

An “Extreme” Floating Elbow: Seven Ipsilateral Fracture Sites and Radial Head Dislocation - Single-Stage Segmental Fixation: Case Report

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Abstract

Case Report

Introduction. Floating elbow refers to ipsilateral fractures of the humerus and forearm. We report an exceptional pattern combining seven fracture sites and a radial head dislocation. **Case presentation.** A 68-year-old left-handed man involved in a motorcycle-versus-motorcycle collision sustained, on the left upper limb, a humeral shaft fracture, a trifocal ulna fracture, a bifocal radius fracture with radial head dislocation and an open comminuted fifth metacarpal neck fracture, without neurovascular deficit. **Methods.** On day 5, in a single anaesthetic session with two successive set-ups: antegrade humeral intramedullary nailing in the beach-chair position, then, in the supine position, distal locking, closed reduction of the radial head under fluoroscopy, radial plating, double ulnar plating, and pinning of the radial styloid, ulnar head and fifth metacarpal. **Results.** Operative time was 200 minutes and blood loss 400 mL. Reduction of all fracture sites was satisfactory. The early postoperative course was uneventful at day 2. **Conclusion.** Planned proximal-to-distal segmental fixation allows single-stage treatment of a multifocal floating elbow and early rehabilitation.

Keywords: Floating elbow; Radial head dislocation; Segmental ulna fracture; Multifocal upper limb fractures; Internal fixation; Humeral intramedullary nailing.

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INTRODUCTION

Floating elbow refers to ipsilateral fractures of the humerus and forearm, which disconnect the elbow joint from both adjacent segments [9]. It is a rare injury in adults, resulting from high-energy trauma and frequently associated with open wounds and vascular and nerve injuries [1]. Its combination with an elbow or radial head dislocation, known as the “floating-dislocated elbow”, is even rarer [3].

We report an exceptional pattern combining a humeral shaft fracture with a trifocal ulna fracture, a bifocal radius fracture with radial head dislocation, and

an open fifth metacarpal fracture. The aim is to describe the segmental fixation strategy adopted and its technical challenges.

MATERIALS

A 68-year-old left-handed man was involved in a road traffic accident (motorcycle-versus-motorcycle collision). The injured limb was therefore his dominant limb. Examination revealed a deformed left upper limb at the arm and forearm, with a dorsal wound over the fifth metacarpal. There was no distal vascular or neurological deficit, and no other associated injury.

Radiographs revealed seven fracture sites associated with a radial head dislocation:

Segment	Injuries
Humerus	Angulated mid-shaft fracture (AO 12-A2)
Ulna (trifocal)	Olecranon · shaft · distal ulnar head
Radius (bifocal)	Shaft · radial styloid; radial head dislocation
Hand	Open comminuted fifth metacarpal neck fracture

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This pattern corresponds to a floating elbow with proximal (olecranon) and distal (ulnar head) articular involvement of the ulna, and radiocapitellar involvement through radial head dislocation (Figs. 1–3).

METHODS

Surgery was performed on day 5 under general anaesthesia with antibiotic prophylaxis, in a single session with an intraoperative change of patient set-up.

First stage.

In the beach-chair position, on a standard operating table and under fluoroscopy, locked antegrade intramedullary nailing of the humerus was performed. Distal locking was deliberately deferred, as the set-up did not allow it to be performed comfortably (Fig. 4).

Second stage. In the supine position, with the limb on an arm table, the following



Figure 1: Preoperative radiographs of the left arm, anteroposterior and lateral views



Figure 2: Preoperative radiographs of the left forearm and elbow, anteroposterior and lateral views



Figure 3: Preoperative radiographs of the left hand, anteroposterior and oblique views



Figure 4 : Photograph of the beach-chair set-up



Figure 5: Photograph of the supine set-up, limb on an arm table

1. distal locking of the humeral nail; steps were performed in order (Fig. 5):
2. closed reduction of the radial head dislocation by external manoeuvre under fluoroscopic control;

3. fixation of the radial shaft with a DCP plate through a Henry approach;
4. fixation of the ulna through a posterior approach: anatomical locking olecranon plate, extended with a non-locking anteromedial shaft plate;
5. pinning of the radial styloid with two K-wires;
6. pinning of the ulnar head with two K-wires, one ascending and one descending;
7. debridement and exploration of the fifth metacarpal wound, with no extensor tendon or neurovascular bundle injury, followed by Foucher bouquet pinning [10], reinforced with a transverse M5–M4 K-wire because of comminution.

Surgical approaches. Four approaches were used:

- **Humerus:** short anterolateral transdeltoid incision for the antegrade nail entry point, and a mini-incision for distal locking.
- **Radius:** anterior Henry approach, between the brachioradialis and the flexor carpi radialis, exposing the radial shaft.
- **Ulna:** posterior subcutaneous approach, starting at the olecranon and extended along

the ulnar crest to the shaft fracture, allowing both plates to be placed through a single approach.

- **Hand:** extension of the dorsal wound over the fifth metacarpal, used for debridement and exploration; the Foucher K-wires were introduced through the base of the metacarpal.

The radial styloid and ulnar head K-wires were inserted percutaneously under fluoroscopic control.

The Henry approach to the radius and the posterior approach to the ulna are two separate approaches, which limits the risk of radioulnar synostosis.

Postoperatively, the limb was immobilised in a long-arm splint.

RESULTS

Total operative time was 200 minutes and estimated blood loss was 400 mL. Postoperative radiographs showed satisfactory reduction of all fracture sites and a reduced radial head (Figs. 6–8).

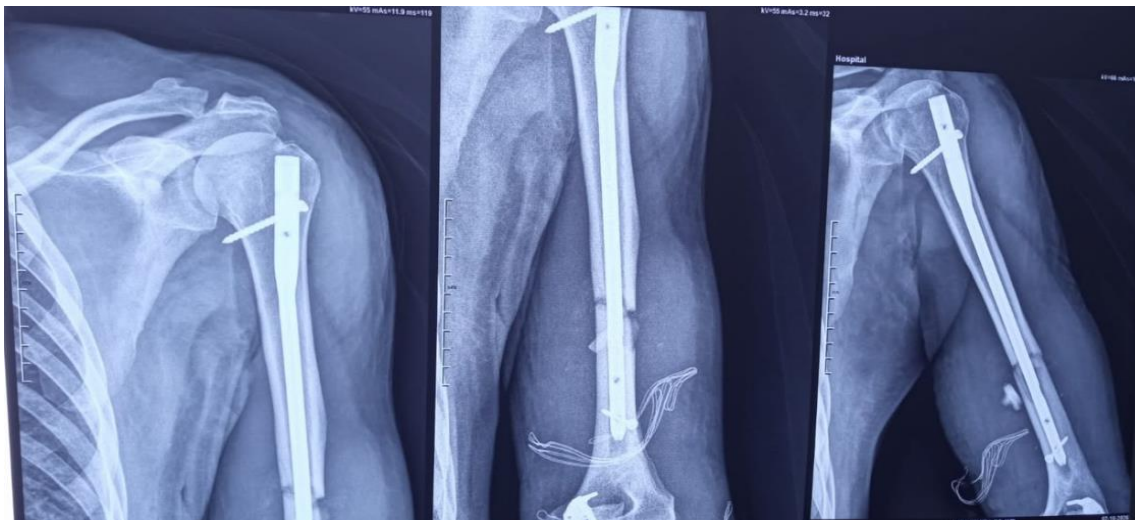


Figure 6 : Postoperative radiographs of the left humerus, anteroposterior and lateral views

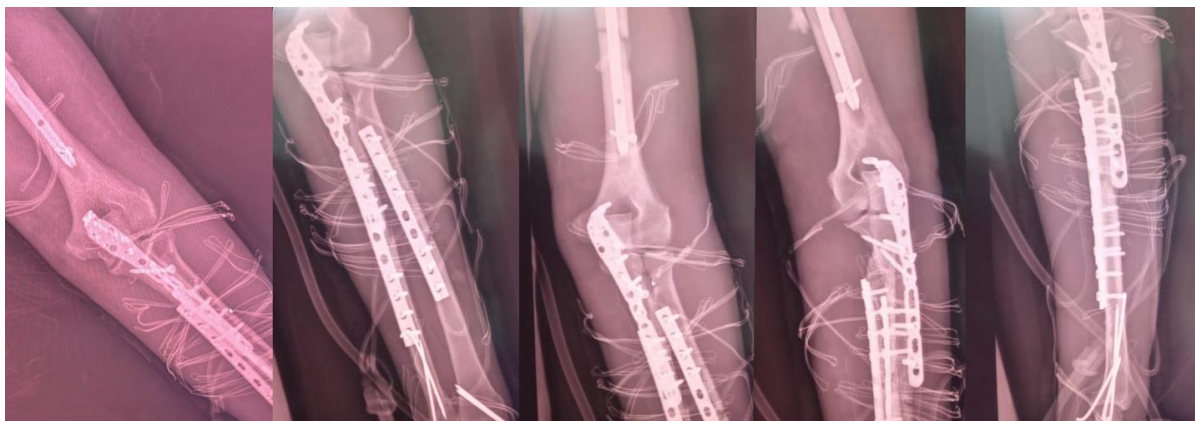


Figure 7: Postoperative radiographs of the left forearm, elbow and wrist, anteroposterior and lateral views



Figure 8: Postoperative radiographs of the left hand, anteroposterior and oblique views

On postoperative day 2, the limb was well perfused, with no sign of compartment syndrome; neurological examination was normal and the hand wound was clean.

Passive followed by active-assisted elbow mobilisation is planned as soon as skin condition allows, and K-wire removal is scheduled at 6 weeks after radiographic control.

DISCUSSION

First described in children and later applied to adults by Rogers in 1984 [9], floating elbow covers heterogeneous injury patterns: at least seven classifications coexist [1]. In Ditsios's meta-analysis (32 studies), 51% of fractures were open, 24% were intra-articular and 35% of patients had a nerve injury [1]. The floating elbow with associated dislocation remains exceptional, with only a handful of adult cases reported [3]. A trifocal ulna fracture combined with a double radial injury, a radial head dislocation and a hand fracture was not found in these series.

A proximal ulna fracture associated with a radial head dislocation constitutes a Monteggia-type fracture-dislocation. Reduction of the radial head determines elbow stability and future forearm rotation. Here, it was achieved by external manoeuvre after restoring humeral length and alignment, and before fixation of the radius, so that forearm fixation secured the reduction.

Open fractures and articular extension are the main factors associated with poor prognosis [1, 4, 5]; our patient had both. Radioulnar synostosis is also associated with poor functional outcome [4], and double forearm fixation should account for this by using separate approaches. In adults, surgical fixation of all fracture sites is the rule [6, 7, 8], and a surgical delay of more than 24 hours or staged surgery is associated with more

complications [2]. Segmental fixation tailored to each fracture site (nail, plates, K-wires) made it possible here to turn an unstable limb into a mobilisable mechanical unit in a single anaesthetic session, a prerequisite for early rehabilitation.

The intraoperative change of set-up is a major technical challenge. The beach-chair position facilitates antegrade nailing but hinders access to the elbow and forearm. Deferring distal locking allowed the steps to follow a logical sequence without compromising final stability.

The strategy followed a proximal-to-distal order: stabilising the humerus restores length and alignment, reducing the radial head restores the radiocapitellar joint, and forearm fixation then restores the radioulnar frame before the distal injuries are treated.

In El Ibrahim's series, union was achieved on average at 3 months for the humerus and 2.6 months for both forearm bones [6]. Union of the shaft fractures is therefore expected in our patient around the third month, and earlier for the metaphyseal-epiphyseal fractures and the fifth metacarpal, which justifies K-wire removal at 6 weeks. The patient's age and the involvement of the dominant limb make the functional stakes particularly high.

The main limitation of this report is its follow-up: it is reported in the immediate postoperative period. Follow-up will determine the actual union of each fracture site and the functional outcome.

CONCLUSION

This case illustrates an "extreme" form of floating elbow combining seven fracture sites and a radial head dislocation. Complete segmental fixation, planned from proximal to distal and performed in a

single anaesthetic session with two successive set-ups, achieved bone stability allowing early rehabilitation.

Take-home messages

1. Floating elbow is a marker of high-energy trauma: systematically look for open wounds, vascular and nerve injuries, and associated dislocations.
2. A radial head dislocation should be sought in any proximal ulna fracture.
3. In adults, surgically fix all fracture sites, ideally in a single anaesthetic session.
4. Tailor the implant to each fracture site: segmental fixation turns a “disarticulated” limb into a stable unit.
5. Plan the set-up: deferred distal locking can simplify an intraoperative change of position.
6. Follow a proximal-to-distal order: humerus, radial head, forearm, then distal injuries.

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