

Traumatic Radial Artery Pseudoaneurysm: Vein Graft Repair through a Single Incision

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Summary: Radial artery pseudoaneurysms are rare clinical entities usually occurring after penetrating trauma or iatrogenic injury. The radial artery is the least common location for peripheral artery pseudoaneurysms, and no clear standard of treatment exists. We present a case of an adolescent male who developed a radial artery pseudoaneurysm after slitting his wrists. Using a single incision, the radial artery pseudoaneurysm was excised and repaired using a reversed venae comitantes interposition graft. This single incision technique for radial artery pseudoaneurysm repair preserves the dual arterial supply to the hand, which is of particular importance in young patients. (*Plast Reconstr Surg Glob Open* 2020;8:e3182; doi: [10.1097/GOX.0000000000003182](https://doi.org/10.1097/GOX.0000000000003182); Published online 23 November 2020.)

Radial artery pseudoaneurysms are uncommon, and no standard treatment guidelines exist. Literature is limited in the pediatric and adolescent population; however, it is believed that ligation of the radial or ulnar artery could impair the growth of the extremity and vascular reconstruction is recommended.¹ We present a case of a traumatic distal radial artery pseudoaneurysm and its repair through a single incision. As part of the surgical consent, the patient and his mother agreed for his deidentified records and photographs to be used in this report.

CASE REPORT

A 16-year-old boy with a history of a prior stab wound to the left forearm was referred to the plastic surgery clinic for evaluation of an enlarging mass at the site of his prior injury. Mother and patient confirmed that this painless mass had slowly enlarged over the past year. Patient denied numbness, tingling, or weakness in his left hand. Examination of the patient revealed a non-tender, pulsatile, 2 cm aneurysmal dilation located just beneath a longitudinal scar on the left distal ventral forearm. Allen's test was normal. Arterial duplex ultrasonography confirmed a 0.7 cm × 1.55 cm pseudoaneurysm of the distal radial artery. It demonstrated both the characteristic “yin-yang

sign” (Fig. 1) and “to-and-fro sign” (Fig. 2). Surgical intervention with vein graft repair was recommended after considering several factors, including pseudoaneurysm size, progressively increasing size over the last year, accessibility given its anatomic location, presence of good collateral arterial inflow, adolescent patient otherwise in good health, and level of concern from both the patient and his family.

In the operating room, the pseudoaneurysm was marked out and a longitudinal skin incision made just radial to the flexor carpi radialis tendon. The radial artery was identified between the flexor carpi radialis tendon medially and the brachioradialis tendon laterally. After gaining proximal and distal control of the radial artery, we fully dissected, and sharply excised, the 1.75 cm × 2 cm pseudoaneurysm, which demonstrated an 8 mm base (Fig. 3). Despite mobilizing the radial artery proximally and distally, the gap that resulted following resection was over 1.5 cm, necessitating an interposition graft. The 2 venae comitantes were identified and small side branches ligated. One of the two venae comitantes was sharply excised, irrigated with heparinized saline and prepared for interposition. Microdilators were used to dilate our radial artery ends and the vein graft; 2 mm size match was confirmed. Anastomoses were performed in a standard fashion using an interrupted 8-0 nylon suture under a 3.5× loupes (Fig. 4). There was excellent flow and no tension was placed on the anastomosis when the wrist was ranged. The wound was closed in layers.

Postoperatively, the patient was maintained on aspirin 325 mg daily for 14 days. At 1 and 2 week follow-up visits, the vein graft demonstrated excellent flow on vascular Doppler. Our patients' postoperative course was uneventful with no complications.

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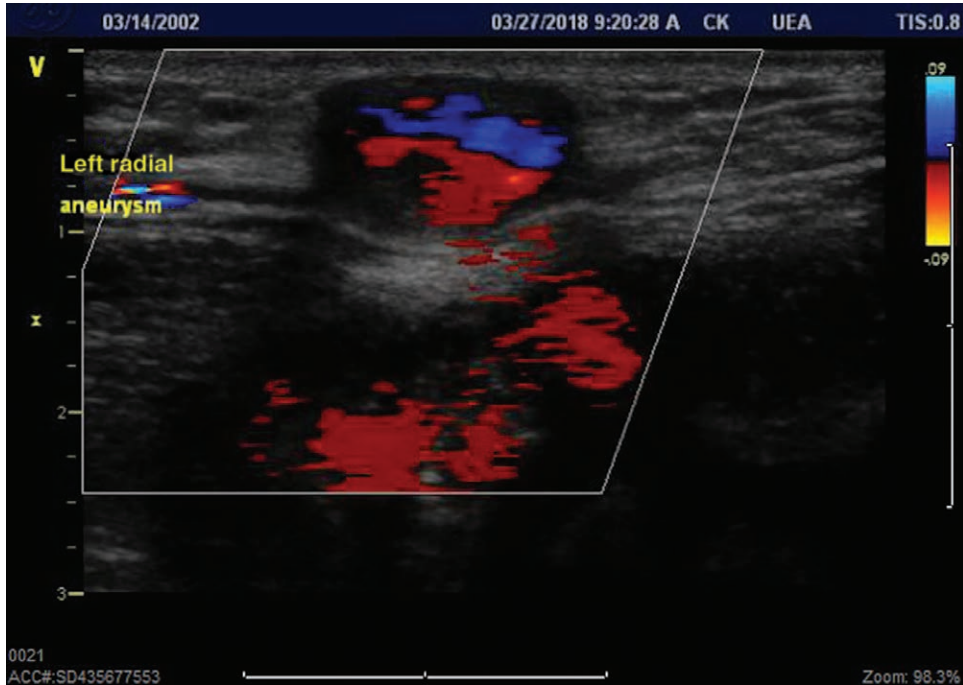


Fig. 1. Arterial duplex Doppler ultrasonography. **“Yin-yang sign”**: blood flow in a cystic structure distinguished by a swirling motion pattern. This flow pattern can be detected in pseudoaneurysms and other similar defects such as saccular aneurysms.^{2,3}

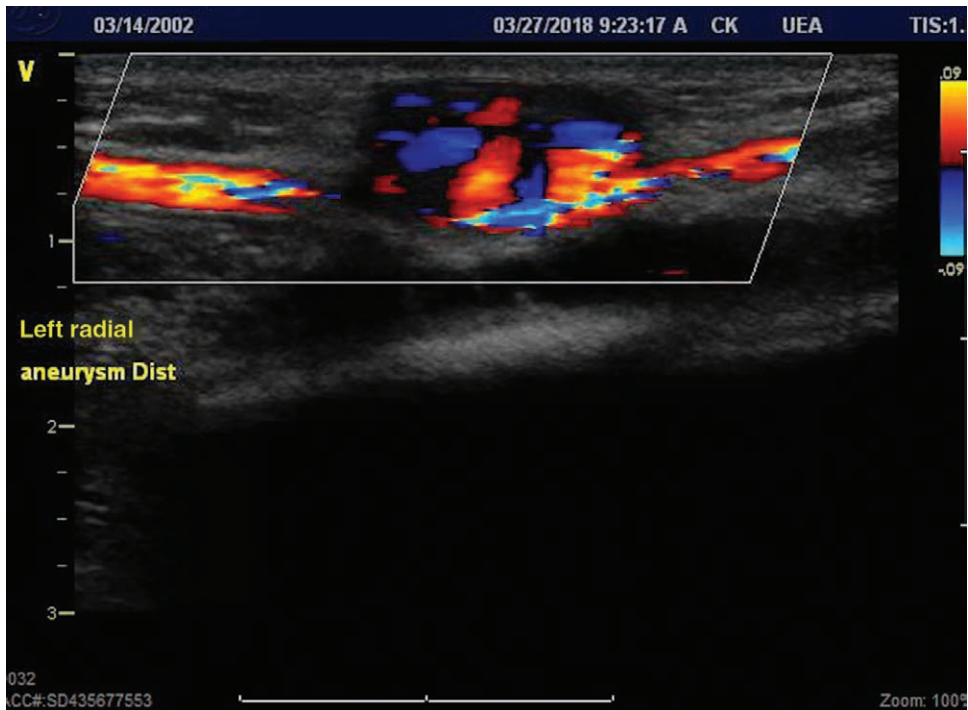


Fig. 2. Arterial duplex doppler ultrasonography. **“To-and-fro sign”**: the “to” represents the arterial inflow going into the pseudoaneurysm during systole, and the “fro” represents the pseudoaneurysm outflow going back into the artery during diastole. This appearance confirms both a communicating neck between the artery and pseudoaneurysmal sac and the diagnosis of a pseudoaneurysm.^{2,3}

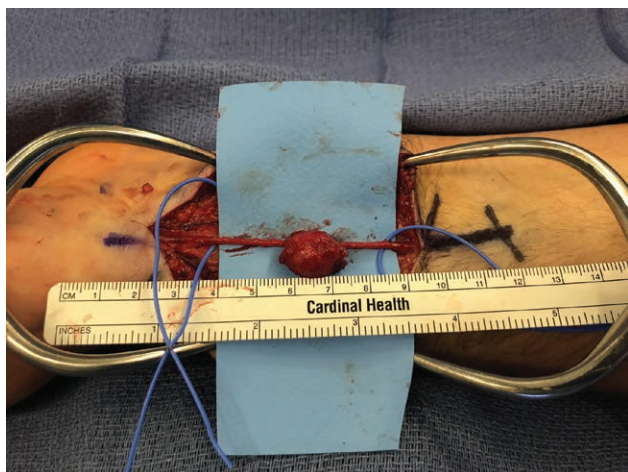


Fig. 3. Photograph displaying radial artery pseudoaneurysm.

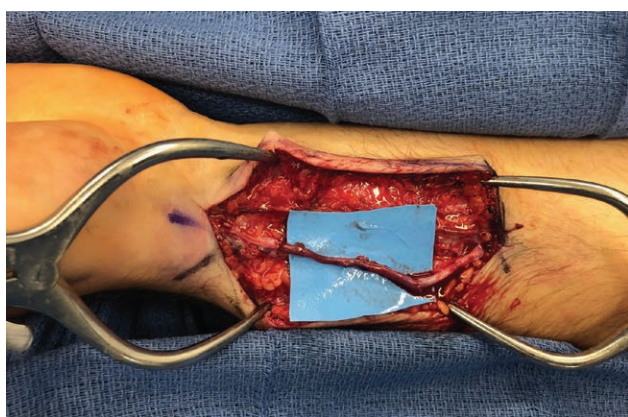


Fig. 4. Photograph showing a radial artery venae comitantes interposition graft.

DISCUSSION

Peripheral artery pseudoaneurysms are rare clinical entities, but have recently drawn increased surgical attention due to an apparent uptrend in incidence. The etiology of radial artery pseudoaneurysm in almost all cases involves penetrating trauma or an iatrogenic injury. The most common etiology of radial artery pseudoaneurysm is arterial cannulation, with an estimated incidence of 0.01%–0.05%.^{4,5} Radial artery pseudoaneurysms are usually found along the distal portion of the vessel near the wrist, where the vessel courses superficially between the flexor carpi radialis tendon medially and the brachioradialis tendon laterally.^{1,5}

The clinical presentation may include stable or increasing localized swelling, pain, neurologic symptoms due to extrinsic nerve compression, pulsatile mass on palpation, and occasionally overlying skin changes.⁵ Surgical delay may result in distal ischemia, local nerve damage, necrosis of overlying skin, or other less predictable outcomes including rupture.⁵ It is important to emphasize that the dual arterial blood supply to the hand should be preserved whenever possible.¹ Surgical intervention is recommended for adults with peripheral artery

pseudoaneurysms >1 cm in size.⁶ Operative planning and strategy are multifactorial.

Autologous vein is the conduit of choice for reconstruction of the distal radial and ulnar arteries.⁷ The great saphenous vein is commonly used from the uninjured lower extremity and has a high success rate. The donor vein needs to have an appropriate size match to the injured artery; more distal injuries necessitate repair with smaller caliber veins. Creating a second surgical site can generate other problems, including increased postoperative pain, vein donor site morbidity, and future sequelae of vein harvest from the lower extremity. There is no published data showing adverse clinical outcomes from harvesting a single small vein. In our case, we chose to use one of the two venae comitantes, which were both uninjured and readily identified in our surgical field. If vessel ligation is being considered, the anatomic location is important because ligation of a more proximal lesion increases the likelihood of tissue damage.⁶ Potential future complications following vessel ligation may include trauma (or iatrogenic injury) to the solitary remaining inflow vessel to the hand, arteriosclerosis, and vasculitis.¹ In most adults with an intact palmar arch, radial artery ligation is well tolerated due to the ulnar artery being the dominant inflow vessel to the hand.⁸ Surgical repair of peripheral artery pseudoaneurysms has high success rates and minimal morbidity in both children and adults.¹

CONCLUSIONS

The radial artery is the least common location for a peripheral artery pseudoaneurysm and no clear standard for treatment exists to help guide clinical and operative decision-making. Radial artery pseudoaneurysm excision followed by a reversed venae comitantes interposition graft is safe and preserves the dual arterial supply to the hand, which is particularly important in young patients. Vein grafting may not be required in cases with smaller pseudoaneurysms or in older patients with a normal Allen's test. Each patient must be evaluated on an individual basis; if vein grafting is indicated, a venae comitantes interposition graft may be a preferred solution.

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