Bilateral capitellum humeri fracture: A case report and review of the literature

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ABSTRACT

We report a case of a 37-year-old woman who sustained a bilateral Hahn-Steinthal type fracture of her capitellum humeri. Open reduction and internal fixation, using extra-articular insertion of Herbert screws, were performed. Both elbows were immobilised for 3 weeks postoperatively. Radiographic signs of union were present at week 8. Within the observation period of 18 months, no signs of avascular necrosis were detected. At the end of the recovery period, despite intensive physiotherapy, the patient was left with a 20° loss of flexion in her right elbow and a 15° loss of extension in her left elbow. We found the use of Herbert screws particularly suitable for this type of injury: it allows good inter-fragmentary compression due to the sub-articular positioning that avoids the risk of damaging the articular surface. Mobilisation should start early to prevent joint stiffness and long-term disability.

Key words: bone; capitellum; fractures; humerus; internal fixation

INTRODUCTION

Fractures of the capitellum humeri are rare injuries and usually a result of axial loading of the capitellum by forces transmitted through the radial head. 1-3
Böhler postulated that the fracture could only occur in patients with increased cubitus valgus and hyperextension of the elbow, which is reflected by a female predominance (male to female ratio of about 1:4) reported in most series. As an isolated injury, fractures of the capitellum humeri account for 0.5% to 1% of all elbow injuries and often result in significant long-term morbidity if treatment is delayed.

In 1853 Hahn, a German surgeon, provided the first description of an isolated capitellum humeri fracture in the medical literature. After further reports by Kocher in 1896, Steinthal in 1898, and Lorenz in 1905, a systematic classification of capitellum fractures into 2 types evolved. The Hahn-Steinthal, or type I fracture, characterises a shear fracture involving a large osseous portion of the capitellum in the coronal plane of the distal humerus (Figs. 1 and 2). The Kocher-Lorenz, or type II fracture, merely involves a superficial osteochondral shell with little osseous bone, and is usually referred to as an ‘uncapping’ of the capitellum (Fig. 1). In more recent decades, comminuted fractures of the capitellum humeri have been referred to as type III injuries (Fig. 1).

The standard treatment of the Kocher-Lorenz type injury is excision of the fragment because re-fixation is difficult and in most cases not feasible. A similar approach is generally adopted for treating comminuted type III fractures. Controversy, however, exists regarding the management of fractures of the Hahn-Steinthal type. Before the advent of modern internal fixation techniques, closed reduction or early excision of the capitellum fragment were the adopted treatments. Clinical results after reduction or resection of the capitellum were frequently complicated by elbow instability, decreased range of motion, and arthritis unless anatomical positioning of the fragment was attained. Reports of avascular necrosis (AVN) of the capitellum fragment, on the other hand, are surprisingly rare, and such cases are not necessarily associated with a poor outcome.

In order to provide a better and more predictable outcome after treating capitellum fractures, a variety of internal fixation methods have been tried over the past 3 decades, including Kirschner wires, staples, bone pegs, Arbeitsgemeinschaft für Osteosynthesefragen (AO) small fragment screws, and Herbert screws. The use of Herbert screw fixation in particular has gained international popularity since early reports confirmed its successful application in the fixation of capitellum fractures.
Figure 4  Postoperative radiographs showing the right elbow after open reduction and internal fixation of the capitellar fragment using 2 Herbert screws: (a) lateral view, and (b) anteroposterior view.

Figure 5  Postoperative lateral radiographs showing the left elbow after open reduction and internal fixation of the capitellar fragment using 2 Herbert screws: (a) lateral view, and (b) anteroposterior view. The lateral epicondyle was stabilised with 2 AO small fragment screws.
CASE REPORT

A 37-year-old woman was admitted to our hospital after having sustained a fall on her outstretched arms. She complained of pain around the outer aspects of both of her elbows, which was triggered by palpation and movement. Clinically she presented with bilateral elbow haemarthrosis and localised tenderness over the lateral epicondyles. Elbow movements were restricted to a range of 60° to 120° bilaterally. The stability of her right elbow was considered normal, whilst her left elbow presented pronounced laxity on valgus stress application. No neuro-vascular abnormalities were noted. Radiographs confirmed the diagnosis of bilateral capitellum fractures of the Hahn-Steinthal type (Figs. 2 and 3). The injury to the left elbow was compounded by a concomitant fracture of the lateral humeral epicondyle.

A posterolateral Kocher-type approach was used to facilitate open reduction. The fixation was performed with 2 Herbert screws, which were inserted through the posterior aspect of the lateral epicondyle into the centre of the capitellum; hence the articular cartilage was not damaged. The epicondyle on the left elbow was refixated using 2 inter-fragmentary AO screws. Postoperatively, her elbows were immobilised for 3 weeks before commencing an intensive mobilisation programme guided by a physiotherapist (Figs. 4 and 5). All fractures presented convincing signs of unification by week 8 on the basis of radiographic appearance of the fracture, and absence of pain on movement. Although the patient recovered well from the operation her elbow mobility remained somewhat impaired. Functionally her right elbow presented a residual 13° fixed flexion deformity compared to 35° on the left, with flexion being limited to 123° on the right compared to 127° on the left. Supination/pronation were measured at 90°/80° in the right and 65°/70° in the left elbow.

DISCUSSION

The move towards open reduction and internal fixation in the late 1970s can be considered a direct reflection of the dissatisfaction with the inconsistent results achieved with closed reduction or excision of the capitellum fragment. Hahn was the first to report on the unsatisfactory outcome after conservative management of a coronal shear fracture of the capitellum humeri. At autopsy he found that the capitellum had been displaced superiorly and consequently united to the anterior aspect of the humerus, causing restriction of elbow flexion. However, there are authors who have shown that excellent results are achievable if closed anatomical reduction can be attained, and subsequently maintained until fracture consolidation is guaranteed. It is generally agreed that if manipulative reduction is impossible, operative fragment removal or fixation is unavoidable. Authors who are in favour of fragment excision argue that complications inherent in the conservation of the capitellum, such as redisplacement, imperfect reduction, and the risk of AVN are entirely eliminated. Mazel, for example, was of the opinion that excessive pressure in attempting a reduction may break up the fragment and that the small fragments left behind could seriously damage the joint.

The use of intra-osseous Herbert screws in the fixation of capitellum fractures is an attractive alternative to the application of AO small fragment screws or Kirschner wires. The major advantage of Herbert screws, in comparison to other fixation modalities, lies in the fact that the screw is placed within the bone without any outside prominence, thereby avoiding unnecessary soft tissue irritation. Another advantage is that metal work removal is rarely necessary. Problems might arise if AVN or chondrolysis occurs, exposing metal implants to the adjacent radial head, and possibly leading to erosion or arthritic changes within the joint. Fortunately there are only a few reports in the literature commenting on the development of AVN after open fracture reduction of the capitellum. Despite AVN, most of the described cases appeared to have had a reasonably satisfactory outcome.

On balance, efforts to re-create normal anatomy are rewarded with elbow stability and more favourable elbow and forearm biomechanics. Hence, long-term sequelae such as reduction in forearm rotation, proximal migration of the radius, cubitus valgus, triangular fibrous cartilage complex disruption or wrist osteoarthritis, all of which may lead to chronic elbow and wrist pain, might be avoidable or at least diminished. Modern fixation methods, such as the use of intra-osseous screws, provide instant fracture stability without compromising articular integrity, which are prerequisites for achieving good functional results. Depending on the quality of the fixation and in the absence of any concomitant injuries, early mobilisation can be commenced, thereby avoiding the problems of elbow stiffness and disability that are commonly caused by prolonged plaster cast immobilisation. Intra-osseous screws also bear the inherent ad-
vantage of not requiring metal removal at a later date. It remains to be investigated whether up-
coming devices like the cannulated Martin screw or biodegradable screws will provide equal 
or superior results to the fixation with Herbert screws.

Since fractures of the capitellum humeri are 
uncommon, most of the information in the availa-
ble literature is based on only a few cases.28,31 This 
fact also implies that it is practically impossible, 
although highly desirable, for a medical centre to 
conduct a larger trial in order to compare different 
treatment options in a randomised and controlled 
fashion.

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