

## Capitulum Fracture Treated by Herbert Screwing: About 4 Cases and Review of the Literature

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### Abstract

### Original Research Article

Capitulum fractures are rare. Their initial management must be early and optimal because of the risks generated on the elbow: stiffness, instability, pain and osteoarthritis. Many treatments have been proposed. Our study describes screwing by Herbert screw performed in four patients identified between March 2021 and December 2021. They were included according to the criteria for elbow trauma with external exquisite pain with a line of frontal radiological fracture of the external humeral condyle carrying the outer cheek of the trochlea. The diagnosis was oriented by clinical examination and confirmed by AP and lateral X-rays supplemented by CT scan. The lesions were classified according to Bryan and Morrey. The patients underwent emergency surgery using the posterolateral Kocher approach, open reduction and then stabilization with buried Herbert screws. The mean follow-up was 16 months. The mean total functional recovery was 5.3 months. The functional evaluation was considered excellent according to the MEPI score (Mayo Elbow Performance Index) for the three patients. There was no dismantling of equipment. Mean bone consolidation was 2.9 months.

**Keywords:** Capitulum, Hahn-Steinthal fracture, Herbert screwing, internal osteosynthesis.

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## 2. INTRODUCTION

Isolated fractures of the capitulum are rare. They represent 1% of all elbow fractures and 6% of humerus fractures [1]. The initial management of these lesions must be early and effective because of the risks generated on the elbow in the short term: rigidity, instability; and long-term ones: post-traumatic osteoarthritis [2]. Numerous treatments have been proposed [2]: radical treatment such as early excision of the capitulum and conservative treatment, in particular osteosynthesis using various implants. Our study describes screwing with Herbert screws in order to help improve the management of these lesions.

## 3. RESEARCH METHODS

Our retrospective study extended over 9 months concerning four patients who were hospitalized in our department. They were included according to the criteria of elbow trauma with exquisite external pain with a line of frontal radiological fracture of the external humeral condyle carrying the external cheek of the trochlea. The diagnosis was oriented by clinical examination and confirmed by AP, lateral and ¾ internal X-rays. The lesions were classified according to

Bryan and Morrey [2]. The patients underwent emergency surgery using the posterolateral Kocher approach [3], open reduction then stabilization with Herbert screws. Intraoperative mobility was assessed looking for instability. The mean follow-up was 16 months. Functional assessment was made using the MEPI score (Mayo Elbow Performance Index) [4].

## 4. RESULTS

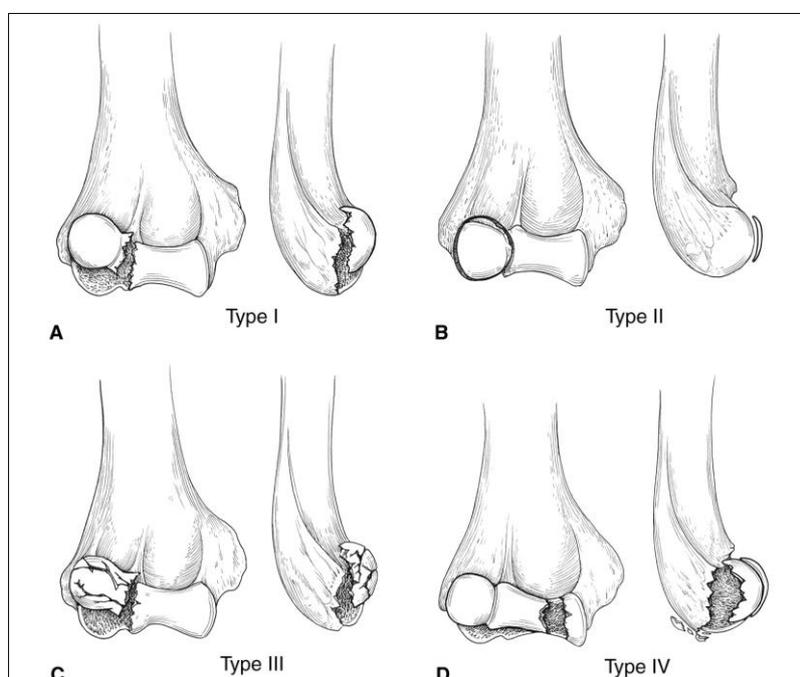
**Observation 1:** A 34-year-old patient, right-handed, was admitted to the emergency room following a fall from height with landing on the left elbow in flexion. On arrival, the clinical examination objectified an attitude of the traumatized left upper limb (Figure 1), lateral pain in the bend of the left elbow with significant swelling. The anatomical landmarks of the elbow corresponding to the Triangle of Nélaton were preserved and there was no sensory deficit. The X-rays (Figure 2) showed a fracture with a frontal line involving the capitulum and the lateral portion of the humeral trochlea. The patient was operated on urgently. The anesthesia was of the interscalene block type. After placement of a pneumatic tourniquet, the approach to the elbow was posterolateral according to Kocher [3].

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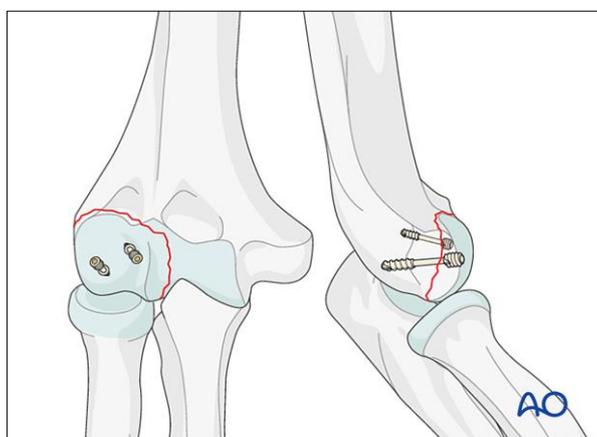
Kirschner wires under scopic control obtained the reduction of the fracture temporarily. The fixation was made by screwing the trochlea and the capitulum with 2 extra-articular anteroposterior Herbert screws buried in the subchondral bone (Figure 3). After verification of elbow mobility, additional elbow immobilization with a posterior brachio-antebrachio-palmar splint was placed for three weeks. No incident per or immediate postoperative was noted, the patient left the hospital 48 hours after the intervention. The follow-up was spread over 16 months with regular clinical and radiological examinations, first monthly during the first 6 months then quarterly. The mobilities were compared with the opposite side. Reduced mobility was noted upon removal of the splint. Rehabilitation was started at 4 weeks by progressive mobilizations. Joint amplitudes were restored at 3 months after 19 physiotherapy sessions. The MEPI (Mayo Elbow Performance Index)

score was 96. The radiological signs of consolidation were partial at 5 weeks and complete at 2 months. There was no dismantling of material.

**Observation 2:** A 47-year-old patient, housewife, left-handed, was admitted following a fall on her left elbow at home, for pain and functional impotence. Initial examination revealed a swollen, hot, painful elbow with exquisite antero- external pain. Anatomical landmarks were preserved. The radiological assessment (Figure 4) showed a displaced fracture of the capitellum and the lateral cheek of the trochlea with a simple frontal line. The patient was operated on (Figure 5, Figure 6) in an emergency according to the same principles as before. Functional recovery was obtained after 19 months also with a MEPI score of 95. Bone healing was complete at 3 months. There was no dismantling of material.



**Figure 1: Types of capitulum's fracture**



**Figure 2: Herbert screwing of the capitulum**

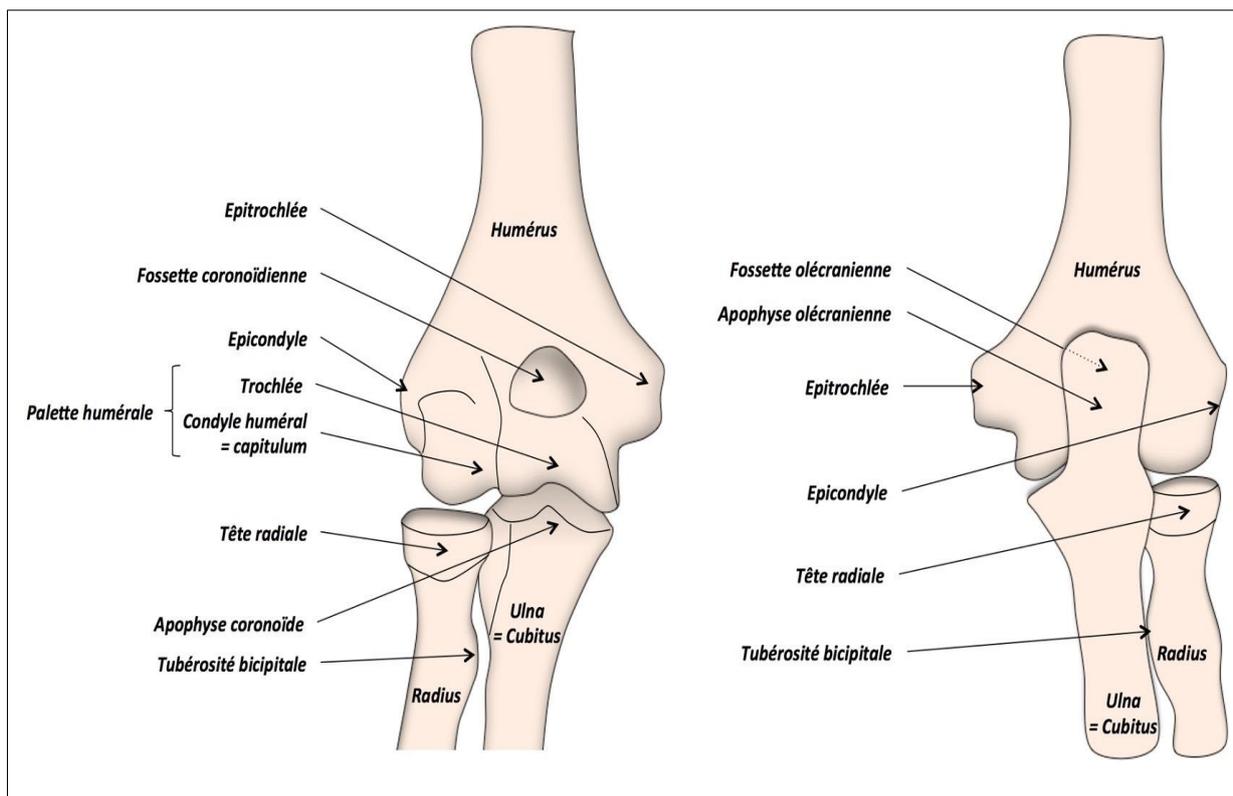


Figure 3: Elbow's anatomy

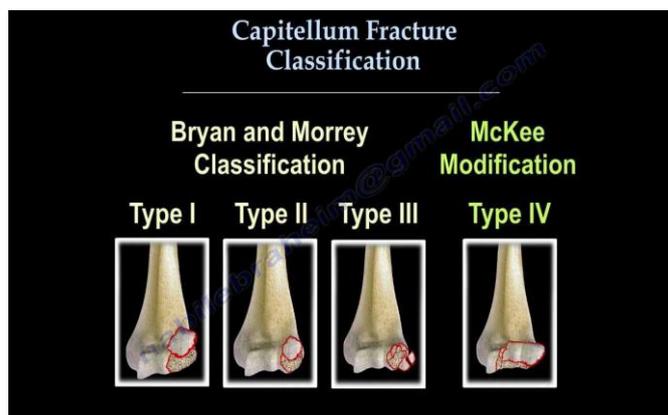


Figure 4: Bryan and Morrey Classification



Arrow: capitellum fracture

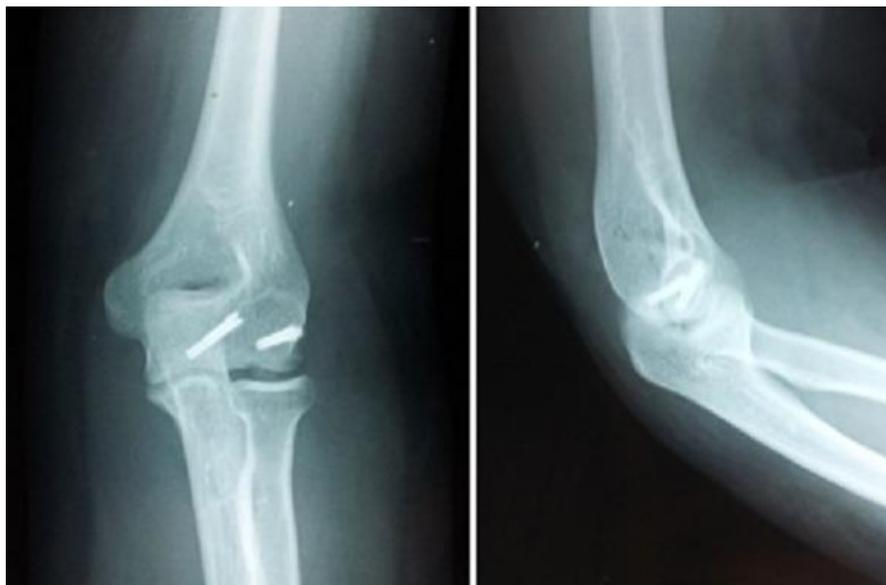
Figure 5: X-ray of a capitulum fracture



**Figure 6: Profile x-ray of the elbow**

**Observation 3:** A 41-year-old patient, left-handed, bank hostess, suffered a fall from the stairs with a landing on her left elbow. She was admitted to the emergency room for left elbow pain with total functional impotence. The examination found a swollen left elbow with a bruise on the external face, exquisite external pains. The anatomical landmarks of the left elbow were preserved. The elbow X-rays (Figure 7)

showed a fracture of the capitellum and the external cheek of the trochlea. Kocher's postero-lateral approach in the operating room after interscalene block demonstrated the fracture. Reduction of the capitellum fracture followed by screwing with two buried Herbert screws were performed. Complete recovery of range of motion was achieved at 19 months. The MEPI score was 97. Bone consolidation was complete at 3 months.



**Figure 7: Postoperative x-ray of the elbow with Herbert screw**

**Observation 4:** A 52-year-old patient, right-handed, philosophy teacher, fell victim to a fall from the stairs in the establishment where she taught with a landing on her right elbow. She was admitted to the emergency room for intense pain in her right elbow with total functional impotence. The examination found a swollen right elbow with a significant bruise and sharp pain on the external side. The anatomical landmarks of the left elbow were preserved. The elbow X-rays (Figure 7)

showed a fracture of the capitellum and the external cheek of the trochlea. Kocher's postero-lateral approach in the operating room after interscalene block demonstrated the fracture. Reduction of the capitellum fracture followed by screwing with two buried Herbert screws were performed. Complete recovery of range of motion was achieved at 16 months. The MEPI score was 99. Bone consolidation was complete at 4 months.



**Figure 8: Intraoperative image of the elbow with visible fracture of the capitulum**



**Figure 9: Herbert screwing of the capitulum**



**Figure 10: Scannographic image of a capitulum fracture**



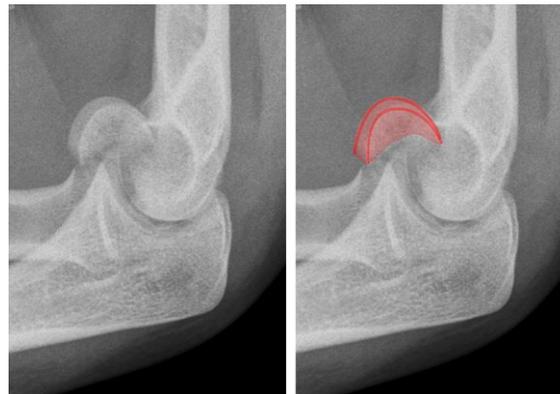
**Figure 11: X-Ray and tomodensitometry image of a capitulum fracture**



**Figure 12: Herbert screwing of the 4<sup>th</sup> patient**



**Figure 13: Intra operative image of a capitulum fracture**



**Figure 14: X-ray of a capitulum fracture with the arc**



**Figure 15: Herbert screwing of the capitulum**

## 5. DISCUSSION

The rare Hahn Steinthal fractures reported describe a female predominance dominated by patients aged over 12 years [5, 6]. The contributing factors

encountered are ulna-valgus and ulna-recurvatum [7, 8]. The causes described in the literature and also for our patients are falls on the flexed elbow. This results from the transmission of an axial force through the radius which produces a shear of the capitulum in the coronal

plane [9]. The three patients presented in our study were identified in our service during the period from January 2012 to December 2013, i.e. two years. The typical warning sign is pain with sometimes lateral swelling of the elbow. As in our case, the frontal X-ray may be normal. The diagnosis is thus made by the lateral X-rays which show a crescent-shaped fragment detached from the humeral condyle. A CT scan with possible reconstruction can be performed for the study of the size of the fragment and the operative planning but it was not essential in our case. The classification proposed by Bryan and Morrey [2] made it possible to classify our patients as stage I. Patient 3 presented with a composite form associated with a radial head fracture classified as stage II by Mason [10]. The treatment of displaced fractures of the capitulum is debated [7-9]. Closed reduction followed by cast immobilization has been recommended. Hahn [9] was the first to report the unsatisfactory outcome of orthopedic treatment of a coronal shear capitulum fracture. During the autopsy, he found that the capitulum had been displaced and joined to the anterior surface of the humerus causing restriction of elbow flexion.

Our treatment consisted of a more anatomical open reduction and stabilization with 2 Herbert screws, thus allowing better compression. A “testing” of mobility was done intraoperatively, thus evaluating congruence. A wide variety of internal stabilization techniques have been described such as Kirschner wires [1, 7], biodegradable pins [8], staples, bone clamps, and lag screws [1, 8]. Pins do not provide strong compression and stabilization of the fracture site. Most of these methods require a long period of postoperative immobilization which interferes with early functional recovery. Herbert screws have the advantage of being buried so they do not irritate the soft tissues. There is no need for screw removal hence the rehabilitation program starts earlier and functional recovery is faster [1]. The MEPI score for our patients was globally excellent, thus reflecting good functional recovery. The implant is placed outside the articular surface, which reduces the frequency of appearance of osteoarthritis. The disadvantages associated with grub screws are pseudarthrosis and chondrolysis. They expose the metallic implant to the adjacent radial head and can lead to erosion or arthritis inside the joint. Fortunately, reports of the development of pseudarthrosis are rare [10].

## 6. CONCLUSION

Open reduction and internal fixation are the treatment of choice for Hahn-Steinthal fracture. Stabilization by Herbert screw, which is a modern method, gives satisfactory results because it allows strong inter-fragmentary compression, early mobilization, and thus functional recovery of the elbow. For our serie of four patients, we obtained very good results.

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