

Complex Posterior Elbow Dislocation Causing Complete Brachial Artery Transection. A Rare Complication of a Common Orthopedic Injury

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Abstract

Introduction: Brachial artery transection is a rare complication of both open and closed elbow dislocation and usually associated with anterior dislocations and penetrating injuries. Only isolated cases are reported in literature. We report an interesting case of a complex posterior elbow dislocation resulting in transected brachial artery.

Case Report: A 37 year old male was brought in following an ATV (All Terrain Vehicle) crash. Clinical examination revealed left upper extremity deformity at the elbow and humerus. X-ray revealed an acutely displaced and angulated mid left humeral fracture along with a posterior elbow dislocation. CT 3D angiogram revealed occlusion 5cm in length with reconstitution of the distal brachial artery at the level of the elbow joint. Closed reduction of the elbow along with ORIF of the humerus and a saphenous venous graft was used to repair the transected brachial artery.

Conclusion: Vascular injuries associated with posterior elbow dislocations are rare. Rich collateral circulation around the joint can mask signs of acute arterial disruption, hence repeated high index of suspicion, serial clinical examinations, appropriate imaging and prompt intervention is warranted.

Keywords: Brachial artery, Elbow dislocation, Vascular transection

INTRODUCTION

Elbow dislocations are the second commonest dislocated joint in the adult population (1), accounting for approximately 25% of all elbow injuries. (2) Arterial injuries are however rare being 5-13% of elbow dislocations. (3) If there is enough force on the elbow, transection of the brachial artery can occur.

Surgical management of this injury is immediate angiography preceding surgical repair. (4) If treatment is delayed, the injury can lead to limb ischemia or may result in significant blood loss leading to potential death.

In this report, we discuss the successful repair of a completely transected brachial artery due to a complex posterior, open elbow dislocation with humerus fracture.

CASE PRESENTATION

A 37 year old male suffered an ATV (All Terrain Vehicle) crash while intoxicated. After crashing, he walked back to his house from the woods. His family members put a tourniquet around the left upper extremity. On arrival to the trauma bay, a primary survey revealed a patent airway with bilateral breath sounds. His vitals on presentation were recorded as BP 121/62, HR 78, RR 14, saturating 98% on room air.

Secondary survey revealed a left upper extremity deformity at the level of the elbow and humerus with a 6cm open wound in the antecubital region. At this time, ulnar and radial pulses were both dopplerable. Clinical hand examination revealed a lack of the left

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thumb DIP joint flexion and the left index finger DIP (Distal Inter Phalangeal) joint flexion. Sensation was present but decreased to light touch throughout the left hand.

An X-ray was performed which revealed an acutely displaced and angulated mid left humeral fracture along with a posterior elbow dislocation with anterior open wound and soft tissue gas.

A trauma pan scan was performed due to the mechanism of the accident and associated alcohol intoxication of the patient. CT scan of head, neck, chest or abdomen were essentially negative for any injuries except the elbow dislocation and brachial artery injury (Figure 1).



Figure 1. showing elbow dislocation and brachial artery injury

CT 3D Angiogram revealed occlusion approximately 5cm in length with reconstitution of the distal brachial artery at the level of the elbow joint. The visualized portions of the radial, ulnar and interosseous arteries were patent. No contrast extravascation or pseudoaneurysm were noted.



Figure 2. 3D reconstruction showing brachial artery transection

The patient was emergently taken to the operating room. Exploration of the wound revealed a pulsatile proximal segment of the transected brachial artery. Closed reduction of the dislocated elbow was performed and relocation confirmed by fluoroscopic exam. Vascular surgery was consulted intraoperatively. The proximal and distal portions of the brachial artery was dissected out. There was excellent inflow. A heparinized segment of reversed saphenous vein harvested from the ipsilateral leg was sutured end-to-end to the brachial artery using 6-0 Prolene suture. There was excellent flow down the vein graft. Doppler signals was good with a palpable radial pulse. The wound was copiously irrigated, a Blake drain was placed and the wound was closed with 2-0 Polysorb. Prolene was used for skin closure. A well-padded posterior splint along with a coaptation splint for humeral shaft fracture and the elbow dislocation. A sling was applied.

An open reduction and internal fixation of the left humerus was done the following day. The fracture was reduced and fixated in place. Fluoroscopic images showed excellent reduction and appropriate hardware positioning. The brachial artery anastomosis was inspected and found to be intact with no leaks. Using live fluoroscopy the elbow was checked for joint subluxation in extension and flexion. The median nerve was identified and found to be intact. The wound was irrigated and closed. A sterile dressing and a long-arm posterior splint was placed.

Postoperatively, the patient was transferred to the ICU for neurovascular monitoring. His recovery was unremarkable. Postoperative day 2, he had intact light touch sensation throughout his left hand. He was able to extend his left thumb and fingers at MP (Metacarpophalangeal) joints. He is also able to abduct his fingers. However, flexion of his left thumb IP (Interphalangeal) joint and left index finger DIP joint were limited. The next day he was discharged with the drain in place which will be removed during the follow up appointments with orthopedic surgery and vascular surgery in 2 to 3 weeks.

DISCUSSION

The elbow joint is the commonest dislocated major joint in the pediatric population and the second most amongst the adults. (1) However associated major vascular injuries are rare (5) although potentially

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serious (6) and usually occurs with open, penetrating injuries and anterior dislocations. (7)

Elbow dislocation are classified into anterior, posterior, postero-medial, postero-lateral, lateral, medial and divergent. (8) Open injuries, concurrent trauma and absence of radial pulses are the risk factors for vascular injuries. (9) Vascular lesions commonly results from direct trauma (penetrating or blunt), while indirect, avulsion type injuries are relatively rarer (1,10). Brachial artery is commonly injured, occasionally radial and ulnar arteries. Brachial artery lesions include spasm, stretching, contusion, intimal flap, laceration, rupture, entrapment and thrombosis (11).

Absent radial pulses should raise alarm regarding the severity of the injury. Arterial injury can present as loss of pulses, neurologic deficits, expanding hematoma, thrill, or active bleeding. Due to rich collaterals often the classical signs can be masked resulting in a delayed diagnosis. (12) Presence of distal pulses does not always rule out arterial injuries. Louis et al (13) in his experimental cadaveric study on elbow dislocations showed that at least one collateral anastomosis gets disrupted with brachial artery injury. Further thrombosis of the collaterals with expanding hematoma causing pressure effects explains the delayed disappearance of pulse in some patients.

CT angiography is the current method of choice for traumatic arterial injuries within the extremities. (14) and potentially reduces the delay between the assessment and repair. Long segment of abruptly occluded flow usually 5-6cm proximal to the elbow joint are the typical angiographic findings. Active extravascation may be absent often due to intraluminal thrombi. (8) Duplex USG is another important tool which can potentially differentiate between transection and entrapment or thrombosis. (8,15)

Bone stabilization with immediate reduction of the dislocation, vascular repair and bridging fixation of the elbow should be the treatment algorithm. (1) Delay in management exceeding 6 hours is associated with amputations in 50% of patients with vascular injuries of the extremities, which reduces to 7% if intervened within first 6 hours. (16)

Arterial repair despite rich collaterals have been recommended by most authors. Direct suture or reversed vein graft interposition are the common choices. If the gap is not too large or the ends are not

traumatised significantly primary repair may be the way to go, otherwise autologous vessels can be used as a bridge. Repairing the transected brachial artery, studies have shown great success with saphenous vein bypass grafting which has a similar caliber to the brachial artery allowing for an optimal anastomosis. (17) Basilic vein is a good alternative. (18) Arterial ligation are reserved for unstable polytrauma patients in hypovolemic shock (1,19). Concomitant venous repair is not performed as collateral vessels allow for adequate venous drainage. There have been case reports using endovascular stent grafts in such vascular transection. (16)

Fasciotomy is indicated in patients with elevated forearm compartment pressures, significant associated soft tissue damage or prolonged delay between the injury and intervention. (1,6). With reperfusion of the extremities, risk of compartment syndrome increases. Compartment syndrome presents as changes in sensation, pain out of proportion with stimulus, and increased tension to the area. As the syndrome worsens, nerve impingement and arterial compression occurs resulting in decreased muscle strength and loss of pulses. Since the diagnosis is dependent on patient's response, it is often difficult to diagnose in those who are unconscious or uncooperative. (20)

CONCLUSION

Elbow dislocations are common although their association with brachial artery transection are rare. The generous periarticular collateral circulation can potentially mask findings of acute vascular injury leading to delay in diagnosis. Early diagnosis and emergent operative repair with a multispeciality team approach is the optimum treatment of this complicated rare injury.

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