac.

**Conclusions:** Isolated CIAA is rare, and endovascular therapy is appropriate for them, given that open surgery, whilst feasible, carries a high morbidity and mortality risk. Application of on-table ultrasound allows definition and targeted treatment of endoleaks, reducing the need for further intervention at a later stage, and thus also reducing the risk of continued pressurisation of the large sac post-EVAR till the next surveillance episode.



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## INTRODUCTION

Isolated common iliac artery aneurysms (CIAAs) are rare, with a reported incidence of 0.03%.[1] CIAAs are most commonly asymptomatic but they can present with rupture or pressure symptoms. Mono-iliac endovascular aneurysm repair (EVAR) of a giant left CIAA, which was complicated by an endoleak, was performed. This report describes the application of successful immediate on-table ultrasound-guided management of an intra-procedural endoleak.

## REPORT

A 58 year old man was admitted for investigations related to weight loss and change in bowel habit. A full body computed tomography (CT) scan revealed an isolated left common iliac artery aneurysm (LCIAA) measuring 13cm in maximum diameter (Fig. 1a). He was a non-smoking, non-hypertensive patient with no family history of aneurysm disease; relevant co-existent medical conditions included atrial fibrillation for which he took apixaban (withheld pre-procedure), non-ischaemic cardiomyopathy, and sleep related breathing disorder (SRBD) for which he was on bilevel positive airway pressure (BiPAP) therapy. On admission he was afebrile with no haematological evidence of infection (CRP 10mg/L (normal range 0—5mg/L), WCC $3x10^9$/L).

A proximal landing zone (>25mm) in the LCIA was present, lending itself to a decision to proceed to emergency endovascular repair. He therefore underwent percutaneous EVAR under a general anaesthetic. The left internal iliac artery was first embolised with two pushable coils. As the outflow and inflow from the LCIAA were not in line (Fig. 1b), a stiff aortic wire was placed after establishing a right to left femorofemoral pull through wire, railroading an angiographic catheter to the aortic bifurcation and then directing the resultant catheter wire combination towards the thoracic aorta. A low profile aorto-uni-iliac converter (ZLC 24—66; Cook Aortic Interventions, Bloomington, USA) was deployed to achieve a proximal seal, necessarily

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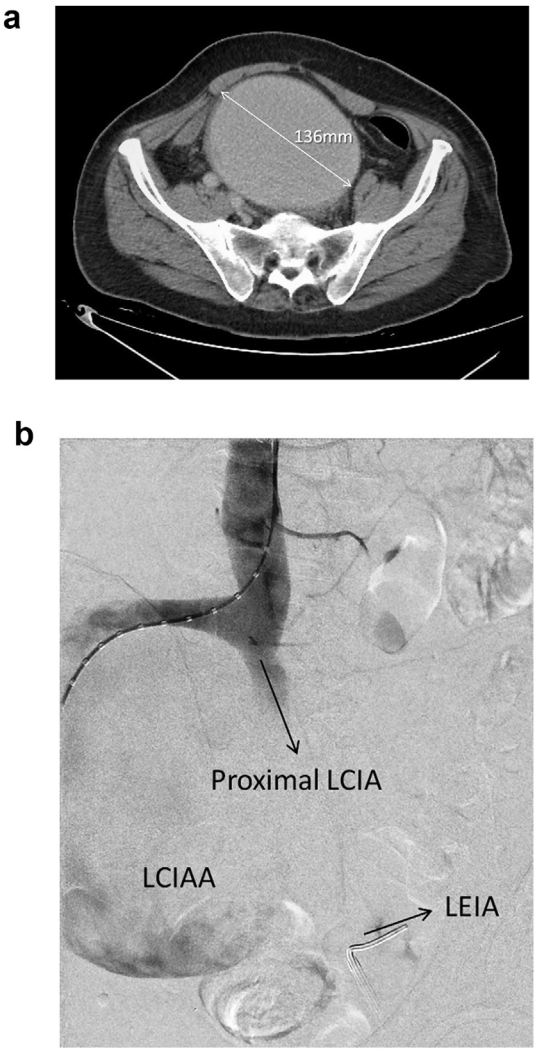


**Figure 1. a** Axial CT view showing LCIAA occupying the pelvis. **b.** Angiogram indicating the profile of the RCIA splayed out over the LCIAA, and the tortuous iliac anatomy exemplified by the lack of alignment between the LCIA and LEIA.

supported by a 20F introducer sheath (Sentrant, Medtronic, Dublin, Ireland) because of the tortuous wire track, with completion of the endograft system by limb extension (Alpha ZISL-16-93, Cook Aortic Interventions) to the external iliac artery at the distal landing zone, with good overlaps between the multiple endograft components (Fig. 2a). All sealing zones and stent overlaps were moulded using a Coda Balloon (Cook Aortic Interventions).

A non-specific blush was noted on the completion angiogram that could not be accurately characterised (Fig. 2b). An ultrasound scan (USS) was undertaken using a 3.5MHz curvilinear probe (Aplio SSA-660A, Toshiba, Tochigi, Japan) which confirmed the absence of type I endoleak. Clear jets of blood were noted from the limb extensions (Fig. 2c). As there was a more than adequate overlap between the endograft components (>3 stent lengths) this was deemed to be a type IIIb endoleak due to a fabric defect. This was immediately relined with a further bridging stent graft [Alpha ZISL-11-59, Cook Aortic Interventions; Fig. 3a] with both angiographic and sonographic confirmation that the endoleak had resolved. USS also confirmed that the LCIAA had thrombosed after exclusion. Post-procedure CT angiography at four weeks also confirmed optimal stent graft positioning with no endoleak (Fig. 3b). The patient was discharged with no early complications and will remain under surveillance.

## DISCUSSION

Isolated CIAAs are described as rare though the commonest of all variants of isolated IAAs.[2] Computational flow dynamic (CFD) studies[3] suggest that local flow parameters predispose to CIAA formation in preference to the IIA and also aortic deviation, which then probably contributes to aorto-iliac tortuosity which is relevant from a technical standpoint. EIAA formation, which is rare, is linked to a different embryological pathogenetic mechanism which makes the EIA less susceptible to aneurysm formation compared with the CIA and IIA[4,5]. The CIAA morphology was that of a Reber type I IAA with the least common variant involving all three IAs (Reber IV).[6] There was no phenotypic indication of systemic tissue disorders such as Marfan or Ehlers-Danlos syndromes[4] in this case, and thus no further tests were undertaken in this context. Nevertheless, it is felt that continued surveillance is mandatory given the young age and the possibility of developing further aneurysms.[7]

In the context of management, open surgical repair (OSR) is associated with high mortality and morbidity[8] with a high risk of iatrogenic injury to pelvic veins, nerves and ureters.[9] In the current era,[10] endovascular repair is therefore appropriate and even proposed as the first line of treatment.[9] It is thus likely that formal comparisons between mono-iliac EVAR and OSR, which have already been undertaken on a historical basis, will probably never happen. Current guidelines suggest treatment at a 35mm threshold.[9] The LCIAA was thus amenable to mono-iliac EVAR based on both size and morphology.

USS availability is a necessary convenience given that most EVAR is ideally undertaken via percutaneous access; the additional reason to consider use of USS when treating such large aneurysms is for consideration of percutaneous transabdominal embolisation e.g. using thrombin[11], which was factored into the plan. In fact, there was already significant thrombus in the LCIAA at the first scan, despite the high flow endoleak, which then propagated as the endoleak was eliminated. Intra-operative (contrast enhanced) USS has been employed in the detection and characterisation and thus treatment of endoleaks, but usually for type I/II endoleakage[12], with only recent papers[13] echoing the premise of using USS for on table characterisation of type III endoleaks. The approach thus described may therefore represent a useful strategy in this scenario when treating type III endoleaks that cannot be localised accurately or, as in this case, characterised by digital subtraction angiography

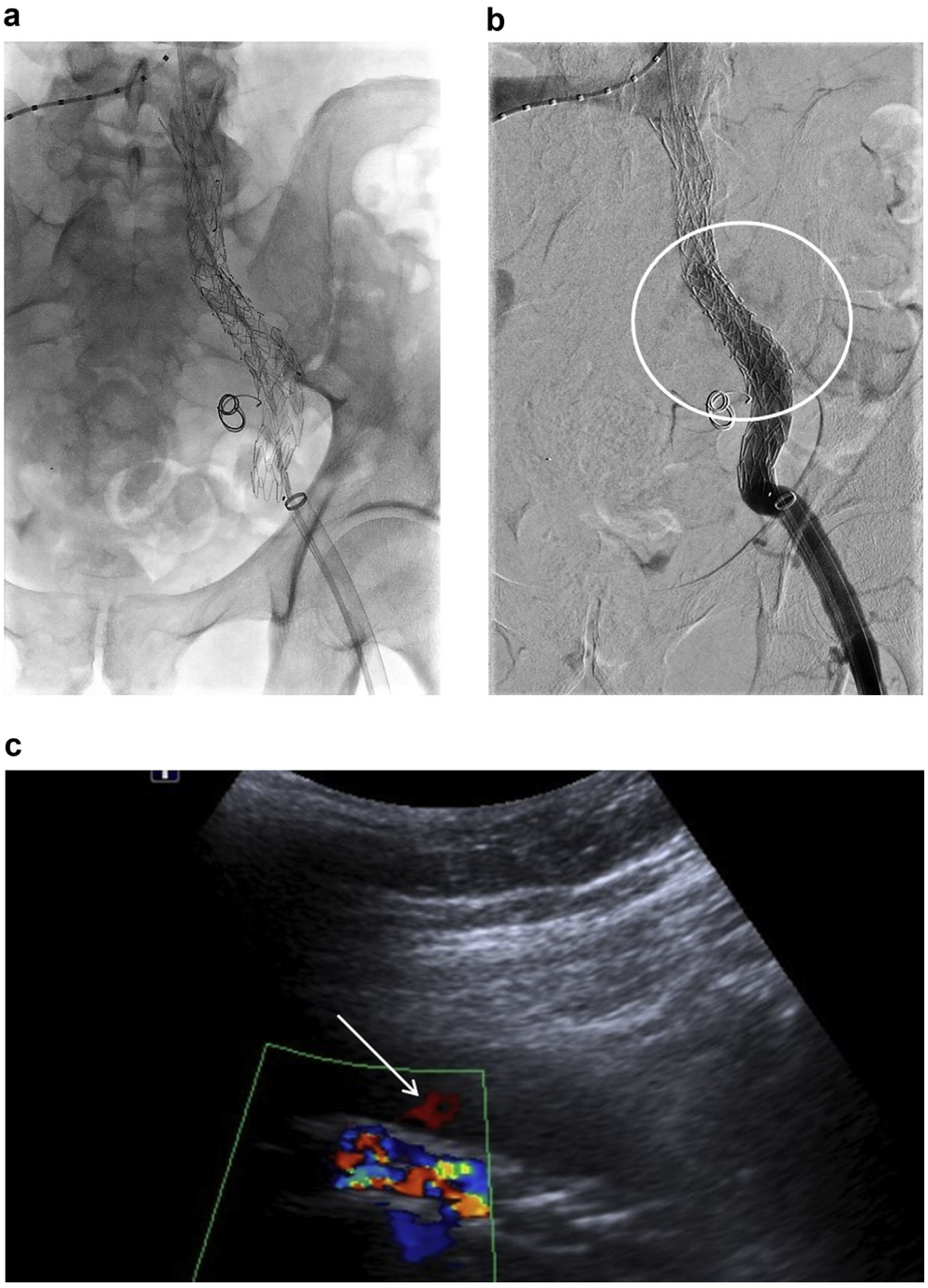


**Figure 2. a** Final position of deployed aorto-uni-iliac stent graft system. The internal iliac coils can be seen. **b.** Completion angiogram indicating the blush of an endoleak (circled). **c.** On table sonographic appearance of endoleak (red jet, arrowed).

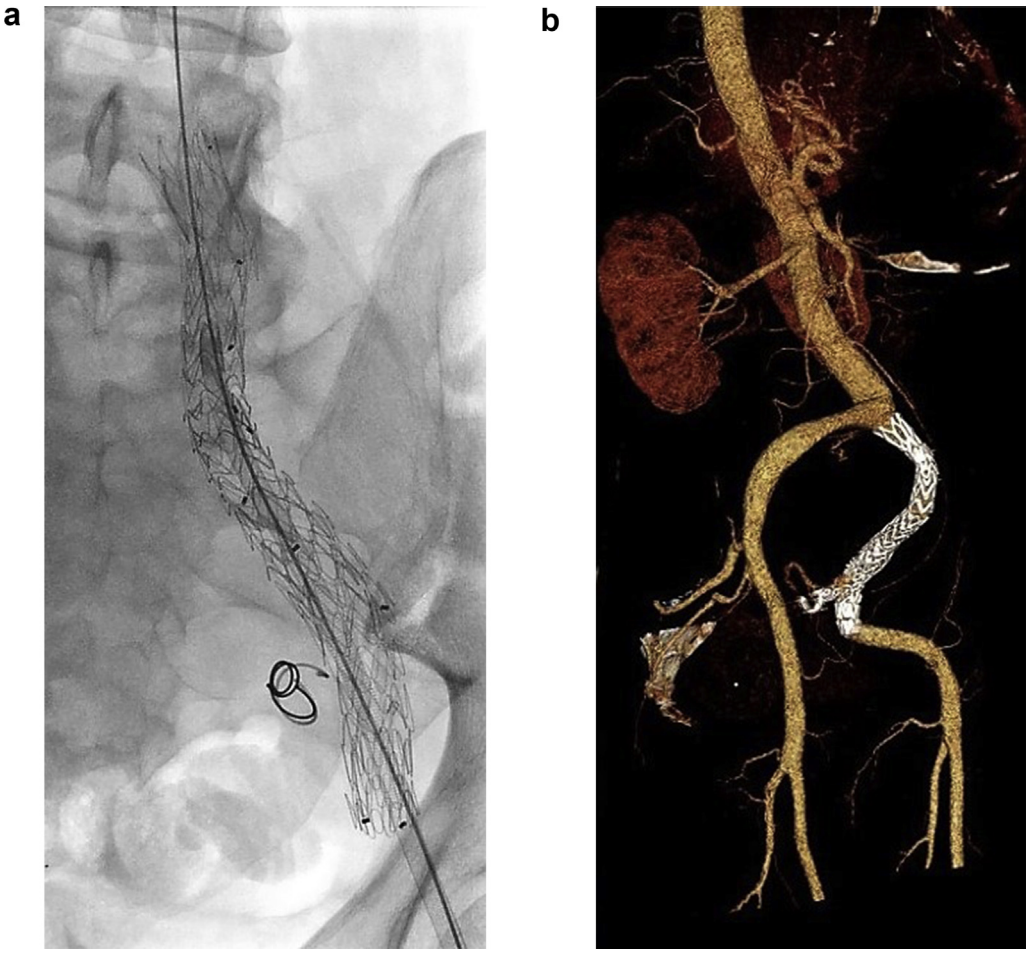


**Figure 3. a** Screenshot indicating the relined aorto-uni-iliac stent graft system. **b.** Volume rendered 3D CT reconstruction showing optimal position of the aorto-uni-iliac stent graft system.

alone. Such an approach then allows immediate treatment without a second intervention.

## CONFLICT OF INTEREST

None.

## FUNDING

None.

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