Acute ligation of the radial and ulnar arteries: A case report and review of literature

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Isolated injury to the radial or ulnar artery results in no significant complications in patients who undergo repair or ligation of the injured artery. However, ligation of both infrabrachial vessels of the upper extremity is associated with limb loss from ischemia due to lack of collateral circulation. A rare case of acute ligation of both the radial and ulnar arteries in a drug abuser where collateral vessels preserved the circulation to the hand is reported.

Key Words: *Ligation of radial and ulnar arteries*

Ligature en urgence des artères radiale et cubitale : exposé de cas et examen de la documentation

Les blessures isolées de l'artère radiale ou de l'artère cubitale n'entraînent pas de complications importantes chez les patients qui subissent une réparation ou une ligature de l'artère lésée. Par contre, la ligature des deux vaisseaux sous-brachiaux du membre supérieur se solde par la perte de celui-ci en raison de l'ischémie causée par l'absence de circulation collatérale. Voici un cas rare de ligature des artères radiale et cubitale, réalisée en urgence chez un utilisateur de drogues chez qui la circulation sanguine dans la main a été assurée par les vaisseaux collatéraux.

A traumatized forearm with disruption of both major arteries usually raises the concern of limb viability. The accepted treatment usually involves reconstruction of at least one of the two major arteries. As long as there is one patent infrabrachial vessel, the remaining vessels may be ligated without significant differences in limb salvage complications (1,2). Amputation rates were less than 5% when either radial or ulnar arteries were ligated; however, when both arteries were ligated the amputation rate was 39.3% (3). The length of time required for collateral circulation to become established is very difficult to determine. We report a case where the radial and ulnar arteries were ligated approximately one week apart following debridement and skin grafting for necrotizing fascitis of the upper extremity, with maintenance of distal viability.

CASE PRESENTATION

A 37-year-old right-handed man presented to the emergency department of an inner city hospital with a two-week history of pain and swelling of the left forearm. He was a known intravenous drug abuser and admitted to injecting heroin in the left forearm veins. He was febrile with signs of sepsis, which included a high leukocyte count. The forearm was swollen with blisters, and he underwent debridement of all skin and soft tissue including the deep fascia of the upper extremity (Figure 1). The patient was then transferred to the plastic surgery service at the Detroit Medical Center for closure of the wound. His hand was viable with good capillary refill and sensation, and he was treated with intravenous antibiotics, wound care and hyperbaric oxygen. The wound cultures showed *Staphylococcus aureus*. Six days after the initial debridement, he underwent split thickness skin grafting of the upper extremity. He showed no signs of sepsis and his graft take was good at the fifth postoperative day. However, on the following day, he had an acute bleed from the forearm that required exploration. At exploration, a large segment of the ulnar artery was found to be ulcerated. The ulnar artery was ligated at the distal forearm and the histology of the segment showed acute and chronic inflammation of the vessel with necrosis. Because he was homeless, the patient was placed in a shelter. He returned for an office visit in an intoxicated state two days following discharge from hospital. The skin graft looked satisfactory and was redressed and resplinted. He returned that night to the emergency room after being kicked out of his shelter for dealing drugs, complaining of pain in his forearm. He developed profuse bleeding from the forearm when the dressing was taken down. At exploration, a 3 cm segment of necrotic radial artery was found. Given the patient's history of drug abuse, finding a vein graft to bridge the gap could not be entertained. The radial artery was ligated at the distal forearm. There was good perfusion of the fingers and good Doppler signal over the palmar arch. He underwent an arteriogram that showed ligated radial and ulnar arteries with reconstitution of the palmar arch through collateral circulation (Figure 2). Pathology confirmed partial necrosis of the artery with acute and chronic inflammation. His skin graft was satisfactory (Figure 3) and he had good hand function. He was fitted with a pressure garment to prevent chronic edema of the hand.

DISCUSSION

The rationale for repair or reconstruction of the upper extremity vessels includes ischemia, cold intolerance, risk of amputation and resident education. Studies have shown that one functional

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Figure 1) *Upper extremity following debridement*

Figure 2) *Arteriogram following ligation of both radial and ulnar arteries*

Figure 3) *Skin grafted upper extremity*

artery is required distal to the elbow for limb viability (1). Even without interruption of one of the two named wrist arteries, a significant early and late morbidity exists in patients with peripheral vascular disease. These include delayed wound healing, claudication, weakness and cold intolerance (2-6). Bone nonunion with only the patent artery, which later healed by reconstruction of an additional vessel, has been reported in the lower extremity (7).

The rationale for ligation of a vessel in the extremity includes multiple injuries where one vessel may be safely ligated because another vessel is present, extensive wound contamination or infection, and associated life-threatening injuries. In patients who sustained both radial and ulnar artery injury of the same extremity, the results were similar regarding viability and function whether both arteries were repaired or one artery was ligated and the other repaired. Nerve injury was the single most important factor in terms of degree of functional loss in extremity injury (1,8), Studies have shown that in vascular injuries of the upper extremity, collateral circulation compensated for the poor vascularity in 19.7% of cases (9). In a series from Bangladesh (10), the authors attributed limb survival following failed repair of the injured vessel with the other vessel being patent to collateral circulation. They conclude that in the absence of hand ischemia, ligation of the lacerated radial or ulnar artery is safe and cost-effective. Studies in intravenous drug abusers have shown a high incidence of septic vascular complications. These infections were a major cause for morbidity and mortality (11). Because there is great risk for infection, it is suggested that ligation and debridement alone be carried out with immediate arterial reconstruction only for nonviability (12).

In this patient who underwent radical debridement of the upper extremity for necrotizing fascitis, the collateral circulation was established enough to salvage the extremity. Pathology of the disrupted vessel confirmed the cause for the arterial disruption to be infective in origin. Although no similar reports could be found, the extremity survived on collateral circulation in this intravenous drug abuser, that was confirmed on the arteriogram.

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