

Peripheral Artery Pseudoaneurysms Following Cathlab Interventions

Dr. Tummidi Vineela¹, Dr. Raju S Iyer², Dr. Lella Nageswara Rao³

¹1st Year General Surgery PG, Katuri Medical College and Hospital, Chinakondrupadu, Guntur (District), Andhra Pradesh, India

²MS, MCh, F. C. C. P, F. I. A. C. S, (CTVS), Katuri Medical College and Hospital, Chinakondrupadu, Guntur (District), Andhra Pradesh, India

³MD Anaesthesia, Katuri Medical College and Hospital, Chinakondrupadu, Guntur (District), Andhra Pradesh, India

Abstract: *Peripheral artery pseudoaneurysms occur due to trauma, vascular interventions, anastomotic disruptions, intravenous drug abuse and infections. Herein we discuss two case studies of peripheral artery pseudoaneurysms that we have encountered following cathlab interventions in our centre and their management.*

Keywords: Pseudoaneurysm

1. Introduction

Pseudoaneurysms are localized arterial disruptions or pulsatile hematomas that communicate with an artery through a disruption in the arterial wall. The usual causes are trauma, vascular interventions, anastomotic disruptions, and intravenous (IV) drug abuse. The characteristic findings are those of a pulsatile mass, palpable thrill, and an audible to-and-fro murmur. Various imaging techniques can be used for diagnosis¹. Pathologically, the wall of the artery has been breached, and external wall of the aneurysmal sac consists of outer arterial layers, perivascular tissue, blood clot, or a layer of reactive fibrosis². PSAs occur when an arterial puncture site does not adequately seal. Pulsatile blood tracks into the perivascular space and is contained by the perivascular structures, which then take on the appearance of a sac. Hematoma and the surrounding tissue form the wall of the PSA.

Case report 1

A 77 year old female presented with dyspnoea on exertion, palpitations since 1 week and bilateral pedal edema since 2 days. After the procedure, the patient developed a swelling in the distal aspect of right forearm which was approximately 2×2 cm in size, soft in consistency, with a smooth surface. Pressure dressing was done and the patient was advised follow up. The patient was lost to follow up and again presented with increase in size of swelling after two weeks.

HRUS of right wrist: Approximately 3.6 ×1.2 cms oval shaped sac arising from the adjacent radial artery showing yinyang sign on colour doppler. There is eccentric 8mm thrombus adherent to wall.

COLOUR DOPPLER of Right upper limb arteries:
Approximately 5.1×1.7 cm sac like structure arising from

underlying radial artery. On colour doppler colour uptake noted in the part of the sac.

Heterogenous mixed echogenic thrombus noted in the sac occupying 2/3rd of the lumen. Underlying radial artery appears to be of normal velocity. No evidence of thrombus.

MDCT Angiogram of Bilateral Upper Limbs:

Right Radial Artery: Approximately 5.8×2.0 cms hypodense outpouch noted on the radial aspect of right distal forearm adjacent to radial artery. On contrast approximately 1.2 cms opacification noted within the hypodensity. There is thin connection with adjacent radial artery

Suggestive of Pseudo aneurysm of right radial artery with partial thrombus. [Figure 1]

Operative procedure: Under brachial plexus block, brachial artery was identified after a horizontal incision over cubital fossa was given. Control achieved. Skin over the aneurysm was opened and sac opened. Proximal and distal control achieved of the radial artery. Clots were removed after the control [Figure 3]. The bleeding point over the radial artery identified and 1 mm probe passed proximally and distally. The punctured bleeding site repaired with 7-0 prolene suture. The brachial artery clamp released. Good flow proximal and distal to repair site. Subcutaneous layer closed with vicryl in 2 layers. Skin closed with interrupted sutures.

Course in the hospital: Intra operative and postoperative periods were uneventful. The patient was discharged on 4th postoperative day.



Figure 1: CT image showing pseudoaneurysm of the right radial artery

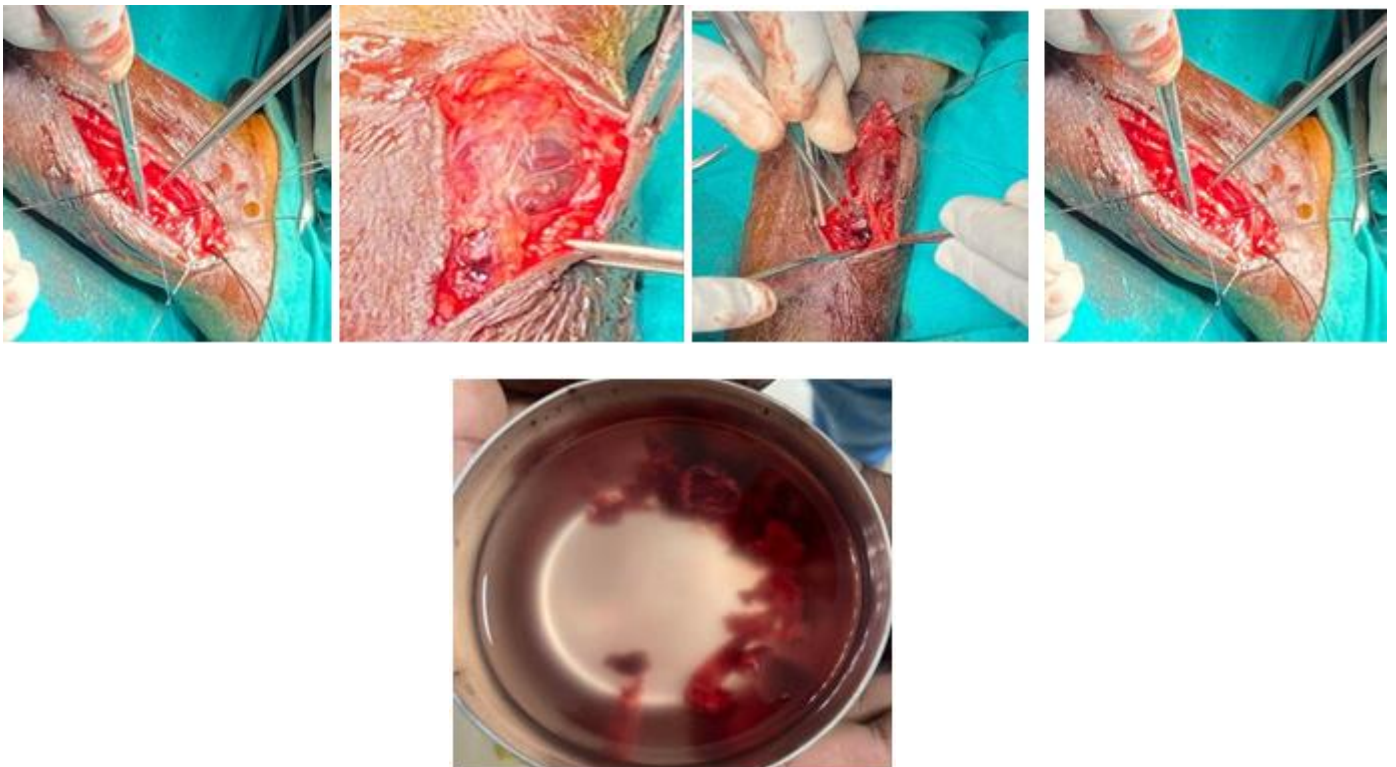


Figure 2: Showing repair of the right radial artery pseudoaneurysm and the removal of thrombus.

Case report 2:

A 47 year old female presented with swelling on the ulnar aspect of right forearm following coronary angiogram which was approximately 2×1 cm in size, soft in consistency and the skin over swelling was excoriated.

HRUS of swelling:

Approximately 2.7×1.5 cms well defined hypoechoic lesion noted adjacent to ulnar artery on colour doppler. YIN-YANG internal flow with connection to ulnar artery noted. [Figure 3]

Suggestive of pseudoaneurysm of ulnar artery.

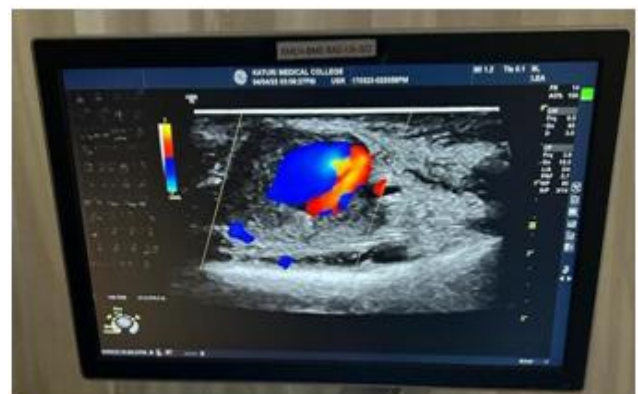




Figure 3 ultrasound and colour doppler showing ying yang pattern of the pseudoaneurysm.

Operative procedure: Under supraclavicular and axillary block, right upper limb anaesthetised, artery was exposed at elbow. The pseudoaneurysm was excised by vertical incision and proximal and distal control was obtained. The clot in the pseudoaneurysm was removed. The puncture point on artery was identified and closed with 6-0 prolene sutures [figure 4a-f]. Intra operative and postoperative periods were uneventful and the patient was discharged on 4th postoperative day.



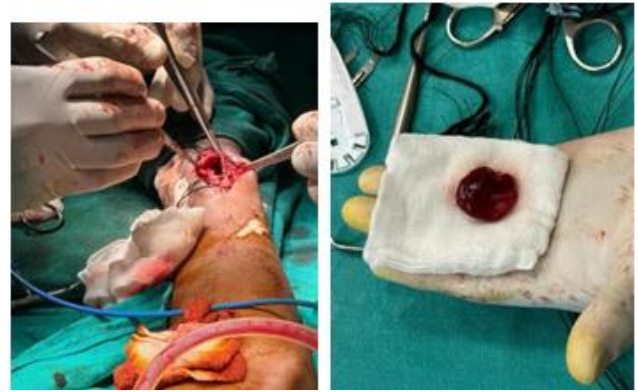
4a

4b



4c

4d



4e

4f

Figure 4 (a-f): showing repair of right ulnar artery pseudoaneurysm and the removal of thrombus

2. Discussion

The pseudoaneurysm formation is the most common complication of arterial catheterization, and it is most commonly observed in the femoral artery that is often used for diagnosis and interventional procedures. Other causes include anastomotic leaks, infections, and trauma³. Anticoagulant therapies, thrombocytopenia, vessel wall calcification, and atherosclerosis increase the risk of the pseudoaneurysm formation⁴. Potential complications of these aneurysms include hemorrhage, thrombosis, peripheral embolism, dissection, the A-V fistula formation, and pressure on the surrounding tissues⁵. Among them the most catastrophic complication is rupture. The risk of spontaneous rupture of PSA is related to size >3 cm, presence of symptoms, large hematoma, or continued growth of the sac⁷. Although most postcatheterization PSAs are sterile, infection of a PSA significantly increases the risk of rupture as well as septic emboli⁷. Swelling from a large PSA or hematoma may also lead to compression of nerves and vessels with associated neuropathy, venous thrombosis, claudication, or, rarely, critical limb ischemia. Local ischemia of the skin may lead to necrosis and infection. On physical examination, there may be a palpable pulsatile mass or the presence of a systolic bruit⁸. The diagnosis is made by an ultrasound which shows a hypochoic area extrinsic to artery. Moving blood may be visualised in pseudoaneurysm due to increased echogenicity of rouleaux aggregate. On colour doppler there will be a flow external to artery and alternating red and blue colour (Ying-Yang pattern) is visualised. Bidirectional to and fro flow in pseudoaneurysm or its arterial connection is seen on pulsed Doppler⁹. When compared to US, MR angiography and conventional angiography, CT angiography has some advantages. CT angiography is a standard method that is not dependent on the operator¹⁰. Unenhanced CT scans usually show a low-attenuated mass in contact with the damaged artery. Hemorrhage may be detected with intermediate or high attenuation adjacent to the pseudoaneurysm. Thrombosis can also be seen as high attenuation within the sac in unenhanced CT scans. After contrast enhancement, a pseudoaneurysm shows up as a well-defined round or oval collection filled with contrast material. Persistent low-attenuated areas within the sac indicate partial thrombosis. High attenuation adjacent to the pseudoaneurysm reveals the most serious complication,

rupture¹¹. Surgical vascular repair is the management of choice for pseudoaneurysms; however, the type of surgery and reconstruction vary with the etiology and the presentation of the patient. Controversy lies as to attempt to reconstruct the vascular continuity in case of the pseudoaneurysm-involved vessel or to simply ligate and excise the involved segment along with the perianeurysmal necrotic tissue¹². Mohammadzadeh et al. have already stated that if reconstruction involves the employment of a prosthetic graft, then graft infection is a serious complication¹³. The solution lies in the fact that in cases where the pseudoaneurysmal segment is not infected, a vascular reconstruction should be carried out either with autologous reversed saphenous vein or a prosthetic graft. The decision for reconstruction is based on the segment of the artery involved and the presence of any infection. The presence of infection precludes any reconstruction, and then, ligation and excision of the involved segment is the treatment of choice. The vascularity of the involved limb is at stake, but then, collateral flow which usually develops is mostly sufficient enough to maintain the viability of the limb¹².

3. Conclusion

Pseudoaneurysms following arterial punctures are a rare occurrence, more so in radial or ulnar artery following cardiac catheterisation. However, as angiograms on day care basis are frequently done now a days and patients who come for coronary angiograms, are in the high-risk category with comorbid conditions like hypertension, diabetes mellitus, atherosclerosis, congestive cardiac failure and thickened muscular arteries. Due to the above-mentioned risk factors, pseudoaneurysm formation at the puncture site also may occur because of improper or insufficient duration of pressure applied at the puncture site following cathlab interventions. The thickened arterial wall additionally also prevents the sealing off of the puncture site especially when the patients are on antiplatelet agents at the time of angiogram. And as upper limb cath intervention patients are discharged home the same day, they may neglect the care of the puncture wound with poorly controlled hypertension. However, presentation, diagnosis and treatment of pseudoaneurysms of the upper limb arteries are easier and more amenable to treatment with lesser morbidity as compared to femoral artery pseudoaneurysms.

The above case reports are mentioned as they presented to us within a month of each other and it made us aware of the pitfalls of peripheral artery interventions, necessitating greater care of the puncture site and thorough evaluation and discharge.

References

- [1] Darbari A, Tandon S, Chandra G, Dwivedi SK, Kumar A, Gupta A. Post-traumatic peripheral arterial pseudoaneurysms: Our experience. *Indian J Thorac Cardiovasc Surg* [Internet]. 2006;22(3):182–7. Available from: <http://dx.doi.org/10.1007/s12055-006-0755-x>
- [2] Sueyoshi E, Sakamoto I, Nakashima K, Minami K, Hayashi K. Visceral and peripheral arterial pseudoaneurysms. *AJR Am J Roentgenol* [Internet]. 2005;185(3):741–9.
- [3] Ylonen K, Biancari F, Leo E, et al. Predictors of development of anastomotic femoral pseudoaneurysms after aortobifemoral reconstruction for abdominal aortic aneurysm. *Am J Surg* 2004; 187: 83-7. [CrossRef]
- [4] Houliand K, Jepsen JM, Saicu C, Vammen S, Christensen JK, Ravn H. Current management of inguinal false aneurysms. *J Cardiovascular Surgery (Torino)* 2017; 58: 278-83.
- [5] Steinhubl SR, Berger PB, Mann JT, et al. Early and sustained dual oral antiplatelet therapy following percutaneous coronary intervention: A randomized controlled trial. *JAMA* 2002; 288: 2411-20. [CrossRef]
- [6] Toursarkissian B, Allen BT, Petrinesc D, Thompson RW, Rubin BG, Reilly JM, Anderson CB, Flye MW, Sicard GA, Sullivan TM. Spontaneous closure of selected iatrogenic pseudoaneurysms and arteriovenous fistulae. *J Vasc Surg*. 1997; 25: 803–809
- [7] Oweida SW, Roubin GS, Smith II RB, Salam AA. Postcatheterization vascular complications associated with percutaneous transluminal coronary angioplasty. *J Vasc Surg*. 1990; 12: 310–315.
- [8] Webber GW, Jang J, Gustavson S, Olin JW. Contemporary management of postcatheterization pseudoaneurysms. *Circulation*. 2007 May 22;115(20):2666-74. doi:10.1161/CIRCULATIONAHA.106.681973. PMID: 17515479.
- [9] Rasmussen TE, Tai NRM, Rich NM. *Rich's Vascular Trauma*. 3rd ed. Philadelphia, PA: Elsevier - Health Sciences Division; 2015
- [10] Busquets AR, Acosta JA, Colon E, et al. Helical computed tomographic angiography for the diagnosis of traumatic arterial injuries of the extremities. *J Trauma*
- [11] Sethi V, Philips S, Fraser-Hill M. Lines and circles: pictorial review of cross-sectional imaging of active bleeding and pseudoaneurysm in the abdomen and pelvis. *Can Assoc Radiol J*. 2013;64:36–45
- [12] Luther A, Kumar A, Negi KN. Peripheral Arterial Pseudoaneurysms-a 10-Year Clinical Study. *Indian J Surg*. 2015 Dec;77(Suppl 2):603-7. doi: 10.1007/s12262-013-0939-8. Epub 2013 Jun 29. PMID: 26730072; PMCID: PMC4692942.
- [13] Mohammadzadeh MA, Akbar MH, Mehr SE. Vascular lesions in intravascular drug abusers in Guilan, North of Iran. *Arch Iranian Med*. 2007;10(4):522–524