Case Report

Triceps avulsion associated with capitellum fracture: An unusual lesional combination in the elbow

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Introduction

Triceps avulsion and fracture of the capitellum is a rare lesional combination. Elbow dislocation with radial head fracture, coronoid process fracture or capitellum fracture, and Monteggia fractures, the “Terrible Triade”, are well-known lesional combinations.

Several authors have recently reported new lesional combinations at in the elbow involving the triceps [1–5]. Only one case reports this specific lesional association of triceps avulsion with fracture of the capitellum [1].

We have encountered one case of capitellum fracture concomitant with bony triceps avulsion, and we have performed a literature review for this rare lesional association in the elbow.

Case report

An 80-year-old woman was experiencing elbow pain and acute functional disability after a short fall. Initial examination showed elbow swelling without neurological, vascular or cutaneous complications. There was no evidence of elbow dislocation.

The X-rays results showed 2 clearly visible bony fragments on the lateral view of the elbow: one on the anterior part and one on the posterior part of the distal humerus (Fig. 1).

A CT-Scan confirmed the combination of bony triceps avulsion and a coronal fracture of the capitellum extending to the lateral part of the trochlea (Figs. 2–4).

Surgical reconstruction was undertaken under loco-regional anesthesia, in dorsal decubitus. The fragments of the condyle were reduced and then fixed by 2 temporary pins, followed by 2 cannulated compression screws (3 mm) in antero-lateral approach to the elbow.

The triceps avulsion was treated with an intramedullary anchor and intraosseous suture in posterior approach (Fig. 5). Three weeks’ immobilisation at 45°of flexion was prescribed, followed by sessions of physiotherapy.
At 12 months after surgery, the patient had recovered active elbow extension, and the range of motion was: flexion 120°, extension −10°, supination 80, and pronation 80.

There was no instability. The MEPS (Mayo Elbow Performance Score) [6] was estimated at 86 points.

X-rays show well-healed fractures and no heterotopic ossifications.
Discussion

We found only one previous report [1] specifically documenting simultaneous fracture of the capitellum associated with a triceps avulsion fracture, or triceps rupture.

Three authors report simultaneous capitellum and olecran fractures, but not specifically [3–5].

Fracture of the head of the radius with a tear or an avulsion of the triceps tendon is a similar lesional combination that is more often described [2,7,8].

As in the study by Kim, our patient was also an elderly woman who fell full length with an outstretched arm. The patient was not able to report the position of her hand at the time of her fall [1].

The initial examination was unspecific. Patients with this lesion can present to the Emergency Unit with an characteristic attitude suggesting traumatised upper limb. The pain is located in the elbow, and elbow swelling is usual.

Testing of elbow stability or the elbow muscles is impossible because of pain. Vascular or neurological complications should be sought.
An orthogonal view of the elbow is required. Complementary views can also complete this imagery (Radial Head Profil). The Flake Sign is mentioned by several authors and visible on the lateral view of the elbow. It corresponds to the avulsion of the bony insertion of the triceps and is pathognomonic in bony triceps avulsion.

Coronal fractures of the capitellum can also be seen on this view.

Ring described a marked polymorphism of capitellum fractures: extension to the trochlea and posterior capitellum comminution among others. He proposed a classification of these fractures to choose the appropriate treatment [4], (Fig. 6).

The CT Scan is useful to characterise capitellum fractures more precisely and to detect fracture avulsions of the triceps that would not be visible on the X-ray (Fig. 7).

The lesional sequence of the injury remains unclear.

According to Levy et al. the contraction force of the triceps in this type of fall may be responsible for tendon avulsion or rupture [7]. The abrupt destabilization of the elbow in the aftermath of this avulsion would involve lesions on the primary and then secondary stabilizing elements, which could lead to elbow dislocation. Ring and Jupiter hypothesized that the elbow capsular and ligamentous structures could be compared to a stabilizing ring whose posterior column is the triceps [4]. Thus, like ruptures of the pelvic ring, a posterior rupture (triceps) would lead to an anterior rupture (radial head or capitellum) by propagation of the lesions on both sides of the lesional point of departure. The report of 4 cases associating triceps avulsion, lesion of the internal ligament and dislocation of the elbow also seems to confirm that failure of the posterior stabilizer could be the starting point of ligament lesions leading to dislocation. Thus, the present authors consider that the association of a tricipital avulsion with radial head fracture or...
capitellum fracture, or with ligament lesion or of a ligamentary lesion contributes to belongs to the spectrum of instability could be a clinical form of instability.

This hypothesis is difficult to verify because this lesional combination is rare, and it is difficult to model the lesional mechanism from the patient's past history, and there is no evaluation of the ligaments around the elbow.

Excision of the fragments of the capitellum has been proposed in lateral approach in the past [9,10]. Recognition of the complexity of these fractures has made the open reduction/internal fixation the reference.

We chose to consider 2 approaches: the antero-lateral approach to the elbow, and a posterior approach.

The first approach, possible after locating and protecting the vascular and nerve elements, provides a direct approach to the condyle and the lateral part of the trochlea. The fragments of the condyle were reduced and then fixed by 2 temporary pins, followed by 2 cannulated compression screws.

The second approach exposed the triceps, and the posterior surface of the olecranon, and the triceps was reinserted without difficulty.

This choice of 2 approaches was made with a view to obtaining a perfect reduction of the fracture of the capitellum, and because of the simplicity of the set-up. Nevertheless, the anterior external pathway exposes to lesion of the sensitive branches of the musculocutaneous nerve, the radial nerve and the radial artery, and does not enable exploration of the lateral and medial ligaments, while some authors report a frequent association of this type of fracture with ligamentous lesions. A lateral or medial extension of the posterior approach can theoretically be proposed, but there is the risk of a significant detachment, given the anterior approach.

Lateral and extended posterior approaches have been proposed by several authors.

From our point of view, the lateral route is less risky, but reduction and synthesis can be difficult, and it does not enable an approach of the internal ligament. The posterior approach can enable the initial management of all the lesions of the elbow by a single route, but the reduction of the capitellum seems to be relatively complex with this method, without olecranotomy.

Concerning the type of osteosynthesis, the use of cannulated compression screws seems to be the only therapeutic option, given

Fig. 7. Classification of capitellum and trochlea fractures.
the size of the fragments. The use of pins does not seem relevant, given the proximity of vascular and nerve elements and the risk of migration. Cannulated screws provide a solid fixation and early mobilisation.

Likewise, the treatment of triceps avulsion should provide a good fixation and early mobilisation. We chose an intramedullary anchor to providing two different methods of fixation to secure the triceps reinsertion in this elderly patient.

The immobilisation for 21 days was opted for because of the mediocre bone quality, and to allow time for soft tissues to heal. Similarly, the 2 cases reported by Kim showed good prognosis for the lesions once correctly healed, with good function and no instability 1 and 4 year later respectively [1].

Conclusion

The association of an avulsion fracture of the triceps and a fracture of the capitellum is rare. X-rays enable firm diagnosis, notably with the Fleck sign, but should be complemented by a CT Scan, because of the frequent extension to the lateral part of the trochlea. Osteosynthesis is currently the reference. The approach can be lateral, posterior, posterior with lateral extension, or both approaches, anterior and posterior, can be used. The excision of the fragments is possible if they cannot be osteosynthesized. Per-operative ligament testing after osteosynthesis should be performed to detect associated ligamentous lesions. Preoperative MRI, ligament testing, and knowledge of the traumatic mechanism can help to understand the pathophysiology of this lesional association, which remains unclear to date.

References

[1] J.-Y. Kim, J.-S. Lee, M.-K. Kim, Fractures of the capitellum concomitant with avulsion fractures of the triceps tendon, J. Hand Surg. 38 (3) (2013 Mar) 495–497.
[2] A.H. Chameddine, Avulsion of the distal triceps tendon with fracture of the radial head, Eur. J. Orthop. Surg. Traumatol. (2011) 607–610.
[3] T.G. Guitton, J.N. Doornberg, E.L.F.B. Raaymakers, D. Ring, P. Kloen, Fractures of the capitellum and trochlea, J. Bone Joint Surg. Am. 91 (2) (2009 Feb) 390–397.
[4] D. Ring, J.B. Jupiter, L. Gulotta, Articular fractures of the distal part of the humerus, J. Bone Joint Surg. Am. 85-A (2) (2003 Feb) 232–238.
[5] H.J. Goodman, J. Choueka, Complex coronal shear fractures of the distal humerus, Bull. Hosp. Jt. Dis. N. Y. N. 62 (3–4) (2005) 85–89.
[6] B. Morrey, K.N. An, Functional evaluation of the elbow, The Elbow and Its Disorders, 3rd ed., WB Saunders, Philadelphia, 2000, p. 82.
[7] M. Levy, I. Goldberg, I. Meir, Fracture of the head of the radius with a tear or avulsion of the triceps tendon. A new syndrome? J. Bone Joint Surg. (Br.) 64 (1) (1982) 70–72.
[8] M.Y. Yoon, M.J. Koris, J.A. Ortiz, R.F. Papandrea, Triceps avulsion, radial head fracture, and medial collateral ligament rupture about the elbow: a report of 4 cases, J. Shoulder Elb. Surg. 21 (2) (2012 Feb) e12–17.
[9] M.H. Ghwabbi, Fracture of the medial condyle of the humerus, J. Bone Joint Surg. Am. 57 (5) (1975 Jul) 677–680.
[10] E. Alvarez, M.R. Patel, G. Nimberg, H.S. Pearlman, Fracture of the capitulum humeri, J. Bone Joint Surg. Am. 57 (8) (1975 Dec) 1093–1096.