

Surgical, endovascular, and hybrid treatment of deep femoral artery aneurysm: three case reports

Hiroki Moriuchi¹, Takuya Maeda¹, Masaaki Koide¹, Yoshifumi Kunii¹, and kazumasa watanabe¹

¹Seirei Hamamatsu Hospital

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Introduction

Degenerative aneurysms of deep femoral arteries are extremely rare, accounting for 1-2.6% of all femoral artery aneurysms⁽¹⁾. They are difficult to diagnose in the early stage and found in large size at presentation because they are located deeply and covered by several muscles⁽²⁾. Deep femoral artery aneurysm (DFAA) can cause complicated conditions such as rapid expansion, rupture, and acute lower limb ischemia due to distal embolism of thrombus. Repair is always recommended for DFAA because of the possibility of those complications⁽³⁾. We herein report either surgical or endovascular treatment of three cases of DFAA.

Case reports

Case1

A 69-year-old man complained about tenderness in his left thigh and computed tomography angiography(CTA) showed a left large fusiform DFAA(Figure 1A). The maximum size of the aneurysm was 60mm×55mm in diameter and the aneurysm contained abundant thrombus within the sac(Figure 1B). This symptomatic huge DFAA was surgically repaired to prevent rupture and release local compression. The open repair was performed through longitudinal groin incision. The DFAA adhered to surrounding tissue and the femoral nerve was dissected from the aneurysm(Figure 1C). Femoral veins were also gently dissected and cared to avoid venous injury and perioperative venous thrombosis. The aneurysmectomy was performed and interposed a 6mm ring-supported expanded polytetrafluoroethylen (ePTFE) graft into DFA(Figure 1D).

Case2

A 67-year-old man was referred to our hospital with sudden right thigh pain. CTA revealed bilateral DFAA and the right DFAA was ruptured(Figure 2AB). Emergency surgery was carried out for the ruptured right DFAA. Right common femoral artery(CFA) and proximal DFA were dissected through groin incision. 5Fr. sheath was inserted via the right CFA into the distal artery of DFA. The distal branch of DFAA was embolized with 7mm Amplatzer vascular plug 4(Abbott, St Paul, MN, USA). Finally proximal DFA was ligated. The patient was discharged with no sign of limb ischemia.

The follow-up CTA showed the enlargement of the left DFAA measuring 25mm in diameter and occlusion of left superficial femoral artery(SFA). The left ankle brachial index showed 0.51. Endovascular management was selected for the left DFAA as a concomitant treatment with endovascular treatment of left SFA occlusion. A 7Fr sheath was inserted into left CFA via small groin incision and the occlusive long lesion in SFA was treated with balloon angioplasty following 6mm×250mm stent graft deployment (Viabahn, WL Gore & Associates Inc.). Next the 7Fr sheath gently advanced to the distal artery of DFAA and 7mm×500mm self-expanding stent graft was deployed from the distal artery to proximal neck of DFAA. Postoperative CT

revealed exclusion of DFAA blood flow and patent stent grafts(Figure 2CD). The left ankle brachial index rose to 0.97 and the patient was discharged without any leg ischemic symptoms.

Case3

A 87-year-old man was referred to our institute because CTA revealed left DFAA measuring 50mm in diameter. The patient was asymptomatic and clinical frailty scale is 7 due to high age and sequelae to cerebral infarction. Endovascular management was considered to be impossible because DFAA enlarged proximally just bifurcation from CFA(Figure3AB). Only aneurysmectomy was done with surgical closure of distal branches of DFA. Aneurysmectomy and proximal and distal ligation of DFAA were performed. Reconstruction of DFA was not done because the patient was low activity and SFA had no stenosis

Discussion

DFAA is rare and difficult to diagnose in the early stage⁽¹⁾. DFAA often progresses asymptotically and is found in large size at presentation because they are located deeply and covered by several muscles⁽²⁾. DFAA can cause complicated conditions such as rapid expansion, rupture, and acute lower limb ischemia due to distal embolism of thrombus, particularly if there is concomitant superficial femoral artery occlusive disease⁽³⁾. All symptomatic femoral aneurysms should be treated to prevent rupture, embolization and worsening local compression. Reslan and colleagues suggested that repair is always recommended for DFAA because of the possibility of those complications⁽³⁾.

Treatment of true femoral aneurysms including DFAA is usually open repair consisting of exclusion of aneurysm and interposition of graft so that the treatment resolves local compression and maintains lower extremity perfusion. The prosthetic grafts are better size matches and patency rates than vein grafts in the femoral artery region⁽⁴⁾. As mentioned in the report of case 1, during open repair, gentle dissection of the branches of femoral nerve and vein is necessary to protect from injury and perioperative venous thrombosis. Preoperative assessment of ipsilateral SFA patency and other regions including iliac artery, popliteal artery, and contralateral side is very important because femoral artery aneurysms are often associated with different aneurysms and bilateral aneurysms.^(5,6)

Although aneurysmectomy and graft replacement are preferred, simple ligation may be reasonable treatment in challenging cases such as ruptured aneurysms, elder patient with poor general condition e.g. case 3.⁽³⁾ Coil embolization has been reported as useful non-surgical alternative if the aneurysm involves distal branches of DFA.^(7,8) In the presented case 2, ruptured right DFAA was treated by hybrid repair with proximal direct ligation and distal embolization using Amplatz vascular plug because the distal artery of DFAA was large measuring 5mm in diameter. When distal branches are large in diameter, prompt embolization is possible by using vascular plugs even in emergency case of ruptured aneurysm. Although embolization has been a successful treatment, the patients are at risk for limb ischemia because DFA is an important collateral source to the lower extremity, especially in cases of femoropopliteal artery diseases.⁽¹⁾

Endovascular management of DFAA using stent-grafts may be effective approach for the preservation of distal perfusion. There are some reports of successful deployment of stent-grafts to treat DFAA with good short-term results.^(5,6,9) In case 2, we successfully deployed 7mm stent- graft because DFAA was short in length with enough both proximal and distal landing zone. Endovascular treatments are attractive for stable patients as well as frail patients because of their less invasiveness. However, contralateral femoral access or groin incision is often required to deliver stent-grafts. There are no officially approved covered stents for peripheral artery aneurysms and appropriate length of landing zone was unknown to completely exclude aneurysm sac. Further size discrepancy between proximal and distal arteries of DFAA is assumed if aneurysm is large and long, so preoperative assessment using CTA or magnetic resonance angiography is essential. Postoperatively, careful follow-up of graft patency and local compressive and ischemic symptoms is necessary.

Conclusion

We reported three cases of DFAA successfully treated with different approaches, open surgical reconstruction,

hybrid embolization and endovascular reconstruction, and simple aneurysmectomy. Since there are multiple approaches for treatment of DFAA, preoperative assessment is important including symptoms, anatomy, presence of different aneurysm, presence of ischemic arterial disease, and comorbidities. Further study is necessary to evaluate long-term results of treatment of DFAA.

References

1. Harbuzariu C, Duncan AA, Bower TC, et al. Profunda femoris artery aneurysms: association with aneurysmal disease and limb ischemia. *J Vasc Surg.* 2008;47:31-34; discussion 34-35.
2. Milotic F, Milotic I, Flis V. Isolated atherosclerotic aneurysm of the profunda femoris artery. *Ann Vasc Surg.* 2010;24:552 e551-553.
3. Reslan OM, Sundick S, Razayat C, et al. Rupture of a True Profunda Femoris Artery Aneurysm: Two Case Reports and Review of the English Language Literature. *Ann Vasc Surg.* 2017;39:290 e291-290 e299.
4. Sapienza P, Mingoli A, Feldhaus RJ, et al. Femoral artery aneurysms: long-term follow-up and results of surgical treatment. *Cardiovasc Surg.* 1996;4:181-184.
5. Piffaretti G, Mariscalco G, Tozzi M, et al. Twenty-year experience of femoral artery aneurysms. *J Vasc Surg.* 2011;53:1230-1236.
6. Gemayel G, Mugnai D, Khabiri E, et al. Isolated bilateral profunda femoris artery aneurysm. *Ann Vasc Surg.* 2010;24:824 e811-823.
7. Terada Y, Wanibuchi Y. [A case of ruptured aneurysm of the profunda femoris artery treated successfully by transcatheter embolization]. *Nihon Geka Gakkai Zasshi.* 1989;90:1278-1281.
8. Cantasdemir M, Kantarci F, Mihmanli I, et al. Embolization of profunda femoris artery branch pseudoaneurysms with ethylene vinyl alcohol copolymer (onyx). *J Vasc Interv Radiol.* 2002;13:725-728.
9. Kouvelos GN, Papas NK, Arnaoutoglou EM, et al. Endovascular repair of profunda femoral artery false aneurysms using covered stents. *Vascular.* 2011;19:51-54.

Figure legends

Figure1: Computed tomography(CT) showed huge left DFAA(A) and abundant thrombus in the sac(B). Femoral nerve was carefully dissected from DFAA(C), and graft replacement was performed(D). DFAA: deep femoral artery aneurysm

Figure2: CT revealed bilateral DFAA and ruptured right-sided aneurysm(A,B). Postoperative CT showed exclusion of DFAA blood flow and patent stent grafts(C,D).

Figure3: CT showed left DFAA(A) and proximal neck from bifurcation was very short(B)

Key Clinical Message

Deep femoral artery aneurysms(DFAA) are extremely rare. We treated 4 DFAAs with different procedures including surgical, endovascular and hybrid surgery. The best treatment should be selected for each individual case.







