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ORIGINAL STUDY

Headless compression screw fixation for type 2 and 3 articular surface fractures of the distal humerus using transolecranon approach

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The objectives of this study were to determine the clinical and radiologic outcome after headless compression screw fixation through the transolecranon approach in patients who had sustained Dubberley type 2 and 3 articular surface fractures of the distal humerus. Twenty-seven patients were included in the study. There were 23 Dubberley type 2 and 4 type 3 fractures. All patients were available for a minimum of 24 months of follow-up. The evaluation was performed using the VAS, the DASH score, and the MEPS. The outcome was excellent in 18 patients, and 9 patients had a good result by the MEPS. The average range of flexion was 132° (range 110°–140°). The mean extensor lag was 7.9° (range 0°–30°). The main advantages of the transolecranon approach are direct fracture visualization, ease of joint inspection, help in reduction, and ease of correct perpendicular fracture fixation.

Keywords : humerus ; articular surface fracture of the distal humerus ; headless compression screw ; transolecranon approach.

INTRODUCTION

Articular surface fractures of the distal humerus are applicable to type B of the AO/OTA classification system, and has some continuity between the humeral shaft and the articular to the segment. These fractures are rare injuries and the reported annual incidence is 1.5 per 100,000 populations, with a marked female predominance *(26)*. In women, there is a bimodal distribution with peaks under the age of 19 and above the age of 80. The increased prevalence of this injury in women over the age of 60 years is believed to be because of the increased carrying angle in women and osteoporosis *(4,26)*. In men, there is a unimodal distribution with a peak incidence under the age of 19, and the mechanism of injury typically being high energy. Other associated injuries, such as ligament tears and radial head fractures, occur in up to 20% of cases *(3,21)*.

Articular surface fractures of the distal humerus are classified according to the Dubberley classification system *(3)*. Dubberley *et al* proposed a classification system taking posterior comminution into account and giving information about fracture prognosis. Type 1 fractures involve the capitellum

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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 trochlea as separate fragments. Each fracture type is additionally subclassified as A or B on the basis of the presence of posterior comminution.

Fractures of the capitellum and trochlea result from a direct force transmitted through the radial head that provides a shearing and/or compressive load to the capitellum and occasionally to the trochlea *(23)*. Displaced articular surface fractures of the distal humerus invariably lead to poor clinical outcomes if left untreated *(1)*.

Open reduction and internal fixation are the recommended treatments of choice in the current management of these fractures to achieve stable anatomic reduction, restore articular congruity, and initiate early motion *(22)*.

The choice of surgical approaches for internal fixation of an articular surface fracture of the distal humerus is a difficult one to make. Lateral *(13,15,25)* and posterior *(18,29)* approaches are commonly used for articular surface fractures of the distal humerus. A lateral approach is recommended for simple type 1 fractures. However, if the medial extension of the fracture fragment is significant (type 2 or 3 fracture), it may be difficult to ensure that there will be sufficient exposure or firm fixation of the fracture site by the lateral approach alone. The other hand, the transolecranon approach allows for the best visualization of the articular surface of the distal humerus. In addition, it has an advantage in that the screw insertion is easy to make vertical to the fracture line so that firm internal fixation is possible.

Articular surface fracture of the distal humerus consist primarily of entirely articular fragments that can only be secured with implants that are countersunk beneath the articular surface. Several methods of fixation have been used in the treatment of these fractures and there is no consensus on the optimal method of fixation. The headless compression screw, which has the properties of differential pitch and a countersunk head, is a good option for fracture fixation. The advantages offered by these screws include excellent compression at the fracture site, stable fixation, and nonprominence of the implant intra-articularly, thus allowing early mobilization of the elbow.

The purpose of the present study was to determine the clinical and radiologic outcomes after headless compression screw fixation through the transolecranon approach in patients who had sustained type 2 and 3 articular surface fractures of the distal humerus.

MATERIALS AND METHODS

This was a retrospective case series of type 2 and 3 articular surface fractures of the distal humerus. This study was approved by our Institutional Review Board. The data from all patients treated during the study period were available for review and analysis. Twenty seven patients were diagnosed and treated with internal fixation using headless compression screws through the transolecranon approach between May 2008 and May 2014. They were subsequently followed clinically and radiographically with subjective and objective outcome measures. No patients were excluded or withdrew.

Fractures in this study were classified according to the Dubberley classification system *(3)*. Fractures were classified based on routine radiographs, CT scans, and the intraoperative findings.

Surgical Technique

All patients were operated on under general anesthesia in the supine position with the arm supported on the arm board table. Examination under anesthesia was performed to rule out concomitant ligamentous injury. The shoulder was placed in 90° abduction and forward flexion, and the elbow was flexed over the arm holder at 90° (Fig. 1A). A tourniquet was applied as far proximally on the brachium as possible.

Numerous operative approaches for the management of articular surface fractures of the distal humerus have been described. To our knowledge, the transolecranon approach provides superior visualization of the articular surface. Therefore, a chevron olecranon osteotomy was performed for all patients. Prior to starting the olecranon osteotomy,

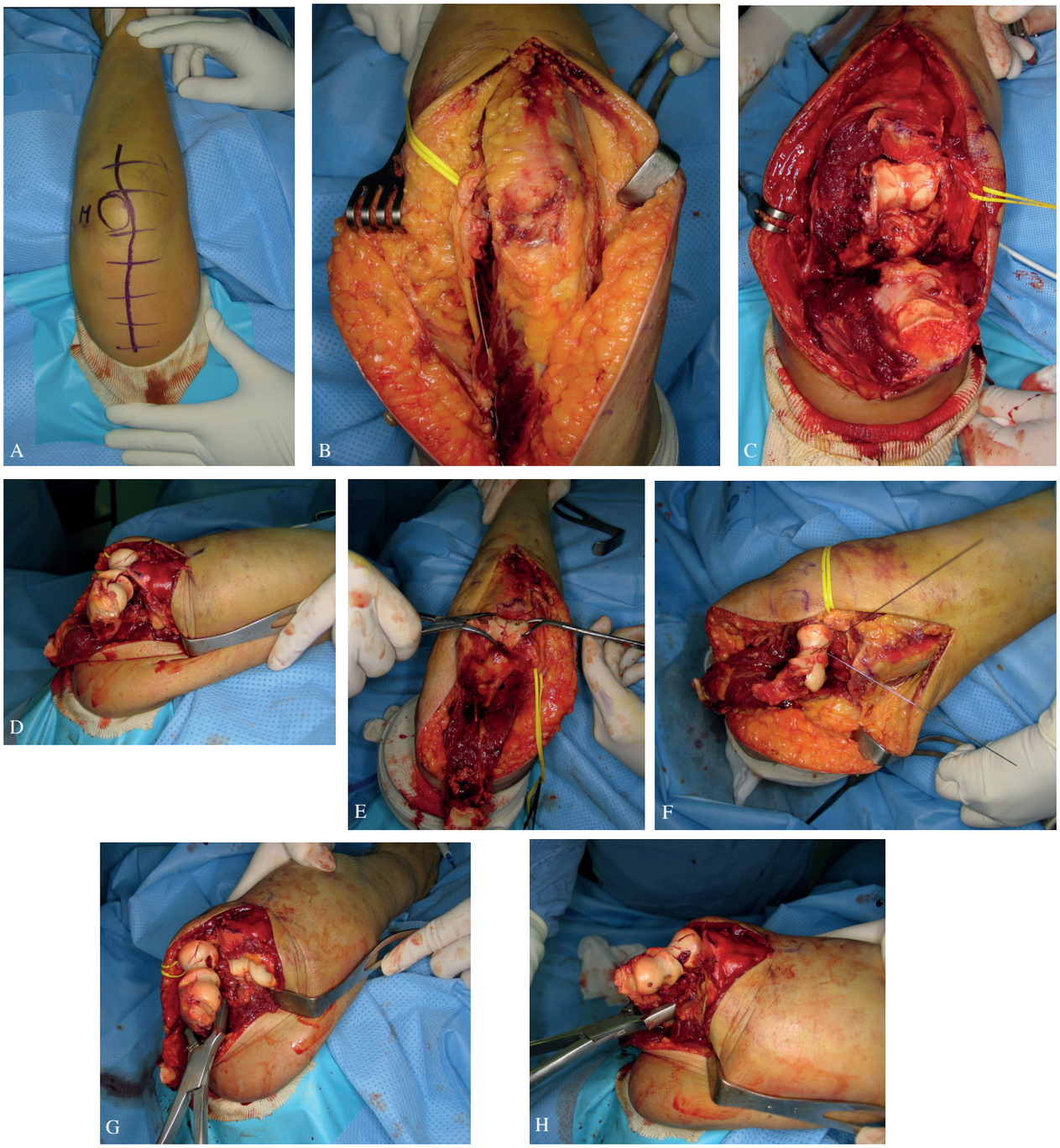

Fig. 1. – (A) The shoulder was placed in 90° abduction and forward flexion, and the elbow was flexed over the arm holder at 90°. (B) Ulnar nerve was routinely identified and isolated, with great effort to avoid nerve injury during operation. (C) Chevron olecranon osteotomy was performed. Transolecranon approach provides superior visualization of the articular surface. (D) Joint was inspected to scan the whole articular surface. (E) Fracture fragments were reduced to the anterior surface of the humerus using a small bone tenaculum. (F) Fracture fragments were provisionally fixed with smooth K-wire to avoid rotational displacement during screw fixation. (G, H) Headless compression screws were inserted from anterior to posterior and the screws were countersunk for at least 2mm to avoid erosion of the articular surface.

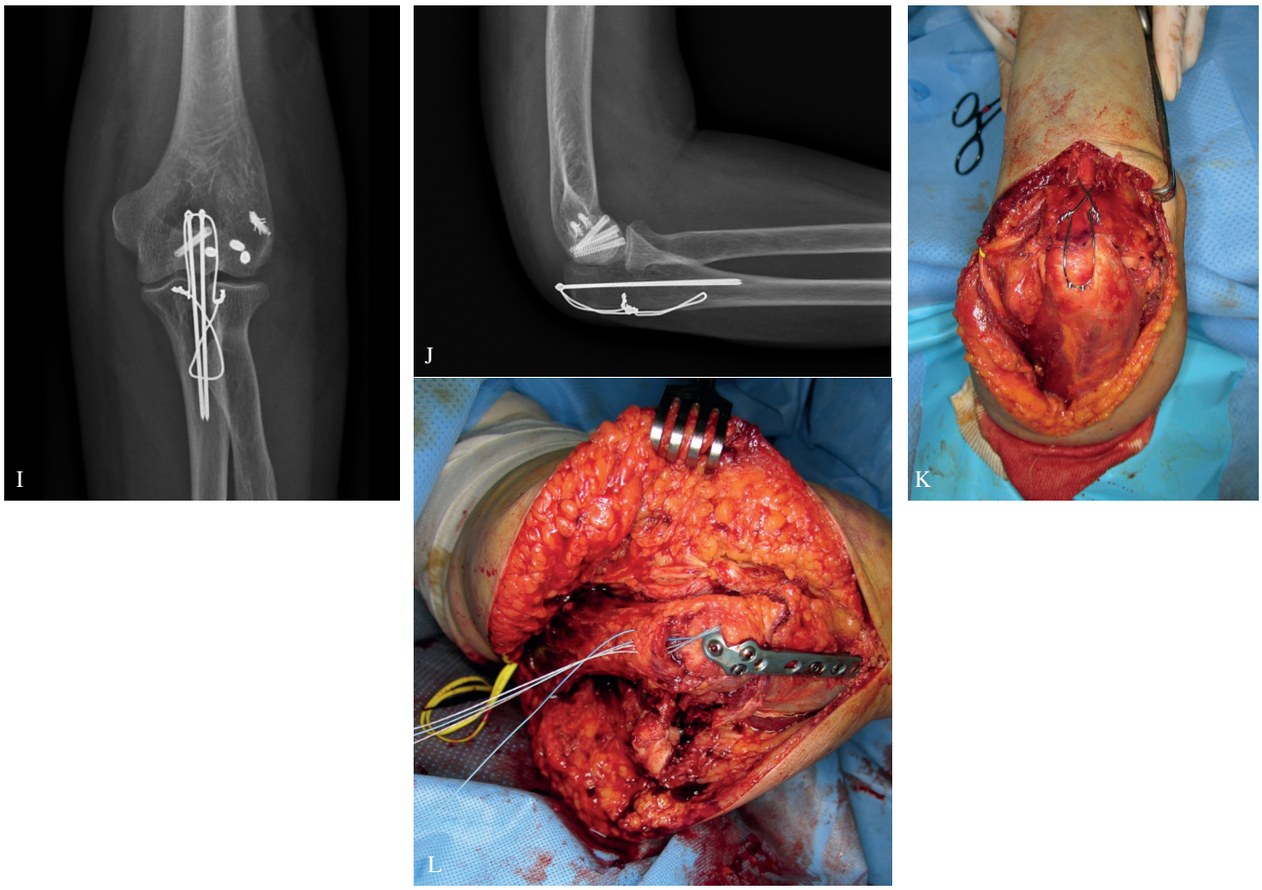

Fig. 1. **–** (I, J) Two or more screws were used for stable fixation, preferably crossing each other in the lateral view, to avoid any rotational displacement. (K, L) At the end of the operation an olecranon osteotomy site was fixed with the placement of tension-band wire or plate.

the ulnar nerve was routinely identified and isolated, with great effort to avoid nerve injury during the operation (Figs. 1B, C).

After adequate exposure of the fracture site, any hematoma or debris was carefully removed. The joint was inspected to scan the whole articular surface (Fig. 1D). To reduce the fragment anatomically, the proximal metaphyseal edge and trochlear articulation were visualized. The fragment was then reduced to the anterior surface of the humerus using a small bone tenaculum (Fig. 1E). To minimize the risk of avascular necrosis, the fracture fragments were gently manipulated into a reduced position taking care to preserve any remaining soft tissue attachment. The fragment was provisionally fixed with a smooth K-wire to avoid rotational displacement during screw fixation (Fig. 1F). Guide wires for the headless compression screws were placed perpendicular to the fracture line from anterior to posterior. The screw length was measured from the guidewire using an appropriate device for measuring depth. The wire was drilled with a cannulated drill bit, and a pilot hole was made. The chosen screw was placed over the guide wire and countersunk for at least 2 mm to avoid erosion of the articular surface (Figs. 1G, H). The fixation was best achieved by the use of two or more screws, preferably crossing each other in the lateral view, to avoid any rotational displacement of the fracture (Figs. 1I, J). When conducting internal fixation of a fracture fragment that does not affect the articular surface, the standard screw (2.7 mm or

smaller size screw) was also used for the fixation. When associated lateral collateral ligament (LCL) injury was present, the lateral collateral ligament was repaired to the bone with a suture anchor.

When the anterior articular fracture fragments did not fit into the fracture bed, there is likely posterior impaction of the posterior aspect of the lateral column. This impaction must be pushed back into place to achieve reduction. Bone defects may result from comminution or are often seen following the reduction of impacted fracture fragments. To improve stability and maintain anatomic reduction of the articular surface, these defects are reinforced with a bone graft.

At the end of the operation, an olecranon osteotomy site was fixed with the placement of a tension-band wire or plate (Figs. 1K, L). Ulnar nerve transposition was not routinely performed.

The elbow range of motion was assessed to ensure no impingement or crepitus after fixation. The forearm was also rotated to ensure that the radial head articulated congruently with the capitellum in full pronation and supination. Intraoperative fluoroscopy was used to evaluate the reduction of the articular surfaces, joint congruity, and hardware position. The elbow was placed into a splint at 60° of flexion with neutral rotation.

Postoperative Management and Rehabilitation

All patients followed the same postoperative management and rehabilitation protocol. A well-padded long arm posterior plaster splint was applied postoperatively in all patients with the elbow at 60° of flexion and the forearm in a neutral rotation. All patients received postoperative, supplementary, intravenous patient-controlled analgesia (IV-PCA), which was initiated in the recovery room. IV-PCA (butorphanol 4 mg + ketorolac 150 mg + normal saline 50 mL), which was programmed to deliver a 1 mg bolus (lockout of 10 min) with a maximum dose of 6 mg/h, was available to all patients until the second or third day postoperatively. On the second or third day after surgery, the drain was removed and the splint was changed to a removable splint to start ROM exercise. Active-assisted elbow motions, including pronation and supination, were initiated and continued under supervision. The patients were evaluated by the principal investigator and physiotherapist. Suture materials and the splint were removed together within 12-14 days, depending on the patient's healing capacity. After 3 weeks, active ROM exercise was allowed. Physiotherapy was usually terminated after 3 months, even though further functional improvement continued to for a longer period. In order to prevent heterotrophic ossification (HO), all patients took celecoxib (Celebrex, Pfizer, New York, NY) 100 mg 3 times daily, starting 1 day postoperatively, for a mean of 6 weeks. However, prophylactic radiotherapy and indomethacin were not used.

Patients and Evaluations

Twenty-seven patients (22 women and 5 men ; 14 right and 13 left elbows) with a mean age of 62.2 years (range 20–81 years) were included in the study. All injuries were the result of trauma, and the non-dominant side was affected 48.2% (13/27) of the time. The most common mechanism of injury was a ground level fall. There were 23 Dubberley type 2 fractures (17 type 2A and 6 type 2B) and 4 type 3 (2 type 3A and 2 type 3B). Seven patients had concomitant injuries. Five patients had isolated concomitant injuries (3 lateral collateral ligament injuries, 1 radial head fracture, and 1 olecranon fracture), and 2 had concomitant injuries associated with radial head fracture, coronoid fracture, and lateral collateral ligament injury. All patients were available for a minimum of 24 months of follow-up. The average follow-up period was 38.2 months (range 24-70 months). The patient demographics are shown in Table I.

Patients were evaluated clinically and radiographically. Preoperative evaluation included anteroposterior, lateral, and oblique radiographs. Computed tomography scans with multi-planar reconstructions were performed to accurately identify comminution, the fracture pattern, or the location of fragments. After operation, radiologic follow-up included standard anteroposterior and lateral radiographs that were evaluated by the principal investigator for reduction, fracture union, implant failure, and HO. Clinical and radiological

Table I. — Patient demographics

No.	Age (years)	Sex	Dominant	Side	Mechanism	Dubberley	Follow up (months)
1	60	F	R	L	Slip down	3A	24
2	69	F	R	R	Slip down	3B	36
3	69	F	R	L	Slip down	2A	33
4	46	M	R	R	Fall down	2A	28
5	66	F	R	L	Slip down	2A	42
6	79	F	R	R	Slip down	3B	44
7	56	F	R	L	Slip down	2B	43
8	65	F	R	R	Slip down	2A	33
9	20	M	R	R	Traffic accident	2A	24
10	40	F	R	R	Traffic accident	2A	28
11	40	F	R	L	Slip down	2B	34
12	72	F	R	L	Slip down	2B	53
13	81	F	R	L	Slip down	2A	28
14	66	F	R	R	Slip down	2A	70
15	56	F	R	L	Traffic accident	3A	62
16	64	F	R	R	Slip down	2A	45
17	58	M	R	L	Slip down	2B	35
18	72	F	R	L	Traffic accident	2A	28
19	63	F	R	R	Slip down	2A	26
20	49	F	R	R	Slip down	2B	33
21	71	M	R	R	Slip down	2A	30
22	77	M	R	L	Slip down	2A	28
23	63	F	R	L	Slip down	2B	48
24	69	F	R	R	Slip down	2A	52
25	73	F	R	R	Slip down	2A	51
26	77	F	R	R	Slip down	2A	47
27	58	F	R	L	Traffic accident	2A	25

Abbreviations : F, Female ; M, Male ; R, Right ; L, Left.

evaluations were performed every 4 weeks post-operatively until callus formation or cortical continuity was observed radiographically, after which patients were evaluated every 3 months.

Clinical follow-up included recording the incidences of complications, evaluating elbow range of motion (flexion, extension, pronation, and supination), measuring pain according to a visual analog scale (VAS) score *(19)*, and obtaining the disabilities of the arm, shoulder, and hand (DASH) score *(7)* and the mayo elbow performance score (MEPS) *(16)*. The range of pronation and supination were evaluated according to the neutral - 0 -— method with the elbow flexed at 90°. These ranges were observed and recorded by a single physiotherapist. The DASH is a validated 30-item questionnaire that reflects upper extremity disability. Its maximum score of 100 indicates the worst possible disability, with 0 indicating no disability. In MEPS, both subjective and objective clinical data are included, with a maximum score of 100 points. Pain (45 points), motion (20 points), stability (10 points), and function (25 points) were evaluated. A following categorical rating was assigned : 90-100 points was considered an excellent result ; 75-89 points, a good result ; 60-74 points, a fair result ; and <60 points, a poor result.

To reduce measurement errors, measurements were taken twice by each author, and the average values were calculated. Intraobserver reliability was recorded using the criteria of Winer (degree of bias and mean squared error) *(28)*. Reliability was classified, according to the intraclass correlation coefficient, as absent to poor (0-0.24), low (0.25-

0.49), fair to moderate (0.50-0.69), good (0.70-0.89), or excellent (0.90-1.0). We achieved an intraobserver reliability of 0.94.

Statistical Analysis

Descriptive statistical analyses were performed using SPSS version 20.0 software (IBM Corporation, Armonk, NY). A Wilcoxon signed rank test was performed to compare range of motion, VAS score, DASH score, and MEPS. A *P* value of less than 0.05 was considered statistically significant.

RESULTS

All patients were treated by open reduction and internal fixation. The surgical procedures were carried out by the same surgeon. All fractures united uneventfully. The mean time to radiographic union was 14.3 weeks (range 9-20 weeks). All patients were available for a minimum of 24 months of follow-up. The average follow-up was 38.2 months (range 12-52 months). Bone graft with an autologous iliac crest bone or allogeneic bone graft substitute was performed in 4 of 27 patients. The autologous iliac crest bone was used in 2 patients and the allogeneic bone substitute was used in 2 patients for fracture comminution or bone loss. As previously stated, olecranon osteotomy was used in all patients. At the end of the operation, 18 patients had fixation performed using tension-band wire and 9 had fixation performed using a plate.

There was no weakness of the extensor power, and there were no limitations in forearm rotation. The average range of flexion was 132° (range 110°-140°). The mean extensor lag was 7.9° (range 0°-30°), but the ROM remained functional in all patients except 1 (Fig. 2). The final elbow ROM, VAS score, DASH score, and MEPS results are shown in Table II.

Age and sex were not significantly associated with postoperative ROM and MEPS (p = 0.03 and p = 0.02, respectively).

At the last follow-up, the mean MEPS was 94.8 (range 80-100), which corresponded to an excellent result in 18 elbows and a good result in 9. The 9 patients with a good result had mild pain with heavy work, but no restrictions to their daily activities.

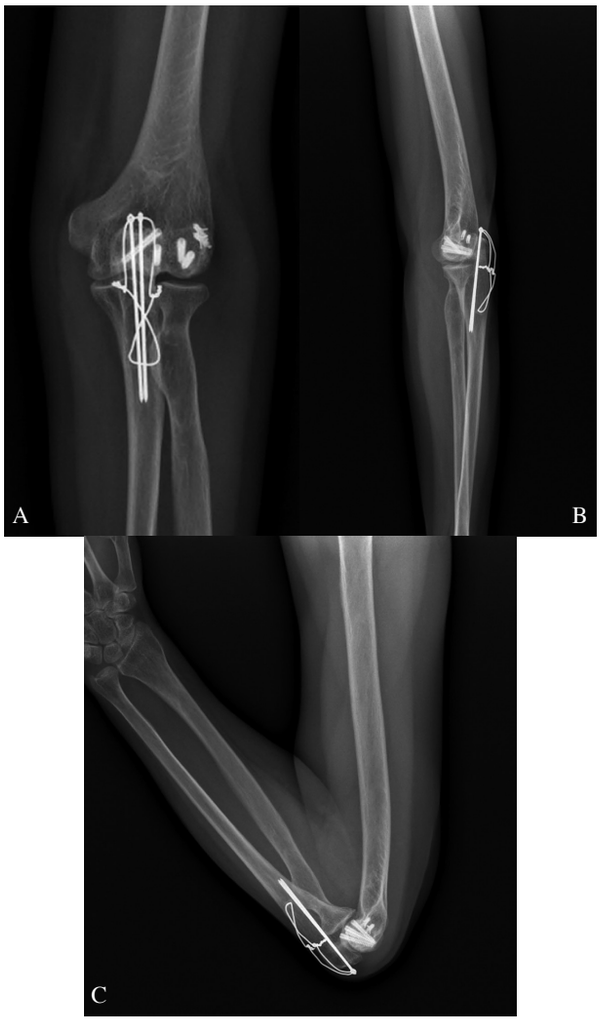

Fig. 2. – (A) AP and (B, C) Radiographic view taken at 22 months postoperatively shows satisfactory fracture healing and a full range of elbow joint motion. There is no evidence of post-traumatic arthritic change.

MEPS of type 3 fractures were significantly lower than those of type 2 fractures (p = 0.03). On the other hand, there was no significant difference between the MEPS of type 2A and 2B fractures (p = 0.03) and between type 3A and 3B fractures (p = 0.04).

We found 2 cases (13.3%) of Broberg and Morrey grade 1 degenerative arthritis (Fig. 3). We did not find any significant differences in ROM (mean arc of motion, 115°/119.3°) between patients who developed degenerative arthritis and patients without this complication. The average MEPS of

Table II. – Clinical outcomes at latest follow-up

No.	Flexion (degrees)	Extension (degrees)	Arc of motion (degrees)	VAS score	DASH score	MEPS
1	125	5	120	2	26.3	85
2	120	10	110	3	38.4	85
3	130	5	125	3.5	27.5	90
4	135	5	130	1	15.4	90
5	135	15	120	2.5	21.2	85
6	125	15	110	1.5	22.5	80
7	125	10	115	2	23.1	100
8	135	5	130	1	16.7	95
9	140	0	140	1	14.8	95
10	135	0	135	1.5	21.4	90
11	135	5	135	1.5	19.8	100
12	120	15	105	2.5	27.4	80
13	120	10	110	2.	23.3	95
14	115	5	110	1.5	22.8	90
15	110	30	80	4	42.4	80
16	125	5	120	2	23.8	80
17	125	5	120	2	14.5	90
18	120	0	120	1	15.7	90
19	120	10	110	2.5	21	90
20	115	5	110	2	14.9	80
21	115	0	115	1.5	22.5	90
22	120	5	115	2	15.4	90
23	120	10	110	2.5	14.8	80
24	120	10	110	2	21.8	90
25	115	5	110	1	15.3	90
26	125	10	115	1.5	18.7	90
27	115	5	110	2	22.3	95

Abbreviations : VAS, Visual analog scale ; DASH, Disabilities of the arm, shoulder, and hand ; MEPS, Mayo elbow performance score.

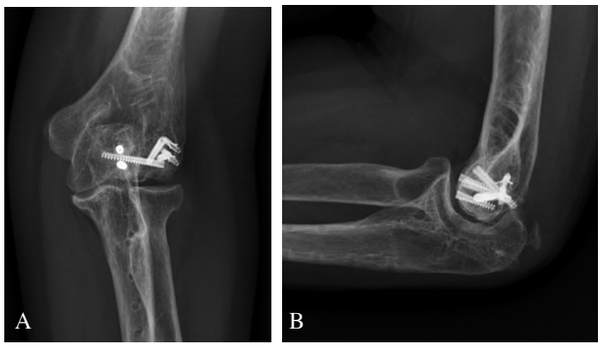

Fig. 3. – (A) AP and (B) Lateral elbow radiographs demonstrating Broberg and Morrey grade 1 degenerative arthritis. The clinical result was good with MEPS score of 85 points (follow-up : 22 months).

patients who developed degenerative arthritis were significantly lower than those of patients who did not develop it *(85/90)*.

Two patients had HO during the follow-up. We monitored changes in HO and elbow ROM, treating the patients with celecoxib and bisphosphonates during the follow-up period. One patient had grade 2 HO and persistent postoperative stiffness with a flexion contracture of 30° at the most recent postoperative visit (33 months). However, MEPS of the patient was good (80) and it was reported that she was satisfied because she had the ability to perform her activities of daily living. Therefore, this patient wanted no further intervention. The other patient had grade 1 HO 3 weeks postoperatively. The arc of elbow ROM was recorded at 105°. However, the HO disappeared 6 weeks postoperatively, and functional limitations were not observed. Therefore, no additional treatment was provided. HO was not present during subsequent follow-up visits, and the final arc of elbow ROM was 110°. HO

was detected only in type 3 fractures. One patient sustained postoperative ulnar nerve neuropathy that resolved spontaneously in 9 weeks, with no residual compromise.

DISCUSSION

This study demonstrates a good, stable surgical option for type 2 and 3 articular surface fractures of the distal humerus by headless compression screw fixation using the transolecranon approach.

An articular surface fracture of the distal humerus can markedly impair the elbow if they are treated inadequately. However, the current body of literature is limited to case series where it is difficult to draw firm conclusions on treatments and outcomes. Several treatment options have been described and include fragment excision, prosthetic elbow arthroplasty, arthroscopic-assisted reduction and percutaneous screw fixation, and open reduction and internal fixation. Previous authors recommended fragment excision *(1,14)*, but this seems to result in pain, instability, malunion, and loss of motion in some series *(4,5)*. It may, however, still be recommended for small osteochondral fragments not amenable to fixation. In the case of prosthetic elbow arthroplasty, if its comminution is too severe for proper internal fixation, it can be a viable treatment option. However, it should be used with the limits of low-demand patients with osteopenia. It is also disadvantageous as it can lead to loosening over time, and it is vulnerable to infection. Arthroscopic-assisted reduction and percutaneous screw fixation have technically high demands and are limited in that they can be applied only to simple fractures that do not have comminution or impaction *(27)*.

Therefore, open reduction and internal fixation is the recommended treatment of choice for the current management of these fractures to achieve stable anatomic reduction, restore articular congruity, and initiate early motion *(22)*. However, the debate has ensued about the optimal surgical exposure and fixation techniques.

The choice of surgical approaches for internal fixation of articular surface fractures of the distal humerus can be a difficult one to make. Lateral *(13,15,25)* and posterior *(18,29)* approaches are commonly used for articular surface fractures of the distal humerus. The most commonly preferred approach is the lateral approach for type I fractures. However, except type I fractures, the lateral approach alone cannot achieve the appropriate anatomical reduction because it is difficult to have adequate exposure of the fracture site. In addition, it has the disadvantage that the screw can be inserted at an oblique angle to the fracture line for the screw insertion. On the other hand, the transolecranon approach allows for the best visualization of the articular surface of the distal humerus. The olecranon osteotomy allows 57% visualization of the articular surface, compared with the 35% and 46% seen in the triceps-splitting and triceps-sparing approaches, respectively *(2)*. In addition, it has the advantage that the screw is easy to insert vertical to the fracture line, so that firm internal fixation is possible. By using the transolecranon approach, the distal humeral cartilage can be exposed entirely and complex procedures such as reduction of multiple fragments, elevation of impacted fragments, and bone grafting can be performed. Although a transolecranon approach provides excellent exposure for management of these fractures, a number of complications can occur after the creation and repair of osteotomy, including osteotomy nonunion, delayed union, hardware failure, and pain secondary to prominent hardware. Olecranon osteotomy carries a nonunion risk of 1-10% *(6,9,20)*. This rate has been observed to decrease with chevron osteotomy, which provides a wider contact surface *(8,10)*. In this study, a chevron olecranon osteotomy was performed for all patients. All olecranon osteotomies went on to heal, with no nonunions or delayed unions.

Osteotomies were secured with either dorsal tension band wire fixation or plate fixation. Theoretically, the plate provides resistance to tensile forces along the posterior surface of the olecranon, and the plate would be expected to more adequately resist both shear and rotational forces along the osteotomy site. However, the bulk of the plate has been an important problem ; the prominence of the hardware gives rise to pain and discomfort. On the other hand, tension-band wiring is a widely accepted fixation technique for the treatment of displaced

olecranon fractures or olecranon osteotomy. It has a well-established biomechanical basis and has been reported to provide good outcomes in several long-term studies *(11,17)*. In addition, fixation techniques using tension-band wire causes less implant prominence-induced pain or discomfort compared to the plate fixation. In the present study, 18 patients had fixation performed using tension-band wire and 9 had fixation performed using a plate. Of the 9 patients who had a plate, 5 patients needed hardware removal. Reasons for removal were pain and foreign material sensation when they placed their arms on a table or compressed their surgical wounds. No pin migration or subsequent loss of reduction was observed, and no skin perforations, deep infections, restrictions in forearm rotation, or nerve problems were encountered in the tension-band wiring group.

Several methods of fixation have been used in the treatment of articular surface fractures of the distal humerus and include fine-threaded K-wires, biodegradable pins, small fragment cancellous screws, headless compression screws, and plates. Fixation by the means of a K-wire is not desirable because it does not bring compression at the fracture site *(12)*. Cancellous screws can also be used for fixation of these fractures, but they necessitate insertion from a nonarticular surface because the screw heads cannot be countersunk. Moreover, the larger pitch of the cannulated cancellous screw is not suitable for the fixation of small cartilage fragments *(24)*. In plate-utilized internal fixation, it is difficult perform the fixation of the distal fragment, and it is used limitedly due to the extensive dissection that will affect the blood supply and increase the nonunion rate. However, headless compression screws provided superior resistance to cyclic loading, and we think that headless compression screws also apply excellent compression on the fracture site, which facilitate fracture healing and stable fixation allowing early mobilization of the elbow. Placing screws posterior to anterior can disrupt the posterior blood supply to the capitellum and trochlea *(5)*. Therefore, we made an effort insert screws in the anterior to posterior direction. We preferred to use at least two screws if possible, in divergent orientations, for adequate fracture stability to allow immediate postoperative active motion. When an impacted fragment was detected, the impacted fragment was reduced such that meticulous attention was spent for joint surface reduction and not to free the fragment from its bed. Bone defects should be reinforced with a bone graft.

This study had some limitations. First, it was a retrospective study without a control group. This was due to the rarity of articular surface fractures of the distal humerus in the clinical practice. A multi-centered study and comparisons with groups that use other treatment methods are warranted in future studies. Even though these early results are promising, longer-term monitoring and larger study populations are required to verify the presented data.

CONCLUSION

Previous reports on the use of headless compression screws for articular surface fractures of the distal humerus have shown satisfactory results. The use of the transolecranon approach has not been previously discussed in any large cases. Satisfactory clinical outcomes were obtained for headless compression screw fixation using the transolecranon approach. No major complications have occurred.

The present case series addressed the safety of and tips for the use of the transolecranon approach for the fixation of type 2 and 3 articular surface fractures of the distal humerus. The main advantages are direct fracture visualization, ease of joint inspection, help in reduction, and ease of correct perpendicular fracture fixation.

We concluded that headless compression screw fixation using the transolecranon approach is an acceptable alternative surgical method for type 2 and 3 articular surface fractures of the distal humerus.

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