

# Management of Isolated Coronal Fractures of Distal Humeral Epiphysis by Herbert Screw

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## Abstract

Isolated fractures of the distal humerus are rare. Their diagnosis is often late, and treatment has progressed but serious complications may occur. We conducted a retrospective study of a series of 10 cases at the Department of Orthopedic and Traumatologic Surgery of the Ibn Sina University Hospital in Rabat over a 4-year period, from January 2018 to January 2022. All our cases were treated surgically with Herbert screws. The functional, clinical and radiological outcome was satisfactory with a return to pre-fracture activity in all patients.

## Keywords

Elbow, Capitellum, Herbert Screw

## 1. Introduction

Coronal joint fractures of the distal humerus are a rare injury (less than 1% of elbow fractures) [1] and often go unnoticed. They are caused by an axial force transmitted by the radial head during a fall on a hand in extension or during the reduction of a posterolateral dislocation of the elbow [2] [3]. They may involve only the capitellum or part or all of the trochlea. Vigilance is necessary since the lateral collateral ligament may be affected and a fracture of the radial head may be observed in some patients [4].

Open reduction and internal fixation (ORIF) is the treatment of choice for coronal joint fractures of the distal humerus. Several fixation options have been described for this type of injury. However, stable fixation remains limited by the small volume of the subchondral fracture fragment, which presents a surgical challenge [2]. Also, it should be mentioned that the ideal management for fron-

tal fractures of the distal humerus is vague since no comparative studies have been conducted in this direction.

We report a series of 10 cases treated in the Department of Orthopedic and Trauma Surgery of the Ibn Sina University Hospital in Rabat.

## 2. Material and Methods

The present work is a retrospective study of 10 cases of coronal fractures of the distal humerus treated by Herbert's screw regardless of the traumatic mechanism, sex, terrain or affected side (notably dominant or not) over a period from January 2018 to January 2022, collected at the Department of Orthopedic and Trauma Surgery of the Ibn Sina University Hospital in Rabat.

We excluded from our study fractures involving the metaphysis and diaphysis of the humerus as well as epiphyseal fractures not treated with Herbert screws. We also excluded incomplete records and patients who were lost to follow-up.

Our study was conducted in accordance with the standards of medical ethics.

The average age of our patients was 26 years (between 18 and 40 years), with a sex ratio of 1.5 (6 males and 4 females).

All patients underwent a complete radiological workup including two orthogonal radiographic views and a CT scan.

We used Dubberley's classification. A slight predominance was noted in the type 2A group, with 4 patients (**Figure 1**); 3 patients were diagnosed as type 1A (**Figure 2**), 2 as type 1B and only one patient as type 3A.

No fracture nor dislocation was noted. The neurovascular system was intact in all our patients.

All our patients underwent open surgery. In 8 cases, a lateral (Kocher) approach was adopted; only 2 patients were treated by anterolateral approach.



**Figure 1.** Pre- and post-operative radiological work-up of a type 2A patient.



**Figure 2.** Pre- and post-operative radiological work-up of a type 1A patient.

Osteosynthesis was performed with Herbert screws, and plaster cast immobilization was routinely applied. Our patients followed a well-defined rehabilitation program.

The average follow-up was 14 months with a range of 12 to 24 months. A monthly check-up was recommended for the first 6 months, followed by a long-term follow-up every 6 months.

Clinical follow-up was based on the presence of pain according to the visual analog scale (VAS); joint amplitudes were tested by goniometer; grip strength was evaluated subjectively in the absence of the availability of a dynamometer; and joint laxity was evaluated by valgus and varus provocation tests.

Radiographic monitoring of bone healing was based on the appearance of a bone callus or the persistence of the fracture line, suggesting pseudoarthrosis, as well as the evaluation of the osteosynthesis in search of possible disassembly of the material.

Data were summarized in **Table 1** and analyzed on SPSS.

### 3. Results

The average bone healing time was 5 months. No reduction loss nor pseudoarthrosis was noted. Clinical evaluation showed intermittent pain in 2 cases; grip strength was similar to the uninjured side in all patients; no laxity was reported. Mobility analysis showed satisfactory results (**Figure 3**), especially in both type 1B patients, with a mean flexion-extension arc of 100°. Pronosupination was complete in all patients.



**Figure 3.** Clinical control of a type 2A patient.

**Table 1.** Summary of the data concerning our group of patients.

	1	2	3	4	5	6	7	8	9	10
Age	18	20	27	32	22	24	25	28	24	40
Sexe	Male	Male	Female	Male	Female	Female	Male	Male	Male	Female
Clinical examination	P + FI	P + FI	P + FI	P + FI	P + FI	P + FI	P + FI	P + FI	P + FI	P + FI
Radiological assessment	X-ray + CT scan	X-ray + CT scan	X-ray + CT scan	X-ray + CT scan	X-ray + CT scan	X-ray + CT scan	X-ray + CT scan	X-ray + CT scan	X-ray + CT scan	X-ray + CT scan
Dubberley's type	2A	2A	2A	1A	2A	1B	3A	1B	1A	1A
Approach	Lateral	Anterolateral	Lateral	Lateral	Lateral	Lateral	Anterolateral	Lateral	Lateral	Lateral

P: Pain; FI: Functional Impotence.

## 4. Discussion

Coronal fractures of the distal epiphysis of the humerus are rare, and the literature is limited to a series of cases, which makes it difficult to make any conclusions and to outline the therapeutic management [5].

The physical examination is a very essential step since associated lesions are frequently involving the lateral collateral ligament or the radial head (in 60% of cases) [4]. Brouwer *et al.* [6] point out that 33% of the patients in their series had a dislocation of the elbow and/or a fracture of the radial head. The clinical examination always begins with an inspection, which may reveal ecchymosis, edema or deformity. Then, palpation allows localizing a painful point especially at the level of the bony prominences (lateral and/or medial epicondyle, olecranon). The joint amplitudes of the elbow are also examined. The overlying and underlying joints are assessed (shoulder and wrist) and finally a vascular-nerve examination is performed. Imaging is based on radiographic views of the face and profile and possibly oblique views. Additional CT scans are most often necessary since they improve inter- and intra-observer reliability [7].

Several classifications have been reported in the literature for coronal fractures of the distal humerus. The system described by Dubberley [10] is used to guide surgical management in the choice of the approach and fixation method. It also allows the prognosis of the fracture to be assessed on the basis of type. Type I involves the capitellum with or without the lateral ridge of the trochlea; type II involves the capitellum and trochlea in a single fragment; and finally type III involves the capitellum and trochlea in two separate fragments. The absence (A) or presence (B) of comminution was also noted.

The traditional treatment for coronal elbow fractures is open reduction internal fixation (ORIF), requiring preoperative planning and anatomical reduction of the articular surface. Other therapeutic options include orthopedic treatment, closed reduction and percutaneous screw fixation, osteochondral fragment excision, and fixation with arthroscopic assistance [8] [9].

Lateral exposure is the most appropriate approach and provides access to the entire anterior surface of the trochlea. Dubberley *et al.* recommended the posterior approach to control the medial and lateral side and avoid nerve damage [10].

Screw fixation is the ideal technique for ORIF. Screws are placed according to the fracture line, playing a compression role [11] or acting as a lag screw which was described by Silvére *et al.* [12]. Some authors have demonstrated that using plates offers better resistance to rotational and shear forces, but leads to clinical discomfort and posterior impingement, requiring removal of the implant [13] [14].

## 5. Conclusion

Coronal joint fractures of distal humerus are a rare condition and often go undetected. Surgical treatment is the GOLD Standard, allowing anatomic restoration of the joint with better clinical results.

## Conflicts of Interest

The authors declare that there are no conflicts of interest.

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