Ulnar Artery Reconstruction, Microembolectomy and Sympathectomy in the Treatment of Finger Ischemia: A Case Report

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Abstract

Lesions of the distal upper extremity arteries are uncommon lesions. We will present a case of a 37 year-old male consulted to us for ischemia of his left distal middle digit post ABG blood draws and previous injury to that left distal upper extremity from a dog bite that occurred approximately 1 year prior to the current episode. Pre-operative auditory doppler and angiogram showed retrograde flow along the ulnar artery with occlusion of the middle and distal thirds. These studies also showed the radial artery was patent, with decreased blood flow to the third ray. The patient underwent a distal middle finger amputation as well as repair of diseased ulnar artery which was reconstructed using a vein graph. A sympathectomy and embolectomy was also preformed during the time of the procedure. Approximately 1 month (can update this with longer pt follow up) after the procedure there was no recurrence of occlusion there is appropriate blood flow to the distal hand.

Key Words: Amputation, dog bite, embolectomy, finger ischemia, microembolectomy, occlusion, reconstruction, sympathectomy, ulnar artery
Introduction

Ischemic injuries to the upper extremity digits due to formation of embolization are rare. When they do happen, they usually arise from emboli from the heart, arterial atherosclerotic disease, and arterial aneurysms[1]. Ischemic injury to the digits can occur from distal emboli formation. These include catheter placement, repetitive work-related vibration trauma, arterial blood gas sampling, complications from dialysis access, and hypothenar hammer syndrome.[2,3] There have also been cases of digital emboli caused by blunt or penetrating trauma and intravenous drug abuse[3]. In traumatic events to the ulnar artery the hand and wrist are the most common upper extremity occlusions as seen in our case[4]. Damage to the radial or ulnar artery, due to puncture, laceration, or thrombus can occur without any or minimal symptoms due to collateral circulation and for this reason it is hard to determine the actual cases of arterial occlusions[5]. It is known that increased sympathetic tone from reflex vasospasm with adequate collateral vessels may decrease perfusion which can lead to ischemic signs and symptoms[5]. For the patients that are symptomatic, they usually present with complaints of pain related to activity or temperature, color changes, ulcerations, and potentially gangrene. It has been shown that reversed interpositional vein grafting has good success in patients with symptomatic ulnar artery thrombosis[6]. We present a case of an ischemic middle finger caused by a chronically occluded distal ulnar artery, as well as micro-emboli in the common palmar digital artery of the index and middle fingers.
Case presentation

A 37 year-old, left-hand dominant male was consulted to us by the emergency department for evaluation of left upper extremity distal middle finger ischemia. The patient reported that he noticed that his middle finger was cold and started blanching followed by extreme pain which started approximately 10 days earlier. The patient denied any acute trauma but did state he was bitten by a dog on the left wrist about 1 year prior. He had also been recently discharged from the hospital ICU after being treated for multiple medical problems including hematemesis and pneumonia. Review of the patients hospital stay showed he had received numerous arterial blood gas draws on the affected hand using the radial artery. The patient has a medical history significant for Crohn’s disease, systolic heart failure, GI bleed, esophagitis, gastritis, respiratory failure from pneumonia, pleural effusion, anasarca, B12 deficiency, anemia of chronic disease, weakness, neuropathy, encephalopathy, depression, Cushing Syndrome from chronic steroid use, chronic diarrhea, chronic pain syndrome and tobacco use. The patient’s social history was also marked with a history of smoking 1 pack per day, denying any alcohol or illicit drug use.

Physical examination of the left upper extremity showed cyanosis of the middle finger to the distal phalanx. There was small wound on the radial aspect of his distal index finger. The entire hand was cool to the touch with mild delay in capillary refill in all digits at approximately 8-10 seconds. A transverse scar was noted 2 cm proximal to the wrist crease on the ulnar aspect of the forearm from the patients previous dog bite. With Allen’s testing, the patient appeared to have no blood flow through the ulnar artery, but did have brisk flow to the palm on the radial side. The patient reported severe pain of
the distal phalanx of the middle finger, but no pain of the middle or proximal phalanx. A therapeutic and diagnostic digital block was performed to the third ray. The third digit then have improved flow but remained cool and sluggish at the distal phalanx. Auditory doppler of the wrist and hand arteries showed that there was retrograde flow along the ulnar artery approximately 1.5 cm proximal to the proximal wrist crease. Audible flow to the palm from the radial artery was present, with no audible flow after occlusion of the radial artery proximally. Doppler evaluation also showed that the middle digit pulses were absent. At this time he was also given a 5000 unit bolus of heparin which did not improve his symptoms. Radiographic films of the hand were obtained with no acute fractures or bony changes, seen in Figure 1.

An angiogram was obtained which demonstrated a patent radial and interosseus artery with occlusion of the ulnar artery at the junction of the middle and distal third of the forearm as seen in Fig 2. The radial artery showed that it was adequately supplying the superficial palmer arch, and most of the digital arteries except for the third digit. The arteriogram also showed a digital artery supplying the radial side of the middle finger to the level of the proximal interphalangeal joint (PIP). The ulnar side of the middle finger was patent to the proximal third of the PIP with some filling of the deep palmar arch as seen in Fig. 3 and Fig. 4. Partial amputation of the middle finger was advised, as well as possible need for ulnar artery reconstruction and open sympathectomy.

Intra-operatively, there was a 6 cm thrombus in the ulnar artery which ended proximal to the deep arch seen in Figure 4. The ulnar artery was then bypassed using a superficial vein of the same extremity of appropriate caliber as a reversed interpositional autograft to accommodate the ulnar artery (Figure 5). An embolus was also found in the
common digital artery to the index and middle fingers which was also removed through a small longitudinal incision. The vessel was then irrigated with heparin solution and microscopically repaired. A sympathectomy was then performed to the index, middle and ring fingers.

Discussion

Ulnar artery thrombosis secondary to blunt trauma has been recognized for quite some time. Within Guyon’s canal the ulnar artery is somewhat fixed and lies between immobile fascia and the carpal bones. The ulnar artery is also relatively unprotected, being only covered by thin skin, fat and the palmaris brevis muscle[7]. Ulnar artery thrombosis most commonly affects males that suffer from hypothenar hammer syndrome in which the hand is used as a hammer[8]. In our case the affecting traumatic event was caused by a dog bite on the wrist that occurred more than 1 year prior to the ischemic event. This case emphasizes the importance in diligent physical exam prior to invasive vascular procedures which can result in acute ischemic events – and in this case – lead to loss of limb and significant surgery. Although the diagnosis of the ulnar artery occlusion was very evident on physical exam, the use of an angiogram remains critical to preoperative planning in microsurgical reconstructive vascular surgery.

It is also known that increased sympathetic tone due to reflex vasospasm can also decrease perfusion and cause ischemia increased in the case of already diseased vessels[5]. As seen in Fig. 3 our patient had almost absent blood flow to the middle digit via the digital arteries. The addition of a sympathectomy can be beneficial and help reduce the painful symptoms of ischemia.
At (time length – update) follow up the patient is doing well and had no complaints.

**Conclusion**

In summary ulnar artery thrombosis at the level of the wrist and hand due to trauma is the most common upper extremity occlusion noted[4]. The need for arterial reconstruction and sympathectomy still remains somewhat controversial depending upon radial inflow, however, in our patient arterial reconstruction and sympathectomy were necessary to prevent future reoccurrences of ischemia and to prevent symptoms of cold intolerance and pain.
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References


Fig. 1 Pre-operative x-ray of left hand. It showed no signs of osteomyelitis.
Fig. 2 Pre-operative arteriogram showed a patent radial and interosseus artery. The Ulnar artery is not visualized at the middle and distal thirds.
Fig. 3 Pre-operative angiogram of hand shows radial artery adequately supplying the superficial palmer arch, and digital arteries except for the third. It shows a digital artery supplying the radial side of the third digit to the level of the PIP, and on the ulnar side a digital artery is supplying the proximal third of the PIP with some filling of the deep palmar arch.
Fig 4. Ulnar artery with a 6 cm thrombus which ended just proximal to bifurcation in the palm.
Fig 5. Reconstruction of ulnar artery using a vein graph.
Fig 6. Reconstructed ulnar artery with vein graft once clamps were released.