A True Aneurysm of the Profunda Femoris Artery: A Case Report and Review of the English Language Literature

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A rare case of true aneurysm of the profunda femoris artery (PFA) is reported. Surgical management consisted of ligation of the aneurysm and decompression of the sac. Presentation, diagnosis, and treatment of true PFA aneurysms are discussed and the English language literature is comprehensively reviewed.

Aneurysms of the profunda femoris artery (PFA) are uncommon. Most result from injury to the vessel wall and have been reported as a consequence of penetrating injury, fracture, orthopedic procedures, or catheterization, and have even been induced by golf swing.[1-4] True PFA aneurysms comprise 1–6.6% of all femoral artery aneurysms.[2,5-8] It has been postulated that aneurysmal change in this location is rare because of a protective muscular tunnel formed by the adductor magnus.[6] Aneurysms may cause symptoms of distal venous congestion related to local venous compression, or neurologic symptoms from compression of the femoral or tibial nerve, be a source of distal emboli, thrombose causing ischemia, or rupture.[5,6] We present a case of an atherosclerotic aneurysm of the PFA and review the English language literature.

CASE REPORT

The patient is an 80-year-old man with past medical history significant for hypertension and abdominal aortic aneurysm (AAA) repair 8 years earlier who presented with a 4-week history of left-sided foot drop, numbness, intermittent tingling, and progressive edema. He thought he had injured his foot while bowling. There was no previous history of claudication and prior ankle X-ray was negative. He had unintentionally 40 lost pounds over the preceding 10 months. The patient had a 100+ pack-year smoking history. The patient's mother had an AAA.

On physical examination, blood pressure was 135/73. There was a large pulsatile mass in the left medial thigh. Bilateral femoral, popliteal, dorsalis pedis, and posterior tibial pulses were easily palpable. There was 2+ edema of the left foot and leg to the knee. Sensation to light touch and pinprick was diminished to the knee. Thigh flexion and extension were normal, but the patient was unable to plantar or dorsiflex the left foot. The anklebrachial index was 1.1, with triphasic Doppler waveforms at the ankle. Lab evaluation was unremarkable.

Ultrasound of the left thigh showed a 5 to 6-cm aneurysm of the PFA. Also noted were aneurysmal changes of the bilateral common iliac, common femoral, and popliteal arteries (Table I). Arteriography showed diffuse arteriomegaly, with bilateral common iliac aneurysms,and left-sided internal iliac, common femoral, and popliteal aneurysms. The PFA had aneurysmal dilatation with distal occlusion (Fig. 1). The superficial femoral artery (SFA) and outflow vessels to the foot were patent. Computed tomography of the thigh was also performed, confirming a 6-cm-diameter aneurysm of the PFA, extending 13 cm caudally (Fig. 2).

Chest radiography revealed a 6-cm lung mass in the left lower lobe. Subsequent transbronchial biopsy was consistent with non-small-cell lung cancer. The decision was made to proceed with treatment of the PFA aneurysm prior to addressing the lung mass.

Procedure

After prepping the leg, a longitudinal incision was made directly over the aneurysm. The patient was found to have ectatic common and superficial femoral arteries. Dissection was continued down onto the PFA, reflecting

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Table I. Ultrasound measurements of pelvic and lower extremity arteries

	CIA (cm)	CFA (cm)	SFA (cm)	Popliteal artery (cm)
Right	3.3	1.7	1	1.5
Left	3.5	1.6	1.3	1.3

CFA, common femoral artery; CIA, common iliac artery; SFA, superficial femoral artery.

the femoral nerve, vastus medialis, and belly of the sartorius laterally. The femoral nerve ran along the lateral aspect of the aneurysm sac (Fig. 3). Proximal control was obtained just distal to the lateral circumflex femoral artery. Upon clamping the neck of the aneurysm, the aneurysm was no longer pulsatile and was opened. After removing a large amount of thrombus, there was minimal back-bleeding from a small outflow vessel, which was oversewn from within the aneurysm sac. The SFA was widely patent, making vascular reconstruction unnecessary. The neck of the aneurysm was therefore ligated, and the leg closed in layers.

Outcome

On follow-up the patient had palpable foot pulses. There was a persistent left foot drop, but his lower extremity edema had mostly resolved. His lung cancer was found to have crossed the major fissure, was deemed nonresectable, and was therefore treated with chemotherapy and radiation therapy. He was alive 12 months after the procedure.

DISCUSSION

We reviewed 46 patients with PFA aneurysms reported in the English language literature (Table II). Data with sufficient detail for analysis (some incomplete) were available for 42 patients. True aneurysms of the PFA are much more common in men (92%) than in women. This pattern of incidence is comparable to the male predominance of all femoral aneurysms (89–100%.)[5-8,11,43]. Average age at presentation of patients with PFA aneurysms is 73.5 ± 10 years. These are bilateral in only 5% of patients; this is in contrast to all femoral aneurysms, which are bilateral in the majority.[5-7,11,43]

Patients with PFA aneurysms often have aneurysms elsewhere: of 31 patients with available data, 20 (65%) had at least one other aneurysm. Twelve (39%) had an (AAA) and 15 (38%) had three or more aneurysms. These findings are consistent with most studies of patients with femoral aneurysms, which have reported multiple aneurysms in 58–69% of patients and AAA in 28–58% of patients[5-7,43]

Presenting symptom history was available for 34 patients. The most common presentation was groin or proximal thigh swelling and pain, occurring in 17 (50%) patients. Eight (24%) patients presented with only thigh swelling or an asymptomatic pulsatile mass. Three patients had evidence of distal emboli, two of whom had no other aneurysms and four who had digital ischemia. It is difficult to account for distal embolization from an isolated PFA aneurysm. One proposed explanation is retrograde passage of clot into the SFA and subsequent embolization, due to compression or manipulation of the aneurysm.[21] Rupture is a common presentation for PFA aneurysms, and occurred in 18 patients (44%). All ruptures presented with both pain and swelling of the groin or thigh. Foot drop is an uncommon presentation, occurring in only one or two other patients. In our patient, the foot drop was likely related to compression of the tibial nerve by his popliteal aneurysm and was therefore not improved after resection of the aneurysm sac.

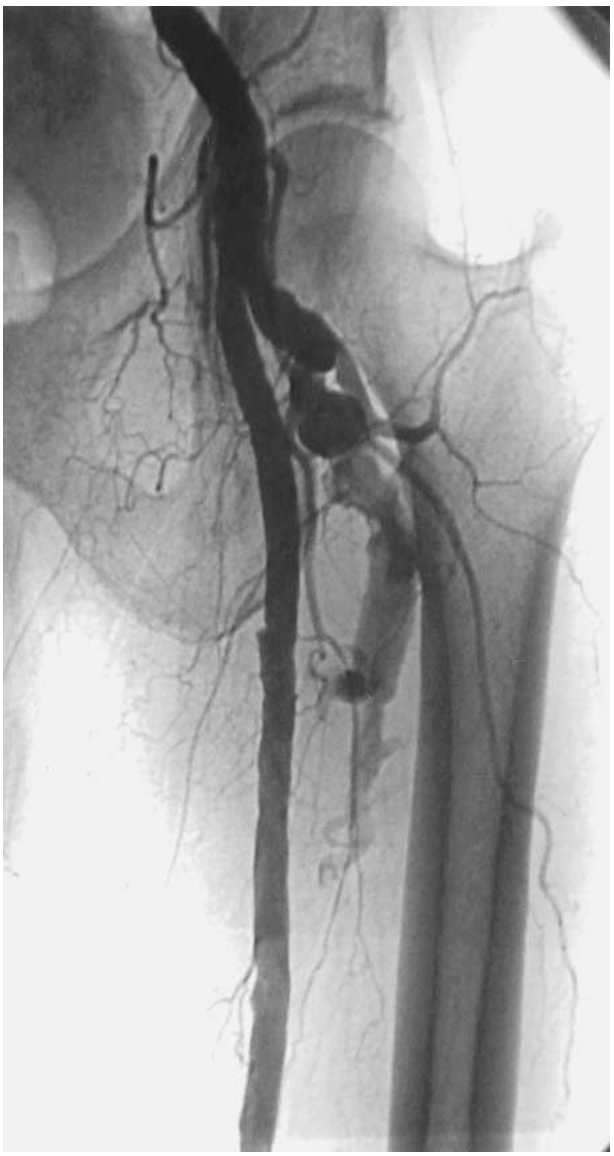

Fig. 1. Arteriogram shows aneurysmal change and occlusion of the PFA.

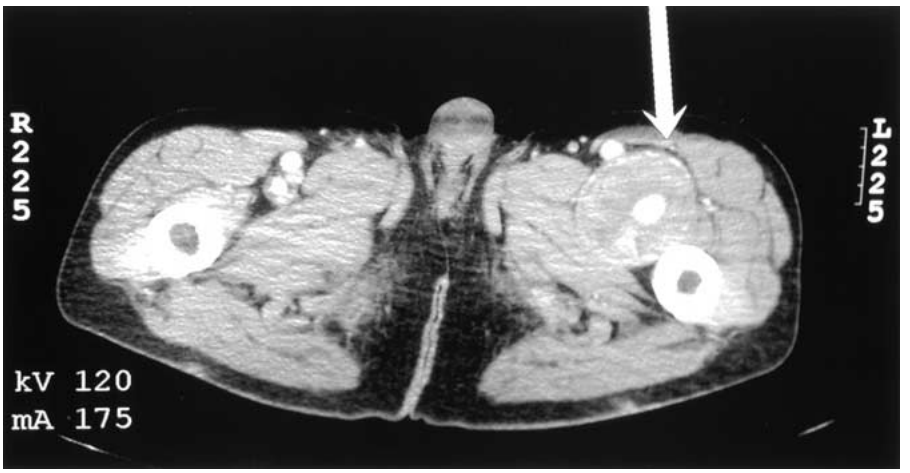

Fig. 2. Computed tomography of proximal thigh: *arrow* indicates 6-cm aneurysm of the PFA.

Fig. 3. Left proximal thigh with large PFA aneurysm at exploration. The patient's head is to the left.

The size of PFA aneurysms is not well documented in the literature. In one series the average size was 3.3 ± 1.8 cm.[43] PFA aneurysms tend to present at a larger size than that of femoral aneurysms. Average size was 7.4 ± 3 cm in 28 patients from this review. Aneurysms that were ruptured on presentation tended to be larger than those that were not (8.8 ± 3.0 cm vs. 6.3 ± 3.1 cm, $p = 0.04$). The larger size at presentation compared with that of all femoral aneurysms is likely due to the deeper position of the PFA in the thigh, which may delay diagnosis, and may also explain the increased incidence of rupture: 18 of 41 (44%) patients presented with rupture, compared with 2–24% of patients with femoral artery aneurysms[5,6,43,44]

Because of the larger size at diagnosis and the greater incidence of rupture, all PFA aneurysms should be treated, with or without reconstruction, on diagnosis. Surgical treatment consisted of ligation in 25 patients, reconstruction in 16 patients, and aneurysmorrhaphy in 1 patient. Prosthetic graft material was used for reconstruction in 11 patients (6 with Dacron,[5,10,21,24,26,32] 4 with ePTFE,[18,20,34,37] and 1 human umbilical vein[17]) and greater saphenous vein graft in 4 patients.[12,31,42] The form of repair could not be ascertained for two patients.[38,41]

The decision to ligate or revascularize a PFA aneurysm depends on the patency of the femoral-popliteal outflow and the feasibility of repair. Most reports recommend reconstruction of the aneurysm with an interposition graft to preserve PFA flow, especially in the setting of distal femoral-popliteal outflow tract occlusion.[12,15,24] However, there was no significant difference in outcome in the 11 patients reviewed with femoral-popliteal outflow tract occlusion (based on the absence of pedal pulses, when angiographic data were not available) according to the form of operative therapy: only four progressed to amputation, one of three were treated with ligation, two of seven underwent reconstruction, and one patient underwent aneurysmorrhaphy. No patient with intact distal pulses required amputation.

Patients with ruptured aneurysms usually have enough anatomic distortion to make reconstruction difficult at best. Of 18 patients who had a ruptured PFA aneurysm, 14 were treated by ligation, with only one amputation. Distal pulses were present in 10 of these patients, absent in 2, and unknown in 6. Therefore, it appears that patients with rupture with intact distal pulses may safely undergo ligation without revascularization. However, in the setting of rupture with absent distal pulses, there are not enough data to document the safety of ligation. In these cases, efforts should be made to perform revascularization, if feasible.

Even though some patients, according to our review of the literature, may not require reconstruction, we recommend reconstruction in all patients with occlusion of the distal outflow. This may be done with autogenous vein graft or prosthetic material. Aneurysmectomy with ligation of the inflow and outflow may be performed safely if there is adequate femoral-popliteal outflow and limited atherosclerotic occlusive disease. Published concerns that operative repair in the setting of SFA occlusion has a poor outcome with a high rate of subsequent amputation[5] have

Table II. Reported cases of PFA aneurysm in the English language literature

Reference	Year	Age	Presentation	Rupture	Size (cm)	Pulses	Diagnostic study	Treatment	Outcome	Other aneurysms
Pappas et al.[6]	1964									
Jamieson and Carroll[9]	1965	70	Thigh pain, swelling, foot drop	Yes	Egg sized	Present		Ligation, debridement		
Billig et al.[10]	1968	73	Pulsatile groin mass	No		Present	Angiogram	Dacron graft		B Pop, CFA, SFA
Dent et al.[11]	1972									
Cutler and Darling[5]	1973			Yes		Absent		Ligation	Amputation	
				No		Absent		Aneurysmorrrhaphy	Thrombose, amputation	
				No		Absent		Dacron graft	Thrombose, amputation	
Symes and Eadie[12]	1973	51	Thigh swelling	No	4	Present	Plain X-ray, angiogram	GSV graft		None
Karmody and Galloway[13]	1974	83	Thigh pain, swelling	Yes		Present	Angiogram	Ligation		
Baird et al.[8]	1977									
Tarrico[14]	1980	72	Anterior leg pain from groin to knee	Yes	12 × 15	Present	Ultrasound	Ligation	Wound ruptured infection, ruptured SFA 25 days postoperature	
Valiulis and Johnston[15]	1980	63	Thigh pain	No		Present	Angiogram	Ligation		None
Feldman and Berguer[16]	1981	66	Thigh pain, swelling	Yes		Present	Angiogram, ultrasound	Ligation	Wound infection	None
Ratto et al.[17]	1984	73	Ischemic leg	No	5 × 3	Absent	Angiogram	HUV graft and fem-pop		R CFA
Wiest et al.[18]	1986	80	Thigh pain, swelling	Yes	10	Absent	Angiogram	PTFE graft		AAA, L CFA
Roseman and Wyche[19]	1987	41	Thigh pain, swelling	No	4	Present	Angiogram, CT	Ligation		None
Bjorck et al.[20]	1987	83	R leg ischemia	No	4	Absent	Angiogram	PTFE graft	Amputation	
		70	Groin pain	No	5	Present	Angiogram, CT	Ligation		B PFA
		76	Groin pain, swelling	Yes	6 × 8	Unknown	Angiogram	Ligation		
Markland[21]	1989	82	Groin pain, emboli to foot, leg swelling	No	4.5	Present	Ultrasound, angiogram	Dacron graft	Forefoot amputation for preoperative emboli	None

(Continued)

Table II. Continued.

Reference	Year	Age	Presentation	Rupture	Size (cm)	Pulses	Diagnostic study	Treatment	Outcome	Other aneurysms
Sadler et al.[22]	1989	78	Thigh pain, swelling	Yes	4 × 3		Angiogram, CT	Not reported		
Bourgeois et al.[23]	1990	73	Thigh pain	Yes	8 × 6.5	Present	CT	Ligation		AAA, R CFA
Tait et al.[24]	1991	76	Thigh swelling	No	>3	Absent	Angiogram	Dacron graft		B CFA and Pop
		69	Thigh swelling		6 × 8	Present	Angiogram	Ligation		AAA, L SFA, R IIA, R Pop
		75		No	6 × 4	Absent	Angiogram	Dacron graft		B pop
Lancashire and Galland[25]	1992	64	Groin swelling	No	5 × 6		Ultrasound, angiogram	Excision/AFB		L CFA, AAA
Reher and Rutsaert[26]	1992	79	Distal emboli, ischemia	No	7.8	Absent	Angiogram, CT	Ligation, AFB to branch of PFA		AAA
Schulze and Chesler[27]	1992	74	Pulsatile groin mass	No	3.2		Ultrasound	GSV graft		AAA, R pop
Evans[28]	1992									AAA
Eastcott[29]	1993	72	Thigh pain, swelling	Yes				Ligation	Wound infection	
Williams et al.[30]	1993	77	Thigh pain, swelling	Yes		Present	Ultrasound, angiogram, CT	Ligation, AFB	Infected groin wound, redo AFB	AAA, R CIA, L IIA, B fem-pop
Tulla and Hippelainen[31]	1994	88	Groin pain, swelling	Yes	10.5	Present	Ultrasound	Vein graft		B pop
Raine et al.[32]	1995	79	Thigh pain, swelling, distal emboli	No		Present	Ultrasound, angiogram	AFB to B PFA, B SFA reimplanted		B PFA and iliacs, L CFA
Sapienza et al.[7]	1996			Yes				Ligation		
Yahel and Witz[33]	1996	69	Thigh swelling	No	15 × 12	Present	Angiogram	Ligation		None
Levi and Schroeder[34]	1996	78	Thigh pain, swelling	Yes	6 × 6		Ultrasound	PTFE graft		
		58	Thigh pain, swelling	Yes			Ultrasound, angiogram	Ligation		AAA, R CFA
El Nakadi et al.[35]	1996	84	Thigh pain, swelling	Yes	10 × 6	Present	Ultrasound, angiogram	Ligation		AAA, B PFA, R Pop
Kuniyoshi et al.[36]	1998	74		No	6.3 × 8.2	Present	Angiogram, CT	B ligation, AIB		AAA, B CIA, B IIA
Reference	Year	Age	Presentation	Rupture	Size (cm)	Pulses	Diagnostic study	Treatment	Outcome	Other aneurysms
Aburahma and Tallman[37]	1999	83	Thigh pain, numbness of foot and lateral leg	Yes	11 × 7	Biphasic PT, no DP	Ultrasound, angiogram: patent SFA, 1 vessel runoff	PTFE graft		None

(Continued)

Table II. Continued.

Reference	Year	Age	Presentation	Rupture	Size (cm)	Pulses	Diagnostic study	Treatment	Outcome	Other aneurysms
Burchi et al.[38]	1999	70	Pulsating groin mass	No		Absent	Ultrasound, angiogram: SFA occlusion	Ligation, CFA to SFA graft		None
Toda et al.[39]	2000	69	Thigh pain, pulsatile mass	No	9.5	Present	Ultrasound, angiogram	Ligation		None
		73	Thigh pain, pulsatile mass	No	10	Present	Ultrasound, angiogram	Ligation		None
Lozano et al.[40]	2001	96	Thigh pain, swelling	Yes	5 × 3	Present	Ultrasound	Ligation		None
Dimarco and Felloni[41]	2001	67	Claudication/ cyanosis	No	6		Angiogram	Resect, graft		
Johnson et al.[42]	2002	70		No		Absent	Angiogram	RSVG to PTFE		AAA, IIA, B Pop, B CFA

Varying amounts of data were reported, some records are therefore incomplete. If data were unavailable, these spaces were left blank.
Abbreviations: AFB, aortofemoral bypass; AIB, aortoiliac bypass; B, bilateral; CFA, common femoral artery; CIA, common iliac artery; DP, dorsalis pedis; Fem-pop, femoral to popliteal artery bypass; GSV, greater saphenous vein; HUV, human umbilical vein; IIA, internal iliac artery; Pop, popliteal artery; PT, posterior tibial; PTFE, polytetrafluoroethylene; RSVG, reversed saphenous vein graft.

not been borne out by careful review of the literature. There are no convincing data to support reconstruction over ligation in the setting of ruptured PFA aneurysm—this decision should be based on adequacy of distal perfusion as assessed clinically at the time of operation.

In summary, an aneurysm of the PFA is a rare problem, comprising only 1−6.6% of all femoral aneurysms. The pathophysiology of patients with aneurysmosis such as this probably have an as-yet undefined connective tissue metabolism defect. Molecular studies comparing patients with isolated AAA and those with multiple aneurysms have not yet been done on a large scale. PFA aneurysms tend to present at a larger size and have a higher incidence of rupture than that of femoral aneurysms. Revascularization in the setting of a patent femoral-popliteal outflow tract may not be necessary, but should be pursued if feasible. When the distal femoral-popliteal outflow tract is occluded, reconstruction is strongly recommended, whereas simple ligation may be safely performed in the setting of adequate outflow to the foot.

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