

Vascular and Endovascular Surgery

<http://ves.sagepub.com>

Endovascular Treatment for Traumatic Popliteal Artery Pseudoaneurysms After Knee Arthroplasty

Keren Sloan, Reza Mofidi, John Nagy, Murray M. Flett and Sam Chakraverty
Vasc Endovascular Surg 2009; 43; 286 originally published online Jan 8, 2009;
DOI: 10.1177/1538574408328664

The online version of this article can be found at:
<http://ves.sagepub.com/cgi/content/abstract/43/3/286>

Published by:



<http://www.sagepublications.com>

Additional services and information for *Vascular and Endovascular Surgery* can be found at:

Email Alerts: <http://ves.sagepub.com/cgi/alerts>

Subscriptions: <http://ves.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

Citations <http://ves.sagepub.com/cgi/content/refs/43/3/286>

Endovascular Treatment for Traumatic Popliteal Artery Pseudoaneurysms After Knee Arthroplasty

Keren Sloan, MB, BS, Reza Mofidi, MB, MCh, MSc, FRCS,
John Nagy, MD, FRCS, Murray M. Flett, MD, FRCS, and
Sam Chakraverty, MB, BS, FRCR

Trauma to the popliteal artery is a recognized complication of knee arthroplasty (total knee arthroplasty). It can present in a variety of ways, one of which is the development of popliteal artery pseudoaneurysm. We report the successful endovascular management of 2 patients who developed popliteal artery pseudoaneurysms following total knee arthroplasty

using covered stent grafts. From presented evidence, endovascular therapy is a safe treatment modality and it appears to be a viable alternative to open surgery.

Keywords: knee arthroplasty; popliteal artery pseudoaneurysm; endovascular stent

Introduction

Trauma to the popliteal artery or its branches is a recognized complication of total knee arthroplasty (TKA). It is uncommon, with a reported incidence which ranges from 0.03% to 0.17%.¹⁻³ However, when such a complication does occur, it is potentially life threatening and can be associated with a significant risk of limb loss. Popliteal artery pseudoaneurysm is one of the sequelae of popliteal artery trauma.³⁻¹² We report 2 cases of popliteal artery pseudoaneurysm, which occurred as a complication of elective TKA and were treated successfully using covered endovascular stents. We also discuss the feasibility of such an approach for management of this serious complication of TKA.

From the Department of Vascular Surgery, Ninewells Hospital, Dundee DD1 9SY, United Kingdom.

Address correspondence to: Reza Mofidi, 27-14 Hawthornbank Lane, Edinburgh, EH4 3BH, United Kingdom; e-mail: rmofidi@doctors.net.uk

Case Reports

Case 1

A 70-year-old man was admitted for elective left TKA due to severe osteoarthritis, and there was no previous history of peripheral vascular disease. The procedure was apparently uncomplicated with intraoperative blood loss estimated at 250 to 300 mL. Postoperatively, the patient developed left calf pain and was found to have a swollen left calf. The left lower limb was warm, well perfused with a normal complement of lower limb pulses. A provisional diagnosis of deep venous thrombosis (DVT) was made, and duplex examination of the left lower limb was organized. This revealed no evidence of a DVT; however, it did reveal a 3.9 cm pseudoaneurysm of the popliteal artery (Figure 1A and B). The patient remained hemodynamically stable with postoperative hemoglobin of 10.5 mg/dL. The diagnosis was confirmed using angiography (Figure 2A).

The lesion was treated with placement of a covered endovascular stent graft. After obtaining antegrade percutaneous access across the lesion, a covered 8 × 30 mm Wallgraft (Schneider, Minneapolis, Minn)

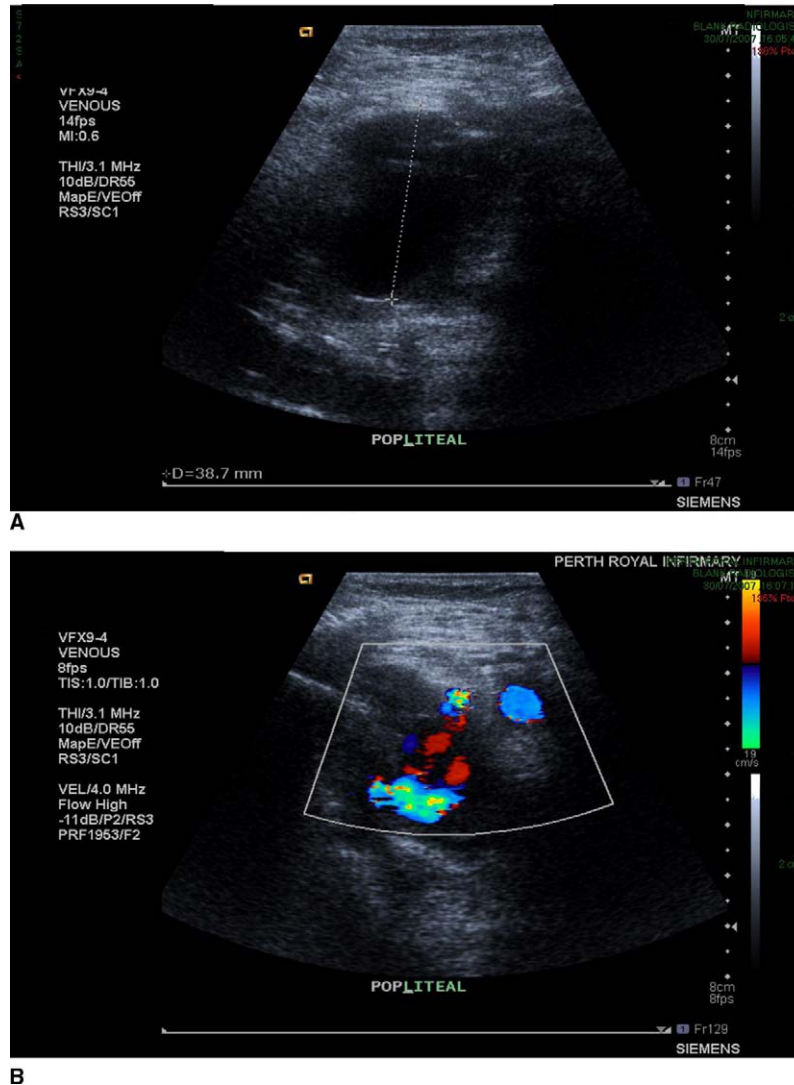


Figure 1. Duplex scan of left popliteal fossa which revealed a 3.9 mm pseudoaneurysm on B mode ultrasound (A) with the classical color flow characteristics (B).

was placed. This resulted in satisfactory sealing of the pseudoaneurysm (Figure 2B).

After 12 months, the patient remained asymptomatic. A follow-up ultrasound scan revealed that the distal superficial femoral artery (SFA) and popliteal artery were widely patent with no evidence of kinking or stenosis, and the stent graft was incorporated in the vessel wall (Figure 3). The patient remains under routine ultrasound follow-up.

Case 2

A 65-year-old woman underwent elective unicompartmental left knee arthroplasty. The procedure was

technically challenging. Immediately following the operation, the patient developed extensive bruising and swelling of the right calf associated with a cold pale left foot. This was investigated with a duplex scan of the left lower limb, which revealed the diagnosis of a popliteal artery pseudoaneurysm containing a significant quantity of occlusive thrombus. The patient underwent antegrade angiography, which confirmed the diagnosis of a large pseudoaneurysm, arising from the popliteal artery just above the knee with a large defect in the arterial wall and considerable intraluminal thrombus (Figure 4A). This thrombus was removed with endovascular suction thrombectomy, and a 6 × 30 mm Wallgraft covered



Figure 2. Antegrade angiogram revealing a large popliteal artery pseudoaneurysm with angiographic measurements (A). Satisfactory completion angiogram revealing sealed pseudoaneurysm (B).

stent graft was placed to seal the pseudoaneurysm (Figure 4B). Completion angiography revealed a significant quantity of thrombus in the tibioperoneal trunk, and the left limb remained cold and pale. After a further attempt at radiological suction thrombectomy, she underwent radiologically guided, surgical thrombectomy of the anterior tibial and common peroneal arteries with a satisfactory completion angiogram (Figure 4C). In addition, calf compartment fasciotomies were performed for treatment of compartment syndrome. Her postoperative course thereafter was uncomplicated and the fasciotomies healed following skin grafting. After 2 years, she remains asymptomatic. Follow-up duplex examination of the popliteal artery revealed that at 1 year the pseudoaneurysm remained excluded with the stent graft being widely patent and in a satisfactory position. The patient remains under follow-up in the vascular laboratory.

Discussion

Trauma to the popliteal artery in the context of knee arthroplasty has a range of presentations, from acute arterial hemorrhage to arterial occlusion and thrombosis resulting in acute lower limb ischemia. A proportion of patients present with a contained pseudoaneurysm of the popliteal artery,³⁻¹¹ which may present early as a pulsatile mass in the popliteal fossa, calf swelling or occasionally present some time after the initial procedure.¹²

The smaller pseudoaneurysms which are associated with small defects in the arterial wall can be treated with ultrasound-guided compression repair or local percutaneous therapy with injections of thrombin or fibrin. However, owing to the nature of the trauma, only a small proportion of these lesions are amenable to local therapy.³ The established treatment for the remainder is open repair with above- to

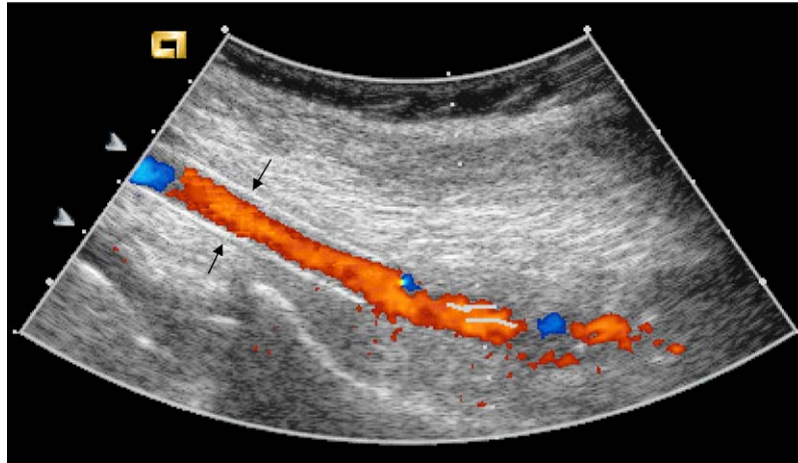


Figure 3. Follow-up duplex scan of the popliteal artery 1 year after endovascular treatment of popliteal artery pseudoaneurysm. The outline of the stent is clearly visible (arrows).

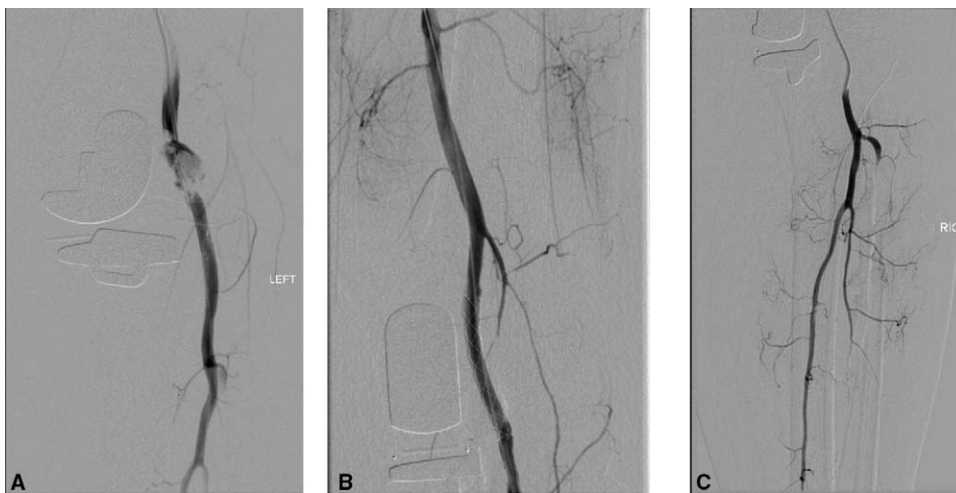


Figure 4. Antegrade angiogram of the right lower limb revealing a large popliteal artery pseudoaneurysm containing copious amounts of intraluminal thrombus (A). After placement of the stent graft, there was successful exclusion of the pseudoaneurysm (B). Completion angiogram after thrombectomy of the posterior tibial and peroneal arteries (C).

below-knee popliteal artery bypass together with ligation of the native artery. This can be an unappealing prospect as it involves operating in a hostile operative field, exposing a recently placed prosthesis to potential infection and requires harvesting of venous conduit from the contralateral limb.

Endovascular treatment involves the placement of a covered stent across the defect in the popliteal artery. There have been a number of reports of successful cases of endovascular treatment of popliteal artery pseudoaneurysm.³⁻¹² Most of these cases also report on short- and medium-term duplex and

radiological follow-up, suggesting that at least in the first 6 to 18 months stent displacement or fracture is uncommon. There is a single report of successful endovascular treatment of a popliteal artery pseudoaneurysm with an uncovered stent, when a covered endovascular device was unavailable.¹³

There have been a steadily rising number of case reports discussing the safety and durability of endovascular repair of traumatic popliteal artery pseudoaneurysms. Because of the relative paucity of these reports and the lack of large patient series, concrete evidence-based conclusions cannot be drawn with

regard to the optimum therapeutic strategy from the published literature. The evidence that is available suggests that endovascular treatment is safe and durable as a treatment modality for the management of traumatic popliteal artery pseudoaneurysms and can be performed with an acceptable morbidity rate. Nonetheless, concerns remain due to the relatively mobile site of the popliteal artery and how this may increase the risk of device migration or stent fracture.

The long-term patency of a stent in the popliteal artery is also a source of concern. However, follow-up duplex scanning suggests that with time, the stent graft becomes incorporated into the vessel wall by the 6 months follow-up appointment (Figure 4).^{3,10} Although more is known about the natural history of vein grafts performed following lower limb arterial trauma, these grafts are not without medium- to long-term complications as long-term graft patency following vein graft bypass surgery can be threatened by the development of neointimal hyperplasia and graft stenosis.^{14,15}

Endovascular repair using a covered stent is a safe treatment modality for the management of popliteal artery pseudoaneurysm, and it appears to be a viable short- and medium-term alternative to open surgery. Further long-term follow-up is required to assess the longevity of such therapy.

References

- O'Connor JV, Stocks G, Crabtree JD Jr, Galasso P, Wallsh E. Popliteal pseudoaneurysm following total knee arthroplasty. *J Arthroplasty*. 1998;13:830-832.
- Ninomiya JT, Dean JC, Goldberg VM. Injury to the popliteal artery and its anatomic location in total knee arthroplasty. *J Arthroplasty*. 1999;14:803-809.
- Calligaro KD, Dougherty MJ, Ryan S, Booth RE. Acute arterial complications associated with total hip and knee arthroplasty. *J Vasc Surg*. 2003;38:1170-1177.
- Vaidhyanath R, Blanshard KS. Case report: insertion of a covered stent for treatment of a popliteal artery pseudoaneurysm following total knee arthroplasty. *Br J Radiol*. 2003;76:195-198.
- Karkos CD, Thomson GJ, D'Souza SP, Prasad V. False aneurysm of the popliteal artery: a rare complication of total knee replacement. *Knee Surg Sports Traumatol Arthrosc*. 2000;8:53-55.
- Davies AJ, Roberts DE. A complication following a total knee arthroplasty. *Br J Radiol*. 1999;72:317-318.
- Plagnol P, Diard N, Bruneteau P, Roncheau V. Case report: pseudoaneurysm of popliteal artery complicating a total knee replacement: a successful percutaneous endovascular treatment. *Eur J Vasc Endovasc Surg*. 2001;21:81-83.
- Ibrahim M, Booth RE Jr, Clark TW. Embolization of traumatic pseudoaneurysms after total knee arthroplasty. *J Arthroplasty*. 2004;19:123-128.
- Papas TT, Maltezos CK, Papanas N, Antoniou G, Lazarides MK. Popliteal artery pseudoaneurysm after total knee replacement. *Vasa*. 2007;36:145-158.
- D'Angelo F, Carrafiello GP, Laganà D, et al. Popliteal artery pseudoaneurysm after a revision of total knee arthroplasty: endovascular treatment with a stent graft. *Emerg Radiol*. 2007;13:323-327.
- Behnke NM, Cui Q, Orndorff D. Late presentation of a mycotic popliteal artery pseudoaneurysm in the setting of a revised total knee arthroplasty complicated by both prior infection and periprosthetic fracture: a case report. *Ann Vasc Surg*. 2007;21:519-524.
- May J, White GH, Yu W, Waugh R, Stephen MS, Harris JP. Endoluminal repair: a better option for the treatment of complex false aneurysms. *Aust N Z J Surg*. 1998;68:29-34.
- Manns RA, Duffield RG. Case report: intravascular stenting across a false aneurysm of the popliteal artery. *Clin Radiol*. 1997;52:151-153.
- Mofidi R, Kelman J, Berry O, Bennett S, Murie JA, Dawson AR. Significance of the early postoperative duplex result in infrainguinal vein bypass surveillance. *Eur J Vasc Endovasc Surg*. 2007;34:327-332.
- Mills JL. Mechanisms of vein graft failure: the location, distribution, and characteristics of lesions that predispose to graft failure. *Semin Vasc Surg*. 1993;6:78-91.

For reprints and permissions queries, please visit SAGE's Web site at <http://www.sagepub.com/journalsPermissions.nav>.