

# Giant internal iliac artery aneurysm successfully treated with endovascular stent-graft placement

ADAM HATZIDAKIS<sup>1,\*</sup>, EMMANUEL TOULOUPAKIS<sup>2</sup>, STAVROS CHARALAMBOUS<sup>1</sup>,  
DESPOINA REPPA<sup>3</sup>, EFSTRATIOS KARAGIANNAKIDIS<sup>4</sup>

<sup>1</sup>Department of Medical Imaging, University Hospital of Heraklion, Heraklion, Greece

<sup>2</sup>Department of Vascular Surgery, Creta InterClinic Hospital, Heraklion, Greece

<sup>3</sup>Department of Internal Medicine, Creta InterClinic Hospital, Heraklion, Greece

<sup>4</sup>Department of Radiology, Arkalochori Medical Center, Crete, Greece

\*Corresponding author: Adam Hatzidakis, MD, PhD, EBIR; Associate Professor of Vascular and Interventional Radiology, Department of Medical Imaging, University Hospital of Heraklion, Medical School of Crete, Heraklion, Greece; E-mail: adamhatz@hotmail.com

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**Abstract:** An 88-year-old male patient of high surgical risk was presented with left sciatic pain symptoms and a palpable pulsatile left lower abdominal mass. He was operated 8 years ago for a large infrarenal aortic aneurysm. Computed tomography angiography (CTA) revealed a giant 161 mm left internal iliac aneurysm with multilocular appearance and left sacral bone erosion causing the symptoms. Endovascular repair was successfully performed using a monotubular iliac stent-graft. Follow-up CTA showed absence of contrast enhancement and a fully thrombosed sac. Patient recovered completely and was discharged 1 month after the procedure in a relatively good condition, nevertheless sciatic symptoms remained.

**Keywords:** internal iliac artery, aneurysm, endovascular repair, stent-grafts, interventional radiology

## Introduction

Internal iliac artery aneurysms (IIAAs) are relatively rare and should be treated over a size of 30–40 mm [1–5]. They usually remain asymptomatic until rupture [2, 3]. If they get symptomatic, they can be presented with flank pain or with symptoms caused by pressure or erosion of adjacent anatomic structures [2, 3, 6]. Median size of isolated IIAA at discovery time was reported 77 mm, whereas median size of ruptured IIAA was 70 mm compared with 60 mm in the non-ruptured IIAA group of patients [3]. Symptomatic IIAA and patients with aneurysmal size over 50 mm should expeditiously be repaired [7, 8]. Multidetector thin slice computed tomography angiography (CTA) delineates vascular anatomy, relations to other adjacent structures, and is essential for pretreatment planning [2, 3]. Over the past decade, interventional techniques established alternatives to open

elective surgery, particularly for elderly patients with multiple comorbidities, to exclude the aneurysmal sac from arterial circulation [8]. Emerging endovascular techniques show promising results in the management of IIAA.

## Case Report

An 88-year-old male patient with a history of pulmonary hypertension, respiratory, and cardiac insufficiency was presented with symptoms of left sciatic pain in the lower limb. He was also on chronic treatment with acenocoumarol tablets due to atrial fibrillation (Sintrom<sup>®</sup>, Novartis, Switzerland). No other atherosclerotic risk factors were present. Patient was successfully operated 8 years ago for a large infrarenal abdominal aortic aneurysm. At that time, CTA showed a small left internal iliac aneurysm of 16 mm

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**Fig. 1.** Abdominal CTA 8 years ago shows a small left internal iliac aneurysm of 16 mm diameter

diameter (*Fig. 1*). Unfortunately, patient missed many of the postoperative ordered follow-up examinations.

Due to the intense sciatic complaints, an abdominal ultrasound examination was performed, which revealed the large left lower abdominal mass. New CTA confirmed a giant left internal iliac aneurysm, starting about 10 mm after arterial origin, embracing ipsilateral external iliac artery, which showed a significant stenosis in the first centimeter (*Fig. 2a*). The aneurysm had a multilocular appearance (*Fig. 2b*) and a maximum size of 161 × 117 mm with relatively small amount of thrombus (*Fig. 2c*). In its posterior portion, erosion of the left sacral bone was revealed, probably due to chronic pressure hence causing the sciatic symptoms (*Fig. 2d*). The right side iliac arteries were normal.

Due to patient's high surgical risk condition, coumarol tablets intake was stopped and endovascular repair was decided under left groin local anesthetic infiltration for surgical preparation of the left common femoral artery. After catheterization through the ipsilateral external iliac stenosis, digital subtraction angiography confirmed CTA's findings and revealed a relatively slow contrast filling of the aneurysmal sac through the short internal iliac neck (*Fig. 3a*). An iliac stent-graft of 70 mm length, proximal width of 16 mm, and distal of 10 mm was inserted through a 16-Fr sheath and successfully deployed (Excluder, W. L. Gore & Associates, USA). Small endoleak from the common iliac was seen, despite

multiple balloon dilatations (*Fig. 3b*). No closer device or compression bandage was used and the left common femoral artery was manually sutured.

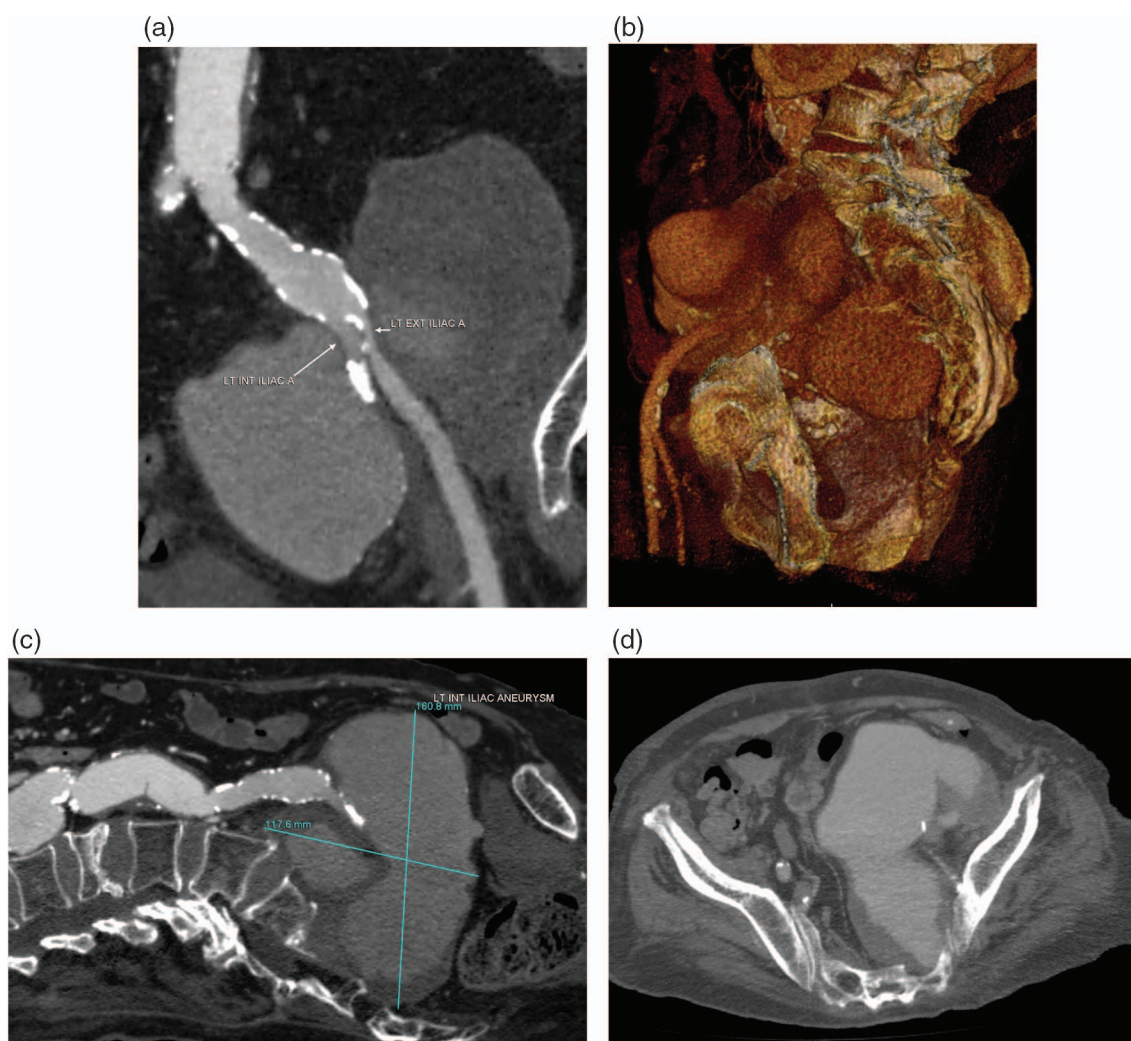
Postoperative recovery was complicated by left groin bleeding due to prolonged bleeding parameters of unexplained origin. A follow-up CTA 16 days later was ordered due to the hematocrit drop, but no intra-abdominal collections were found. Regarding the aneurysm, absence of contrast enhancement in a fully thrombosed sac was seen (*Fig. 3c*). Groin bleeding stopped 1 week later, without further consequences. Patient recovered completely and was discharged 1 month after the procedure in a relatively good condition. Coumarol tablets were again administered for chronic use.

A postoperative follow-up protocol with ultrasound imaging after 3, 6, and 12 months and yearly after was ordered for the first year. Instructions were given that if ultrasound reveals revascularization of the aneurysm, new CTA should be performed. He remains in a relatively good condition 12 months after the procedure, without further growth or endoleak signs; nevertheless sciatic symptoms still exist.

## Discussion

Iliac artery aneurysms, mostly of the common iliac, have an estimated incidence of just 2% of all abdominal aneurysmal diseases [2, 4, 7, 8]. Isolated IIAA is defined as a twofold diameter increase without coexisting aneurysm at another location and can be characterized as an unusual variant of aortoiliac aneurysm disease, representing only 0.3% of all aortoiliac aneurysms and a general population prevalence of 0.03% based on large autopsy series [1–4, 6]. Most of the IIAAs are diagnosed in association with other intra-abdominal aneurysms [8]. Institutional data reveal that IIAAs are present in 10.2% of patients with aortoiliac aneurysms [1]. Most common etiologic factor for developing IIAA is a degenerative process of the vascular wall mainly associated with arteriosclerosis, while other conditions, such as infection, trauma, connective tissue and arterial wall disorders, and rarely traumatic childbirth, high forceps deliveries, or Caesarian section, have been implicated in the pathogenesis [2, 3, 6–8].

Patients with IIAA are usually elderly males occurring in the seventh to eighth decade of life (mean age: 75.1 ± 7 years) with a male to female ratio of 6:1 [1–3]. The vast majority of patients remain asymptomatic until rupture symptoms occur. Because most of the symptoms are not directly related to the vascular system, diagnosis of IIAA is often delayed. Due to rare occurrence and usually deep localization within the pelvis, IIAA elusive physical examination is usually incidentally discovered during abdominal imaging examinations or at the time of rupture [2, 3, 7]. Many authors describe that

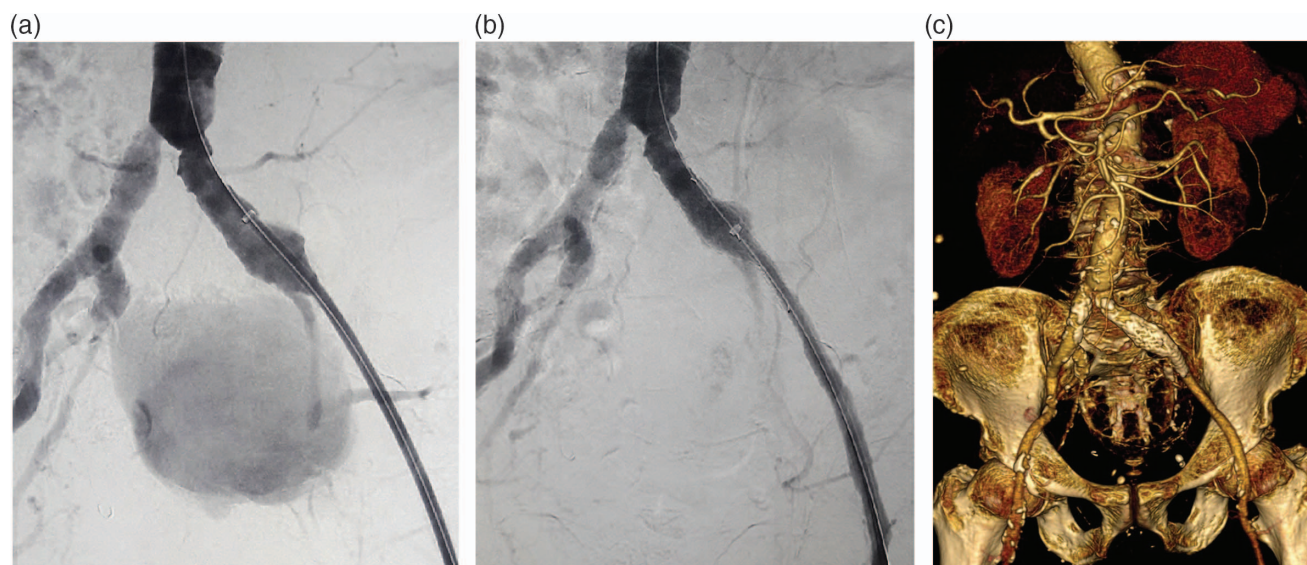


**Fig. 2.** (a) New abdominal CTA reveals a giant left internal iliac aneurysm, starting about 1 cm after arterial origin embracing ipsilateral external iliac artery, which has a significant stenosis in the first centimeter. (b) The aneurysm has a multilocular appearance. (c) Aneurysm has a maximum size of  $16.1 \times 11.7$  cm with relatively small amount of thrombus. (d) There is an erosion of the left sacral bone due to chronic pressure hence causing the sciatic symptoms

IIAAs can be clinically manifested as a tender, palpable, pulsatile mass in the hypogastrium or the iliac fossa, ascertained by rectal or vaginal examination [2, 3, 6, 7]. Less frequently, patients are presented with flank pain, local pressure symptoms, or by complaints caused by erosion of adjacent anatomic structures [2, 3, 7]. Complaints include abdominal discomfort (constipation, tenesmus, and rectal bleeding), urinary symptoms (hydronephrosis, pyelonephritis, renal failure, and hematuria), neurological symptoms, groin-, hip-, or buttock pain, deep vein thrombosis, and even pulmonary embolism [2, 3, 6]. Neurologic signs are usually present secondary to compression of the pelvic and lumbosacral nerve roots due to IIAA location within pelvis, like in our case, where left sciatic pain caused by deep ipsilateral sacral bone erosion was the patient's main symptom.

Untreated IIAAs continue expansion with an average rate of aneurysm growth up to 4 mm/year [1]. In our case, IIAA expanded from 16 mm in 2009 up to 161 mm 8 years later. This is an impressive growth rate of about 18.1 mm/year. According to a study by Dix et al. [3], the median size of isolated IIAA at diagnosis was 77 mm (range: 20–130 mm) and death was significantly associated with rupture. It seems that an association between rupture risk and IIAA size is not yet found, but obviously increasing size is associated with higher rupture risk like in patients with aortoiliac aneurysms [3, 6]. There is also no documented relation between aneurysm rupture and patient's age [3].

Symptomatic IIAAs and patients with an aneurysmal size over 50 mm should expeditiously be repaired [8]. There are several studies suggesting elective repair for a threshold size of 30–40 mm in asymptomatic



**Fig. 3.** (a) Digital subtraction angiography reveals slow contrast filling of the aneurysmal sac through a short internal iliac neck. (b) An iliac stent-graft of 7 cm length, proximal width of 16 mm, and distal of 10 mm is inserted and successfully deployed. Small endoleak from the common iliac is seen. (c) Post-repair CTA shows absence of contrast enhancement in a fully thrombosed sac

patients [1, 3, 4]. For asymptomatic patients with IIAs of 30–35 mm in size, a serial follow-up with CTA or B-mode ultrasound at 6 months intervals can be advised, since the smallest reported ruptured IIAA was 30 mm [7–9]. Laine et al. [5] suggest that a 40-mm threshold for elective treatment might be quite safe, due to low incidence of rupture in IIAA <40 mm.

Conservative management is associated with continued expansion of the aneurysm and much higher operative mortality rate if emergency rupture occurs (33%–50%) compared with elective treatment (7%–11%), due to uncontrolled massive bleeding and intraoperative management difficulties [1, 3, 8]. Open surgical procedure is challenging, because these aneurysms extend deep into the pelvis, thus carrying high risk of complications and should therefore be reserved for candidates who are unfit for interventional treatment [1]. Treatment selection should consider the aneurysm size, involvement of other aortic segments, presence of bilateral/unilateral aneurysmal disease, compression symptoms, as well as patency of IIA branches. Open surgical techniques involve proximal and/or distal aneurysm ligation, entire aneurysm resection with outflow revascularization, and proximal ligation with endo-aneurysmorrhaphy [2, 3, 10]. Surgical excision of the entire aneurysm is a hazardous procedure with high mortality rate due to increased hemorrhage risk or damage to nearby structures [2, 3].

Over the past decade, interventional techniques became established alternatives to open elective surgery, particularly for elderly patients with multiple comorbidities [8, 10]. Endovascular treatment is a minimal invasive option associated with lower morbidity, less blood loss, and shorter hospital stay [7, 8, 10].

It is important that pelvic blood flow is preserved to prevent ischemic complications. Bilateral involvement of IIA is challenging, because exclusion of both IIAs carries higher risk of serious ischemic complications [1]. IIAs with compressive symptoms should be treated with open surgery, because endovascular approach cannot lead to immediate decompression [2]. In our case, we chose to perform endovascular repair without sacral decompression due to patient's comorbidities.

There are no absolute contraindications to interventional treatment besides those related to percutaneous interventions, in general, like bleeding diathesis, severe coagulopathy, and groin sepsis [8]. The key objective is to exclude aneurysmal sac from the arterial circulation. This can be achieved by coil embolization, endovascular plug insertion, stent-graft coverage, or glue/lipiodol, and human thrombin injection [3, 8]. The reported technical success rate for elective interventional repair of asymptomatic IIAA approaches 100%, with an overall 0%–5.5% mortality rate and perioperative and delayed complication rate of up to 20% [8].

Combination of coil embolization and stenting can be used. Several iliac stent-grafts are available either in the form of balloon expandable or self-expanding stent-grafts [8]. Self-expanding devices are favored, because they conform better to the tortuous anatomy and allow potential future expansion [8]. When endovascular iliac artery repair is preferred, IIAA and IIA branches can be initially embolized by coils in case a sufficient orifice of >15 mm length in the proximal IIAA is found. If the arterial orifice is shorter or absent, proximal side can be

supported by a stent-graft with extension into the external iliac, while the IIA branches are embolized [2, 6]. However in cases of bilateral IIAs, if proximal orifices are <15 mm on both sides, open surgery is recommended to preserve at least one IIA [6]. Placement of embolic agents should be as proximal as possible to maintain patency of more distal IIA branches as well as to prevent interference with pelvic collateral circulation [3]. Potential embolization complications include buttock claudication (12%–55%) and erectile dysfunction (1%–13%) [3]. In our case, a short neck of 10 mm did not allow coil placement. In addition, coiling of deep IIAA branches was considered as hazardous and very time consuming, which could potentially increase the rupture risk. Despite our decision not to perform selective distal branch embolization, no signs of retrograde endoleak were seen at 6 months follow-up.

In conclusion, interventional elective IIAA repair has been shown to be safe and effective, providing good mid-term results. To the best of our knowledge, this is the largest non-ruptured IIAA successfully managed by endovascular means.

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**Conflict of interest:** All authors declare no conflict of interest.

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