

 **Case Report** 

# Surgical Repair of an Arteriovenous Fistula in the Posterior Wall of the Right Common Iliac Vein

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We present the case of a right internal iliac artery aneurysm with arteriovenous fistula in the posterior wall of the right common iliac vein. The fistula would have been difficult to close using endovascular treatment. We strongly anticipated difficulty in controlling bleeding; therefore, we performed cardiopulmonary bypass. Closing the fistula with suture would have been difficult, so we ligated the right common iliac artery and vein around the aneurysm. Femoro–femoral bypass was also performed to preserve blood flow in the lower right leg. The use of cardiopulmonary bypass should be considered in such difficult cases.

**Keywords:** arteriovenous fistula, internal iliac artery aneurysm, cardiopulmonary bypass


## Introduction

Arteriovenous fistula (AVF) is one of the possible complications of an aneurysm. We present the case of an AVF associated with right internal iliac artery aneurysm (IIAA). This case was quite rare in that the AVF was located in the posterior wall of the right common iliac vein (CIV). The fistula is not directly visible in such cases, and controlling bleeding is very difficult. We describe the successful repair of the AVF using cardiopulmonary bypass (CPB).

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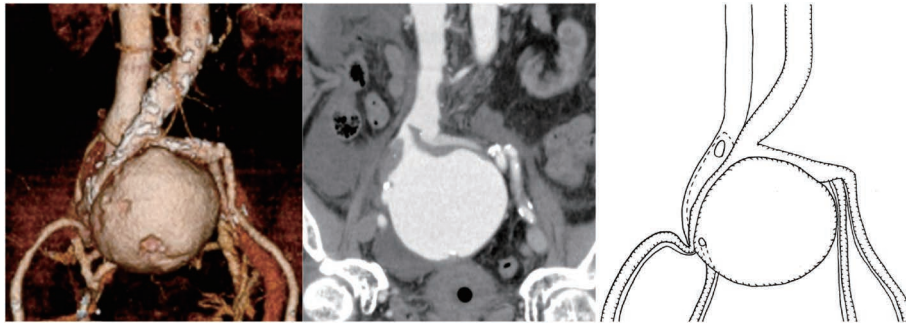
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## Case Report

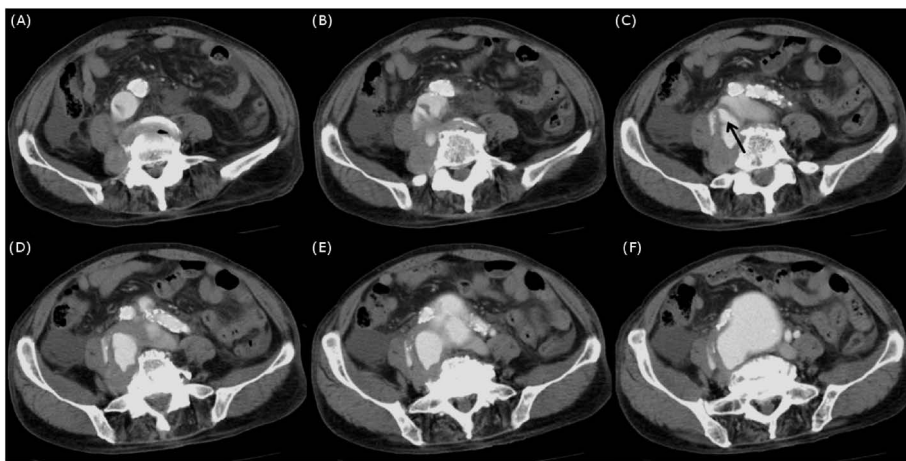
An 87-year-old man with a treatment history of creatinine 2.0 mg/dL for chronic kidney disease and chronic atrial fibrillation was admitted to our hospital. Two days earlier, he had visited his primary care doctor and was admitted for investigation. His creatinine was 4.22 mg/dL upon admission, which increased to 6.34 mg/dL, and he reported respiratory discomfort on day 2 after admission. Plain computed tomography (CT) revealed a right IIAA measuring 89 mm in diameter. Enhanced CT revealed an AVF located in the posterior wall of the right CIV and contrast leakage into the inferior vena cava (IVC) (Figs. 1 and 2). Brain natriuretic peptide and potassium levels were 942.51 pg/dL and 5.9 mEq/L, respectively. The patient exhibited symptoms of renal failure and heart failure and was transferred to our hospital where he was immediately taken to the operating room for emergency treatment of the aneurysm.

In the operating room, the patient's blood pressure was 86/42 mmHg and his heart rate was irregular, averaging 108 beats/min. There was a pulsatile abdominal mass with vascular murmur, and the lower right leg was swollen compared with the left leg. We strongly anticipated difficulty in controlling bleeding and thus planned to perform CPB.

We used a median laparotomy approach. The aneurysm extended posteromedially from the right common iliac artery (CIA), such that the right CIV was sandwiched between the right CIA and the aneurysm. The left CIA was impinged by the aneurysm and could not be freed. We exposed the bilateral femoral artery and vein so that we could clamp them. Heparin was administered, and activated clotting time was >400 s. An arterial line was inserted into the abdominal aorta and a venous line into the IVC. Low venous pressure as a result of CPB facilitated the exfoliation of tissue around the aneurysm. The aorta, IVC, and bilateral femoral artery and vein were clamped. When the aneurysm was opened, there was considerable venous bleeding. We attempted to observe the fistula but were unable to directly visualize the site. The site was palpable with fingers. We first tried to close the fistula using the



**Fig. 1** Preoperative enhanced CT revealed a right internal iliac artery aneurysm measuring 81 mm in diameter and contrast leakage into the inferior vena cava. The fistula was located in the posterior wall of the right common iliac vein.



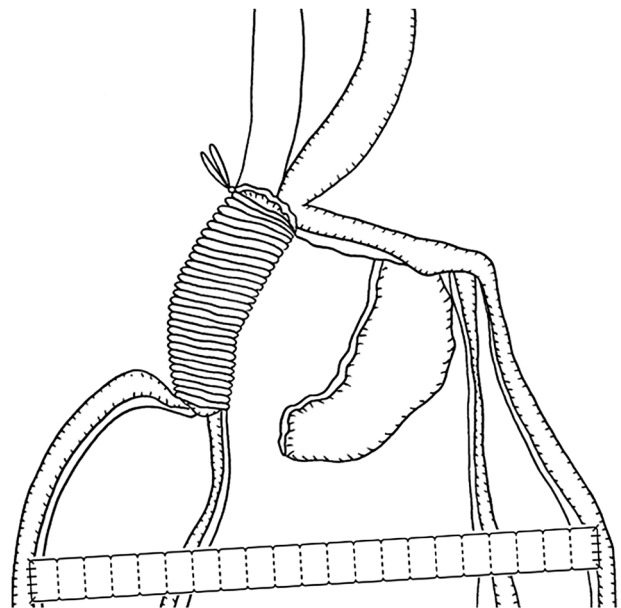
**Fig. 2** An arteriovenous fistula was located in the posterior wall of the right common iliac vein.

aneurysm wall. However, the weak wall of the vein and aneurysm caused massive bleeding, which was difficult to control. Despite the massive bleeding, hemodynamics were stable because the withdrawn blood was returned through the arterial line. We ligated the right CIA and CIV around the aneurysm and eventually closed the fistula using tetron tape. We additionally performed femoro-femoral bypass to preserve blood flow to the lower right leg. A J-graft (9 mm) was anastomosed to the left common femoral artery using a 5-0 prolene suture. The distal side of the graft was passed under the skin to the right side and anastomosed in the same manner (Fig. 3).

The swelling of the lower right leg gradually resolved. Creatinine improved to 2.03 mg/dL, and upon discharge, the ankle-brachial index was 0.97 on the right side and 0.96 on the left side. The patient was transferred to another hospital for rehabilitation on postoperative day 25.

## Discussion

Ilio-iliac AVF is a rare disease that occurs in <1% of all CIA aneurysms and in 27% of ruptured aneurysms.<sup>1)</sup>



**Fig. 3** The right CIA and vein were ligated around the aneurysm using tetron tape, and femoro-femoral bypass was performed.

There were 640 cases wherein surgery was performed for aortoiliac aneurysm in our hospital between January 2003 and December 2016. There were four cases (0.6%) with an AVF, including the case reported here. In one case, open repair was performed. Balloon occlusion of the fistula was performed to control bleeding, and the fistula was closed using the aneurysm wall. In one case, open surgery was initially attempted. When the aneurysm was opened, there was considerable venous bleeding from the incised area, which was difficult to control. The incised part of the aneurysm was closed, and endovascular repair was performed on the next day. In the last case, endovascular surgery was performed with a positive outcome.

Two strategies exist to treat an AVF with aneurysm: open surgery and endovascular treatment. Open surgery includes repair of the fistula, usually with direct suture, and reconstruction of the aortoiliac aneurysm with an artificial vessel.<sup>2)</sup> The merit of this technique is that it fundamentally treats the AVF. Its demerits include difficulty in controlling bleeding and invasiveness. Endovascular treatment causes a decrease in arterial flow into the aneurysm and shunts flow into the adjacent vein. The merit of endovascular treatment is that it is less invasive and does not require abdominal laparotomy. Its demerit is that the fistula cannot be closed, so the risk of type 2 endoleak due to venous bleeding through the AVF and consequent expansion of the aneurysm remains.<sup>3)</sup> The long-term performance of endovascular treatment is still unknown. In this case, the fistula was located far from the right CIA and the external iliac artery, so it was anatomically unsuitable for endovascular treatment.

The control of venous bleeding in open surgery can affect surgical outcome. Venous bleeding from the fistula of the aneurysm can be excessive, and careful and expeditious control of bleeding using digital compression, sponge sticks, or balloon catheters is imperative.<sup>2)</sup> Some studies have reported an AVF located in the anterior wall of veins.<sup>3,4)</sup> This case is quite rare in that the AVF associated with the aneurysm was located in the posterior wall of the CIV. The fistula was not directly visible in this case. If the fistula had been located in the anterior wall of the vein, direct observation of the fistula when cutting the aneurysm would have been possible. With better visibility, closing the fistula using one of the aforementioned techniques would have been feasible.

There are many different symptoms caused by an AVF.<sup>5)</sup> Our patient presented with symptoms of renal failure and heart failure, so immediate intervention was needed. High venous pressure caused by the AVF and anticoagulant for chronic atrial fibrillation make severe hemorrhage more likely. Given the site of the AVF, we correctly anticipated

difficulty in controlling bleeding. Preoperative evaluation of the patient for conditions including heart disease was insufficient. As described above, this patient had several worrisome conditions, so we planned to perform CPB. The merit of CPB is that it can secure circulating blood volume by suctioning the withdrawn blood. It can stabilize hemodynamics by returning blood through the arterial line. Decreased venous pressure makes it feasible to exfoliate tissue around the aneurysm. The demerit is that it can cause complications during the insertion of arterial and venous lines, such as embolism, cerebral infarction, systemic inflammatory response, or blood clotting defects. It is important to consider CPB as an option when performing open surgery.

## Conclusion

We experienced a case of an AVF located in the posterior wall of the CIV and associated with a right IIAA. Difficulty in controlling bleeding from the AVF could be predicted by checking the site of the fistula and the adjacent vein. The use of CPB in open surgery should be considered in difficult cases.

## Disclosure Statement

None of the authors have any conflict of interest.

## Author Contributions

Data collection: KH

Writing: KH

Final approval: all authors

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