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Case report

COMPLETE BRACHIAL ARTERY INJURY AFTER OPEN ELBOW DISLOCATION: A CASE REPORT.

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ABSTRACT

Elbow dislocation is a frequent event however, despite the anatomic proximity of the periarticular neurovascular structures to the joint, vascular injuries after dislocation are extremely rare.
Their clinical presentation can be subtle and the diagnosis is often delayed. In the event of a vascular injury, after dislocation, reduction, and joint stabilization are performed, a prompt arterial injury repair using adequate surgical techniques must take place to avoid serious consequences to the upper limb. Herein we present a case of complete injury of the brachial artery after open elbow dislocation repaired by end-to-end suture.

1. Introduction

Elbow dislocation is a frequent event, and typically occurs in young adults during sports trauma. The elbow is the second most commonly dislocated joint after the shoulder, and the estimated incidence is 6:100,000 (1).
Despite the anatomic proximity of the periarticular neurovascular structures to the joint, vascular injuries after elbow dislocation are extremely rare (1), varying from 0.3 to 1.7%. However, this frequency remains difficult to establish due to the short series of sporadic case studies reported in the literature (1).
A direct relationship between the incidence of vascular injury and the extent of the joint dislocation was described in the literature, considering the gravity and dynamic of the trauma as predictive of vascular or nervous structure damage. In this light, open dislocation is more likely to cause a concomitant vascular injury than closed dislocation (1-2).
Clinical presentation of vascular injury can be subtle and the diagnosis is often delayed due to the rich collateral circulation around the elbow, which can eventually mask findings of acute arterial occlusion (2).
Overt signs such as severe acute ischemia of the hand are not always present in the case of brachial artery transection, but common findings can be pulse weakness, capillary refill decrease and oxygen saturation reduction measured at the finger (3).
Some authors have described this clinical presentation as "Pink Pulseless Hand" (PPH) (4). Duplex Ultrasonography, CT-Angiography and Arteriography are essential instrumental procedures to correctly assess and diagnose (1).
The initial evaluation and the best treatment must be performed as quickly as possible. Therefore, a multidisciplinary collaboration between vascular surgeons and orthopaedic surgeons plays a vital role. After dislocation reduction and joint stabilization, a prompt arterial injury repair with adequate surgical techniques regarding the type, extent and localization of the lesion, must take place (1).
This paper reports a case of complete brachial artery transection associated with acute open elbow dislocation.

2. Case presentation

A 63 year-old man was transported to our hospital with a bruised-lacerated wound on the left elbow as a result of an accidental fall in his home. The bystanders reported that he fell down a small step and landed on his left hand with the superior limb extended. During the physical examination, we noticed a severe axial deformity of the upper left limb and, additionally, a large wound on the volar region of the elbow with complete exposition of the trochlea of the humerus (Figure 1).

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Figure 1. Open elbow dislocation

The radial pulse was present and valid, there were no findings of acute ischemia or sensitive/motor neurological deficit of the ipsilateral hand. An X-ray revealed a posterior luxation of the elbow without associated fractures (Figure 2). Thus, the patient was transferred to the emergency room for surgery.

Figure 2. X-ray presentation of elbow dislocation.

After abundant washing with sodium chloride solution and disinfection of the wound, a dislocation reduction under C-arm X-ray system was performed. During surgical exploration and soft tissue debridement, a complete brachial artery lesion with blood flow interruption was detected (Figure 3).

We immediately contacted the vascular surgeon on duty, who performed an end-to-end suture of the damaged artery and verified the restoration of the downstream blood flow. After this procedure, we repaired the lateral collateral ligament with direct suture. Then we evaluated the articular mobility and joint stability and decided to put an articulated elbow external fixator in place.

Figure 3. Brachial artery injury

The patient's post-operative healing was optimal and no local or systemic complications were observed.

During the first week, the elbow was fixed at 90° of flexion; after that period, the external fixator was progressively unblocked and the patient started the active and passive assisted kinesis, only avoiding extreme extension (maximum 30° degree) to preserve the brachial artery suture.

One month after surgery, the external fixator was removed and the patient continued rehabilitation without the device.

Two months after the traumatic event, the patient had regained complete articular ROM of the elbow without pain. A color-doppler-ultrasonography (CDUS) of the superior limb was performed and revealed a good seal of the vessel suture. Moreover, the blood flow inside the brachial artery was optimal.

3. Discussion

A complete lesion of the brachial artery after elbow dislocation is a very rare event. This could be considered as quite surprising considering the relatively high frequency of this type of luxation and the anatomic proximity of the periarticular neurovascular structures to the joint (1).

Based on the literature regarding this topic, damage to the vascular structures must be suspected when a high energy trauma, important articular limb excursion, anterior luxation or evident skin wound with soft tissue/bone exposition are present. Injuries and complication to the brachial artery include spasm, contusion, stretching, laceration, intimal flap, entrapment, rupture and thrombosis (2). The clinical presentation is particularly subtle, especially because the typical finding of acute ischemia like pallor of extremities and pulse weakness are often absent. This is due to the instant recruitment of the very effective collateral circle, which can provide a sufficient blood supply despite an acute interruption of the main brachial axis (1). When anamnestic information related to the dynamic of the trauma and physical examination create some doubt about possible vascular damage, a CDUS, CT-Angiography and Arteriography are mandatory to confirm or exclude arterial injury.

Ultrasound is the first procedure used to confirm a suspected vascular lesion, whereas arteriography is the gold-standard for definitive diagnosis (2).

A delayed or undiagnosed vascular lesion could lead to serious consequences, like ischemia or compartment syndrome severe enough to warrant limb amputation (2).

The patient in this case report mentioned a minor domestic trauma without high-energy impact. The dynamic of the patient's trauma was that of a typical posterior elbow dislocation with no fracture associated with a superior limb hyper-extension, supination, valgus and axial compression. Moreover, the clinical presentation of the patient was misleading, because the typical ischemia findings were absent, the radial pulse was valid and no peripheral neurological deficit was detected. The only factor that could have implied a possible arterial injury was the bone exposition. Therefore, we didn't proceed to further diagnostic exams and the patient was immediately taken into surgery.

A brachial artery lesion is generally treated with surgery to later avoid the risk of complications like chronic ischemia, limb claudication and cold intolerance. In cases of severe hypovolemic shock or serious life-threatening lesions, the artery must be surgically clamped (2).

The artery can be surgically repaired by a direct end-to-end suture or by an interposition graft. In the first technique, the edges of the artery lesion must not be excessively traumatized and the gap between the two should not be too wide. Otherwise, an interposition graft must be performed. The graft typically used is an autologous venous implant generally harvested from the saphenous vein (2).

Vascular injuries after elbow dislocation treated by an end-to-end suture, as in our case, are very rare. Even though the gap between the two vascular margins was significant, an end-to-end suture was performed and the post-operative follow-up CDUS showed an excellent hematic flow without any critical signs of ischemia.

In some clinical cases reported in the literature regarding severe traumas involving soft tissue or in cases of delayed diagnosis and treatment of vascular lesions, a fasciotomy was performed (1-2). In our case, there was no need to perform a fasciotomy of the forearm since no clinical signs of increased intra-compartmental pressure were identified, the peripheral pulses were constantly valid and the patient was rapidly and successfully treated by surgery within 4 hours of the trauma.

In all elbow dislocations, it is essential to evaluate the articular stability after reduction. Together with potential associated fractures, an articular dislocation can cause a complex ligamentous lesion, which generally runs in a lateral-medial direction. All of these things reported factors can lead to articular instability of the elbow (5).

In our case there were no associated fractures, but a lateral collateral ligament lesion was detected, which was repaired with a direct suture. We did not use a tendon anchor because only the medial third of the ligament was involved with no complete sign of avulsion.

Furthermore, an articulated external fixator was used to achieve an additional stabilization and to allow for an early controlled mobility of the elbow (6). Complete extension was not permitted to avoid any complications to the vascular suture

4. Conclusions

Elbow dislocations are common events, but their association with vascular accidents is very rare. They are more likely to occur in cases of open articular dislocation as opposed to closed dislocation.

A delayed diagnosis of a complete arterial injury may occur due to the rich periarticular collateral circulation of the elbow, which can mask findings of acute downstream ischemia.

Therefore, early diagnosis and immediate repair of this complicated injury in cooperation with the vascular surgeon are the gold standard to achieve the best clinical and functional results.

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