# Open aneurysmorrhaphy for repair of a massive iliac vein aneurysm and review of the recent literature

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## ABSTRACT

An iliac vein aneurysm is a rare vascular anomaly, scarcely reported in the vascular literature. We present the case of a 72-year-old man with a history of a remote heart transplant complicated by severe tricuspid regurgitation and traumatic abdominal injury, who was incidentally found to have a 10-cm right common iliac vein aneurysm. Because of the size and risk of rupture, we elected to treat him with surgical iliac vein aneurysmorrhaphy. His iliac venous diameter and flow continued to be stable at subsequent follow-up. (J Vasc Surg Cases Innov Tech 2023;9:101336.)

**Keywords:** Aneurysmorrhaphy; Iliac vein; Iliac vein aneurysm; Venous aneurysm

Iliac vein aneurysms are exceedingly rare, even among the anatomic distribution of venous aneurysms.[1] Owing to the paucity of data, no guidelines are available for the diagnosis and management of iliac vein aneurysms. Iliac vein aneurysms are classified as primary when they arise de novo and as secondary if an underlying cause is identified.[2] Among the secondary presentations, the most common cause is an arteriovenous fistula (AVF), with other etiologies, including congenital cardiovascular maldevelopment or prior surgical intervention.[2] Commonly used diagnostic imaging modalities are duplex ultrasound, computed tomography (CT) venography, venography, and arteriography for cases involving an AVF. Most patients are asymptomatic, with iliac vein aneurysms incidentally found on imaging. Symptoms, if present, include groin pain, lower extremity swelling, or other symptoms secondary to the mass effect of the aneurysm.[3,4] Life-threatening complications are rare but include pulmonary embolism and hemorrhagic shock from aneurysm rupture.[5,6]

## CASE REPORTS

The patient provided written informed consent for the report of his case details and imaging studies. The patient is a 72-year-old man with a medical history significant for nonischemic cardiomyopathy after heart transplantation (1990s) complicated by severe tricuspid regurgitation. He also underwent interval pericardial tricuspid valve replacement in 2001, which was complicated by severe tricuspid stenosis with subsequent transcatheter tricuspid valve replacement in 2018. He also has a history of atrial fibrillation during apixaban therapy, right leg varicose veins after great saphenous vein ablation with subsequent superficial stab phlebectomy, blunt abdominal trauma requiring left nephrectomy and splenectomy, and cirrhosis thought to be secondary to backfilling from the longstanding tricuspid regurgitation and subsequent stenosis. He presented to our vascular clinic for evaluation of a very large right common iliac vein aneurysm found incidentally on CT of his abdomen ordered by cardiology for additional evaluation because the laboratory test results showed evidence of hepatic congestion. He was further evaluated with CT venography, which demonstrated a common and external iliac vein aneurysm measuring ≤10 cm in diameter (Fig 1). No evidence of an AVF was found on imaging. No additional venous duplex ultrasound imaging studies were performed given that he did not have leg swelling or evidence of deep vein thrombosis.

After a discussion of the risks and benefits, the patient elected to undergo open iliac vein aneurysmorrhaphy. The patient was positioned supine on the operating room table. Urology placed a ureteral stent under cystoscopic guidance for protection given his history of nephrectomy. In anticipation of difficult distal control in the pelvis, a vertical right groin incision was made for femoral vein control with Silastic vessel loops. A curved hockey-stick incision was made 4 cm above the right inguinal ligament. The peritoneal sac was reflected medially to access the retroperitoneal space. The iliac vein aneurysm was encountered, mobilized, and dissected free. We were able to obtain control of the proximal common iliac vein, distal external iliac vein above the inguinal ligament, and internal iliac vein (Fig 2). After systemic heparinization, the aneurysm sac was entered via a longitudinal venotomy, with no evidence of thrombus found in the sac and patent venous branches. Numerous posterior bleeding branches were encountered and controlled. The thin vein wall on both sides was excised, and the rest of the iliac vein was reapproximated with a 4-0 Prolene baseball stitch at an appropriately durable location (Fig 3) using a ruler to ensure uniformity of the aneurysmorrhaphy.

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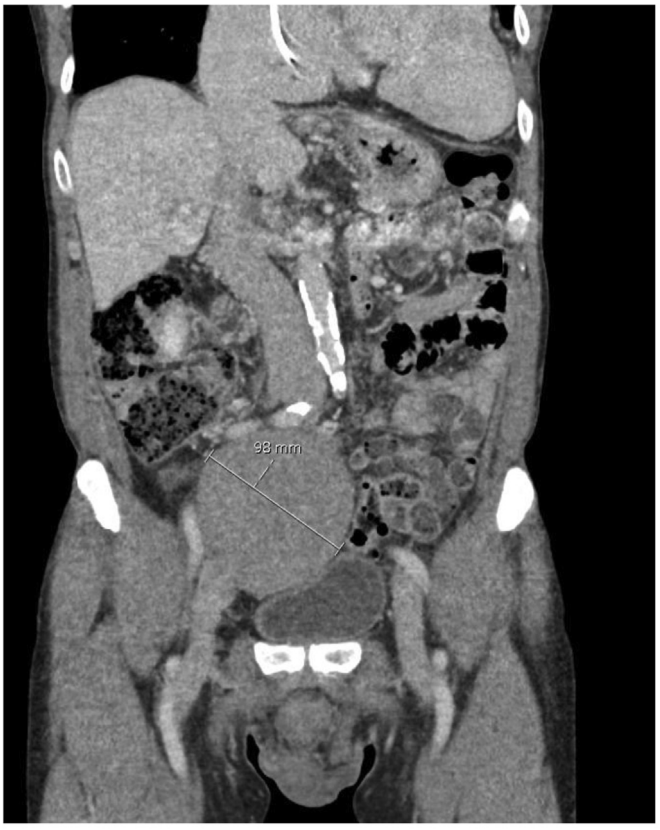


**Fig 1.** Preoperative computed tomography (CT) venogram demonstrating common iliac vein.

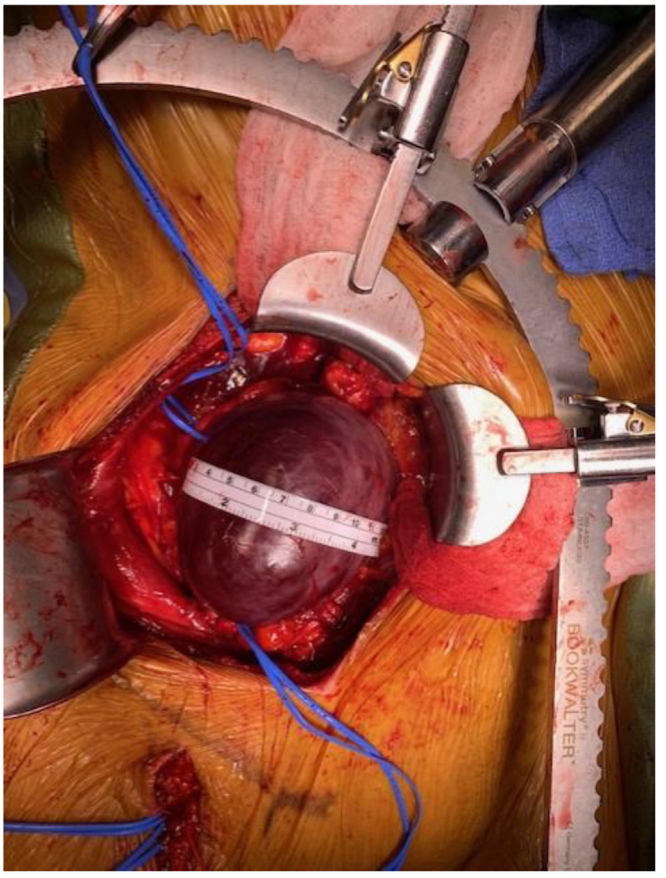


**Fig 2.** Intraoperative photograph showing right common iliac vein aneurysm.

The total operative time was ~4 hours, and the estimated blood loss was 1 L. The patient was discharged after 7 days, and he resumed his home apixaban therapy 14 days later. He was readmitted with an infected retroperitoneal hematoma requiring drain placement and antibiotics at 2 weeks postoperatively. Imaging at 3 weeks (Fig 4, *A*) and 8 months (Fig 4, *B*) postoperatively demonstrated successful primary repair of his venous aneurysm with patency of flow.

## DISCUSSION

An iliac vein aneurysm is a rare entity even in the venous anatomy.[1] Most patients, including ours, are asymptomatic and present after an incidental finding on imaging. When symptoms are present, they are usually limited to groin pressure and leg swelling, but, rarely, some patients can progress to aneurysm rupture and hemorrhagic shock. The diagnosis can be made with duplex ultrasound, CT venography, or venography.[2] Our patient's anatomy was evaluated with CT venography. His venous aneurysm was likely secondary to elevated pressures from his longstanding tricuspid regurgitation; however, we did not transduce the pressure measurements pre- or postoperatively to declare this as the primary cause. In the limited literature we have available, the management strategies varied. Given the scarcity of these venous aneurysms, a standardized treatment approach does not exist, and clinical trials are difficult to perform; thus, continued reporting of these cases is important for guidance of the diagnosis and intervention.

To evaluate the evolving practice of treatment, we performed a review of reports of iliac vein aneurysm cases in the past 10 years written in English with a discussion of disease management and compared their findings with our patient's management (Table). Of the 26 cases that matched our criteria, we found no significant differences in patient sex or aneurysm laterality, with the external iliac vein the most common location for aneurysm formation in the iliac system. The aneurysm diameters ranged from 1.4 to 13 cm, and 10 cases (38.4%) had evidence of an AVF contributing to aneurysm formation. One half of the patients in our review had an unknown etiology for aneurysm formation. Three patients were conservatively managed (11.5%), and 11 (42.3%), 3 (11.5%), and 9 (34.6%) underwent open, hybrid, or endovascular repair, respectively.[3-28]

All patients undergoing conservative management were found to have stable iliac vein aneurysms on

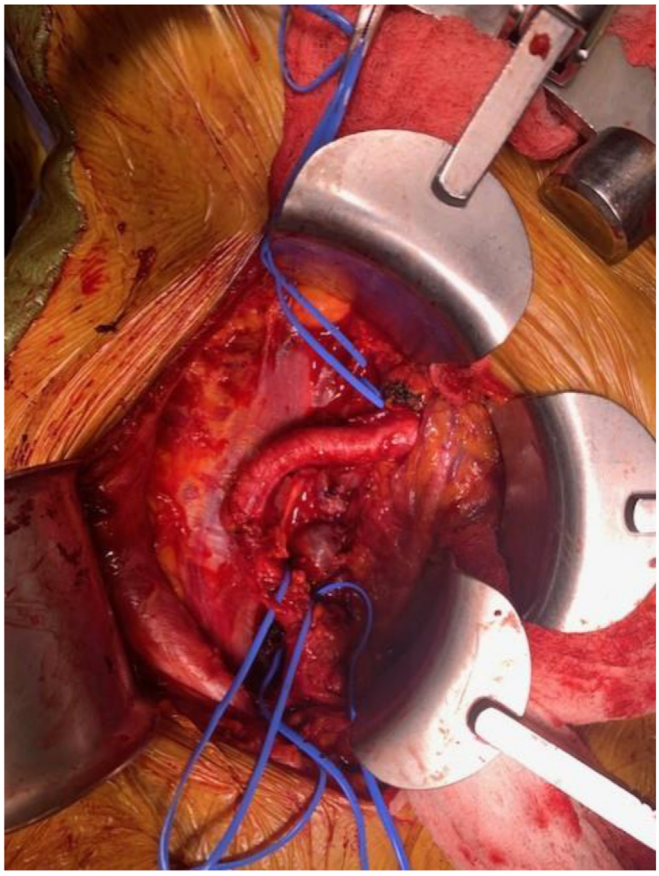

**Fig 3.** Intraoperative photograph showing right common iliac vein after aneurysmorrhaphy.

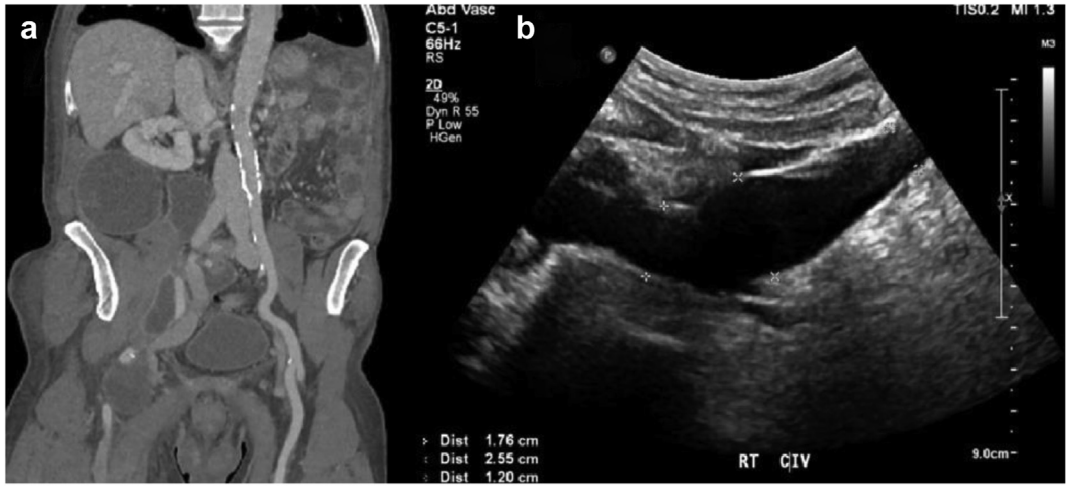


**Fig 4. A,** Computed tomography venogram at 3 weeks postoperatively demonstrating repair with known hematoma. **B,** Duplex ultrasound at B8 months postoperatively demonstrating stability of aneurysm repair.

follow-up.[10,11,28] The 11 patients who underwent open aneurysm repair were stable on follow-up, except for 1 patient with iliac vein thrombosis found on follow-up imaging that was asymptomatic and managed with anticoagulation therapy.[15] Several patients undergoing endovascular or hybrid repair (5 of 12; 41.7%) required reintervention or demonstrated stent thrombosis on follow-up imaging.[12-14,20,23]

**Table.** PubMed literature review of reported cases of iliac vein aneurysm in the past 10 years

| Investigator | Anatomy | Laterality | Maximum diameter, cm | Age, years | Sex | History of symptomatic venous disease | Suspected cause | Presence of AVF | Surgical type | Complications | Last known outcome | PMID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| George et al,[28] 2021 | EIV | Right | 5.3 | 62 | M | No | Genetic predisposition, trauma from high-intensity cycling | No | CM | None | Stable at last follow-up | 35036671 |
| Prochno et al,[27] 2022 | EIV | Right | 5.6 | 72 | F | No | Unknown | No | Open | None | Stable at last follow-up | 36345349 |
| Laamiri et al,[26] 2023 | CIV | Right | NR | 64 | F | No | Unknown, fistulized to bowel | No | Open | None | Stable at last follow-up | 37164801 |
| Spanos et al,[7] 2022 | EIV | Left | NR | 60 | M | No | Prior trauma | Yes | EV | None | Patent, stable at last follow-up | 36007712 |
| Park et al,[6] 2016 | EIV, ruptured | Right | 5 | 63 | F | No | Unknown | No | Open | None | Stable at last follow-up | 26946902 |
| Meghpara et al,[25] 2022 | IIV | Right | 3 | 61 | F | No | May-Thurner syndrome | No | EV | None | Stable at last follow-up | 35996731 |
| Pena et al,[3] 2020 | EIV | Left | 8 | 38 | M | No | Prior trauma | Yes | Open | None | Stable at last follow-up | 32544286 |
| Fanshawe et al,[24] 2018 | EIV | Right | 5 | 26 | M | No | Neonatal vascular trauma | No | Hybrid | None | Stable at last follow-up | 29977509 |
| Shah et al,[23] 2014 | EIV | Right | NR | 22 | F | No | PFO | No | Hybrid | Recurrent IVC thrombosis | Stable at last follow-up | 26992313 |
| Singh et al,[22] 2021 | CIV, EIV | Left | NR | 26 | M | No | Prior trauma | Yes | Open | None | Stable at last follow-up | 33339551 |
| Ahmad et al,[21] 2018 | EIV | Left | 6 | 40 | M | No | Unknown | Yes | Open | None | Stable at last follow-up | 33060911 |
| Parikh et al,[20] 2021 | EIV | Right | NR | 34 | F | No | Infection | No | EV | Stent thrombosis | Stable at last follow-up | 34132912 |
| Torodov et al,[19] 2013 | EIV | Left | 1.4 | 62 | M | No | Prior trauma | yes | EV | None | Stable at last follow-up | 26992591 |
| Li et al,[18] 2021 | CIV | Left | 6.5 | 49 | M | No | Unknown | No | Open | None | Stable at last follow-up | 33708987 |
| DeWane et al,[17] 2018 | CIV | Left | 5.5 | 35 | F | No | Unknown | Yes | EV | None | Stable at last follow-up | 29886213 |
| Thompson et al,[16] 2015 | EIV | Left | 7.2 | 55 | M | No | Prior trauma | Yes | EV | None | Stable at last follow-up | 26335991 |
| Taki et al,[15] 2018 | EIV | Right | 7.2 | 40 | M | No | Unknown | No | Open | Asymptomatic thrombosis of EIV | Stable at last follow-up | 29682124 |
| Cookson et al,[14] 2019 | EIV | Left | 9 | 45 | M | No | Prior major surgery | Yes | EV | Proximal and distal stenosis, stent thrombosis | Stent patent on anticoagulation, stable at follow-up | 31515003 |
| Chang et al,[12] 2019 | EIV | Left | 13 | 15 | M | No | AV malformation | Yes | Hybrid | Coil embolization failure, aneurysm growth around endovascular stent | Stable after open repair at follow-up | 30771833 |
| Mendes et al,[13] 2022 | EIV | Bilateral | 6.3 | 70 | M | Yes (DVT) | Unknown | No | EV | Complete recanalization not achieved | Asymptomatic on follow up | 35537645 |
| Audu et al,[4] 2017 | IIV | Left | 3.1 | 63 | M | Microscopic polyangiitis, venous insufficiency | Unknown | No | EV | None | Stable at last follow-up | 28214495 |
| Banzic et al,[11] 2015 | CIV | Left | 4 | 24 | F | Klippel-Trenaunay syndrome | Parkes-Weber syndrome | Yes | CM | None | Stable at last follow-up | 26122423 |

**Table.** Continued.

| Investigator | Anatomy | Laterality | Maximum diameter, cm | Age, years | Sex | History of symptomatic venous disease | Suspected cause | Presence of AVF | Surgical type | Complications | Last known outcome | PMID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Warot et al,[10] 2018 | CIV | Right | 5.5 | 68 | F | No | Unknown | No | CM | None | Stable at last follow-up | 30253742 |
| Ostertag-Hill et al,[9] 2022 | EIV | Bilateral | 6.8 | 17 | M | No | Unknown | No | Open | None | Stable at last follow-up | 36052207 |
| Hosaka et al,[5] 2014 | EIV | Right | 3.7 | 22 | F | Bilateral PE | Unknown | No | Open | None | Stable at last follow-up | 24201597 |
| Yamamoto et al,[8] 2019 | EIV | Bilateral | 4.4 | 50 | M | No | Unknown | No | Open | None | Stable at last follow-up | 30496895 |

*AVF,* Arteriovenous fistula; *CIV,* common iliac vein; *CM,* conservative management; *DVT,* deep vein thrombosis; *EIV,* external iliac vein; *EV,* endovascular; *F,* female; *M,* male; *NR,* not reported; *PE,* pulmonary embolism; *PFO,* patent foramen ovale.

Our patient did not have evidence of an AVF or other etiology of aneurysm formation; however, his longstanding tricuspid regurgitation could have contributed to his iliac vein aneurysm (Table). Despite the favorable outcomes with conservative therapy, our patient had a sizeable aneurysm (>10 cm), much larger than the reported cases treated conservatively (4-5.5 cm). We found one reported case of iliac vein aneurysm rupture at 5 cm. Furthermore, given that our patient's aneurysm diameter was greater than two times that of his native vein, we proceeded with repair because he had no contraindications to surgery. We elected to perform open aneurysmorrhaphy because it has demonstrated acceptable outcomes with a lower risk of complications and reintervention. Open surgery is not without risk, and our patient did have hematoma-related complications postoperatively that required drainage.

## CONCLUSIONS

Our case demonstrates successful open repair of an iliac vein aneurysm with a stable vessel diameter and patency on subsequent follow-up. Surgical treatment of an iliac vein aneurysm of this size has rarely been addressed in the literature, and we demonstrate that open primary aneurysmorrhaphy can be a safe option for select patients to reduce the risk of rupture and other complications. Considering the lack of specific guidelines for treatment, therapy should be determined by the patient's anatomy, frailty, tolerance of general anesthesia, and presence of secondary causes of aneurysmal dilation.

## DISCLOSURES

None.

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