

# Preservation of internal iliac artery flow during endovascular aortic aneurysm repair in a patient with bilateral absence of common iliac artery

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## ABSTRACT

Bilateral absence of the common iliac artery is an extremely rare congenital vascular malformation in which the distal aorta divides directly into two external iliac arteries and two internal iliac arteries. In the case of the presence of this vascular malformation in association with an aortic aneurysm, preservation of the internal iliac artery flow during endovascular aortic repair represents a technical challenge. We have reported a case in which the bilateral absence of the common iliac artery associated with an infrarenal abdominal aortic aneurysm was successfully treated by endovascular aortic repair using commercially available iliac branched devices to maintain pelvic perfusion. (*J Vasc Surg Cases and Innovative Techniques* 2021;7:108-12.)

**Key words:** Abdominal aortic aneurysm; Bilateral absence of common iliac artery; EVAR; Iliac branched devices; Novel iliac artery bifurcation

Congenital anomalies of the iliac arterial system are rare and often discovered by chance or during the diagnostic workup for lower limb ischemia. The incidence of this malformation is unknown; however, in a report of >8000 angiograms performed in patients with ischemic symptoms of the lower extremities, only five anomalies of the iliac arteries were noted.<sup>1</sup> Some cases of congenital malformation of the iliac arteries have been reported in previous studies.<sup>2-9</sup> However, the bilateral absence of the common iliac artery (CIA), characterized by an aorta terminating into two external iliac arteries (EIAs) and two internal iliac arteries (IIAs), has been described only twice and, then, only at autopsy.<sup>10,11</sup> Consequently, the management of an abdominal aortic aneurysm (AAA) associated with this vascular anomaly has never, to the best of our knowledge, been reported.

We have reported the case of a patient with the bilateral absence of CIA associated with a fusosaccular AAA. The patient was successfully treated by endovascular aortic aneurysm repair (EVAR) using a technical modification to maintain pelvic perfusion. The patient had provided written informed consent for the report of his case before submission.

## CASE REPORT

A 65-year-old man was transferred to our vascular surgery department for management of an infrarenal AAA that had been diagnosed during an investigation for a palpable abdominal mass. His medical history included hypertension and a colectomy combined with protective ileostomy to treat a colonic perforation in 2010. Computed tomography angiography identified his peculiar morphologic characteristics, including a fusosaccular infrarenal AAA with a largest diameter of 52 mm, with the aorta dividing directly into two EIAs and two IIAs (Fig 1).

An EVAR was electively performed with the patient under general anesthesia using iliac side-branch stent grafts (E-liac; JOTEC, Hechingen, Germany). Access to the common femoral arteries and left brachial artery was obtained using ultrasound guidance, with two percutaneous closure systems (ProGlide; Abbott, Chicago, Ill) in each femoral artery. A 6F, 100-cm-long sheath (Fortress; Biotronik, Dresden, Germany) was introduced via the left brachial artery into the abdominal aorta. An 18F hydrophilic main body sheath and a 16F hydrophilic sheath were placed over an extra-stiff 0.035-in. wire (Lunderquist; Cook Medical, Bloomington, Ind) into the left and right common femoral arteries, respectively.

Embolization of the right IIA with a 12- × 9-mm vascular plug (Amplatzer; Abbott Laboratories, Minneapolis, Minn) via the left femoral sheath was performed first (Fig 2, A). The main body graft, with dimensions of 23 × 13 × 100 mm (E-tegra; JOTEC, Hechingen, Germany), was advanced into the aorta from the left femoral sheath. After locating the exact position of the two renal arteries by aortography, the main body graft and right short limb were deployed under fluoroscopic guidance. Next, from the right side, a 14- × 12- × 53-mm iliac branched device (IBD; E-liac; JOTEC) was advanced to connect to the right short limb and deployed into the aneurysmal sac. Catheterization of the side branch of the E-liac graft (JOTEC) and the left IIA was successfully performed using a hydrophilic 0.035-in. wire

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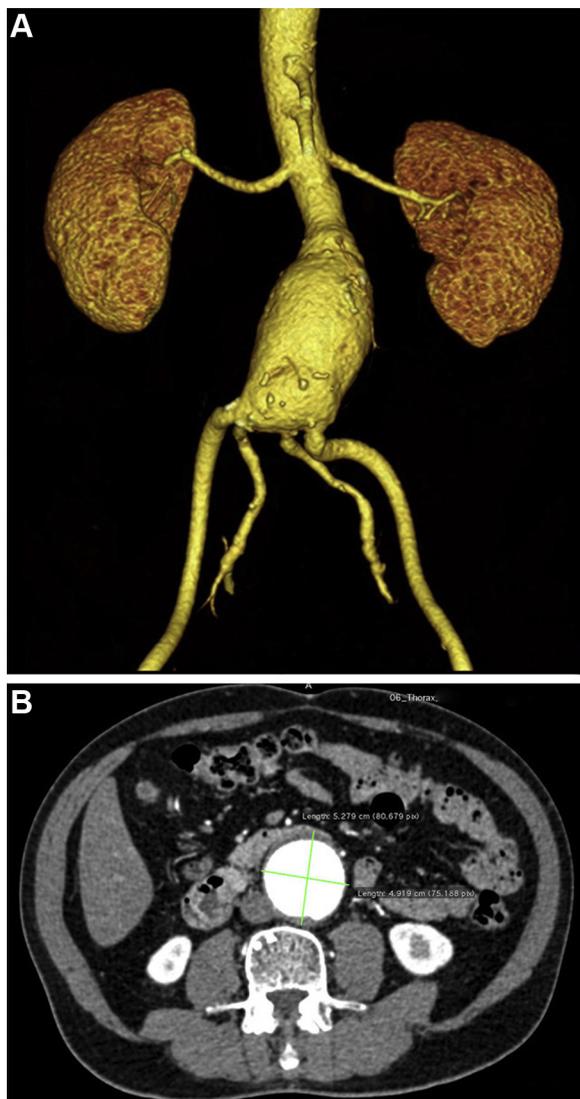
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**Fig 1.** Preoperative three-dimensional reconstruction (A) and axial computed tomography imaging (B) of the fusosaccular infrarenal aortic aneurysm (AAA) associated with bilateral absence of the common iliac artery (CIA). Note the termination of the distal aorta into four branches: two external iliac arteries (EIAs) and two internal iliac arteries (IIAs). The AAA was ~52 mm in the largest diameter with a nonangulated cylindrical proximal neck.

(Terumo, Tokyo, Japan) via the left brachial sheath. An 8- × 57-mm balloon-expandable covered stent (BeGraft; Bentley InnoMed, Hechingen, Germany) was extended into the left IIA connecting the side branch (Fig 2, B). Finally, a 15- × 13- × 100-mm iliac extension (JOTEC) was used to bridge the left limb of the main body to the left EIA. The completion angiography showed complete exclusion of the aneurysm with no evidence of endoleakage (Fig 2, C).

The patient was discharged on the second postoperative day. At 6 weeks after the procedure, the patient was recovering well without any symptoms related to occlusion of the right

IIA. Computed tomography angiography demonstrated complete exclusion of the aneurysm and preservation of the left IIA (Fig 3, A) but persistence of a type II endoleak from the lumbar arteries, which we elected to manage nonoperatively in the short term (Fig 3, B).

## DISCUSSION

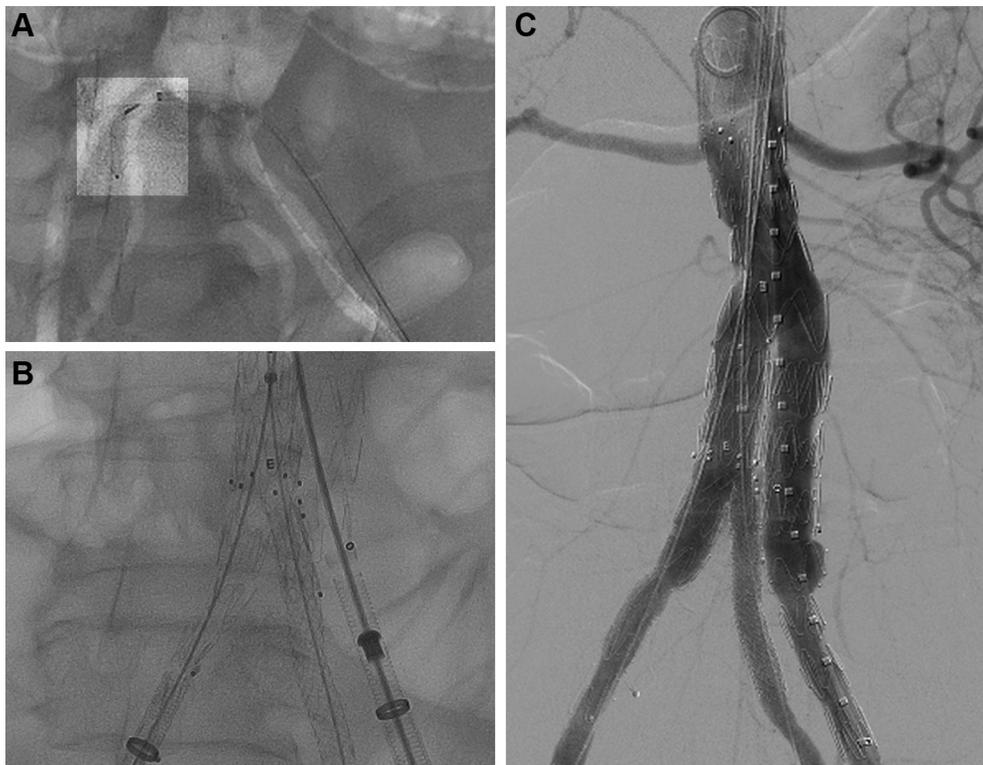
To the best of our knowledge, management of an aortic aneurysm combined with the bilateral absence of the CIA has not been previously reported. We believe in situ surgical aortic reconstruction with a prosthesis in association with the surgical creation of a unilateral or bilateral neo-iliac bifurcation is the most appropriate treatment for a fit patient. However, endovascular repair could also be a suitable alternative. In view of the hostile abdomen and the patient's preferences, EVAR was finally selected as the method of treatment.

Before EVAR, concern existed regarding whether to preserve IIA flow, because that would be technically challenging. Although some studies have indicated that bilateral hypogastric occlusion during EVAR will generally be well tolerated in patients with normal anatomy, the safety of such a procedure in a patient with the bilateral absence of the CIA remains unknown. In addition, evidence has shown that the loss of IIA perfusion can lead to buttock claudication, impotence, and, more rarely, colonic ischemia, gluteal necrosis, and spinal cord ischemia.<sup>12-17</sup> Thus, we decided to preserve the flow of one of the IIAs.

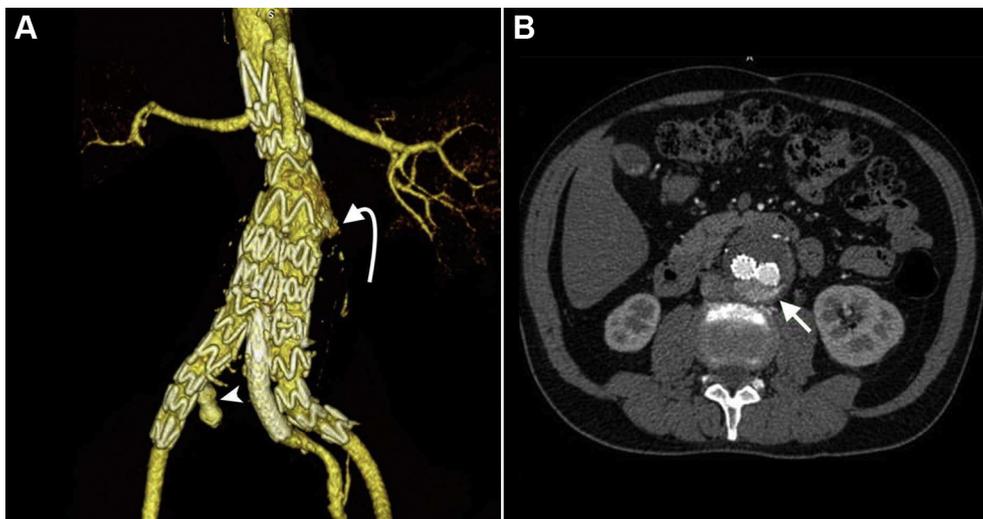
Among the various strategies available to preserve pelvic perfusion, IBD has generally been considered to be the method of choice for preserving antegrade flow to the IIA in patients with feasible morphologic features.<sup>18-20</sup> Compared with open surgery, EVAR with IBD has demonstrated lower rates of mortality and morbidity.<sup>19-22</sup> In addition, compared with IIA embolization, IBD does not result in greater rates of device-related or procedure-related complications.<sup>23-25</sup> Accordingly, we chose to perform EVAR with IBD for the present patient.

Evidence has suggested that the presence of severe angulation of the native vessels<sup>26,27</sup> and IIA ostial stenosis<sup>28</sup> are risk factors for endograft failure. In the present patient, the angulation between the right EIA and IIA was extremely acute. Thus, preservation of the right IIA flow, using an IBD to create a novel right EIA–IIA bifurcation, would be impossible or would result in early occlusion of the internal iliac limb owing to plication. Likewise, the same technical issue can be anticipated for the combination of the left EIA and IIA. In addition, the ostium of the right IIA was slightly stenotic, although that of the left IIA was normal. For all these reasons, a novel iliac artery bifurcation was constructed by combining the right EIA and the left IIA after performing embolization of the right IIA.

Of the commercially available IBDs, the shortest proximal length is 53 mm, including 27 mm for the main



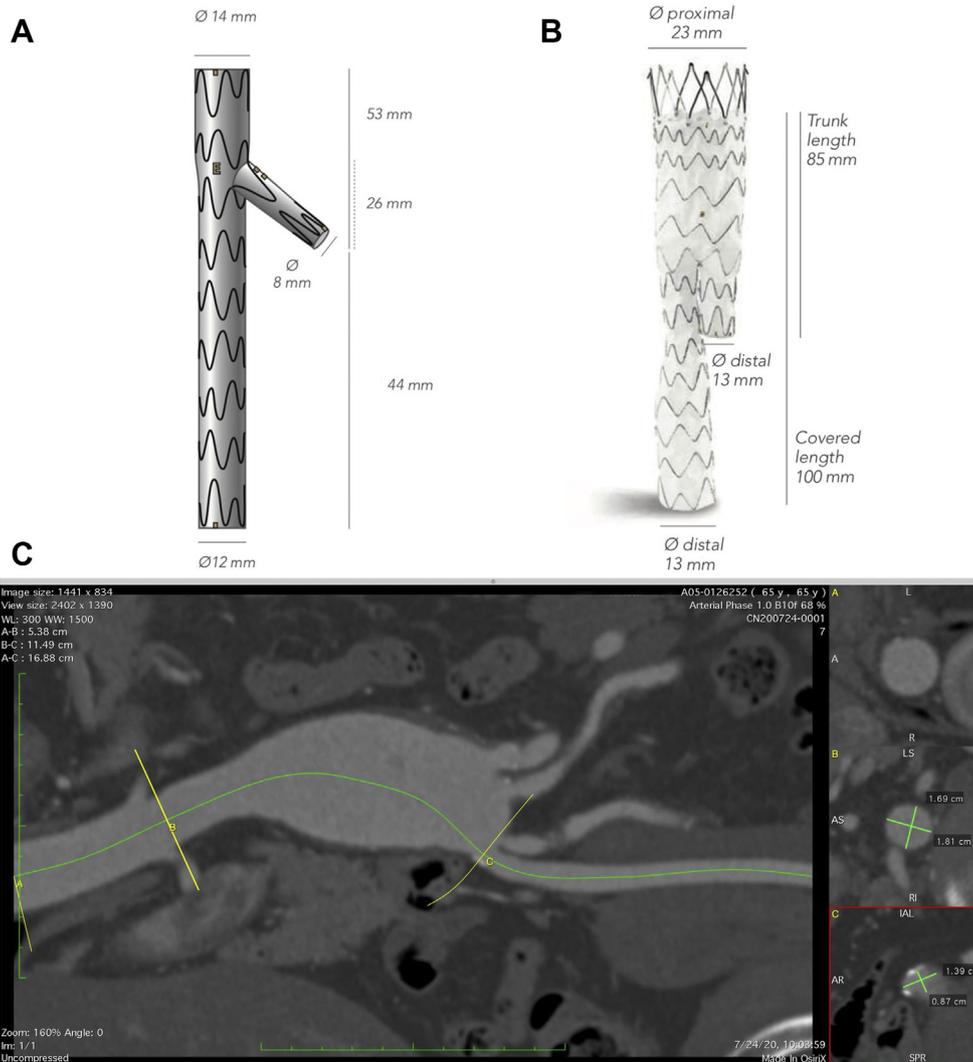
**Fig 2.** Digital subtraction angiography during endovascular aortic aneurysm repair (EVAR). **A**, Embolization of the right internal iliac artery (IIA) with a vascular plug. **B**, Catheterization of the side branch of the E-liac (JOTEC) iliac branched device (IBD) and deployment of a balloon-expandable covered stent to bridge the side branch to the left IIA. **C**, Completion angiogram showing complete exclusion of the abdominal aortic aneurysm (AAA) and the absence of endoleaks.



**Fig 3.** **A**, Postoperative three-dimensional reconstruction showing complete exclusion of the abdominal aortic aneurysm (AAA) with a type II endoleak from the lumbar arteries (*curved arrow*) and patency of the left internal iliac artery (IIA). Note the vascular plug in the right IIA (*arrowhead*). **B**, Axial computed tomography scan showing the type II endoleak (*arrow*) from the lumbar arteries.

body limb overlap and 26 mm for the internal iliac limb (E-liac; JOTEC; Fig 4, A). Accordingly, the shortest total trunk length of the main body stent graft is 85 mm

(E-tegra; JOTEC; Fig 4, B). Even with such short devices, successful deployment requires an infrarenal aorta >111 mm in length. In the present patient, the length



**Fig 4.** **A**, Diagram showing the iliac branched device (IBD) with the shortest proximal length (53 mm), which includes a 27-mm segment for the main body limb overlap and a 26-mm segment for the internal iliac limb. **B**, Diagram showing the main body graft with the shortest possible main trunk length (85 mm). **C**, Imaging study showing the length (115 mm) from the lower renal artery to the orifice of the right external iliac artery (EIA).

from the inferior edge of the right renal artery to the orifice of the right EIA was ~115 mm, just several millimeters longer than the minimum length requirement. (Fig 4, C). With the limited length of the patient's infrarenal aorta, the risk existed of the internal iliac limb of the IBD being jammed into the right EIA. This added complexity required meticulous management during stent graft implantation.

## CONCLUSION

Bilateral absence of the CIA is an extremely rare congenital vascular malformation. Endovascular management of an infrarenal AAA associated with such complex anatomic features remains a technical challenge with regard to preservation of the IIA flow. The primary technical and short-term clinical success of the present

case has shown that the versatility of the currently available devices could allow for the broadened usage of IBDs for complex morphologic cases with meticulous preoperative evaluation and intraoperative manipulation.

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