



Traumatic radial artery aneurysm at National Orthopaedic Hospital, Enugu.

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Summary

Background: Traumatic radial artery pseudo aneurysms are rare and infrequently present to the plastic surgeon. At National Orthopaedic, Enugu, between January 2003 and June 2012 repair of aneurysms constituted 0.04% of all elective surgical procedures carried out by plastic surgeons. Repair by excision and vein conduit is well established but not many reports in children abound. Our aim is to share our experience, review the literature, and propose treatment options.

Methods: Theatre records, photographs and case notes of patients that presented with traumatic radial artery aneurysm between 2003 and 2012 were retrieved and examined.

Results: Three patients presented with radial artery pseudo-aneurysms within the period. All the three patients had excision of the aneurysms and reversed cephalic vein interposition graft. The outcomes were satisfactory.

Key words: radial artery aneurysm, vein graft

Introduction

Radial artery aneurysms are a rare occurrence in adults and children¹ and the vast majority are due to iatrogenic arterial lesions^{1,2}. Post traumatic cases are even rarer. When they occur, prompt intervention may be required to prevent potential complications such as thromboembolism and rupture. Various approaches to treatment have been described. These include conservative measures and surgical excision with either ligation or reconstruction. No report of reconstruction by vein interposition has been noted from our environment. We review three cases of traumatic radial artery pseudo aneurysm treated with excision and interposition vein graft with good results.

Case one: MO, a 35yr old female civil servant was referred to us from Federal Medical Centre, Asaba with a three month history of swelling on the right forearm. She had sustained a road traffic injury about four months prior to presentation in which she sustained laceration on the volar aspect of the mid forearm by a broken glass. There was associated right Colle's fracture. She had primary wound closure, reduction of the Colle's fracture and Plaster of Paris (POP) cast application in the referring hospital. On removal of the POP, she noticed a swelling on the distal part of the scar. Swelling was slowly increasing in size. There was inability to extend all fingers. Significant findings on examination included an oblique scar measuring about 16cm on the volar aspect of the mid forearm with a mass measuring about 4cm diameter, figure 1. The mass was pulsating synchronously with the brachial and radial arteries. Pulsation ceased with compression of the brachial artery. Thrills and bruits were demonstrable. Ulnar artery pulsation was absent. There were features of median and ulnar nerve injuries. Ultrasound showed pulsatile anechoic mass with vascular aneurysm and Doppler revealed low flow in the ulna artery.

Intra operative findings included a globular mass of about 3cm diameter on the anteromedial aspect of the middle third of the radial artery, figure 2. It was attached to the tendons of palmaris longus and flexor carpi radialis. The mass was excised between bulldog clamps with 2.5cm of the artery. Ipsilateral cephalic vein was harvested, irrigated with heparin solution, reversed and anastomosed end to end with 8/0 PDS, figure 3. Wound was closed in layers and anticoagulation for five days with subcutaneous enoxaparin was commenced. She did very well post operatively. Doppler confirmed blood flow through the repair. The histology of the excised mass showed aneurysm with fibrous walls, lamellated thrombus and focal inflammation. She had median and ulna nerve repair about four months later. She was followed up for seven years. No recurrence or cold intolerance was noted.



Figure 1: Mid-forearm mass and a scar.



Figure 2: Intra-operative demonstration of a globular aneurysm in the radial artery



Figure 3: Anastomosis with cephalic vein inter-positioning.

Case two: CC a 13 year old boy presented with a three months history of swelling on the right wrist. He was injured by a broken bottle while playing and he sustained a laceration on the volar aspect of the wrist. The wound was closed primarily in a peripheral hospital and healed after two weeks. After removal of stitches, he noticed slowly progressive swelling in the area. Examination showed a mass on the volar aspect of the right wrist, measuring about 6cm diameter. The mass was visibly and palpably pulsatile. Radial artery pulsation was palpable proximally. Intra operative finding was an irregularly shaped mass about 4.5 x 2.5 cm which was continuous proximally and distally with the radial artery. The mass was excised between bulldog clamps. Ipsilateral cephalic vein was harvested, flushed with heparin solution, reversed and anastomosed end to end with 8/0 nylon sutures. Wound was closed in layers and anticoagulation for five days with subcutaneous enoxaparin was commenced. Post operatively he had partial wound dehiscence which healed by third week. Pulsation was palpable proximal, over and distal to the area of anastomosis. He has been lost to follow up.

Case three: OD, a 9 year old girl was referred to us from Enugu State University Teaching Hospital with a six week history of swelling on the left forearm. She had a domestic accident in which she fell onto a glass table and sustained lacerations on the left arm and forearm. The wounds were closed primarily in the referring hospital. The sutures were removed after one week when she noticed the swelling. Examination revealed scars on the anterior surface of the left arm and forearm with a mass distal to the forearm scar. The mass measured about 2cm x 3cm, was fluctuant and pulsatile. Radial artery pulsation was palpable. Doppler scan showed 1.33 x 0.93 x 1.15cm anechoic collection (haematoma) in communication with the radial artery and swirling of blood within the collection. Intra operative finding was a saccular aneurysm that measured 2.5 x 2cm on the middle portion of the radial artery. The aneurysm was excised between microvascular clamps. A 4cm ipsilateral cephalic vein graft was harvested. The graft was flushed with heparin solution, reversed and anastomosed end to end with 8/0 nylon. The wound was closed in layers and anticoagulation for five days with subcutaneous enoxaparin was commenced. The patient did very well post operatively and was discharged after eight days. Doppler scan showed normal vascular architecture left forearm, no collections, with normal flow in the radial vessels. She is still being followed up. Her last visit was at four weeks after discharge.

Discussion

Pseudo aneurysms are usually caused by perforation of an artery with haematoma formation between the arterial wall and surrounding parenchyma.² A cavity results and is lined by endothelium with outer covering of fibrous scar. Most reported cases of radial artery pseudo aneurysm are due to arterial cannulation for blood gas analysis and continuous blood pressure monitoring^{1, 2, 3}. Post traumatic cases are rare in the literature. Penetrating trauma on the wrist that was closed primarily resulting in pseudo aneurysm of the radial artery has been reported.⁴⁻⁷ All our three patients had similar aetiology, but in the forearm. The time between the initial trauma and development of aneurysm is variable, ranging from hours to months.⁵⁻⁷ Direct wound closure and infection,^{4-6,9} especially by *Staphylococcus aureus*,⁸ are implicated in its aetiology. Since it is the commonest cause of surgical wound infection there should be a high index of suspicion for traumatic radial aneurysm in every infected wrist and forearm injury following stitching involving the course of the radial artery.

There are no consistent symptoms for diagnosis of aneurysms.^{1,4} Radial artery pseudo-aneurysm has been misdiagnosed as a ganglion!⁹ Rapidly expanding or slowly progressive swelling may be the only symptom. All patients in our report had a pulsatile mass. Pulsations, thrills and bruit are usually present in large aneurysms, and the patient may also present with bleeding from the ruptured aneurysm.⁶

Neurologic deficits may result from nerve compression. Neurologic deficit in one of the patients was due to associated traumatic nerve injury. Compression neuropathy associated with traumatic radial aneurysms have however been reported.⁴ Ultrasonography which is the investigation of choice³ is usually required for diagnosis. There are three characteristic features of pseudo-aneurysms on ultrasound: the presence of expansile pulsatility, detection of turbulent flow that appears as a classic "yin-yang" sign, and a haematoma with variable echogenicity.⁴ In our series, all the patients had pulsatile swellings but only one had demonstrable thrill and bruit. We used ultrasonography for confirmation of diagnosis. In childhood, pseudo aneurysm may be caused by a wide variety of paravascular infectious, inflammatory, and traumatic processes (especially cannulation) that disrupt or destroy the arterial wall.⁷

Various approaches have been described for the treatment of radial artery pseudo aneurysm. Conservative measures are now being considered a reliable alternative to surgery and rely on induction of thrombosis. These include ultrasound guided compression therapy and percutaneous injection of thrombin, reapplication of compression bandage, and clinical observation of the natural course.^{4, 7} However, there is a significant risk of failure, thrombosis, distal ischemia and limb loss.⁴ Moreover, compression can be discomforting and may have to be maintained for up to an hour. Spontaneous resolution is unlikely to occur when the aneurysm has been unresolved for several weeks. In our series the lesion had been present and unresolving for up to 12 weeks, making observation unwise.

It has been recommended that pseudo-aneurysms larger than 10 mm, are located in an area that is predisposed to injury, or are associated with an important artery be managed by surgical intervention.¹⁰ Surgical interventions are required to avert potential complication or when complication already exists. It has been noted up to 25% of peripheral femoral pseudo-aneurysms may rupture spontaneously and bleed, the risk increasing with age and the presence of peripheral vascular disease.¹¹ Advancing age is also a risk factor for the development of radial artery aneurysms.¹²

Surgical management for aneurysms include excision with vessel ligation, end-to-end anastomosis following excision, Matas aneurysmorrhaphy, and interposition grafts using vein or prosthetic materials.^{1,2,4-13} However reconstruction following surgical excision remains controversial.² Some advocate excision and ligation when collateral circulation can be assured. Clinically, Allen's test has been used for this but it has shown significant false positive and negative results². There is also a risk of limb loss if the ulnar artery is injured in future. Indeed the ulnar artery is more frequently the forearm artery involved in post-traumatic pseudo-aneurysmal dilatation owing to its location. Full restoration of dual supply is recommended

especially in children to prevent limb growth retardation. This can be by repair of the arterial wall if excision can be achieved without disrupting the continuity of the artery. The authors are not trained in Matas aneurysmoplasty although it has been used in Nigeria for radial artery aneurysm repair.⁶ End to end anastomosis is also a viable option but has been associated with recurrence,¹ and the significant gap after excision in all cases in our series precluded its use. In our series, two of the patients were children, while there was an adult but with unreliable ulnar collateral circulation. A well-developed collateral circulation is needed for Matas aneurysmoplasty.¹³ Prosthetic materials are expensive and not readily available in our environment. In this situation, vein interposition graft becomes the most reliable option. As a result we chose excision and vein interposition grafts. This option has been reported previously,^{9,10,14} even in the paediatric patient,¹⁰ but not in our environment where microsurgery is at infancy. As the forearm is rich in veins, harvest is easily done from the same anatomical region with little morbidity. The restoration of dual hand circulation is ideal and its success in our environment further indicates that microvascular repairs are both feasible and successful in resource challenged environments as ours.

It is however, pertinent that the surgeon undertaking these procedures in such resource-challenged settings as ours be aware of some of the likely challenges. Constant uninterrupted power supply is not always guaranteed from the public power supply chain. Often the use of diesel-powered or occasionally petrol-powered electric generators becomes almost a sine-qua-non. Liga clips and their applicators are often unavailable. When these are procured from abroad, suppliers for the consumable parts are seldom available locally. This is perhaps not unrelated to the low volume of the available microvascular surgical practice. Manufacture and marketing of these tools are, expectedly, commerce and turn-over driven.

The substitution of the haemostatic process, served by these, with the use of sutures and ligatures invariably increases operation time. Post-op monitoring of the anastomotic site is also a challenge. Internal Doppler probes are not readily available in these settings leaving the burden of clinical monitoring almost exclusively on the microvascular surgeon. Dedicated microvascular nurse practitioners do not yet exist. General duty nurses with experience in the actual minute-by-minute monitoring clinical features of tissues supplied by the anastomosed vessels remain a hope for the future as microvascular procedures are undertaken with greater frequency and regularity.

Conclusion

Traumatic radial artery pseudo aneurysms are rare with treatment options varied and having different schools of thought. Aneurysm excision and reconstruction remains the most reliable option in maintaining dual vascular supply to the hand. Vein grafts from the ipsilateral limb may be considered a work-horse for this reconstruction, even in children.

References

1. Bridge PM, Lerhaupt K, Armstrong MB. Recurrent radial artery aneurysm in a five month old infant; case report. *Journal of the National Medical association* 2000; 92(6): 309 -311.
2. Leone V, Misuri D, Console N. Radial artery pseudo aneurysm after a single arterial puncture for blood gas analysis: case report. *Cases Journal*. (Online) 2009. Available from: doi: 104076/1757-1626-6890. (Date accessed: 19th August 2012).
3. Ranganath A, Nanumanthiah Radial artery aneurysm after percutaneous cannulation using Seldinger techniques; case report. *Indian Journal of Anaesthesia* 2011; 55(3): 274-276.
4. Pero T, Herrick J. Pseudoaneurysm of of the radial artery diagnosed by bedside ultrasound. *West Journal of Emergency Medicine*. 2009; 10(2): 89-91.
5. Orhewere F A. Post-traumatic Aneurysm of the Radial Artery at the Wrist. *Brit med J*. 1966;2: 1501-1502.
6. Agaja SB. Matchet cut injury at the wrist as a cause of traumatic radial artery aneurysm: a case report. *West Afr J Med*. 2002;21(1):79-81.
7. Cozzi D A, Morini F, Casati A, Pacilli M, Salvini V, Cozzi F. Case report: Radial artery pseudoaneurysm successfully treated by compression bandage. *Arch Dis Child* 2003; 88:165–166.
8. Ganchi P A, Wilhelmi, BJ, Fujita KBS, Lee W P, Andrew MD. Ruptured Pseudoaneurysm Complicating an Infected Radial Artery Catheter: Case Report and Review of the Literature.

- Annals of Plastic Surgery*: 2001; 46(6): 647-650.
9. Kerr CD, Duffey TP. Traumatic false aneurysm of the radial artery. *J Trauma*. 1988; 28(11):1603-1604.
 10. Provencher MT, Maurer C, Thompson M, Hofmeister E: Operative grafting of a Pseudoaneurysm of the Radial Artery after a Pediatric both-bone Forearm Fracture. *Orthopedics* 2007; 30: 874
 11. Graham ANJ, Wilson CM, Hood JM, Barros D'Sa AAB. Risk of rupture of postangiographic femoral false aneurysm. *Br J Surg* 1992; 79: 1022-1025.
 12. Falk PS, Scuderi PE, Sherertz RJ, Motsinger SM. Infected radial artery pseudoaneurysms occurring after percutaneous cannulation. *Chest*. 1992; 101(2):490-495.
 13. Gage IM. The Technical Simplicity of the Matas Endo-aneurysmorrhaphy. *Ann Surg*. 1944; 119(3):468-473.
 14. Duchateau J, Moermans JP. False aneurysm of the radial artery. *J Hand Surg Am*. 1985; 10(1):140-141.