Repair of a symptomatic true radial artery aneurysm at the anatomic snuff box with interposition great saphenous vein graft

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ABSTRACT

Radial artery aneurysms are exceedingly rare, with only a few reported cases of surgical revascularization. We describe a 25-year-old man who presented with severe ischemia of the right hand secondary to an idiopathic true radial artery aneurysm at the anatomic snuff box. The patient had embolic occlusions in his hand and fingers that were treated with catheter-directed thrombolysis. During angiography, the blood supply to the affected hand was determined to be radial artery dominant, and therefore the aneurysm was resected and revascularized using an interposition great saphenous vein graft. The patient denied ischemic symptoms postoperatively, and duplex ultrasound examination at a 10-month follow-up showed patent interposition graft. (J Vasc Surg Cases and Innovative Techniques 2018;4:292-5.)

Keywords: Peripheral radial aneurysm; Interposition; Revascularization; Ischemia

Upper limb aneurysms are very rare, accounting for approximately 1% of all peripheral artery aneurysms.[1] Aneurysms of the distal radial artery are even more uncommon, with only 10 reported cases of true radial artery aneurysms in the last five decades.[2-10] In all case reports, the patients were older than 60 years and underwent surgical repair. The majority were treated with proximal and distal arterial ligature, and only three were revascularized because of poor hand collateralization from the ulnar artery.[2,4,11] We describe a unique case of a 25-year-old man who presented with severe ischemia of the right hand due to a partially thrombosed true radial artery aneurysm, which was repaired using interposition great saphenous vein graft. Informed consent for publication of this case report was obtained.

CASE REPORT

A 25-year-old man, a nonsmoker with history of Hashimoto disease and bilateral Raynaud syndrome, presented with acute worsening of chronic pain, pallor, and coolness of his right hand. His symptoms began 1 year earlier and did not correlate with temperature changes or improve with medication therapy. The patient had no history of hypertension and denied hand trauma or arterial access at any point in the past. He also has no personal or family history of aneurysms. On physical examination, the right hand digits D2 to D5 were cyanotic with preserved motor and sensory function throughout the hand. Capillary refill time was significantly delayed in all affected fingertips; however, radial and ulnar pulses were palpable.

A right upper extremity duplex ultrasound examination was performed (Fig 1), demonstrating a partially thrombosed radial artery aneurysm (0.63 × 0.58 cm) at the anatomic snuff box with patent color flow signal but absent flow in proper digital arteries D2 to D5. Finger photoplethysmography revealed absent pulse waveforms. The patient underwent angiography of the right upper extremity (Fig 2, *A*) through ultrasound-guided access of the right common femoral artery using a 5F micropuncture system. Imaging revealed a fusiform aneurysm of the radial artery that supplied a large deep palmar artery. Whereas the ulnar artery supplied the superficial palmar artery, it diffusely tapered at the forearm and wrist because of vasospasm. Intra-arterial nitroglycerin was administered to improve imaging of the hand vessels. Although all the common digital arteries were patent, the proper digital arteries (D2-D5) and a segment of the deep palmar arch were occluded. A 4F end-hole catheter was then advanced into the right distal brachial artery. The sheath was connected to a heparin infusion of 500 units/h (goal partial thromboplastin time of 40-70 seconds) and the catheter to 50 mL/h alteplase infusion for 48 hours. Lysis-check angiograms were obtained every 24 hours, and the final angiogram (Fig 2, *B*) revealed markedly improved hand perfusion with patent proper digital arteries in the thumb and small finger, with segmental patency in the ring, middle, and index fingers.

Our attention was then turned to resecting the aneurysm and planning revascularization. Preoperative vein mapping revealed an adequately sized great saphenous vein of 2.3 mm in diameter within the right leg. In the operating room, we dissected into the right anatomic snuff box and found a small fusiform aneurysm (Fig 3, *A*). Given the length of the aneurysm, we decided against

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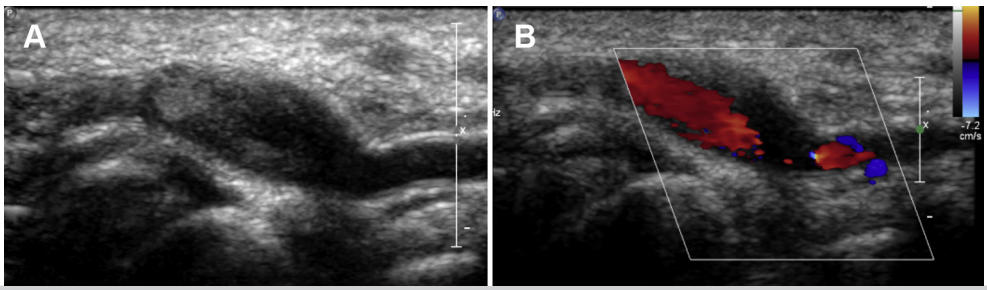

Fig 1. A, Duplex ultrasound image of the right anatomic snuff box, revealing a >6-mm fusiform radial artery aneurysm that is partially filled with mural thrombus. **B,** Color flow signal demonstrating patent radial artery at the anatomic snuff box.

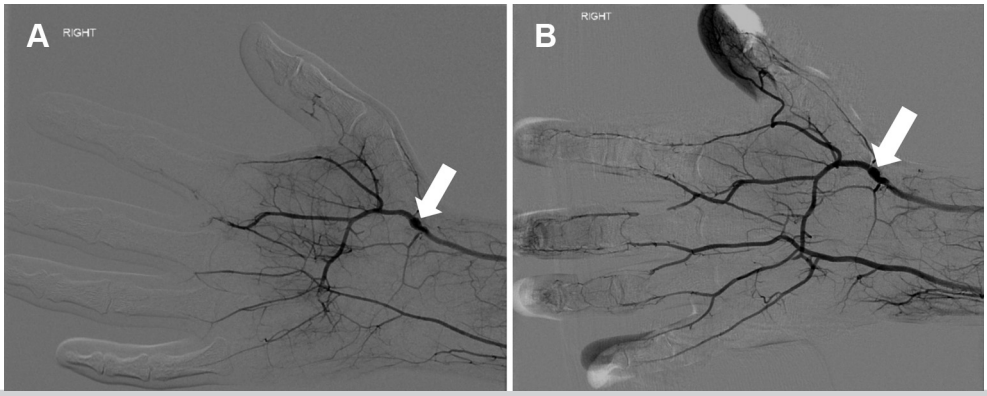

Fig 2. A, Angiogram of right hand before lysis, demonstrating a small fusiform aneurysm (*arrow*) and a filling defect in the deep palmar arch over the level of the fourth metacarpal head, with complete occlusion of proper digital arteries D2 to D5. **B,** Angiogram of right hand after 48 hours of lysis therapy, revealing normal perfusion in the small finger and thumb, with improved segmental patency in the index, middle, and ring fingers.

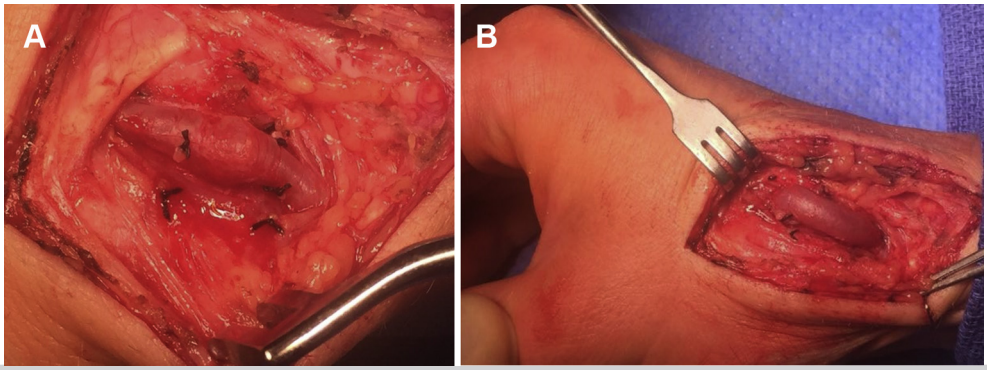

Fig 3. A, Surgical exposure of the aneurysmal segment of the right radial artery at the anatomic snuff box. **B,** Interposition great saphenous vein graft across the resected aneurysmal segment.

performing a primary end-to-end anastomosis of the radial artery after aneurysm resection and instead chose to revascularize with interposition great saphenous vein of 3 cm in length (Fig 3, *B*). The operation was uncomplicated, and an aneurysm fragment was sent for pathologic examination, which revealed chronic inflammatory reaction with predominantly plasma cells and histiocytes. Postoperatively, there were no motor or sensory deficits, with triphasic Doppler signals at the palmar arch. The patient was discharged home with a 3-month prescription of apixaban (Eliquis) and instructed to start 325 mg of aspirin daily after anticoagulation. At a 10-month follow-up visit, the patient denied having any ischemic hand symptoms, and a duplex ultrasound examination demonstrated patent vein graft with normal hand perfusion.

DISCUSSION

This case involves a true radial artery aneurysm in the anatomic snuff box of a young adult man, which is an exceedingly rare occurrence.[1] Patients may complain of hand swelling and localized pain due to nerve

compression, or they can present with pain, pallor, and paresthesias due to thromboembolization.[2,3,9,10] Some patients may present with symptoms that are nonspecific, such as hand pain or the presence of an asymptomatic mass.[3,10] Diagnosis is confirmed with duplex ultrasound, and finger photoplethysmography can be helpful in the setting of thromboembolism. The most likely complication is distal ischemia, resulting from embolization of mural thrombus from within the aneurysm.[9] Whereas aneurysm rupture is a possibility, there are no reported cases, and rupture becomes increasingly rare the more distal the location of the aneurysm.[1,9]

Symptomatic radial artery aneurysms demand intervention, and given the risk of complications with asymptomatic upper extremity aneurysms, they too demand treatment.[1,3,12] In this case, our patient presented with severe hand ischemia due to embolic occlusions, warranting immediate treatment to prevent tissue loss or gangrene. Whereas there is limited reported experience on the management of acute hand ischemia, there are some reports of successful blood flow restoration using a combination of catheter-directed thrombolysis and anticoagulation in patients with hypothenar hammer syndrome and polycythemia vera.[13-16] We therefore elected to treat the embolic occlusions with both therapeutic heparin and catheter-directed thrombolysis.[17]

After 48 hours of lysis and restoration of hand perfusion, operative management was planned on the basis of the patient's anatomy. It is imperative to determine the hand's main arterial supply to decide between aneurysm ligation and revascularization.[10] Typically, a modified bedside Allen test is performed; however, duplex ultrasound, Doppler ultrasound, or angiography can also be helpful.[3,6,10,18] In this case, we used arteriographic findings during lysis checks, which demonstrated dominant radial artery inflow with poor ulnar collateralization. We therefore planned management around maintaining arterial inflow with a revascularization procedure. Although a previous case study reported success with primary end-to-end anastomosis after aneurysm resection, we thought that the length of the aneurysm would leave too long a segment to be reconnected after resection of the aneurysm.[4] Therefore, revascularization was undertaken using an interposition vein graft as previously reported by Ayers et al[2] in a 65-year-old patient. The great saphenous vein is known to be a superior conduit for peripheral arterial reconstruction, and it was selected for use in interposition grafting, even though the patient had adequate-sized cephalic veins as well.[19]

We suggest close follow-up with duplex ultrasound within 1 to 2 months postoperatively to ensure adequate anastomosis and hand perfusion. Although the risk of anastomotic aneurysm is unknown for upper extremity grafts, the incidence of complications that can arise from such aneurysms is high.[20] For this reason, we recommend follow-up imaging every year for at least 5 years to ensure that no anastomotic complications arise, as anastomotic aneurysms may develop 5 years postoperatively.[20]

There are only 10 reported cases of true radial artery aneurysms in the literature, and the causes include trauma, atherosclerosis, infection, Marfan syndrome, vascular tumor, and systemic vasculitis.[1,3,11,21] To diagnose the underlying cause, a histopathologic sample may be helpful; for example, a granulomatous lesion in the arterial wall may imply vasculitis, or a disruption in the three arterial layers can imply an unnoticed trauma.[3,22] The pathology report in our case, which demonstrated chronic inflammation, favors atherosclerosis as the possible etiology.[22] This is unlikely, however, given our patient's young age and his lack of smoking history. Given this exclusive presentation, we also performed chest computed tomography to look for intrathoracic aneurysms, which could be explained by Marfan syndrome; however, this returned normal. This aneurysm was therefore classified as idiopathic, but an aberrant course of the tendons overlying the artery is certainly a possibility in this young patient.[2]

CONCLUSIONS

We report the first case of a symptomatic true radial artery aneurysm in a young patient treated with interposition great saphenous vein graft. This case highlights important diagnostic information and management of patients with severe hand ischemia due to aneurysm thromboembolic phenomena. Furthermore, our case emphasizes the importance of surgical repair of symptomatic aneurysmal disease and determining the dominant source of arterial hand inflow to plan adequate surgical management.

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