



Rare cases of pseudoaneurysm

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Abstract

Pseudoaneurysms (PSA) are permanent dilatation of arterial wall with 50% increase in the diameter when compared to normal arterial diameter. They are false aneurysms that occur at the site of arterial injury. They are different from true aneurysms which contains full thickness of arterial wall layers. It requires prompt recognition and immediate treatment as it can lead to life threatening complications like rupture, torrential bleeding or cause for sudden death. Causes for pseudoaneurysm are following an endovascular procedure, post traumatic, from the anastomotic failure following a bypass procedure, pancreatitis with pseudocyst/pancreatic fistula, infection. In this case series we present three patients who developed pseudoaneurysm following an endovascular procedure in a patient with Takayasu arteritis, post traumatic pseudoaneurysm in paediatric age group, pseudoaneurysm following arthroscopic procedure for PCL repair.

Keywords: pseudoaneurysm, takayasu arteritis, endovascular procedure, trauma, excision

Introduction

An arterial pseudoaneurysm, is caused due to breakage in the layers of arterial wall, causing a locally guarded hematoma which shows turbulent blood flow and a neck formed due to breach in the arterial wall layer. ^[1] It is an encapsulated haematoma in communication with the ruptured vessel which is pulsatile. When compared to the distal arteries, pseudoaneurysms are seen more often in the proximal arteries, such as the femoral and popliteal arteries. Takayasu arteritis, is a chronic inflammatory arteritis affecting large sized vessels, mostly the aorta and its branches. ^[2] Significant complications during or after surgical intervention in Takayasu arteritis patient are rare, but if complications occur they are related to the site and type of intervention. ^[3] Femoral pseudoaneurysms typically result from access for catheter-based interventions and carry an incidence of 0.6 to 4.8%. ^[4] Total knee arthroplasty is a common orthopaedic procedure, and popliteal artery injury is one of the complications associated with it. One of the presentations of popliteal artery injury is popliteal artery pseudoaneurysm. ^[5] Popliteal artery trauma is considered to be one of the most serious peripheral vascular injuries because it carries a significant risk for complications potentially leading to limb dysfunction and limb loss. ^[6] Posterior tibial artery pseudoaneurysm is a rare condition with only a few cases reported in the paediatric age group. Research quotes pseudoaneurysms following aortobifemoral bypass is 3.8%. ^[7] Visceral artery pseudoaneurysms are associated with chronic pancreatitis. ^[8]

Case 1

A 60 year old female presenting with no pulse in both arms and her blood pressure could not be recorded in either arm. She had both upper limb and lower limb claudication pain, chest pain and breathing difficulty 2 years back for which she underwent cardiac and peripheral angiogram and diagnosed as severe atherosclerotic aortoarteritis. After the procedure patient noticed a swelling in the

right upper part of thigh at the right lower limb angiogram access site in the past 2 years, initially it was a size of 2*2 cms, non-painful, non-progressive; but 2 months ago, patient noticed a sudden increase in the swelling to a current size of 10*8 cms, it is associated with heaviness and pain of right lower limb. On examination: A solitary swelling measuring 12 *8 cms situated over the right upper part of thigh just below the groin fold, uneven surface, non-pulsatile, no cough impulse, no skin changes over the swelling, no local raise of temperature, not tender, invariable consistency, not mobile, no thrill, no bruit heard over the swelling. [Fig.1]



Fig 1: Pre-operative photo showing swelling in the right upper thigh just below the groin crease

Right lower limb Arterial Doppler showed a large, thick walled, well encapsulated cystic mass seen in the right femoral region, colour doppler demonstrates a bidirected turbulent swirly blood flow pattern, Aneurysm with hematoma of common femoral artery.

CT angiography of both lower limbs showed contrast filled elongated sac centrally with partial thrombosis, the sac is seen to be communicating with common femoral artery just near to its bifurcation. A large pseudoaneurysm with partial thrombosis involving right common femoral artery, just near to its bifurcation. [Fig. 2]

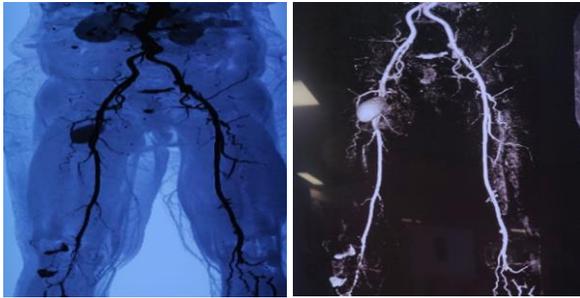


Fig 2: CT Angiogram showing a large pseudoaneurysm of common femoral artery, just proximal to its bifurcation. Digital Subtraction Angiogram showing pseudoaneurysm of common femoral artery

Patient underwent right SFA pseudoaneurysm excision and primary repair. Under epidural anaesthesia, right groin incision made, pseudoaneurysm excised, hematoma evacuated, SFA puncture hole identified, distal and proximal control obtained and puncture hole closed with 5.0 prolene with 2 simple sutures. [Fig.3]



Fig 3: Intra operative: Groin incision made and pseudoaneurysm excised, SFA puncture hole identified, distal closed with 5.0 prolene with 2 simple sutures

Case2

A 9-year-old male presented with complaints of swelling over his right foot, near right ankle joint since 3 months. Patient received first aid at a local clinic 4 months ago after suffering a penetrating trauma to his right foot near the ankle joint while playing with a sharp glass. They extracted a piece of glass from the wound site and treated him with oral medications for 1 week. Till 1 month, the patient did not have any symptoms or discomfort after which he noticed a swelling over the same site while wearing his footwear, which was initially 1×1 cm which gradually developed to the current size of 3×3 cm. The swelling was not associated with pain, discharge, fever or other lumps elsewhere in the body, there was no restriction of function around the ankle joint. On examination a solitary, spherical swelling in the upper aspect of right ankle joint, just behind the medial malleolus, size approximately 3×3cm, surface is smooth with well-defined

edges. There is an healed scar over the upper surface of the swelling, there. Rotatory movements around the right ankle joint were normal [Fig.4]. Swelling is compressible, fluctuant, fluid thrill present, not transilluminant, expansile pulsation present, skin over the swelling is pinchable and swelling reduces in size when the posterior tibial artery was occluded proximally. Bruit heard on auscultation.



Fig 4: A solitary swelling present over right ankle joint

CT scan of right lower limb showed a smooth wall cystic lesion of 14x10 mm along the PTA at the ankle, posterior to the medial malleolus. In the arterial phase, there was a contrast opacification of the sac, which was suggestive of a pseudoaneurysm neck was 70 mm, Proximal and distal arterial ends measure 1.8 & 1.6 mm respectively. [Fig.5]

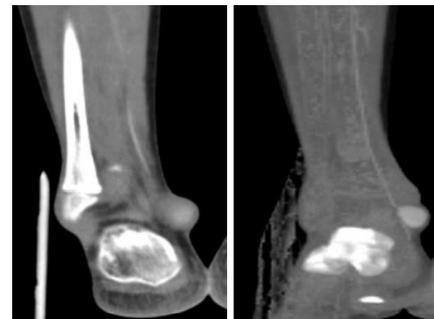


Fig 5: CT scan of right lower limb showed a smooth wall cystic lesion of 14x10 mm along the PTA at the ankle, posterior to the medial malleolus.

Patient underwent excision and ligation of a fibrous aneurysmal sac arising from PTA that measured approximately 3 x 3cm. [Fig.6].



Fig 6: Fibrous aneurysmal sac arising from distal PTA

Case 3

A 34 year old male had history of self-fall from bike 20 days back, and sustained right posterior cruciate ligament (PCL) tear for which he underwent arthroscopic right knee PCL repair, intra op patient collapsed due to severe haemorrhage and the procedure was terminated and was referred to our hospital for vascular intervention, On examination there was right knee stiffness, sutured arthroscopic port with suture in situ, right knee flexion of 30degree, posterior sag sign present, fixed flexion deformity of 30-degree, range of movements were painful and restricted beyond 90 degrees, no neurological deficits. Peripheral pulses beyond popliteal artery were feeble.

Right lower limb doppler showed bidirected turbulent swirly blood flow pattern of right popliteal artery [Fig. 7], CT angiogram showed large pseudoaneurysm from right popliteal artery with rent of 2.5 mm size along anterior wall of popliteal artery at the origin of anterior tibial artery. [Fig. 8].

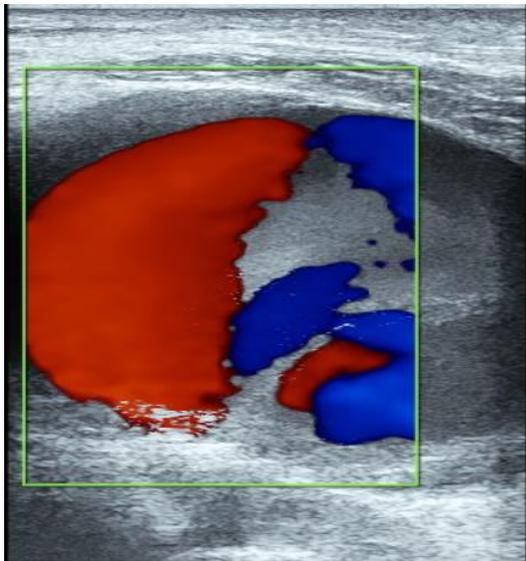


Fig 7: Arterial doppler showing bidirected turbulent swirly blood flow pattern of right popliteal artery

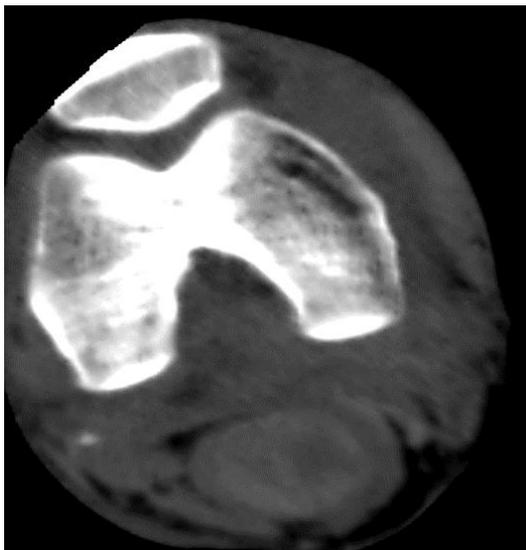


Fig 8: CT showing sac with partial thrombosis, the sac is seen to be communicating with the popliteal artery.



Fig 9: Three-dimensional CT angiography of the right limb; pseudoaneurysm of the popliteal artery.

Patient underwent endovascular procedure for repair of pseudoaneurysm, Teflon wire was used to cross the rent under fluoroscopy, covered stent graft of size 6x60mm (covera) was deployed across the rent from popliteal artery and PT, thrombosis was noted in stent which was thrombolysed and there was complete resolution of the thrombus with good distal flow, good distal reformation of ATA was seen by collaterals.

Discussion

Now a days, numerous diagnostic and interventional angiographic procedures are being performed quite often. Among the patients who have undergone angiographic procedures only some have developed complications associated with the procedure. One such complication includes femoral pseudoaneurysm (PSA).^[9] Pseudoaneurysms can develop even after surgeries related to aorta, after massive MI and septic emboli due to Salmonella infection.^[10] Autoimmune processes such as polyarteritis nodosa, Behcet's disease, Kawasaki disease, and others are occasionally characterized by the formation of pseudoaneurysms.^[11] Pseudoaneurysms can also develop after transplantation like heart and liver, or after procedures like diagnostic biopsy.^[12] Dilatation and curettage of the uterus and caesarean section are a further cause of pseudoaneurysms. Patients with Takayasu's arteritis have localised arterial segments which has severe stenosis that is often dilated by cardiologists, leading to increased chances of developing pseudoaneurysms. Pseudoaneurysms can develop after cardiac catheterisation, if the puncture of femoral artery is too low. Pseudoaneurysm can develop in profunda femoris artery when the artery is not supported below by the femoral bone or femoral head. The incidence of pseudoaneurysms after catheterisation ranges from 0.5% to 14%.^[13] Pseudoaneurysm are rare consequences of foot and ankle injuries and surgery. Because of the increased incidence of ankle injury and anterior ankle surgery, anterior tibial artery pseudoaneurysm is the most common pseudoaneurysm reported till date.^[14] Pseudoaneurysm of the anterior tibial artery are very rare and its cause can be divided as; pseudoaneurysms after surgery and aneurysm after trauma. A surgical cause can be arthroscopy, traumatic cause can be ankle distortion, ankle fracture.^[15] In our case the cause for pseudoaneurysm of anterior tibial artery was injury by a sharp

object. Knee arthroscopy is commonly performed procedure which is safe, with few complications. The incidence rate of nerve and vascular injuries described subsequent to arthroscopy ranges from 0.56% to 0.80% in large series. This low incidence is one of the reasons why vascular complications are difficult to diagnose and are diagnosed late.^[16]

Hematoma, abscess, arteriovenous fistula, or ganglion cyst are among most common differential diagnosis of pseudoaneurysm. Hence it becomes very important for proper diagnosis of pseudoaneurysm and differentiating it from conditions as abscess because an incision drainage done may lead to catastrophic bleeding which can be difficult to control.^[17]

Investigation to detect pseudoaneurysm include colour doppler ultrasound which shows typical swirling colour flow seen in a mass separate from the affected artery, and colour flow communicating with the mass and the affected artery as a pseudoaneurysm neck.^[18]

The initial management of femoral pseudoaneurysm is ultrasound-guided compression of pseudoaneurysm.^[19] Other methods are minimally invasive percutaneous therapies such as thrombin or collagen injection and coil embolization, surgical repair.^[20] Treatment of choice in many centres currently is percutaneous ultrasound-guided thrombin injection because of the advantages like it takes shorter time for the procedure, patients tolerance is better and it is effective for the patients on anticoagulants. In pseudoaneurysms < 2 cm in diameter, spontaneous thrombosis can be induced, whereas pseudoaneurysms > 5 cm require surgical ligation and coil embolization. A large pseudoaneurysm can be surgically removed, and bypass surgery can be used to restore distal blood flow.^[21] Indications of surgical treatment includes; if the pseudoaneurysm is expanding rapidly, percutaneous intervention has failed, presence of ischemia to the distal part of limb, and presence of neurological deficits.^[22]

Complications of Pseudoaneurysm include; spontaneous rupture, embolism of distal vessels, severe pain, neuropathy and ischemia of the skin from its mass effect.^[18]

Conclusion

Patients with Takayasu's arteritis, which is an arterial wall disease, it is better to do a CT angiography rather than a direct angiography as this will prevent punctures in already diseased blood vessel. Direct puncture should be considered only for cardiac interventions; non-invasive tests are preferred for diagnosis of coronary artery disease.^[23]

Any trauma to the ankle requires immediate trauma care. Because of the rare presentation and location in the distal extremity, this sort of injury should have been better handled at the beginning to avoid the formation of a pseudoaneurysm. Primary care providers must be knowing the possibility of complication of pseudoaneurysm in ankle after penetrating/blunt trauma; hence a thorough and complete assessment must be done, including a vascular and neurological examination, and if there is any impending injury to the vessel it has to be repaired immediately.

Arterial injury during knee surgery is due to knee anatomy since vessels are close to the joint capsule, during flexion of knee joint the popliteal artery will come close to the joint capsule which may get injured and posterior surface is difficult to visualize through arthroscopy hence any injury to the vessel is difficult to view the

bleeding immediately during the procedure.^[24] Knowledge of the vascular anatomy of the knee is essential in order to preventing this type of complication.^[25]

Degree

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

References

1. Rivera, Philip A., and Jeffery B. Dattilo. "Pseudoaneurysm.", 2019.
2. Lupi-Herrera E, Sanchez-Torres G, Marcushamer J, Mispireta J, Horwitz S, Vela JE. Takayasu's arteritis. Clinical study of 107 cases. American heart journal,1977;93(1):94-103.
3. Porter A, Mason JC. Intervention in Takayasu Aortitis: When, Where and How?. Hearts,2020;1(2):62-74.
4. Stone PA, Martinez M, Thompson SN, Masinter D, Campbell JE, Campbell II JR *et al.* Ten-year experience of vascular surgeon management of iatrogenic pseudoaneurysms: do anticoagulant and/or antiplatelet medications matter?. Annals of vascular surgery,2016;1:30:45-51.
5. Sloan K, Mofidi R, Nagy J, Flett MM, Chakraverty S. Endovascular treatment for traumatic popliteal artery pseudoaneurysms after knee arthroplasty. Vascular and endovascular surgery,2009 Jun;43(3):286-90.
6. Frykberg ER. Popliteal vascular injuries. Surgical Clinics,2002;82(1):67-89.
7. Littooy FN, Steffan G, Steinam S, Saletta C, Greisler HP. An 11-year experience with aortofemoral bypass grafting. Cardiovascular Surgery,1993;1(3):232-8.
8. Regus S, Lang W. Rupture risk and etiology of visceral artery aneurysms and pseudoaneurysms: a single-center experience. Vascular and endovascular surgery,2016;50(1):10-5.
9. Min JJ, Shon Y, Kim HJ, Hong DM, Jeon Y. An undiagnosed pseudoaneurysm found during arterial catheterization in a Takayasu arteritis patient. Korean journal of anesthesiology,2012;63(4):374.
10. Sueyoshi E, Sakamoto I, Nakashima K *et al.* Visceral and peripheral arterial pseudoaneurysms. AJR,2005;185:741-9. 2 Saad NEA, Saad WEA, Davies MG, *et al.*
11. Megalopoulos A, Siminas S, Trelopoulos G. Traumatic pseudoaneurysm of the popliteal artery after blunt trauma: case report and a review of the literature. Vascular and endovascular surgery,2007;40(6):499-504.

12. Psuedoaneurysms and the role of minimally invasive techniques in their management. *Radiographics*,2005;25:S173-89.
13. Gupta PN, Basheer AS, Sukumaran GG, Padmajan S, Praveen S, Velappan P *et al.* Femoral artery pseudoaneurysm as a complication of angioplasty. How can it be prevented?. *Heart Asia*,2013;5(1):144-7.
14. Yu JL, Ho E, Wines AP. Pseudoaneurysms around the foot and ankle: case report and literature review. *Foot and Ankle Surgery*.2013;19(3):194-8.
15. Melenhorst MC, Van Der Mooren K, Van Nieuwenhuizen RC, Wüst AF. Traumatic pseudoaneurysm following ankle trauma. *BJR| case reports*,2015;27:20150132.
16. Shaw A, Stephen AB, Lund JN, Bungay P, DeNunzio M. Genuiculate arterial pseudoaneurysm formation following trauma and elective orthopaedic surgery to the knee: 2 case reports and a review of the literature. *J Radiol Case Rep*,2009;3(3):12-16.
17. Singh D, Ferero A. Traumatic pseudoaneurysm of the posterior tibial artery treated by endovascular coil embolization. *Foot & ankle specialist*,2013;6(1):54-8.
18. Eisenberg L, Paulson EK, Kliewer MA, Hudson MP, DeLong DM, Carroll BA. Sonographically guided compression repair of pseudoaneurysms: further experience from a single institution. *AJR Am J Roentgenol*1999;173:1567-73.
19. Labropoulos N. Techniques and Contraindications for Thrombin Injection of the Groin and Other Periphral Pseudoaneurysms.
<http://www.veithsymposium.com/index.php>.
20. Ahmad F, Turner SA, Torrie P, Gibson M. Iatrogenic femoral artery pseudoaneurysms—a review of current methods of diagnosis and treatment. *Clinical Radiology*,2008;63(12):1310-6.
21. Hilborn M, Munk PL, Miniaci A, MacDonald SJ, Rankin RN, Fowler PJ. Pseudoaneurysm after therapeutic knee arthroscopy: imaging findings. *AJR. American journal of roentgenology*,1994;163(3):637-9.
22. Lenartova M, Tak T. Iatrogenic pseudoaneurysm of femoral artery: case report and literature review. *Clinical Medicine & Research*,2003;1(3):243-7.
23. Joseph S, Mandalam KR, Rao VR, Gupta AK, Unni NM, Rao AS *et al.* Percutaneous transluminal angioplasty of the subclavian artery in nonspecific aortoarteritis: results of long-term follow-up. *Journal of vascular and interventional radiology*,1994;5(4):573-80.
24. Audenaert E, Vuylsteke M, Lissens P, Verhelst M, Verdonk R. Pseudoaneurysm complicating knee arthroscopy. *Acta orthopaedica belgica*,2003;69:4-2003.
25. Aldridge JM, Weaver JP, Mallon WJ. Avulsion of the middle genicular artery: a previously unreported complication of anterior cruciate ligament repair: a case report. *The American journal of sports medicine*,2002;30(5):748-50.