CASE REPORT

Conservative treatment in displaced fractures of the humeral capitellum: a reduction technique under local anaesthesia

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SUMMARY

We report the case of a 46-year-old woman who struck her right elbow on the ground after a fall on ice. Radiography showed a right humeral capitellar fracture, and CT further confirmed a Dubberley type 1A fracture. Closed reduction was performed under local anaesthesia, and an anatomical position was obtained. After the reduction, her right elbow was casted for 18 days. Three months after the injury, bone union was achieved without displacement, and the active range of motion of her right elbow recovered similar to the unaffected side. At 1 year postinjury, the Grantham score was excellent, and she obtained a two-point score on the Disabilities of the Arm, Shoulder and Hand (DASH) Questionnaire. Although surgical treatment is recommended for a displaced humeral capitellar fracture, a Dubberley type 1A (no posterior column fracture of a distal humerus) can be effectively treated by early closed reduction.

BACKGROUND

Humeral capitellar fracture comprises 2% of all upper limb fractures.¹ Open reduction and internal fixation has been widely used to treat humeral capitellar fracture with the development of surgical implants for internal fixation. Regarding displaced capitellar fracture, operative treatment is recommended.² However, some reports have shown favourable results after conservative treatment for capitellar fractures.^{3,4} We experienced a displaced capitellar fracture treated conservatively by closed reduction with a good postoperative outcome. Herein, we explain the procedure of the closed reduction.

Figure 1 Radiographs showed a coronal shear fracture.

Figure 2 CT scan images revealed a Dubberley 1A type humeral capitellar fracture.

CASE PRESENTATION

We admitted a 46-year-old woman who struck her right elbow on the ground after slipping on ice and falling from standing height. She was brought to our hospital approximately 6 hours after the incident and presented with difficulty moving her right elbow.

INVESTIGATIONS

Radiography showed the positive double arc sign, and she was diagnosed with a displaced right humeral capitellar fracture (figure 1). On CT, the type of fracture was determined to be Dubberley type 1A (figure 2).

TREATMENT

We attempted a closed reduction initially because she refused operative options.

The reduction manoeuvre was performed as follows (figure 3, model patient). First, the fracture site was examined under fluoroscopy. Then, a spinal needle was inserted into the lateral side of the elbow joint. After aspiration of the fracture haematoma, lidocaine (Xylocaine; Aspen, Japan) was injected as local anaesthesia. Next, the elbow was gradually extended fully and flexed to 90° under a varus force. Although there was no clicking sensation, after the manoeuvre, the fracture site was reduced in a normal anatomical position.

After reduction, we ensured via fluoroscopy that the fracture fragment was reduced. Then, the stability was examined in passive extension and flexion of the patient's elbow under lateral view of fluoroscopy. The patient's right elbow was placed in 90° of flexion and the forearm in a neutral position, and casted above the elbow for 18 days (figure 4).

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Figure 3 Reduction technique (model patient). Placing a finger gently on the fracture fragment, the patient's forearm is distracted and forearm extended by applying a varus force (upper pictures). Continuing distraction and application of a varus force, while flexing the patient's forearm (lower pictures).

The patient was allowed to move her elbow and forearm gently, as tolerated, after the cast was removed.

OUTCOME AND FOLLOW-UP

At 3 months postinjury, her elbow pain was completely resolved, and bone union was achieved with no displacement (figures 5 and 6). The patient was then allowed weight bearing and returned to typical activities of daily living. Active range of motion of her right elbow was 140° in flexion, 0° in extension, and 90° in both pronation and supination. The Grantham classification was excellent, and she scored five points on the Disabilities of the Arm, Shoulder and Hand (DASH) Questionnaire (figure 7). One year after the injury, her DASH score improved to two points.

DISCUSSION

A humeral capitellar fracture is caused by a vertical shear force after direct contact or a fall with an outstretched elbow.⁵ Most humeral capitellar fractures show displacement. In humeral capitellar fractures, previous literature has described conservative treatment or removing the fracture fragment because no appropriate equipment was available for fracture fixation. However, after the advent of strong fixation implants, surgical fixation has been widely used to treat displaced humeral capitellar fractures. Early mobilisation after surgical fixation can prevent joint

Figure 4 Radiography after reduction showed the fracture fragment located in a normal anatomical position.

Figure 5 Radiography 2 months after the injury showed no displacement.

contraction and lead to a more favourable outcome. Therefore, recently, displaced fractures are an indication for surgical treatment rather than conservative treatment, especially for young patients.²⁻⁶ However, those reports have not mentioned the precise classification for the fracture; thus, we believe conservative treatment is applicable in some cases. Indeed, some reports have shown that conservative treatment for displaced humeral capitellar fractures results in as good an outcome as surgical treatment.³⁻⁴ Although previous reports describe that closed reduction is performed under general anaesthesia to provide maximal relaxation of the injured forearm, we used local anaesthesia, replacing the joint haematoma with the anaesthetic liquid.

As our case shows, conservative treatment can be acceptable if the fracture meets the following three criteria: (1) the fracture fragment contains intact cortex bone on the posterior aspect of the distal humerus; (2) the fracture fragment is not shattered into many pieces; (3) after closed reduction, the fracture is confirmed by fluoroscopy to be reduced in an anatomical position with stability. Those conditions meet the Dubberley classification type 1A; thus, we believe this can be the indication for the use of conservative treatment⁷ (figure 8). According to a previous report, the number of type 1A capitellum fracture was 35%, therefore there would be enough chance to treat those fractures by closed reduction.⁷

The plausible explanation of the effectiveness of conservative treatment by closed reduction with local anaesthesia is as follows. First, distraction while placing varus stress produce a space allowing reduction of the capitellar fracture fragment

Figure 6 Three-dimensional CT 3 months after the injury showed bony union.

Figure 7 The patient had no symptoms 3 months after the injury. She scored five points on the Disabilities of the Arm, Shoulder and Hand Questionnaire score, and the Grantham classification was excellent.

(figure 9). Second, extension of the elbow pushes the anterior elbow joint capsule against the capitellar fracture towards the distal humerus which helps reduce the fracture fragment (figure 10). Finally, after the reduction, the contracture force of the forearm extension and flexion muscles places pressure on the capitellum fragment towards the humeral which enables stabilisation of the fracture fragment (figure 11).

Complications of the surgical treatment include avascular necrosis of a fracture fragment, idiopathic ossification, infection and joint contracture.^{2, 8} Although avascular necrosis is uncommon after open reduction and internal fixation of

Figure 8 Dubberley classification type 1A which includes intact bone structure posterior to the fracture fragment, can be an indication for conservative treatment.

Figure 9 Distraction of the forearm towards a varus direction enables creation of the space where the capitellum fragment can be reduced.

Figure 10 Extending the elbow can push the anterior elbow joint capsule towards the capitellar fracture fragment and into anatomical position.

capitellum fracture, the rate of avascular necrosis is reported as 0%–30%.⁸ Dubberley *et al* reported three cases of osteonecrosis which were type 3A and type 3B.⁷ Conversely, Puloski *et al* reported no cases of avascular necrosis out of seven cases treated closed reduction.⁴ Regarding type 1A fracture repaired in anatomical position, the risk of avascular necrosis was reduced by an intact posterior wall of the distal humerus which could compromise the vascular supply of the capitellum.⁹ If surgery is delayed more than 48 hours postinjury, the postoperative outcome can be worsened.¹⁰ As our case shows, the benefit of closed reduction with local anaesthesia is that only a short period of 6 hours is necessary before the technique can be performed.

Figure 11 After reduction, the capitellar fracture fragment is pushed by the forearm towards the distal humerus which stabilises the fracture.

Therefore, closed reduction is a treatment option when patients present early to the hospital. A favourable outcome of five points using the DASH is attributed to early closed reduction which is comparable with surgical treatment, wherein the mean DASH scores have been reported to be 20 points.¹¹ We also immobilised the patient's arm at 18 days to avoid joint contracture. This is supported by Puloski *et al* who indicated that gentle mobilisation with active ROM should be begun approximately 14 days after reduction to avoid joint contracture.⁴ This was our first case of treating coronal shear fracture conservatively after closed reduction; thus, further evaluation is needed.

Learning points

- An isolated humeral capitellar fracture (Dubberley type 1A) can be treated conservatively if the anatomical position is obtained.
- Closed reduction with local anaesthesia can be performed quickly in an outpatient setting.
- The detailed reduction technique and plausible explanation are described herein.

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