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Open reduction and internal fixation of coronal fractures of the capitellum in patients older than 65 years

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Background: The aim of this study was to describe the fracture patterns of capitellum coronal fractures and to evaluate the complications and functional and radiographic outcomes of open reduction and internal fixation in patients older than 65 years.

Methods: A retrospective study of 23 patients with a mean follow-up of 48 months (36-105) was performed. Fractures were classified according to the Dubberley classification. All patients were evaluated by the Mayo Elbow Performance Index (MEPI) and the Disabilities of the Arm, Shoulder, and Hand (DASH) scores.

Results: Three patients were lost to follow-up. There were 16 type 1 and 4 type 2 fractures. The mean age was 71 years (66-79), and 65% were women. The mean MEPI score was 92 (60-100), and the mean DASH score was 9 (0-75). Either a concomitant fracture or an elbow dislocation was present in 50% of the patients. Mean sagittal plane range of motion at last follow-up was 122° ± 8°, with lower extension in type 2 and worse scores on MEPI (91 vs. 97) and DASH (3 vs. 0) scales. Placement of the screws in the posteroanterior direction was associated with better range of motion in flexion (130° vs. 122°) and better outcomes in functional scores (MEPI, 97 vs. 89; QuickDASH, 0 vs. 4). Complications were posttraumatic osteoarthritis in 3 patients, avascular necrosis in 1 patient, and heterotopic ossification in 5 patients. One patient required reoperation.

Conclusions: Patients older than 65 years have no substantial risk of complex fracture patterns, but they have a large number of concomitant injuries. Open reduction and internal fixation with cannulated screws allow stable fixation and provide satisfactory functional results with a lower complication rate.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Capitellum; trochlea; coronal plane; fracture; complications; open reduction and internal fixation

Partial articular fractures in the coronal plane of the distal humerus involving the capitellum and trochlea account for 1% of all elbow fractures and 6% of distal humeral fractures.[16] Apparently isolated, they are often more complex and involve both the capitellum and the trochlea. Consequently, it is important

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to perform preoperative computed tomography (CT) to help us ascertain the true extent of the injury. These fractures are difficult to treat because of the limited amount of subchondral bone available for hardware fixation. Treatments have evolved from closed reduction, immobilization, and fragment excision to an option for arthroscopy-assisted fixation (in particular types of these fractures) and open reduction and internal fixation (ORIF).[1,5,13,22] Currently, this last technique is regarded as the preferred method for treating these injuries.

The low incidence of these fractures means that surgeons have limited experience, and the studies evaluating the outcomes after ORIF are limited.[6,11,14,18,19,20,24,26,28] There are no reports of the effect of age on fracture healing after the fixation of a coronal plane fracture of the distal humerus.

The aim of this study was to evaluate radiographic and functional outcomes and complications after ORIF of capitellum coronal fracture in patients older than 65 years to further define the impact of surgical technique, fracture pattern, and concomitant injuries.

Materials and methods

This was a retrospective cases series of distal humeral coronal plane fractures. Between 2003 and 2012, 673 patients were diagnosed and managed operatively for fracture of the distal part of the humerus at our institution. Retrospective evaluation of collected medical and radiographic data from the fracture database at our institution identified a cohort of 23 patients older than 65 years (3.4%) who had sustained distal humeral coronal plane fractures treated with ORIF. Among these, 3 were excluded from the study. One of them died from causes unrelated to the surgery; the other 2 were lost to follow-up. Our population of patients consequently consisted of 20 patients. All of them were available for clinical and radiographic evaluation at a minimum of 1 year postoperatively and had a minimum of postoperative radiographs at 15 days, 1 month, 2 months, 3 months, 6 months, and 1 year. They were also invited to return for a long-term functional and radiographic evaluation made by an independent observer unrelated to surgical treatment, so the mean duration of follow-up was 48 months (36-105).

The fractures of the capitellum and trochlea were classified on the basis of radiographs made immediately after the injury (anteroposterior and lateral views), the CT scan, and the intraoperative findings according to the Dubberley classification system.[6] Dubberley et al proposed a classification system taking posterior comminution into account, giving information about fracture prognosis. Type 1 fractures involve the capitellum with or without the lateral trochlea, type 2 fractures involve the capitellum and trochlea as a single piece, and type 3 injuries consist of fractures of both the capitellum and the trochlea as separate fragments. Each fracture type is additionally subclassified as A or B on the basis of the presence of posterior condylar comminution.

Functional evaluation was done by Mayo Elbow Performance Index (MEPI),[16] shortened Disabilities of the Arm, Shoulder, and Hand (QuickDASH) scale,[15] and range of motion (ROM) measures with a hand-held goniometer.

Radiographic assessment included anteroposterior and lateral radiographs of the involved elbow evaluated by 2 independent orthopedic surgeon reviewers who were not involved in management of the patients. They assessed evidence of fracture union, loss of fracture reduction, presence of osteonecrosis, heterotopic ossification classified by the Brooker system applied to the elbow,[4] and post-traumatic osteoarthritis according to the Broberg and Morrey classification system.[3]

Statistical analysis

The descriptive methods to evaluate the data were the median and the interquartile range. Differences in continuous variables were evaluated with the Student *t* test. Differences in categorical variables were evaluated using the Fisher exact test. Scores were compared by Dubberley fracture classification and epidemiologic data using the Mann-Whitney *U* or Kruskal-Wallis tests. The level of significance was set at .05.

Results

Epidemiologic data

The group included 13 women (65%) and 7 men. The mean age was 71 years (66-79). The trauma mechanism was a fall from a standing height in 19 cases and high-energy trauma in 1 case. None of them had previous injury in the affected elbow. The nondominant side was injured in 78.5% of the cases; in 16 cases, the affected elbow was the left side, although 19 cases were right-handed patients.

There were 16 Dubberley type 1 fractures (13 type 1A and 3 type 1B) and 4 type 2 (2 type 2A and 2 type 2B). Ten patients (50%) had concomitant injuries. Eight patients had isolated concomitant injuries (2 lateral epicondyle fractures, 2 medial epicondyle fractures, 3 radial head fractures, and 1 lateral collateral ligament lesion), and 2 had fracture-dislocation (posterolateral dislocations associated with a radial head fracture and a lateral epicondyle fracture).

Epidemiologic data of the 20 patients are summarized in Table I.

Surgical technique

All cases were operated on under general anesthesia in the supine position with the arm placed on a hand table. A tourniquet was used in all cases. A lateral skin incision was employed in 16 cases (80%) (Fig. 1), an anterolateral approach in 1 case (5%), and a posterior incision in 3 cases (15%) with an olecranon osteotomy fixed with figure-of-8 tension