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Hinged external fixation and closed reduction for distal humerus fracture

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Abstract Elbow fractures are relatively rare in extremity injuries. Functional deficits often comprise the outcome. We report of a 77-year-old diabetic lady with a distal humerus fracture. She was treated with external fixation and closed reduction. Special emphasis was directed to early motion exercises. Follow-up after 1 year demonstrated a range of motion of 0-30-130° for extension and flexion of the elbow joint. No neurovascular deficits were seen. The use of a hinged device was successful in re-establishing a good function. Although there are no earlier reports using this technique in acute treatment, we consider this strategy as an alternative option in carefully selected cases.

Keywords Elbow · Joint spanning · Articulated · Injury

Introduction

Although fractures of the elbow are quite rare compared with the total incidence of extremity injuries (2–6% of all extremity fractures [1, 15, 18]), the proximity of neurovascular structures requires careful attention. In elderly women, fracture incidence of the distal humerus from the Finnish National Hospital Discharge Register is quoted at approximately 200 per 100,000 women [10]. Outcomes are as yet often compromised by functional deficits, especially following prolonged immobilization. Fractures in elderly patients

with diabetes mandate a stepwise protocol to minimize the potential complications of delayed fracture healing and wound complications. Hinged external fixation of the elbow has been used with success for elective treatment of elbow dislocations [16], degenerative diseases or contractures [2, 12]. This technique might be indicated in some distal humerus fractures although there are no reports in the literature until the present day after early application of such a device in acute treatment. Hence, we report of a case using a technique that primarily leads up to good functional results.

Case report

A 77-year-old diabetic female was presented to the emergency room with pain in the left elbow after stumbling over a curb. She showed tenderness over the radial side with crepitation. There were no neurovascular deficits seen. Radiographic investigations indicated a distal humerus fracture of the radial and ulnar condyle (Type C3.3 [8], Fig. 1). Due to the co-morbidity of diabetes it was decided to treat her with closed reduction and application of a hinged external fixation.

The device we used was the Compass hinge (Smith and Nephew, Memphis, TE, USA) which is applicable with Ilizarov instrumentation. Under plexus anaesthesia, the elbow's centre of rotation joint was determined using a pin under fluoroscopic control. This pin was inserted to position the hinges of the external fixation with the proximal and distal rings attached to the humerus and the ulna. Two Ilizarov half-rings were fixed with Steinmann's nails drilled into the bones. After distraction and radiological control of concentric reduction the fixation was temporally locked in 20° of flexion.

Physiotherapy was initiated the next day with active and passive range of motion exercises. Prior to discharge she was able to reach 0-30-90° range of motion and

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Fig. 1 A 77-year-old diabetic female struggled over a curb and injured the left elbow. The anteroposterior radiograph (a) shows displaced articular fragments from the capitellum and the trochlea.

The lateral radiograph (b) shows a double arc including parts of the trochlea and the capitellum. To enhance the three-dimensional understanding a CT reformation (c) was performed

physiotherapy was continued on an outpatient basis. Radiological results were documented (Fig. 2).

Seven weeks after application the hinge was removed under local anaesthesia (Figs. 3, 4). Four months after trauma the patient was free of pain. The left elbow showed normal alignment and was neurovascular intact. There were no signs of infection. The range of motion was 0-30-110° and the joint was stable on examination. There were no side-to-side difference with respect pro- and supination. Physiotherapy was prescribed to enhance extension. Radiographic control showed concentric reduction of the elbow and a proper joint alignment. On follow up after 1 year she demonstrated a range of motion of 0-30-130°. Mayo Performance Index was 80 demonstrating a good result [7].

Discussion

Distal humerus fractures in elderly diabetic patients are a challenging task. The therapeutical recommendations, also in the elderly, are relatively homogeneous: primary open reduction and internal fixation should be carried out aiming for an early postoperative functional treatment, but it carries the risks of non-union, loss of fixation, infection, and stiffness [9]. Nevertheless, operative treatment is recommended for displaced fractures in recent studies [14]. Early mobilization is critical for late functional outcome of elbow fractures; however, its extend depends on the method of primary treatment [18]. Elbow instabilities are rare

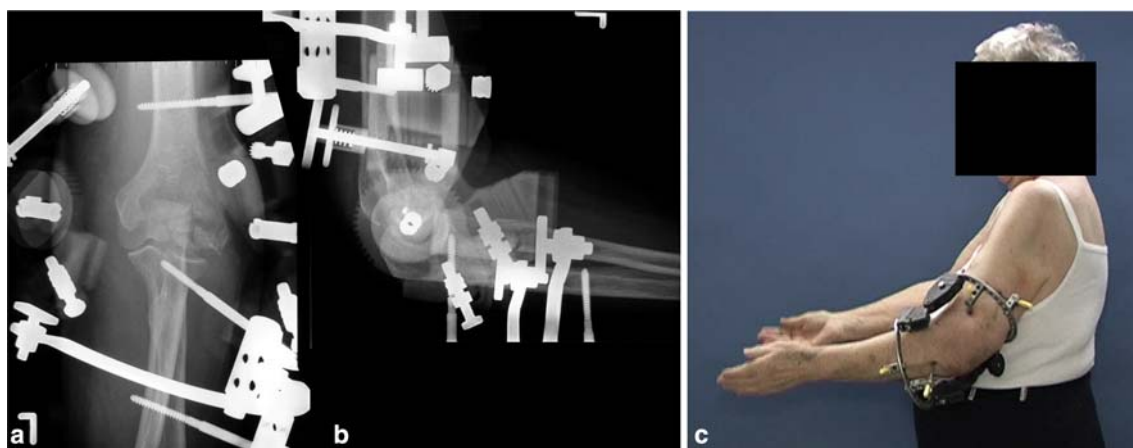


Fig. 2 Anteroposterior (a) and lateral (b) radiograph made days after surgery show stable realignment of the fracture fragments and applied external device: Compass hinge (Smith and Nephew, Memphis, TE, USA). c Clinical impression of the hinge in place

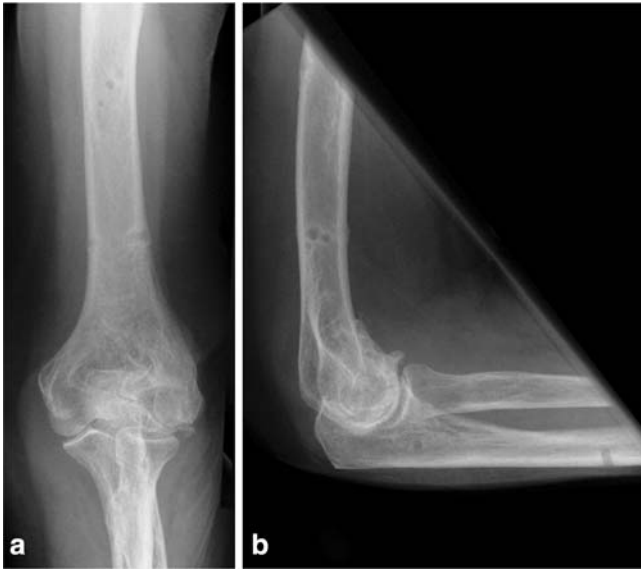


Fig. 3 Anteroposterior (a) and lateral (b) radiographs made 4 weeks after hardware removal and 11 weeks after injury show a bony consolidated fracture of the elbow

after injury of the distal humerus and external fixation is not typically used [4, 13]. Function and stability of the ulno-humeral joint after trauma is dependent on bony and soft tissue constraints, because those make it to one of the most stable articulations in the human body. Therefore elbow surgery remains a very challenging task. Due to lack of randomized trials, many clinical decisions have to be based on empirical evidence.

External fixation of juxta-articular fractures of the elbow has been reported earlier, after good results in treating such fractures in the lower extremity. In particular, those of the tibial plateau postulated gratifying success applying this non-joint spanning technique to the distal humerus for restoring limb alignment and permitting immediate joint motion [19]. In case of unstable reduction or joint dislocation this technique

cannot be sufficient. Alternatively a hinged external fixation can span the joint, stabilize it, and permit early functional treatment [20]. It fosters an immediate return to a partial range of motion. In the literature we were able to review that there is only one case described using such a device lately after elbow instability due to a distal humerus fracture, which was treated initially with internal fixation [3].

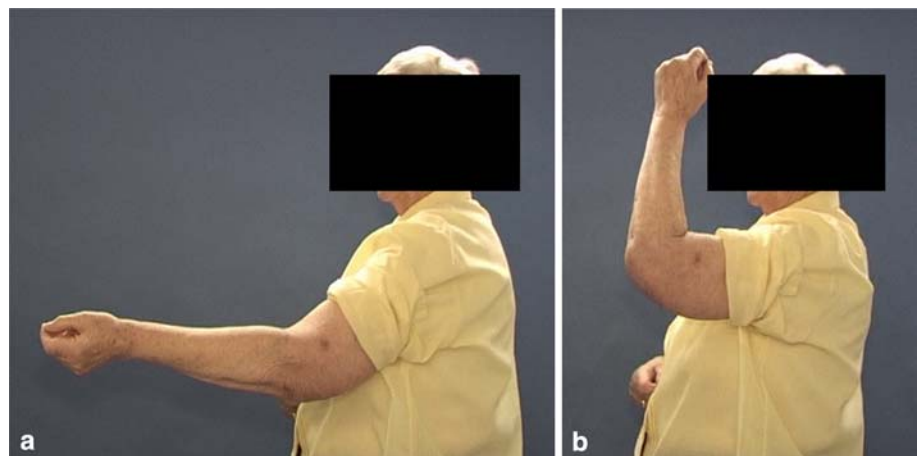
Recently, there were reports using hinged external fixation to provide stability and early mobilization for complex elbow dislocations and fractures, example given of the radial head, with good results [5, 6, 11, 16]. Those findings suggest that operative treatment with changes of anatomy is not necessary. Also repair of ligaments seems not to be necessary. This shows that even in case of dislocation there may be no mandatory need for open reduction. Stable and concentric reduction is the key for an acceptable outcome.

Biomechanical investigations using an elbow joint spanning hinged external fixation showed correct joint position between 0 and 120° with variation of the central axis through the radial and ulnar condyle of less than 3° [17]. This underlines the need of an accurate placement of external fixation where the hinge has to be co-linear with the axis of rotation of the joint [6].

Hinged external fixation combines advantages of closed reduction with minimal complications for wound healing and early mobilization to enhance the functional outcome. We did not observe potential disadvantages like poor stability or infection [3]. Our outcome was satisfying and in our view justified an uncommon surgical treatment.

We suggest that the use of a hinged external fixation in distal humerus fracture is rarely indicated, but could be an interesting alternative of success for cases like the one we describe. Compromised patients with high risk of infection and non-high demanders for function might gain benefit of this treatment with early motion exercise. Restoring a good function and avoiding neurovascular deficits should be the prerogatives of all treatment strategies.

Fig. 4 Extension (a) and Flexion (b) in clinical pictures on an outpatient visit a few weeks after hardware removal



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