



## Case report

# A case of deep femoral artery aneurysm found with superficial femoral artery aneurysm

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### Abstract

**Objective:** Deep femoral artery (DFA) aneurysms are extremely rare cases of aneurysms that are difficult to diagnose. The objective of this report was to discuss the timing and method of surgery for this disease.

**Patient:** We encountered an asymptomatic left DFA aneurysm that was discovered along with a symptomatic aneurysm of the right superficial femoral artery (SFA). Both sides of the aneurysm were resected with Dacron knitted artificial vascular grafts (Gelsoft™ Plus, Vasctek, UK) simultaneously.

**Result:** After the operation, the right SFA had good blood flow, but the graft of the left DFA was occluded. The occlusion was considered to be caused by insufficient blood flow in the graft. The patient was discharged without any complications.

**Conclusion:** The coexistence of DFA aneurysms should be examined if other aneurysms are found. DFA aneurysms are at a high risk of rupture. Careful follow-up is required, and intervention is recommended when the diameter exceeds 35 mm.

**Key words:** deep femoral artery aneurysm, superficial femoral artery aneurysm, surgery

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## Introduction

Deep femoral artery (DFA) aneurysms are an extremely rare disease<sup>1–3</sup>. The number of cases is small; therefore, treatment guidelines have not been established. DFA aneurysms are difficult to diagnose. Because DFA is surrounded by adductor muscles, aneurysms progress asymptotically<sup>8</sup>. However, it has been reported that there is a higher risk of rupture in DFA aneurysms than common femoral artery aneurysms<sup>4, 6–8</sup>, and early intervention is often required. In this paper, we consider the treatment method and intervention timing of DFA aneurysms through a case incidentally discovered with a superficial femoral artery aneurysm (SFA).

## Case report

A 76-year-old male complained of weakness and numbness in his right lower limb. We found a pulsating mass in the right groin. Computed tomography (CT) revealed a right SFA aneurysm that compressed the femoral nerve (Figure 1) and an aneurysm of the left deep femoral artery (DFA) (Figure 2). Compared to the CT taken at the time of his femoral neck fracture one year ago, the diameter of the right SFA aneurysm increased from 30 to 38 mm and that of the left DFA aneurysm increased from 32 to 36 mm. Since neurological symptoms appeared in the right lower limb and the left DFA aneurysm might be at risk of rupture, we decided to operate on both sides of the aneurysm simultaneously.

Surgery was initiated for the right SFA aneurysm. We removed the aneurysm and mural thrombus and released compression of the femoral nerve. We reconstructed the SFA using an 8-mm artificial graft (Gelsoft™ Plus, Vasctek, UK).

We then performed surgery on the left side. We clamped the common femoral artery, SFA, and two distal branches of the aneurysm. When we made an incision on the wall of the aneurysm, blood drained out. When we checked the aneurysm again, we found another distal branch that was not clamped. We ligated this branch and did not reconstruct the branch. We then dissected the entire aneurysm (Figure 3), excised the aneurysm, and replaced it with an 8-mm Gelsoft

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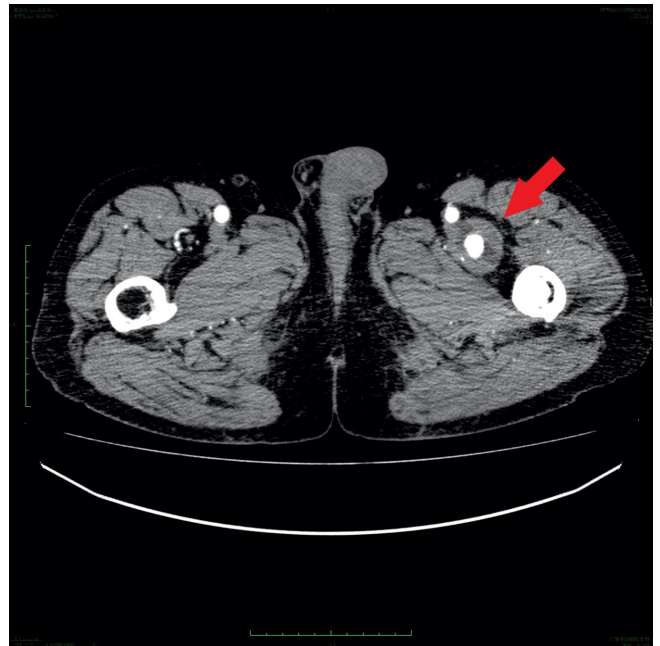
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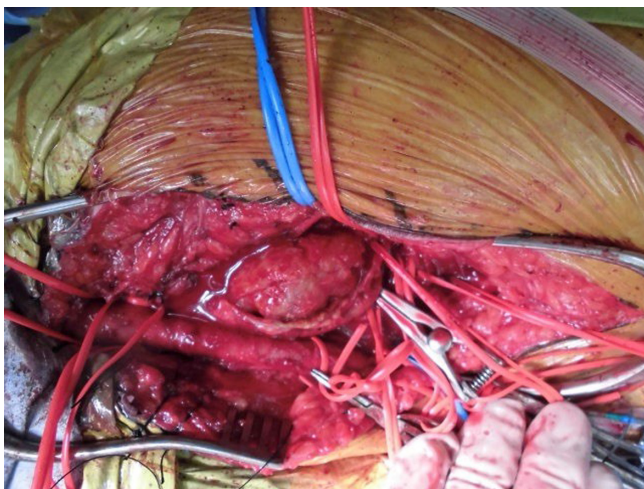




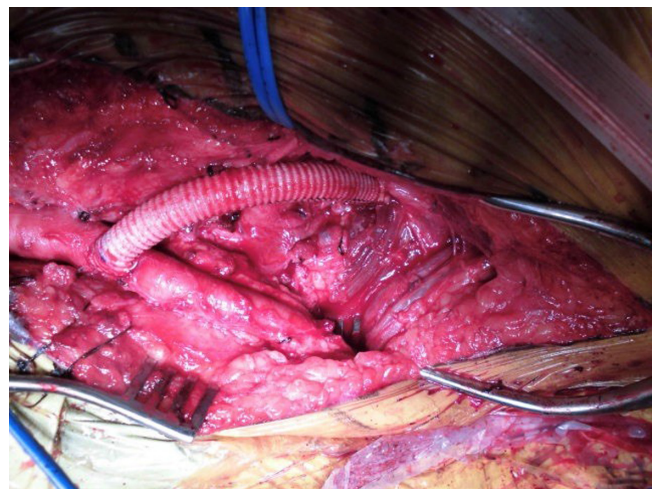
**Figure 1** A red arrow: An aneurysm with a diameter of 38 mm was found in the right SFA.



**Figure 2** A red arrow: An aneurysm with a diameter of 36 mm was found in the left DFA.



**Figure 3** We made an incision in the left DFA aneurysm. We found a thrombus inside the aneurysm and removed it.



**Figure 4** We excised the DFA aneurysm and reconstructed it with an 8-mm Gelsoft.

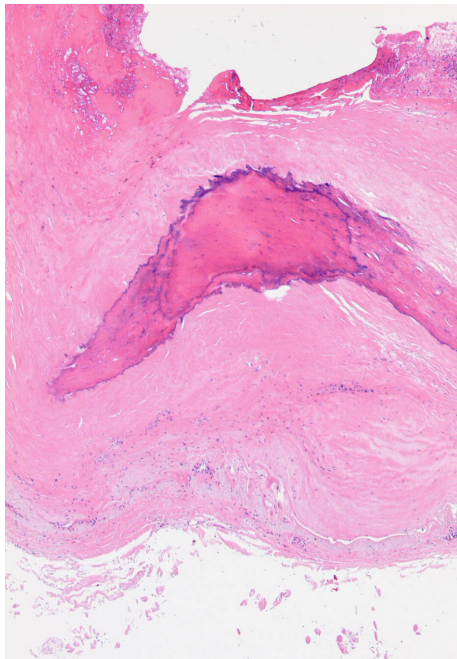
(Figure 4).

Pathological examination revealed atherosclerosis and thickening of the media on the DFA aneurysm (Figure 5). 3DCT showed good blood flow in the right SFA. The left aneurysm of the DFA was resected completely, but the graft was occluded (Figure 6). The patient progressed without any complications and was discharged 8 days after surgery.

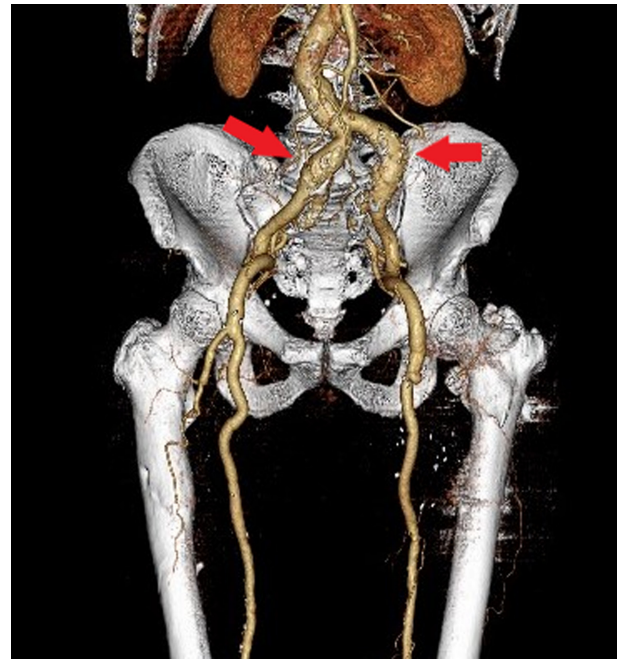
## Discussion

DFA aneurysm is a very rare disease, accounting for only 0.5% of all peripheral artery aneurysms<sup>1)</sup>. It accounts for only 1–2.6% of femoral artery aneurysms<sup>2,3)</sup>. Most occur in older men and are thought to be caused by age-related atherosclerosis of the arterial wall<sup>4,7)</sup>. Trauma and iatrogenic trauma have also been reported but are very rare<sup>5)</sup>.

The diagnosis of a DFA aneurysm is difficult. This is because the DFA is surrounded by the adductor muscle, so



**Figure 5** This is a pathological photograph of the arterial wall of DFA. We observed atherosclerotic change in the arterial wall.



**Figure 6** Postoperative 3DCT. The left DFA showed obstruction from the reconstructed part. Red arrow: We found aneurysms in the bilateral common iliac arteries.

it often progresses asymptotically<sup>8</sup>). Some reported that 73% of the patients were asymptomatic. When symptomatic, there was a palpable mass with pain and edema in the lower leg<sup>4,6,7</sup>). It should be noted that DFA aneurysms have a high risk of rupture (13–44% have been reported<sup>6–8</sup>). These rates are higher than those for common femoral artery aneurysms<sup>4,6,7</sup>).

DFA aneurysms are often associated with other aneurysms. In some reports, more than 60% of DFA aneurysms occur with other aneurysms<sup>4,6,7</sup>). In our case, there were left SFA aneurysms and aneurysms of both sides of the common iliac artery. By checking for DFA when diagnosing other aneurysms, we may be able to reduce the oversight of DFA aneurysms.

There are no treatment guidelines for DFA aneurysms due to the small number of cases. We summarized the ruptured aneurysms of DFA from studies that describe the details (Table 1). Most ruptured over 35 mm in diameter, but some ruptured with smaller diameters. Some studies reported that the larger the size, the higher the risk of rupture<sup>21</sup>). In our case, the diameter of the DFA aneurysm was 36 mm, and it increased by 6 mm over 12 months. We decided to operate both on the right SFA aneurysm and the left DFA aneurysm at the same time due to risk of rupture. In the past, ligation of the aneurysm was often performed in surgery, but recent studies recommend reconstruction of the deep femoral artery<sup>5,6</sup>). It has been reported that there was no difference in the rate of ischemic complications between the ligation-only

group and the reconstructed group<sup>6</sup>). However, with ligation alone, the patient loses important collateral circulation. In our case, as a common iliac artery aneurysm with a diameter of about 30 mm was found, endovascular repair of the aneurysm of the common iliac artery (EVAR) will be necessary in future. EVAR is associated with a risk of embolism. We decided to reconstruct the DFA to prevent ischemic crisis of the leg due to distal embolism during EVAR. The graft was occluded, probably due to insufficient blood flow and bending of the graft due to right hip joint flexion. Blood flow was reduced because we ligated the bleeding distal branch. Even if thrombectomy is performed, there may be a high possibility of reocclusion. Since he had no symptoms, we decided not to perform thrombectomy. The graft occlusion in our case revealed an important lesson. Careful evaluation of CT is important before surgery to prevent underestimation of blood flow in the distal branch. Recently, there have been some reports of endovascular treatment performed in ruptured cases<sup>12,14,20</sup>). Angiography during surgery is useful for the precise evaluation of the distal branch of the DFA. We may prevent the sacrifice of the necessary distal branch to keep the graft patent. Initially, we considered endovascular repair of DFA aneurysms, but stent grafts for peripheral artery aneurysms are not available in Japan. Although the number of reports of endovascular repair of DFA aneurysms is still limited, it will become a standard therapy in the near future.

**Table 1** Summary of cases of ruptured deep femoral artery (DFA) aneurysm, which revealed its size

Author, year	No.	Size	Form	Treatment	Basal disease
Amer <i>et al.</i> <sup>10)</sup> 2004	1	10 × 15 cm	N/A	Open surgery	
Hariharan <i>et al.</i> <sup>11)</sup> 2006	1	5.5 cm diameter	Saccular	Open surgery	
Ganeshan <i>et al.</i> <sup>12)</sup> 2007	1	6 × 6.5 cm	Saccular	Endovascular (Coiling)	
Emrecaan <i>et al.</i> <sup>13)</sup> 2010	1	2.9 cm diameter	Fusiform	Open surgery	Neurofibromatosis
Saha <i>et al.</i> <sup>14)</sup> 2010	1	5 × 5 cm	Saccular	Endovascular (Stent graft)	
Idetsu <i>et al.</i> <sup>15)</sup> 2011	1	7 cm diameter	Fusiform	Open surgery	
Dulic <i>et al.</i> <sup>16)</sup> 2015	1	4.5 × 5 cm	Fusiform	Open surgery	
Reslan <i>et al.</i> <sup>17)</sup> 2016	2	12 × 13 cm 5.6 × 4 cm	N/A	Open surgery	
Malinowski <i>et al.</i> <sup>9)</sup> 2018	1	3.5 cm diameter	Fusiform	Open surgery	
Bouarhroum <i>et al.</i> <sup>18)</sup> 2018	1	4 cm diameter	Fusiform	Open surgery	
Nishimura <i>et al.</i> <sup>19)</sup> 2019	1	6.5 × 4.5 cm	Saccular	Open surgery	
Fakhoury <i>et al.</i> <sup>20)</sup> 2019	1	3.9 × 2.6 cm	Saccular	Endovascular (Stent graft)	Fibromuscular dysplasia

## Conclusion

DFA aneurysms are rare and difficult to diagnose. If there are other aneurysms, complications of DFA aneurysms should be checked. Careful follow-up is required even when the diameter is small, and when the diameter of the aneurysm exceeds 35 mm, there is a high risk of rupture; hence, early treatment should be considered. Great care should be

taken when reconstructing the DFA.

**Informed consent and ethical considerations:** This study was conducted in accordance with the Declaration of Helsinki.

**Conflict of interest:** The authors declare no conflicts of interest in association with the present study.

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