

CLINICAL CASE

THE FALSE EQUIVALENT OF TERRIBLE TRIAD OF ELBOW COMBINED WITH NEUROVASCULAR DAMAGE IN A RUGBY PLAYER A NEW CASE REPORT

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ABSTRACT

Terrible triad is a severe traumatic injury of the elbow. We report a new variety of this clinical entity originating from a rare combination of injuries, namely the fracture-dislocation of the right elbow. The symptoms are acute ischemia of the hand with neurological damage following a sport accident suffered by a professional rugby player. We treated him surgically after immediate reduction of the dislocation. The short-term monitoring was clinical, while in the medium-term it was radiological and electrophysiological. On the whole, our (clinical, electrophysiological and radiological) results obtained initially, and medium-term during the last consultation, were satisfactory. The objective of this study is to draw attention to this clinical and radiological variety, as well as to its neurovascular complications and to discuss its therapeutic treatment. During the vascular and neurologic exam we should pay attention to and systematically look for neurovascular complications when treating a similar clinical case.

KEYWORDS: Equivalent of terrible triad, anterior dislocation, elbow, neurovascular lesion, contact sport.

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INTRODUCTION

Terrible triad is a severe traumatic injury of the elbow. It refers to a posterior dislocation of the elbow associated with fracture of the radial head and fracture of the coronoid process (1, 2). This clinical entity was first

described by Hotchkiss in 1996 (1). It is generally caused by a violent injury of indirect mechanism. We report a case with a rare combination of a closed injury in the right elbow secondary to a sport accident. It combines a reconstructable fracture of the radial head, a fracture of

the coronoid process and an antero-lateral dislocation of the elbow. This condition was accompanied by an acute ischemia and paralysis of the hand.

The objective of our study is to draw attention to this serious traumatologic entity and to the necessity of meticulous, systematic neurovascular exam in case of all elbow injuries. On the whole, our (clinical, electrophysiological and radiological) results obtained initially and medium-term during the last consultation, were satisfactory.

CASE REPORT

The patient was a 28-year-old French national and professional rugby player who was admitted to the Emergency Department with a closed injury of the right elbow after having suffered an accidental injury at a training session. The exam showed a swollen, edematous, deformed elbow without normal anatomical landmarks. We were struck by the marbled appearance of the hand with impaired extension of the wrist and the fingers. The dorsal and palmar sides of the hand had loss of sensation, while he could not extend or adduct the thumb, giving the impression of a "paralytic hand". The vascular exam showed a cold hand. Distal pulses, including the radial and the ulnar pulse, were absent. The elbow radiographs (frontal and lateral view) (Figures 1a-b) showed a large antero-external dislocation of the elbow with no fracture in the olecranon, associated with a large displacement and a type II fracture of the radial head, according to Mason classification.

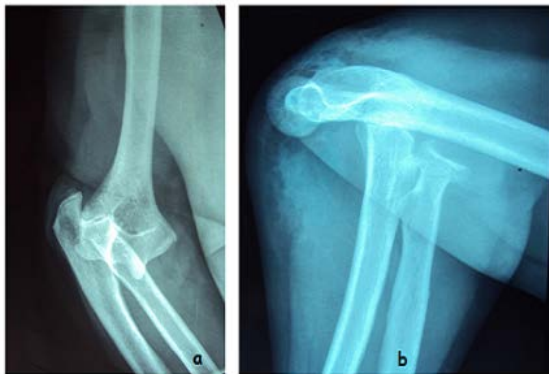


Figure 1: Standard radiography of the right elbow. a) Frontal view showing an external displacement. b) Lateral view showing the fracture of the radial head associated with an anterior dislocation.

Reduction of the dislocation was done urgently under general anesthesia (Fig.2). The member was warmed and monitored. We observed that fingers progressively regained their color, and radial and ulnar pulse became palpable. From the neurological standpoint, we first saw the extension of the thumb, while sensation in the area of the radial nerve and in the area of the median nerve was still decreased. Abduction and adduction of the fingers were still impaired. The elbow was immobilized with a temporary brachial-antebrachial-palmar plaster splint

(BABP), and with proper analgesia. An additional elbow scan was performed, which confirmed that the radial head was fractured and the coronoid process was pulled-out (Fig.3).



Figure 2: Post reduction radiological imaging.

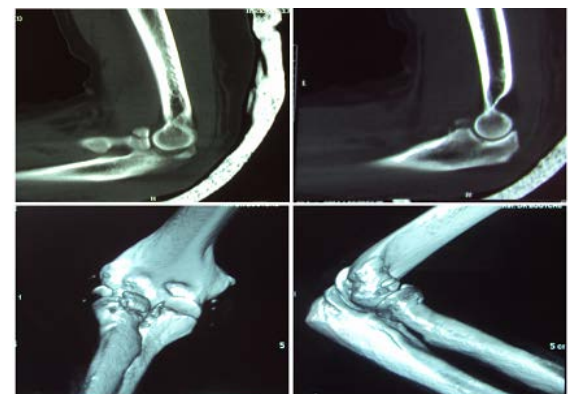


Figure 3: Scan check with 3D reconstruction.

The post reductional treatment consisted of monitoring the fingers regaining their color, the distal pulses, as well as administering an anticoagulant at a prophylactic dose. By the next day, the patient had partially recovered the extension of the fingers, in particular the index and the middle fingers and the opposition of the thumb. Sensation in the area of the median nerve was present with persistence of tingling sensation and hypoesthesia. However, the ulnar nerve was completely paralytic. An electromyogram (EMG) was taken and showed a decrease in the sensory and motor nerve conduction velocity in the area of the radial and median nerves. On the other hand, it showed an absent ulnar nerve conduction velocity on the forearm and the wrist. In the second intention, treatment of the bone and ligamentous damage was scheduled 3 days later, and done by surgery. Reconstruction of the radial head was performed with external approach, using micro screws after the reduction. However, the coronoid process had a small, not synthesizable fragment. We repaired the anterior capsule with transosseous sutures. Then, we repaired the lateral ligament with the same approach using resorbable anchors, followed by a complimentary immobilization by BABP splint (Fig.4). The post-operative follow-up consisted of clinical monitoring of the pulses and clinical signs of compartment syndrome, as well as passive

rehabilitation of the hand. By the end of the next week, the patient had fully recovered the extension of the fingers, as well as the sensation in the area of the median nerve but the ability of abducting and adducting the fingers was still completely missing. The patient returned 4 weeks later. The neurologic exam showed a full recovery of radial and median nerves' neurologic functions, with persistence of paresthesia in the area of the median nerve. Furthermore, the tingling sensation still remained but we saw a sign of approaching moves of fingers in the area of the ulnar nerve. The EMG showed normal radial and subnormal median nerve conduction, and a decrease in the ulnar nerve conduction with substantial improvement compared to the initial electrophysiologic results.

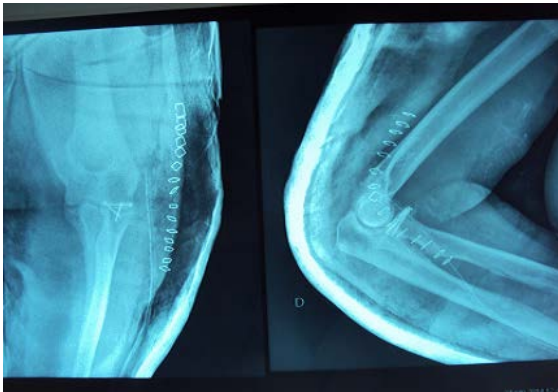


Figure 4: Standard radiograph, frontal and lateral view, after surgical repair in the second intention.

DISCUSSION

Fracture-dislocation of the elbow is a serious disease entity, and management is often difficult (3). Terrible triad of the elbow represents a well-defined anatomical-pathological variety that was first described by Hotchkiss in 1996 (1). It is characterized by a posterior dislocation of the elbow associated with a fracture of the radial head and the coronoid process. Our study is unique because of the antero-external variety of the elbow dislocation and because the hand's neurovascular lesion is misleading. With this resemblance, taking into account the differences when compared to terrible triad, we called it "equivalent of terrible triad" associated with a very serious neurovascular complication.

Anatomically, the elbow is a very stable, mobile joint complex that suffers mechanical stress in the lever arms. It is also rich in neurovascular elements, with almost all of them located on the anterior side that leaves passage to vascular and nervous elements going to the forearm and the hand, with the exception of the ulnar nerve, which passes on the posterior side. Generally, fracture-dislocations of the elbow are a result of a violent, high-energy injury. This lesion can be caused by two mechanisms; either by an indirect mechanism or by a violent shock directly on the elbow. Two types of lesion can occur depending on the velocity of the injury and the combination of the previously described mechanisms.

Isolated dislocation, which can be posterior, anterior or lateral, and ligament rupture are systematic. In case of fracture-dislocations, lesion exam is more complex and includes ligamentous, capsular, bony and neurovascular damages (4). In our case, as the clinical and anatomical analyses were complex, we think of the association of at least two of the above mentioned lesion mechanisms. Also, we believe that the antero-external dislocation was complicated with lateral and medial ligament rupture. The mechanism of the neurovascular lesion was caused by the stretching of the nerves without a clear section, and a spasm in the brachial artery, as it was shown by the nervous and vascular recovery after the reduction. Anterior dislocations are not uncommon (5). In case of isolated anterior dislocations, predisposing factors, such as olecranon aplasia or excessive joint laxity, should be systematically looked for. Clinically, anterior fracture-dislocations present with an elbow that is almost completely extended, with limited supination in the forearm, and with posterior palpation of the distal humerus while the surface of the olecranon disappears. Moreover, the tendon of the biceps protrudes anteriorly under the skin. Orthopedic treatment generally allows an easy reduction under general anesthesia, by axial traction in order to open up the olecranon. This should be followed by immobilization and rehabilitation. In case of triceps rupture, a transosseous reinsertion is necessary. Complexity of bone damage should not prevent the search for associated lesions, notably those of neurological or vascular nature, as well as for compartment syndrome due to the rupture of interosseous membrane.

In our case, reduction of the dislocation was performed urgently under general anesthesia. On the third day, reconstruction of the radial head was performed with an external approach using micro screws after reduction. However, coronoid process was in the form of a small, non-unifiable fragment. We closed the anterior capsule by with transosseous sutures. Then, we repaired the lateral ligament with the same approach using absorbable anchors, associated with a complimentary immobilization by BAPB splint. Some other therapeutic options may be possible to treat this type of fracture, notably prosthesis replacement or resection of the radial head and repairing the coronoid process with micro screws if the radial head suffered a burst fracture, and if the coronoid process is unifiable (1-3). Otherwise, reduction of the dislocation is systematic (1). Vascular complication is rare but very serious. It can affect either the brachial artery or one of its branches (6). During our literature research, we have found rare cases presenting with this complication (7), but in our clinic there were no cases registered that resembled this clinical and radiological entity. Anatomic and pathologic lesion of the artery can present in form of vascular spasm, intimal lesion, acute thrombosis or artery rupture. This complication remains classic in open fracture-dislocation

patterns. If a closed fracture-dislocation occurs, even if it looks common, vascular emergency should not be ignored. It presents with disappearance of the radial and downstream pulse, which not necessarily immediately but threatens distal blood supply because of several anastomoses in the area of the elbow. Sometimes the clinical picture is characterized by acute ischemia, as it happened in our case. It occurs after a serious elbow injury, as it is associated with large damage in the anterior part of the capsule (6). Only the disappearance of the radial pulse can suggest the diagnosis, and dislocation must be reduced urgently, as well as arteriography has to be performed in the operating room, if necessary. If the downstream pulse does not reappear or if arteriography is hindered, surgical exploration becomes necessary (8). Surgical repair may be done by endovascular technique, while a rupture may be repaired with venous graft, whether associated or not with surgical repair of the structure of the antero-internal capsular ligaments. If this clinical form is typical, special attention should be paid to more discrete, subacute forms, initially conserving the pulse (8). It is also necessary to look for early signs of compartment syndrome. If the lesion is confirmed by the arteriography, the aforementioned therapies should be associated with systematic brachial and antebrachial aponeurotomy. Some authors suggest a systematic surgical exploration of arterial spasms if doubts persist after orthopedic treatment. This is to eliminate any incarceration or focal thrombosis of the brachial artery after intimal lesion (9). One of the rare cases was described by Hofmann D et al. as a total rupture of the brachial artery following a surgically repaired elbow dislocation. The nerve is most often strained, in exceptional cases is torn (10). Otherwise, after the reduction of fracture-dislocations, median nerve may be incarcerated in the humero-ulnar joint (10), which means that the treatment of this kind of lesion has not only medical but also legal consequences.

Thus, our clinical, anatomical and electrophysiological results may be more significant than that of other authors in literature (1, 2, 10, 11). We insist that preoperative planning, as well as surgical treatment should be specific to each case. Overall, prognosis of these lesions depends on the swiftness of initial treatment and the complexity of anatomical lesions.

CONCLUSION

This case is an exceptional case with neurovascular damage following a variety of terrible triad of the elbow, secondary to a contact sport accident. In the vascular and neurologic exam, we should pay attention to and systematically look for neurovascular complications when facing a similar case.

PATIENT CONSENT

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

COMPETING INTERESTS

The authors declare no competing interests.

AUTHORS' CONTRIBUTIONS

The participation of each author corresponds to the criteria of authorship and contributorship emphasized in the [Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly work in Medical Journals](#) of the [International Committee of Medical Journal Editors](#). Indeed, all the authors have actively participated in the redaction, the revision of the manuscript and provided approval for this final revised version.

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