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Traumatic arteriovenous fistula of the left ulnar artery and vein

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Abstract

Traumatic arteriovenous fistulae (AVFs) result from a puncture of adjacent artery and vein, leading to a low-resistance, high-pressure gradient with consequent high flows. Flow in the supplying artery exhibits a high-velocity, low-resistance waveform, while the draining vein shows arterial-type pulsations. At the fistula site, high-velocity flow jets can produce ambiguous and confusing color and spectral Doppler signals, with possible artefacts from adjacent tissue vibration. Distal to the fistula, hemodynamics may be altered, and vascular steal syndrome is possible. A 45-year-old male construction worker presented with a gradually enlarging, pulsatile swelling on the volar aspect of his left wrist for two months. He reported a throbbing sensation and occasional numbness in his left hand with a history of wrist trauma. Doppler ultrasound confirmed an arteriovenous fistula between the ulnar artery and vein with preserved brachial artery flow. Blood tests showed normal renal function with no evidence of infection or inflammation. He was diagnosed with multiple arteriovenous fistulous formations of the ulnar artery and vein and referred for surgical repair. He underwent successful surgical correction and was followed up at regular intervals to monitor for recurrence. Timely diagnosis and surgical intervention are necessary to prevent complications such as venous insufficiency, thrombosis, or limb ischemia.

Keywords: Arteriovenous fistula, Duplex ultrasound scan, vascular surgery, Laboratory test.

Introduction

Arteriovenous fistula (AVF) formation between the ulnar artery and vein represents a unique vascular anomaly with profound clinical implications. This condition involves an abnormal connection between the ulnar artery and vein, leading to direct communication between the arterial and venous systems in the upper extremity. The ulnar artery and vein, crucial components of the vascular network in the forearm and hand, play a significant role in maintaining proper blood flow and circulation to the distal extremities.

The presence of an arteriovenous fistula in this specific anatomical location can result in various complications, including altered hemodynamics, compromised blood flow, and potential risks of thrombosis or embolism. Understanding the pathophysiology, diagnostic modalities, management strategies, and potential outcomes associated with ulnar artery and vein AVF is essential for clinicians to provide optimal care for affected individuals.

Further exploration of this condition through clinical studies and case reports can enhance our understanding of its prevalence, etiology, and long-term implications. By shedding light on the complexities of ulnar artery and vein AVF, healthcare professionals can improve diagnostic accuracy, treatment approaches, and patient outcomes in cases presenting with this vascular anomaly.

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Case report

A 45-year-old male construction worker presented to a radio-diagnostic center in Umuahia with complaints of a gradually enlarging swelling on his

left wrist for two months. He reported a throbbing sensation in the area and occasional numbness in his left hand. He admitted to a history of trauma to the wrist. There was no history of hypertension, diabetes, or renal disease.

Examination: Vital signs were stable. A swelling was noted on the volar aspect of the left wrist, measuring approximately 4cm in diameter. The swelling was warm and pulsatile with a palpable thrill over it. The radial pulse was intact.

Investigations: Doppler ultrasound confirmed the presence of an arteriovenous fistula between the ulnar artery and vein in the left wrist. The brachial artery from its origin down to its bifurcation was preserved. Blood tests revealed normal renal function with no evidence of infection or inflammation.

Management and Outcome: The patient was diagnosed with multiple arteriovenous fistulous formations of the ulnar artery and vein and referred to a vascular surgeon for surgical repair. He underwent successful surgical correction and is under regular follow-up to monitor for any recurrence.

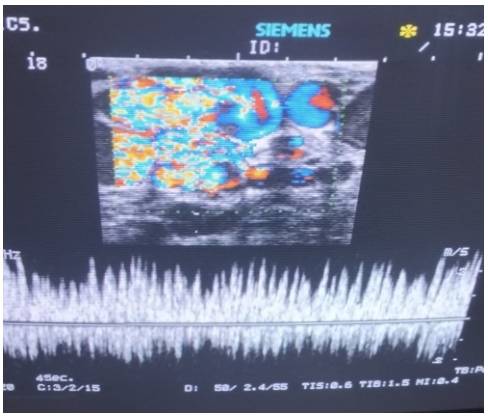

Fig 1: Doppler ultrasound image of the arteriovenous fistula of the left ulna artery and vein demonstrating the turbulent flow in the fistulous connection.

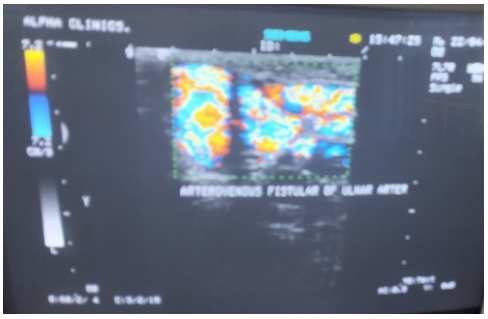

Fig 2: Arteriovenous fistular of the ulna artery and vein

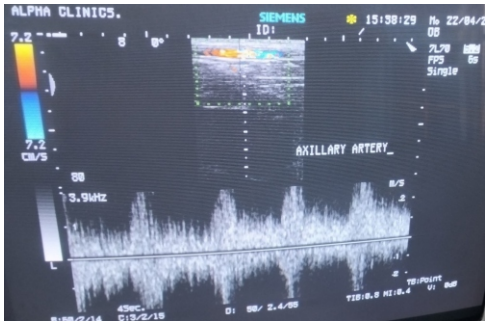

Fig 3 Doppler image of the left auxiliary artery showing normal flow with normal peak systolic and end diastolic velocities

Fig 4: Doppler ultrasound image showing the bifurcation of the brachial artery into the radial and ulna artery before the arteriovenous fistular formation at the distal ulna

Literature Review

Traumatic arteriovenous fistulae are uncommon complications of penetrating or blunt injuries. Hallowell first described traumatic AVF in 1750[1]. Kelm et al. reported an incidence of iatrogenic AVF formation up to 0.88% in arterial catheterizations[2,3]. AVFs involving the ulnar artery and vein are rare, with few cases documented. El Kheir et al. reported a radial artery AVF following a stab wound managed surgically with good outcome[4]. Rahimi et al. described successful endovascular repair of a forearm AVF using covered stents[5].

Diagnosis primarily relies on duplex ultrasound, while CT or MR angiography aids in complex cases or surgical planning[6]. Management depends on size, location, and symptoms, ranging from observation to open surgical repair or endovascular interventions such as coil embolization or covered stents[7,8].

Discussion

Arteriovenous fistulas (AVFs) are abnormal connections between arteries and veins, resulting in diversion of blood flow from the high-pressure

arterial system to the low-pressure venous system. Fistulas may be congenital or acquired and can occur almost anywhere within the body. In this case, the AVF was acquired following blunt force trauma to the patient's left forearm, highlighting trauma as an important non-iatrogenic cause. The commonest cause of AVFs generally is iatrogenic injury by means of arterial access in the groin for endovascular procedures, where the incidence of traumatic AVF formation is estimated to be as high as 0.88%[2,3]. Incidence is highest in therapeutic procedures compared with diagnostic, which likely reflects the caliber of the access sheath required[9]. Many of these iatrogenic AVFs are minute, clinically silent, and resolve without ever being observed. Risk factors for AVF formation include increased BMI, advanced age, female gender, and hypertension[10]. However, in this patient, blunt trauma alone was sufficient to cause vessel injury leading to fistula formation.

Newly formed AVFs are often asymptomatic and may remain as such for days to months, while the fistulous tract matures to a hemodynamically significant size. In this patient, symptoms arose due to increased venous pressure and altered distal arterial supply, presenting as left forearm swelling, visible engorged veins, and mild distal discomfort. Symptoms of AVFs generally include new or worsening varicose veins, oedema, claudication, and potential formation of deep vein thrombosis[9,11]. Clinical suspicion of an AVF is high in patients presenting with a history of trauma, visible swelling, and on examination a palpable thrill with an audible bruit over the left forearm. Duplex ultrasound remains the gold standard diagnostic tool, demonstrating continuous flow and elevated diastolic velocities, as was seen in this patient[6]. CT angiography may also be useful for precise anatomical mapping, while formal angiography offers both diagnostic evaluation and the option for endovascular treatment.

Medical management in this patient involved limb elevation, analgesia for pain control, and close monitoring of neurovascular status. Medical therapy alone is limited to supportive care as AVFs do not resolve with pharmacotherapy. Anticoagulation may be indicated in patients with associated deep vein thrombosis or in those at risk of thromboembolic events[9,11], though our patient showed no evidence of thrombosis on duplex scan. Beta-blockers or diuretics are used in AVF-induced high-output cardiac failure to reduce cardiac workload, but this was not necessary in our patient as systemic signs were absent.

Given the forearm location, symptomatic presentation, and risk of progressive venous hypertension and distal ischemia, surgical repair was considered in this patient. Open surgical repair involves proximal and distal control of the ulnar artery and vein, careful dissection of the fistulous tract, division of the abnormal communication, and closure of vessel defects with direct suture or patch angioplasty if required[12]. In traumatic upper limb AVFs, surgery can be challenging due to surrounding scar tissue and vessel wall changes. Our patient was counselled for surgical repair, with intraoperative findings confirming a fistulous communication between the ulnar artery and vein, which was successfully ligated and repaired, restoring normal flow.

Endovascular techniques were also considered in this patient as they are less invasive, particularly coil embolization, which is effective in small to moderate-sized fistulas with a sufficiently long tract[7], and covered stent graft deployment, used to seal off the fistulous communication while maintaining arterial patency[7]. This is particularly useful in upper limb AVFs if anatomy permits. Ultrasound-guided compression has been successful for femoral AVFs but is less feasible in upper limb fistulas due to anatomical limitations[8,13]. In this case, endovascular intervention was deferred due to the superficial nature of the fistula and favorable anatomy for direct surgical repair, which allowed definitive treatment with minimal morbidity.

Other case reports and reviews on traumatic arteriovenous fistulas have demonstrated similar diagnostic approaches and treatment outcomes, with variation based on injury mechanism and anatomical site. Berceli (2004) emphasised that early recognition is essential to prevent complications such as high-output cardiac failure, aligning with the timely intervention in this patient 14. Chmielnicki et al. reported a traumatic radial AVF following penetrating injury managed successfully with endovascular covered stent placement, thereby avoiding open surgery[15]. In contrast, the current case required surgical ligation due to superficial anatomy and easy vessel accessibility.

Nitecki et al. concluded that while surgical repair remains the definitive treatment, endovascular

techniques can reduce morbidity and shorten hospital stay, especially in anatomically favourable lesions[16]. Similarly, Reuben et al. described a brachial AVF post-penetrating trauma managed surgically with good outcome, reinforcing that surgical ligation remains a robust option where endovascular expertise is unavailable or anatomy favours open repair[17].

These comparative reports demonstrate that while endovascular interventions are evolving, open surgical repair remains a definitive treatment, particularly in traumatic upper limb AVFs with favourable anatomy, as in this case.

Conclusion

Traumatic arteriovenous fistula involving the ulnar artery and vein, as seen in this patient, is an uncommon but significant vascular condition requiring prompt diagnosis and intervention. Timely treatment through surgical ligation and repair, as done in this patient, is crucial to prevent complications such as limb ischemia or heart failure. Long-term follow-up is essential to ensure optimal outcomes and quality of life.

References

1. Hallowell J. A case of traumatic arteriovenous fistula. Med Chir Trans. 1750;34:45-48.
2. Kelm M, Perings SM, Jax T, Lauer T, Schoebel FC, Heintzen MP, et al. Incidence and clinical outcome of iatrogenic femoral arteriovenous fistulas: implications for risk stratification and treatment. J Am Coll Cardiol 2002;40:291. [PubMed] [Google Scholar]
3. Oweida SW, Roubin GS, Smith RB III, Salam AA. Post catheterization vascular complications associated with percutaneous transluminal coronary angioplasty. J Vasc Surg 1990;12:310. [PubMed] [Google Scholar]
4. El Kheir N, et al. Traumatic radial artery AVF: a case report. Vasc Endovasc Surg. 2013;47(6):475-477.
5. Rahimi SA, et al. Endovascular repair of forearm AVF. J Vasc Surg Cases Innov Tech. 2017;3(2):61-63.
6. Miller-Thomas MM, West OC, Cohen AM. Diagnosing traumatic arterial injury in the extremities with CT angiography: pearls and pitfalls. Radiographics 2005;25:S133. [PubMed] [Google Scholar]
7. Topuz M, Coşgun M, Şen Ö, Çaylı M. Coil embolization of a traumatic arteriovenous fistula of the lower extremity. Turk Kardiyol Dern Ars 2015;43:724. [PubMed] [Google Scholar]
8. Kirsch JD, Reading CC, Charboneau JW. Ultrasound-guided compression and repair of post angiographic femoral arteriovenous fistulas. Mayo Clin Proc 1993;68:612. [PubMed] [Google Scholar]
9. Muller DW, Shamir KJ, Ellis SG, Topol EJ. Peripheral vascular complications after conventional and complex percutaneous coronary interventional procedures. Am J Cardiol 1992;69:63. [PubMed] [Google Scholar]
10. Perings SM, Kelm M, Jax T, Strauer BE. A prospective study on incidence and risk factors of arteriovenous fistulae following transfemoral cardiac catheterization. Int J Cardiol 2003;88:223. [PubMed] [Google Scholar]
11. Toursarkissian B, Allen BT, Petrinec D, Thompson RW, Rubin BG, Reilly JM, et al.. Spontaneous closure of selected iatrogenic pseudoaneurysms and arteriovenous fistulae. J Vasc Surg 1997;25:803. [PubMed] [Google Scholar]
12. Davis PM, Gloviczki P, Cherry KJ Jr, Toomey BJ, Stanson AW, Bower TC, et al.. Aorto-caval and ilio–iliac arteriovenous fistulae. Am J Surg 1998;176:115–8. [PubMed] [Google Scholar]
13. Kirsch JD, et al. Ultrasound-guided compression repair of post angiographic AVFs. Mayo Clin Proc. 1993;68:612.
14. Berceli SA. Hemodialysis access-induced distal ischemia—diagnosis and treatment. Semin Vasc Surg. 2004;17(1):50–56. doi:10.1053/j.semvascsurg.2003.12.006.
15. Chmielnicki M, et al. Endovascular treatment of a traumatic radial arteriovenous fistula using a covered stent graft. J Vasc Surg. 2011;53(1):217-220. doi:10.1016/j.jvs.2010.07.008.
16. Nitecki S, et al. Traumatic arteriovenous fistulas: early diagnosis and late results. World J Surg. 2001;25(10):1327-1332. doi:10.1007/s00268-001-0102-3.
17. Reuben BC, et al. Increasing incidence of upper extremity arteriovenous fistulae in trauma patients. Ann Vasc Surg. 2007;21(5):626-631. doi:10.1016/j.avsg.2007.02.010.