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A case report of an anterior tibial artery pseudo-aneurysm open surgical management: A rare complication post total knee arthroplasty



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ABSTRACT

INTRODUCTION: Complications involving injury to neurological and vascular structures are infrequently reported after total knee arthroplasty (TKA). They are associated with significant morbidity and can be limb threatening.

PRESENTATION OF CASE: We present a patient with an anterior tibial artery (ATA) aneurysm post total knee arthroplasty.

A 69-year-old female was referred for a swelling over her left antero-lateral aspect of her leg 4 years post TKA. Radiological investigations showed an ATA pseudo aneurysm. The aneurysm was repaired by open ligation.

DISCUSSION: ATA pseudo aneurysm is a rare condition post arthroplasty. Patients can complain about calf pain, digits discoloration, paresthesia and the presence of a pulsating or enlarging mass. Symptomatic aneurysms require surgical intervention.

CONCLUSION: ATA pseudo aneurysms are uncommon. They are usually identified shortly after the initial insult. A delayed manifestation of a post knee arthroplasty complication as illustrated in our case is likely the first reported case of its kind. Clinicians should maintain a high index of suspicion should there be persistent localised swelling post TKA. However, due to the rarity of this condition, a variety of interventions have been reported in the English medical literature with probably no compelling evidence that favors one modality over the others.

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1. Introduction

Complications involving injury to neurological and vascular structures are infrequently reported after total knee arthroplasty (TKA), with an incidence ranging from 0.03% to 0.17% [1]. They are associated with significant morbidity and can be limb threatening with arterial thrombosis, arterio-venous fistulation or arterial severance.

We hereby report a rare case of a pseudo aneurysm arising from the anterior tibial artery (ATA) presenting as an enlarging swelling over the antero-lateral aspect of the leg. The patient was managed by a team of vascular surgeons in an academic tertiary hospital.

Multiple reports of pseudo aneurysms following TKA involving the popliteal artery have been described previously at the

time of the surgery. These presented as recurrent haemarthrosis or swelling in the popliteal fossa. However, structural injury to ATA is not common, as it usually arises from the popliteal artery inferior to which the tibial bone is cut.

Our work has been reported in line with the SCARE criteria [2].

2. Case report

A sixty-nine-year-old, female patient with a significant past medical history of hypertension underwent left total knee arthroplasty in 2012 for her left osteoarthritic knee. A lateral parapatellar approach was used followed by implant-specific instrumentations and the insertion of the implants themselves. No adverse intra operative events were noted. She recovered well and was discharged on post-surgery day 5. Subsequently, she was reviewed periodically by the orthopedic surgeons who noted a swelling but she was told merely to observe and no investigations or interventions were done. She re-presented to vascular surgery 4 years later complaining of an enlarging painful swelling with pulsation

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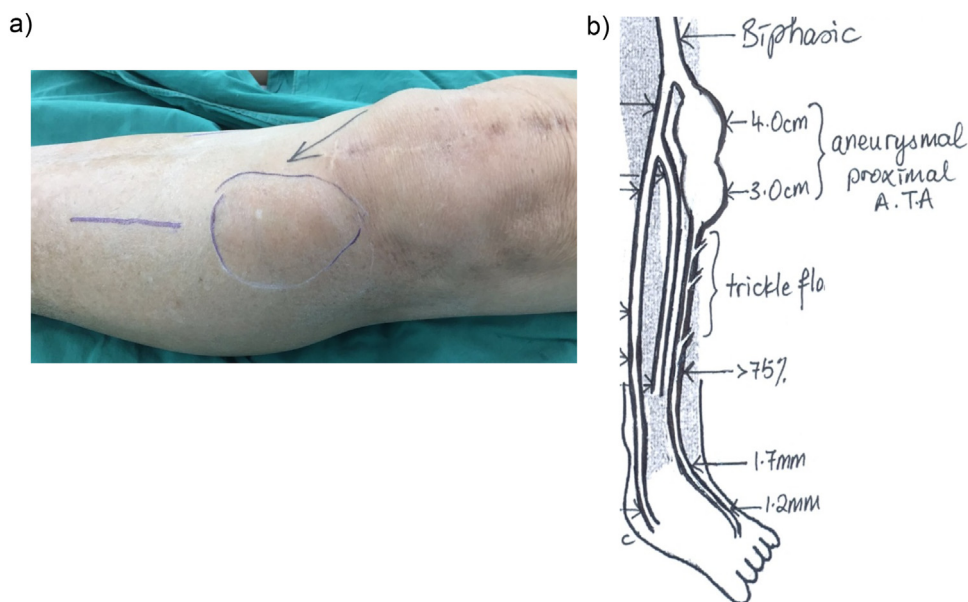


Fig. 1. a. Left anterolateral pulsatile swelling 3 cm × 2 cm. Good clinically popliteal, dorsalis pedis and posterior tibial pulses. b. Aneurysmal proximal anterior tibial artery with good proximal doppler signal but slow flow distally into dorsalis pedis.

around the antero-lateral aspect of her left knee, increasing in size over a 2-month period. Clinical examination revealed a 3 cm × 2 cm fluctuant, pulsatile swelling with no sensory, motor or circulatory deficit (Fig. 1a). Distal pulses of dorsalis pedis, posterior tibial were well palpated. A duplex ultrasound was then performed, which suggested a 4 cm × 3 cm pseudo-aneurysm arising from the ATA with trickle of flow distally (Fig. 1b). She has no symptoms of peripheral vascular disease.

A computed tomography angiography of the left lower limb was then performed to further delineate the anatomy and to assess suitability for endovascular repair. This demonstrated a pseudo aneurysm of the left proximal ATA measuring 6.5 cm in width and 7 cm in length. There was mural thrombus in the posterior aneurysm with associated scalloping of the adjacent bones suggestive of its chronicity of the aneurysm. There was good flow distally via the posterior tibial and peroneal arteries (Fig. 2). In view of the close proximity of this to the origin of the ATA, it was felt that there would be insufficient length proximally either to stent or to embolize, and that an open ligation would be a far more straightforward procedure. This was especially true in view of the minimal run-off via the ATA owing to long term compression of the ATA just distal to the pseudo aneurysm.

The patient subsequently underwent open ligation of the ATA via the medial approach by two senior vascular surgeons. A lateral calf incision over the anterior compartment of the lower limb was then performed to gain access to distal ATA distally. The artery was ligated proximal and distal to the aneurysm. Patient did well post operatively and the drain was removed on day 3 post operatively. She remained well at her 1, 2 and 11-month outpatient review, where the swelling was noted to have significantly decreased in size and the pain resolved.

3. Discussion

Pseudo aneurysm of the ATA is a rare complication following orthopedic knee surgery. Procedures that have been linked to this form of vascular injury include tibial osteotomy [3,4], total knee arthroplasty [5], intramedullary nailing [6] as well as knee arthroscopy [7].

The ATA commences at the lower border of the popliteus muscle, enters the anterior compartment of the leg via an aperture at the interosseous membrane and courses anteriorly on the interosseous membrane medial to the neck of the fibula. As it approaches the ankle joint, it lies more superficially and becomes the dorsalis pedis artery. Of note, the larger posterior tibial artery communicates with the ATA via branches and thus enabling retrograde flow from the PTA to the ATA.

Localized injury to the wall of the ATA leads to blood extravasation which soon becomes tamponaded by the surrounding tissue. Subsequent fibrosis leads to the formation of a pseudo aneurysm which communicates with the lumen of the ATA via its neck. Pseudo aneurysms of the ATA can be asymptomatic or present with swelling, pain, bruising or complications such as tibial nerve palsy, rupture, embolism or thrombosis. Diagnosis can be made with non-invasive imaging (Ultrasound, CT angiography or MR angiography) although digital subtraction angiography is generally accepted to be the gold standard.

While this form of pseudo aneurysm has been reported to thrombose off spontaneously [8], vascular intervention rather than surveillance remains the favored approach in view of the potential catastrophic complications. However, due to the rarity of this condition, a variety of interventions have been reported in the English medical literature with probably no compelling evidence that favors one modality over the others.

Successful treatment of an ATA pseudo aneurysm using open surgery includes repair of the pseudo aneurysm with a saphenous vein interposition graft, as well as resection of the aneurysm followed by primary anastomosis [9]. These two types of operations restore the normal arterial blood flow to the lower limb and are best suited for lower limbs with healing wounds. However, the resection and primary anastomosis option are suitable only in clean, small limited lesions of the ATA [9].

Ligation of the ATA to treat a pseudo aneurysm is the third surgical option reported in the medical literature and is feasible when the posterior tibial artery is patent all the way down to the foot [6,9,14]. First described in 1963, this method is probably based upon the cumulative experience from managing vascular injuries during the major wars of the 20th century. The key learning point from these major human conflicts was that the ATA is a minor vessel

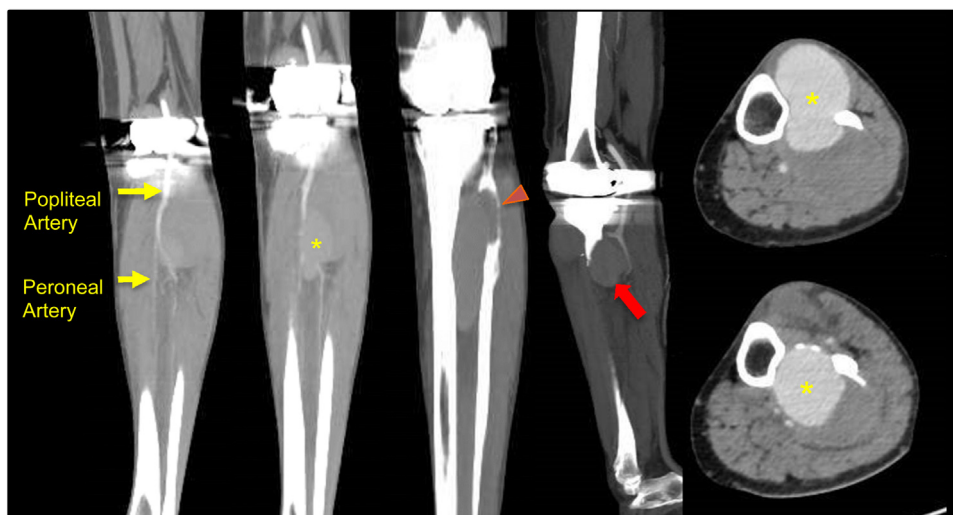


Fig. 2. Dumbbell shape aneurysm superior to interosseous membrane with anterior and posterior component; Eccentric mural thrombus in the aneurysm with scalloping of the adjacent bones. **Yellow Asterisk:** False Aneurysm; **Orange Arrow:** Scalloping of bones; **Red Arrow:** Mural Thrombus.

that could be safely ligated with minimal risk to the lower limb. In our present case, the additional finding of a distal ATA occlusion renders arterial ligation and excision of the pseudo aneurysm an even more favorable choice.

With the advent of endovascular intervention, some authors have documented promising results in using endovascular technique to exclude ATA pseudo aneurysms [10–12]. De Roo et al. are among the first to publish their success with a covered stent graft to manage an iatrogenic pseudoaneurysm of the ATA. At 1 year post stenting, their patient's stent remained patent with no recurrence of the pseudoaneurysm [10]. Likewise, Golledge et al. recounted a patient who developed a pseudo aneurysm of the ATA after sustaining a stab injury to his left lower leg. The pseudo aneurysm was excluded using 2 covered stents and at 6 weeks' follow up, clinical examination revealed that the pseudo aneurysm was no longer pulsatile and had grown smaller [11]. Despite endovascular stenting being less invasive compared to open surgery, our patient was not suitable for stenting because the proximity of the pseudo aneurysm to the ATA's origin resulted in the lack of a suitable landing zone to deploy a covered stent.

Besides vascular stent grafts, other minimally invasive methods utilized to treat ATA pseudo aneurysms include trans arterial embolization of the pseudo aneurysm [4,13] as well as ultrasound guided thrombin injection [14]. The caveat to these therapies is that the sac should have a narrow and well developed neck to safeguard against the unintentional migration of thrombotic agents into the distal arterial flow. Lastly, obliteration of an ATA pseudo aneurysm using external compression has also been described [15].

Particularly, in our patient with no significant peripheral vascular disease, ligation of the ATA is a reasonable option that is both more cost effective, and requires minimal follow up as opposed to endovascular intervention. It should be noted that the long-term outcomes of endovascular treatment in such circumstances remains uncertain. Although we have shifted significantly towards endovascular treatment in recent years, open surgery is still sometimes the best option.

Most of the case reports have a short time interval between TKA and intervention. In this patient, the diagnosis and treatment were not made till 4 years post procedure. Although the outcome was good in this instance, it does not indicate that all cases will be as benign in progress, and one should have a high index of suspicion should there be persistent localised swelling post TKA.

4. Conclusion

To date, there are only a handful of case reports that describe ATA pseudo aneurysms complicating orthopedic knee procedures. Given our understanding of the ATA's anatomy as well as historical data, ligation of the ATA and excision of its aneurysm is a safe and durable solution. Although endovascular stenting is a plausible alternative, more study in this aspect is necessary due to the lack of long term results for this modality.

Conflict of interest

The authors declare that there are no conflicts of interest.

Source of funding

The authors received no specific funding for this work.

Ethical approval

No research studies were performed on human subjects.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Authors contribution

Darius and Jack Kian wrote the manuscript. Choon Chieh proof-read the manuscript. Siew ping gave valuable and critical critique.

Guarantors

Chng Siew Ping.
Darius Aw Kang Lie.

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References

- [1] K.D. Calligaro, D.A. DeLaurentis, R.E. Booth Jr., et al., Acute arterial thrombosis associated with total knee arthroplasty, *J. Vasc. Surg.* 20 (1994) 927–930.
- [2] R.A. Agha, A.J. Fowler, A. Saetta, I. Barai, S. Rajmohan, D.P. Orgill, for the SCARE Group, The SCARE statement: consensus-based surgical case report guidelines, *Int. J. Surg.* 34 (2016) 180–186.
- [3] M.A. Bartoli, G.B. Lerussi, R. Gulino, M. Schroeder, A. Branchereau, False aneurysm at the origin of the anterior tibial artery after opening wedge osteotomy, *Vascular* 18 (January–February (1)) (2010) 45–48.
- [4] J.F. Griffith, J.C. Cheng, T.K. Lung, M. Chan, Pseudoaneurysm after high tibial osteotomy and limb lengthening, *Clin. Orthop. Relat. Res.* 354 (September (1998)) 175–179.
- [5] R. Verma, R. Seymour, M. Hockings, Endovascular coil embolization of pseudoaneurysm of a branch of the anterior tibial artery following total knee replacement, *J. Knee Surg.* 22 (July (3)) (2009) 269–271.
- [6] K.J. Han, Y.Y. Won, S.Y. Khang, Pseudoaneurysm after tibial nailing, *Clin. Orthop. Relat. Res.* (January (418)) (2004) 209–212.
- [7] E. Audenaert, M. Vuylsteke, P. Lissens, M. Verhelst, R. Verdonk, Pseudoaneurysm complicating knee arthroscopy. A case report, *Acta Orthop. Belg.* 69 (August (4)) (2003) 382–384.
- [8] S. Shah, A. Fischman, M. Marin, J. Won, Spontaneous tibioperoneal trunk and anterior tibial artery pseudoaneurysms, *Vasc. Med.* 17 (June (3)) (2012) 164–167.
- [9] A. Tomescot, E. Mackowiak, M. Coggia, O. Goeau-Brissonniere, Pseudoaneurysm of the anterior tibial artery after a tibial true-cut needle biopsy treated by an arterial resection and anastomosis, *Ann. Vasc. Surg.* 25 (April (3)) (2011) 386.e13–386.e15.
- [10] R.A. De Roo, P. Steenvoorde, H.M. Schuttevaer, A.J. Den Outer, J. Oskam, P.P. Joosten, Exclusion of a crural pseudoaneurysm with a PTFE-covered stent-graft, *J. Endovasc. Ther.* 11 (June (3)) (2004) 344–347.
- [11] J. Golledge, R. Velu, F. Quigley, Use of a covered stent to treat two large false aneurysms of the anterior tibial artery, *J. Vasc. Surg.* 47 (May (5)) (2008) 1090.
- [12] P.B. Van Hensbroek, K.J. Ponsen, J.A. Reekers, J.C. Goslings, Endovascular treatment of anterior tibial artery pseudoaneurysm following locking compression plating of the tibia, *J. Orthop. Trauma* 21 (April (4)) (2007) 279–282.
- [13] R. Spirito, P. Trabatttoni, G. Pompilio, S. Zoli, M. Agrifoglio, P. Biglioli, Endovascular treatment of a post-traumatic tibial pseudoaneurysm and arteriovenous fistula: case report and review of the literature, *J. Vasc. Surg.* 45 (2007) 1076–1079.
- [14] J.D. Fraser, B.E. Cully, D.C. Rivard, C.M. Leys, G.W. Holcomb, S.D. St Peter, Traumatic pseudoaneurysm of the anterior tibial artery treated with ultrasound-guided thrombin injection in a pediatric patient, *J. Pediatr. Surg.* 44 (February (2)) (2009) 444–447.
- [15] P. Van Schaardenburgh, P. Steenvoorde, J.F. de Bruine, J.H. Viersma, P.G. Warmenhoven, Thrombotic resolution of a traumatic pseudoaneurysm of the tibial anterior tibial artery after external compression, *J. Trauma* 55 (September (3)) (2003) 561–565.

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