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Case Report

CT-fusion-guided endovascular repair of iatrogenic common iliac artery aneurysm: A case report

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ABSTRACT

We present a case of a CT-fusion-guided endovascular repair of an iatrogenic common iliac artery aneurysm in a 60-year-old male with a history of robotic prostatectomy with wide lymphadenectomy. Taking into account iatrogenic nature, rapid evolvement, previous surgical intervention, and oncological history, our team, including vascular and endovascular surgeons, refused open surgery in favor of endovascular iliac repair. We coiled the ipsilateral hypogastric artery and then deployed 2 Fluency Plus stent grafts from the common iliac into the external iliac artery. All manipulations were made under CT-fusion vascular mask control, which provided precise neck positioning, a minimal contrast infusion, reduced radiation dose, and better overall control. Our results suggest that anatomically suitable isolated iliac aneurysms can be successfully and safely treated with CT-fusion-guided endovascular repair without major perioperative and mid-term complications. The case is highlighting the potential complexity of repeated surgery with previously operated patients and the necessity of surgical and endovascular team interactions, especially in case of iatrogenic vascular complications.

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Introduction

Isolated iliac artery aneurysm (IIAA) is a relatively rare case of aortoiliac disease. Most IIAA cases have nondegenerative nature, relatively rapid growth, and nonordinary anatomy. Open vascular surgery and endovascular repair are the 2 main options for IIAA management. The important issue is to choose one that is most appropriate for the specific clinical and anatomic situation.

Case report

We present a 60-year-old former smoker with a 40-pack-a-year history, mildly hypertensive on proper medications with normal body mass index.

In October 2017, patient had a robotic prostatectomy with left and right lymphadenectomy for his cT2cT0M0G3 prostate adenocarcinoma and 6-month abdominal ultrasound was scheduled. In July 2018, a huge asymptomatic left common iliac aneurysm was found during follow-up abdominal ultrasound and subsequent computed tomographic angiography (CTA) confirmed the diagnosis of 41 mm wide heavily calcified dissecting common iliac aneurysm with short 10 mm neck (Fig. 1). Because of a definite perivascular process, iatrogenic nature, and high risk of aneurysm rupture, our team and the patient chose the endovascular iliac repair.

The aneurysm anatomy and its treatment plan were determined as type B according to Uberoi et al. [1]: aneurysm had a small but sufficient proximal neck and there was no distal landing zone between the sac and ipsilateral hypogastric artery (Figs. 2 and 3).

First, we made a vascular 3D reconstruction from preoperative CTA using Volume Share 7 software on Advantage Workstation (GE Healthcare, France) and merged it with bone 3D reconstruction to make 2 virtual volumes in 1 model. Then, we exported the whole 3D model to the Vision 2 fusion application (GE Healthcare, France) and fused it with live intraoperative fluoroscopy when the patient was on the operating table. Two-dimensional/three-dimensional fusion was made by aligning bone reconstruction volume with patient's live fluoroscopic bone landmarks in 2 projections—anterior-posterior (AP) and 70-75° lateral (LAO). Then we chose the vascular volume and started the procedure.

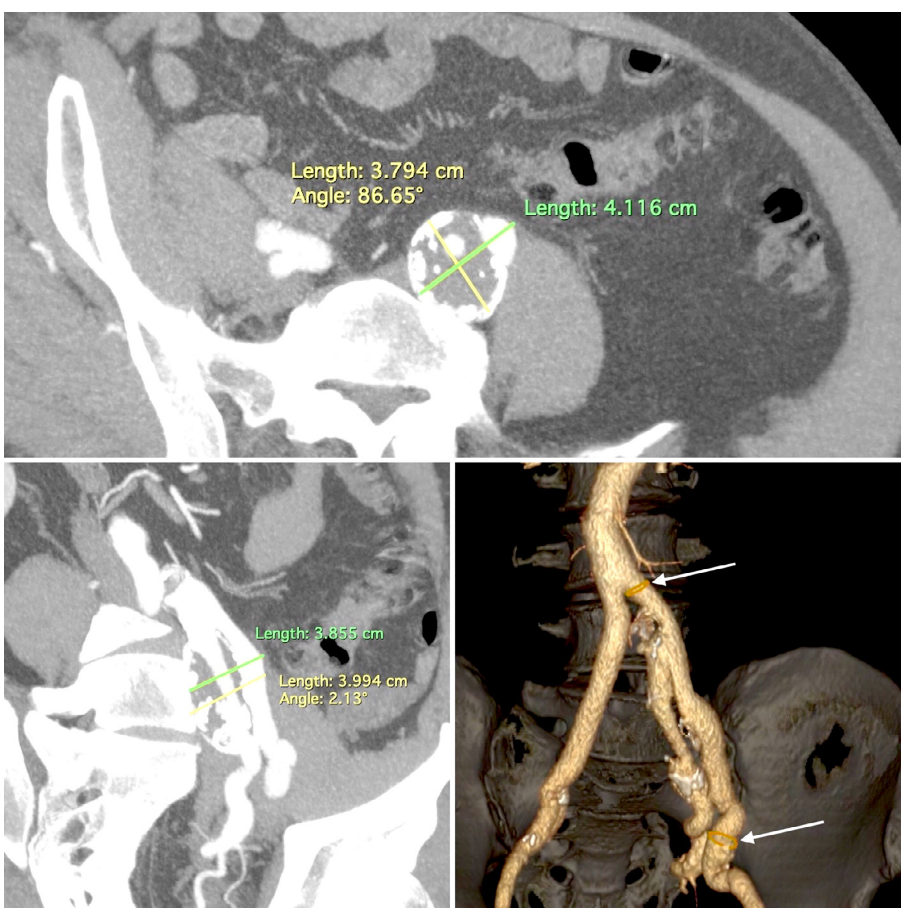

Fig. 1 – CTA images of the common iliac artery aneurysm (top, bottom left); reconstructed 3D model with proximal and distal landing markers (bottom right, arrows show the markers).

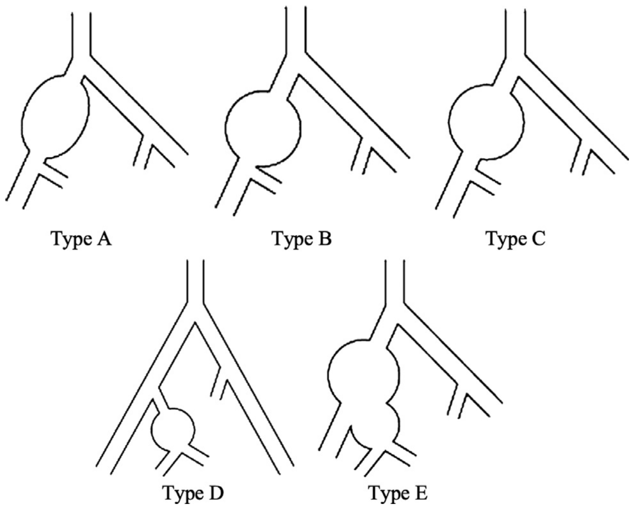

Fig. 2 – Uberoi et al. [1] classification of isolated iliac aneurysms. Type A: there is no proximal landing zone of 1.5 cm in the common iliac artery. Type B: the common iliac artery aneurysm has sufficient proximal neck, but there is no distal landing zone of 1.5 cm or more between the aneurysm and the ipsilateral hypogastric artery. Type C: there are adequate proximal and distal landing zones within the common iliac artery, and therefore only a covered stent is required to adequately exclude the aneurysm from the circulation. Type D: a solitary hypogastric artery aneurysm that does not extend to its ostium and has a length of proximal landing zone of at least 1 cm. Type E: there is a common iliac artery aneurysm that extends into the ipsilateral hypogastric.

We preclosed left common femoral puncture with 1 Perclose Proglide (Abbott, USA) suturing device, made a direct 10F sheath angiography from the left side using 50/50 diluted contrast media to check the alignment of the vascular volume, corrected it appropriately and proceeded with left hypogastric coiling from the right 5F common femoral approach. We used 4 Azur Pushable 0.035 coils (Terumo, Tokyo, Japan) and Judkins Left 5F (Cordis, USA) diagnostic catheter (Fig. 4). After that, we changed the JL to 5F Pigtail catheter for angiocontrol and deployed two 13.5 mm × 120 mm and 13.5 mm × 80 mm Fluency Plus stent grafts (Bard, USA) from the left common iliac artery ostium into the external iliac artery. Then we did Admiral 12 mm × 40 mm balloon catheter (Medtronic, USA) postdilation according to the Fluency instructions for use. All manipulations were made under CT-fusion vascular mask control, which provided precise neck positioning, as well as minimal contrast infusion, reduced radiation dose, and better overall control (Fig. 5). The left femoral access was percutaneously sutured and angiochecked from the right femoral access for suture-related stenosis or bleeding. Right femoral hemostasis was achieved with standard manual compression. Total contrast volume was 30 mL of 350 mg/L iohexol diluted in 30 mL of normal saline, total procedure time was 50 minutes, direct air product and effective dose were 90 Gy*cm^2 and 18.0 mSv, respectively.

There were no perioperative complications. Twenty-four hours later, the patient had developed left buttock claudication with 15 meters pain-free walking and was discharged on the third day on 1-month dual antiplatelet therapy and lifetime aspirin with recommendations to practice pain-free walking.

A patient's postoperative follow-up protocol comprised physical examination, abdominal ultrasound, and CTA scan at 1 and 6 months and yearly thereafter.

Ultrasound and CTAs at 1 and 6 months were unremarkable: patent grafts, fully thrombosed aneurysm sac without endoleaks, stent graft-induced dissections or new entries (Fig. 6). At the time of the second CTA, his pain-free walking distance was 1500 meters with no discomfort or concerning symptoms. For now (August 2019), he is alive and well.

Discussion

Isolated iliac artery aneurysms are rare, accounting for approximately 0.4%-1.9% of all arterial aneurysms and usually associated with trauma or other nondegenerative causes, for instance, iatrogenic injury [2–4]. Despite rare occurrence, the mortality of open IIAA repair is comparable to that of elective

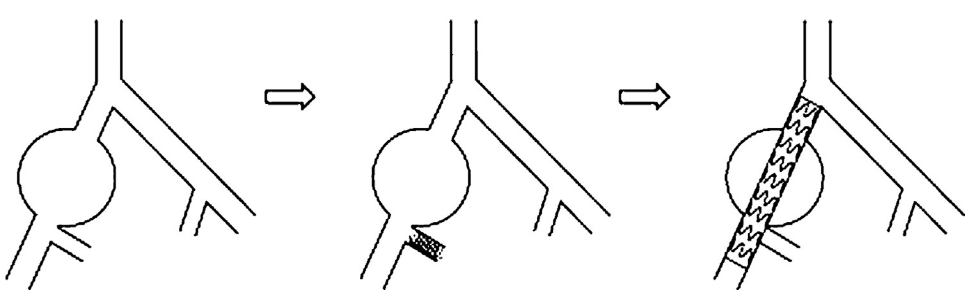

Fig. 3 – Treatment strategy for type B isolated iliac aneurysm according to Uberoi et al. [1]: ipsilateral hypogastric artery coiling followed by common to external iliac stent-graft deployment.

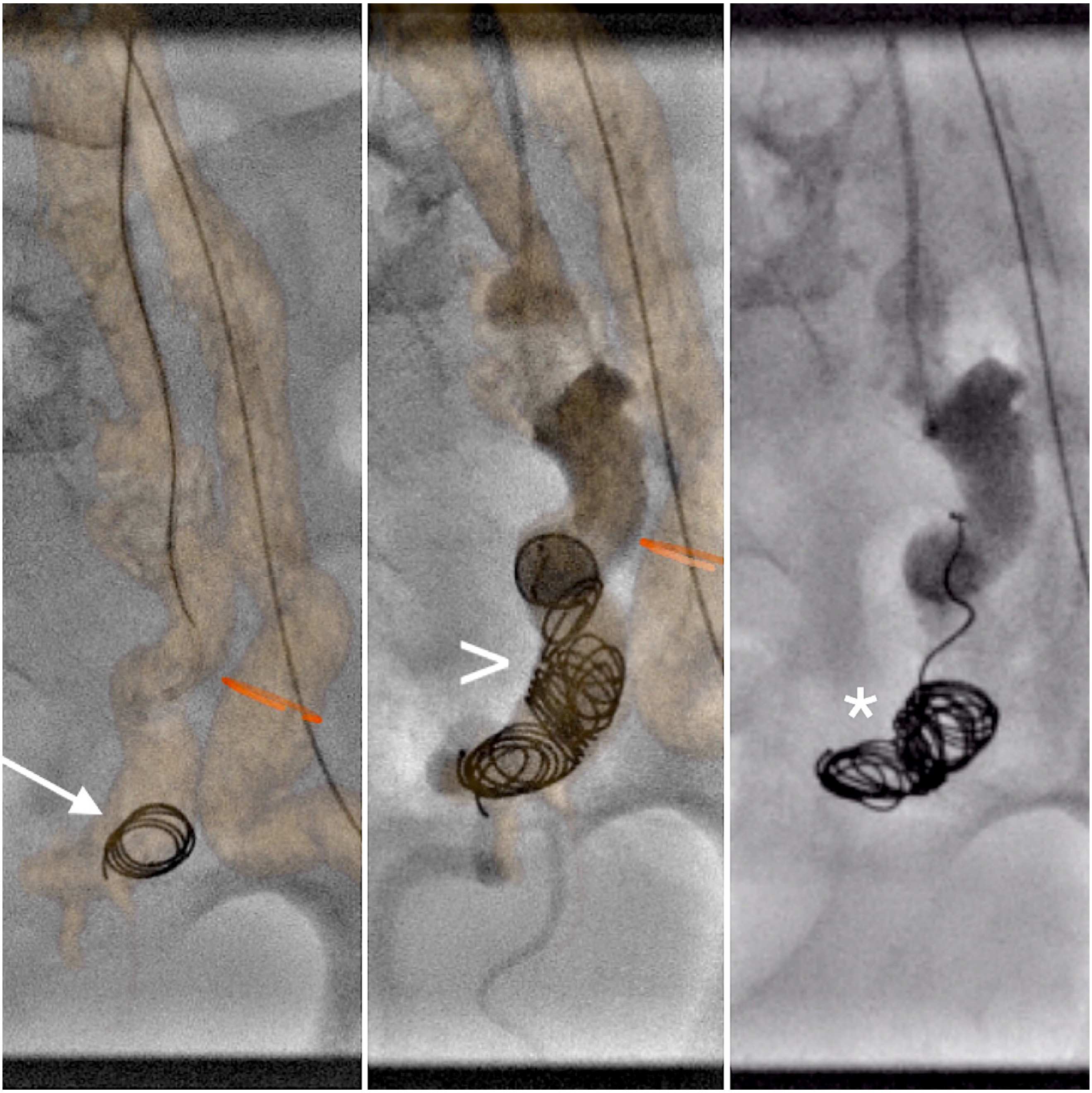

Fig. 4 – Left internal iliac coil embolization. The first coil (arrow); coiling in progress (arrowhead); no blood flow distally to the coiled segment (asterisk).

open repair of abdominal aortic aneurysms and increases up to 33% in the acute setting [5]. Taking into account the rareness and life-threatening potential, it is very important to make the right diagnostic and treatment decisions in IIAA patients.

Our team emphasizes the significance and difficulty of early detection IIAA because of its asymptomatic course in 65%-70% of cases [1,5,6]. In some cases, including ours, IIAA is discovered during an examination performed for unrelated causes [7].

Buck et al noticed that treatment of isolated IIAA has shifted away from open surgical repair toward a less invasive endovascular repair at the background of increasing in a total number of IIAA-associated interventions [8].

Endovascular iliac repair is the dominant treatment method for isolated iliac artery aneurysms with suitable anatomy and is associated with lower morbidity, mortality, and shorter length of stay, despite more frail and comorbid patients [8].

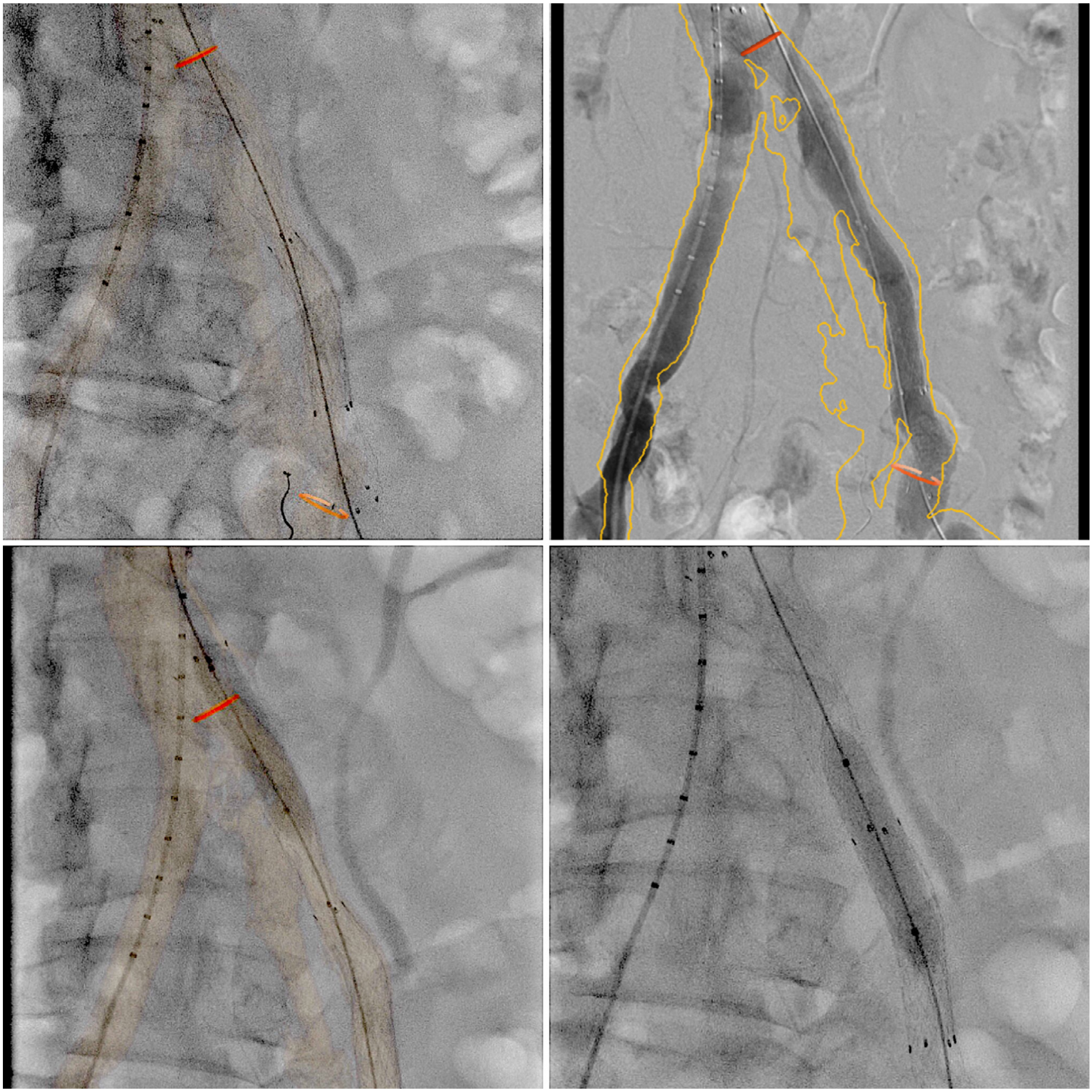

Fig. 5 – CT-fusion-guided endovascular repair. Stent-graft deployment (top left); postimplantation angiography (top right); balloon postdilation (bottom left and right).

Taking into account the iatrogenic dissecting nature, rapid aneurysm evolvement, previous surgical intervention, and oncological history, our team, including vascular and endovascular surgeons, has refused open surgery in favor of endovascular repair.

CT-fusion with vascular mask provided us with precise positioning and full procedure control. It was shown that fusion application assistance helps to reduce contrast media volume, radiation exposure and procedural time in standard, fenestrated and branched endovascular aneurysm repairs [9,10]. In our center, we routinely use 2D/3D CT-fusion for aortic and aortoiliac aneurysm repair, so in this case, we have utilized fusion-guided approach.

The careful preoperative planning was needed to choose the stent grafts' sizes, arterial access approach and to address the possibility of the iliac bifurcated device implantation to preserve the hypogastric flow. However, the complexity of the common iliac artery dissection, heavy calcium distribution within the arterial wall, and concerns about adequate distal sealing with bifurcated device pushed us toward primary embolization of hypogastric artery with a subsequent endovascular iliac repair.

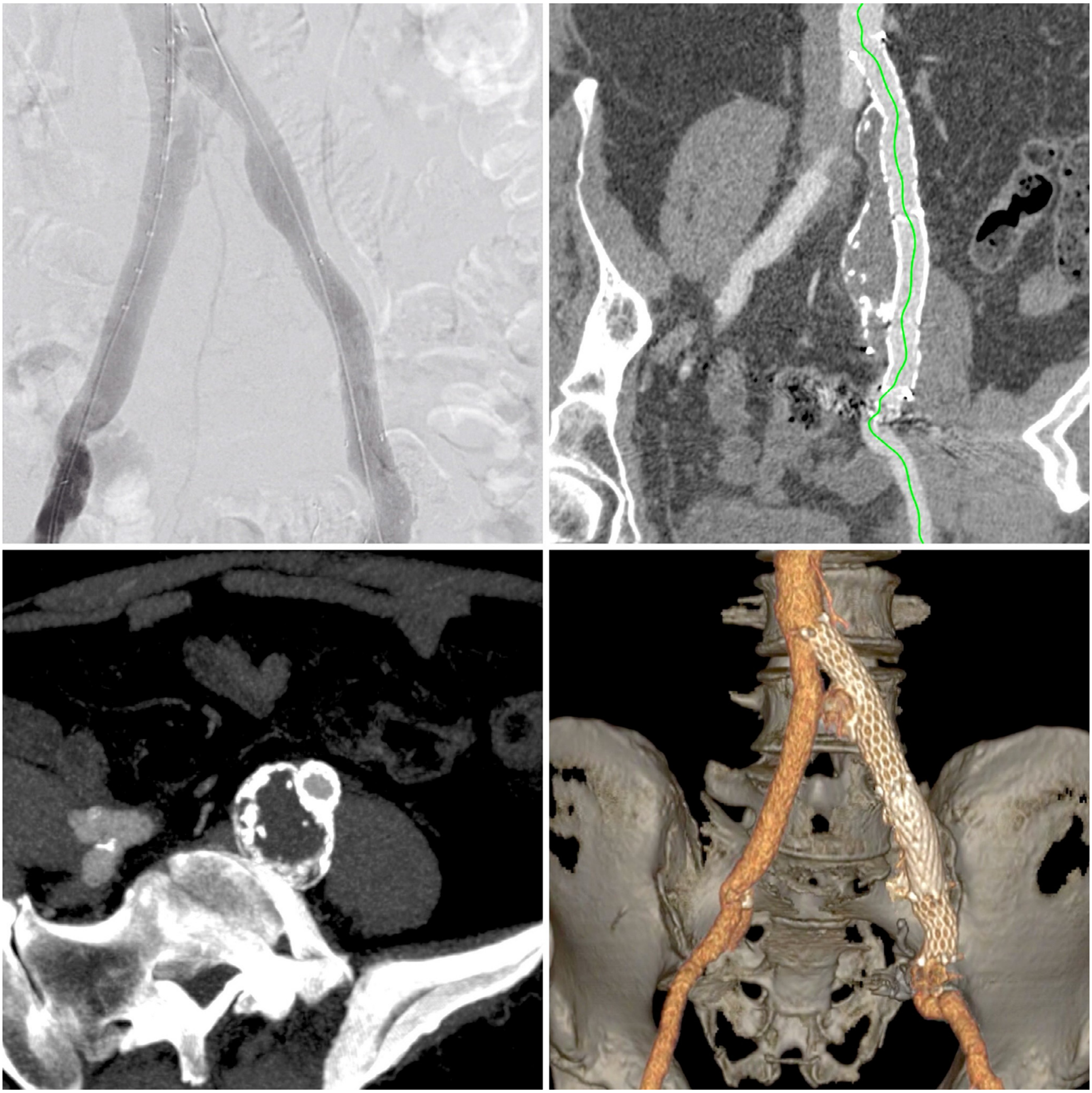

Fig. 6 – Follow-up images. Completion angiography immediately after the repair (top left); left iliac central line reconstruction in 6 months postop (top right); perpendicular slice through the repaired aneurysm in 6 months postop (bottom left); volume rendering in 6 months postop (bottom right).

Conclusion

Our results suggest that such patients can be successfully and safely treated with CT-fusion-guided endovascular repair without major perioperative and mid-term complications. Patients' postoperative buttock claudication is one of the most common procedure complications with up to 65.3% incidence and an excellent long-term prognosis [11].

The case is also highlighting the potential complexity of repeated surgery in the previously operated zones and the necessity of surgical and endovascular team interactions, especially in patients with iatrogenic vascular complications.

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