Case Report

Structural and Functional Salvaging of Traumatic Brachial Artery Cut with Multiple Nerve Cut: Case Series

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Abstract

Upper limb arterial injury is relatively rare among trauma cases. Among them, the majority is contributed by brachial artery injury. Brachial artery injury is associated with nerve injuries given that its anatomical course, which brings a significant impact to the patient. We reported 2 cases of patients who sustained a deep laceration wound over the right upper limb. Both presented to the Emergency department with active bleeding over the wound, and clinically cold right hand, associated with absent radial and ulnar pulses with profound sensory and motor deficit. Wound exploration and brachial artery repair with reverse saphenous vein interposition graft, followed by structural and nerve repair. This case series highlighted the importance of prompt detection and intervention of brachial artery injury. Any further delay might result missing the golden hour of revascularization for the patients. It also showed the importance of consideration of limb salvage in a patient who was deemed Rutherford III, especially nerve cut was uncertain. In conclusion, prompt intervention of traumatic brachial artery injury and proper intraoperative assessment are mandatory to properly decide if a limb is salvageable or not.

Keywords: Arm injuries; brachial artery injury; interposition graft; limb salvage; vascular system injuries

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Introduction

Upper limb arterial injury occurs in about 0.48% of trauma cases, which makes it rare as compared to other injuries (1). However, the brachial artery is the most commonly injured in the upper limb, which constitutes about 28% of all vascular injuries (2). It can potentially bring significant morbidity or mortality to the trauma patient (3). It is also commonly associated with nerve injuries due to the course of the brachial artery (4).

This case series highlighted the importance of prompt diagnosis and early referral to a vascular center in the management of traumatic brachial artery injury. It also showed the challenges faced in an event of concomitant nerve injury, where the surgeon's judgment was very important in making an accurate decision. The need for a timely intervention to prevent limb loss was the major responsibility of the trauma and vascular team. The options for arterial repair and the sequence of repair were also discussed.

Case Report

The first patient was a 48-year-old man who presented to the Emergency Department about 2 hours following an alleged cut by shattered glass from his aquarium as he was cleaning it. Post-trauma, he sustained a deep laceration wound over his right antecubital fossa extending to the elbow crease, with excessive bleeding from it. It was associated with absent radial and ulnar pulses and profound neurological deficits. Creatinine kinase value was 1089 U/L on arrival.

After resuscitation, the patient was sent to the vascular center and brought to the operating theatre 6 hours post-injury for wound exploration and primary repair of the brachial artery cut. Intraoperatively, it was noted transection of brachial artery, median nerve, and ulnar nerve. It was also noted total cut over the common flexor origin tendon, biceps tendon, brachialis, and supinator. Primary repair of the brachial artery was performed, as shown in Fig. 1. Structural repair of the muscles and nerves was also done. Post repair, radial and ulnar pulses were palpable (1+) with biphasic doppler signals.

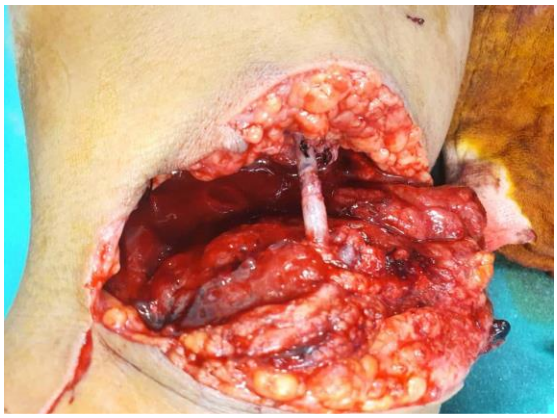

FIGURE 1: The transacted right brachial artery was repaired primarily and a showed deep cut involving most of the flexor muscles

Subsequently, at 9 hours post-operation, reassessment of the right upper limb pulses was found to be absent, and he was sent back to the operation theatre again for wound re-exploration and intraoperatively noted previous repair segment contused and thrombosed, hence revision was done with interposition graft with reversed saphenous vein, as shown in Fig. 2. Post-operatively radial and ulnar pulses were palpable. Patient was able to recover well post-operatively without significant ischemic reperfusion injury and discharged on day 5 after surgery.

The second patient was a 63-year-old man who presented to the Emergency Department following an alleged cut by a chainsaw while cutting wood. He sustained a deep laceration wound over the medial aspect of the right distal arm with complete transection of the brachial artery, which bled profusely but was controlled after compression. Right radial and ulna arteries doppler signal were absent, with loss of sensory and motor function. The patient was resuscitated with fluid and blood products and sent to the operating theatre of the vascular center about 7

FIGURE 2: The brachial artery post-embolectomy and interposition graft

hours post-injury. The intraoperative findings confirmed complete disruption of the brachial artery and transection of the muscles of the forearm including the biceps and long head of triceps muscle with the total cut of median and ulna nerves.

Optimal debridement of injured soft tissues was performed, and then injured and bleeding arterial and venous structures were exposed. The total transacted brachial artery was repaired with a reversed great saphenous vein graft in interposition as seen in Fig. 3. Post repair, radial and ulnar pulses were palpable (2+).

FIGURE 3: The brachial artery post-interposition graft

However, 2 hours later the patient experienced postoperative thrombosis evidenced by loss of distal pulses, wound re-exploration, and embolectomy was performed, and arterial reperfusion was successfully achieved. Structural repair of muscles was done. The use of an autologous sural nerve graft to correct the secondary median and ulnar nerve injury was performed during the next operation. The post-operative period was uneventful, healing was complete and physiotherapy was employed for elbow rehabilitation.

Discussion

Despite there are having numerous publications regarding traumatic brachial artery injuries, it is still inadequate recommendation given in addressing concomitant nerve injuries. The rate of upper limb salvage is almost 100% due to the prompt detection and transfer to a tertiary center (5). The golden hour of revascularization is less than 6 hours. Upper limbs with arterial injury were said to have a better prognosis than ordinary non-traumatic acute limb ischemia because of the presence of collateral circulation (6). Our patient was sent to the operation theatre at 6 hours of presentation. It showed that the importance of prompt intervention leading to the successful salvage of an acute limb.

Based on the Rutherford classification for acute limb ischemia, the absence of doppler signals, and profound sensory and motor loss, is categorized into Rutherford III, which is deemed to be irreversible ischemia (7). Whereas in the ESVS 2020 Clinical Practice Guidelines on the Management of Acute Limb Ischaemia, patients with Rutherford class III acute limb ischemia, primary amputation is recommended as the mortality and major amputation rates are high despite urgent revascularization (8). The patient, in this case, presented to us with a traumatic deep right cubital fossa laceration wound with suspected right brachial artery injury with the clinically cold right hand with absent pulses and doppler signals. The examination also showed profound sensory and motor loss. Despite the patient fulfilling the criteria for non-salvageable acute limb ischemia, there is still a possibility to doubt that the injury could be associated with median and ulnar nerve injuries given its anatomical location. We proceeded with wound exploration for this patient, and it was found that both the right median and ulnar nerves were cut. The patient was able to be benefited from revascularization and the upper limb remained well perfused after surgery without significant reperfusion injury. This case highlighted the fact that in traumatic acute limb ischemia, Rutherford classification can be used as a guide, but it is still very important for the surgeon's judgment in the decision of revascularization versus amputation, especially when nerve injury is uncertain.

It was recommended that the options for the artery repair would perform an end-to-end anastomosis, providing without tension or injury to collateral vessels. In an event where primary anastomosis is not feasible, another option would be performing an interposition graft. Most literature recommends saphenous vein interposition graft because it provides a superior patency rate and is more resistant to infections (9). Our patient benefited from primary end-to-end anastomosis of the brachial artery initially, however the repair is complicated with a thrombosed artery. Hence, we re-explored and performed a saphenous vein interposition graft for him. Post-operatively the patient recovered well, and the upper limb remained well perfused until now. Muscle, tendon and nerve repair should be performed after the arterial revascularization (10). Our patient underwent structural repair after the revascularization.

Conclusion

In conclusion, urgent detection and intervention for a traumatic brachial artery injury is important to allow patients to benefit from limb salvage and avoid amputation. We also recommended that one should always bear in mind that the neurological assessment of a traumatic acute limb does not always represent ischemic neuropathy, whereas the possibility of a traumatic nerve cut should not be ignored.

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