

RESULTS OF SURGICAL TREATMENT OF INTRA-ARTICULAR (AO-C3)
DISTAL HUMERAL FRACTURES IN ADULTSERİŞKİN HUMERUS ALT UÇ EKLEM İÇİ (AO-TİP C3) KIRIKLARININ
CERRAHİ TEDAVİ SONUÇLARI

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ÖZET

Amaç: Bu çalışmada distal humerus kırıkları arasında eklem içi çok parçalı ve sorunlu olan tiplerin açık redüksiyon ve iki plak ile tespit sonuçları literatür gözden geçirilerek tartışıldı.

Gereç ve Yöntem: Uludağ Üniversitesi Tıp Fakültesi Ortopedi ve Travmatoloji Anabilim Dalı'nda 1995-2002 yılları arasında açık redüksiyon ve internal fiksasyon uygulanan intraartiküler çok parçalı humerus distal kırıklı 20 hastanın sonuçları değerlendirildi.

Bulgular: Olguların 11'i (%55) erkek, 9'u (%45) kadın olup ortalama yaş 40.6 (18-76) idi. Kırıkların AO/ASİF sınıflandırmasına göre tümü C3 tip idi. Kırıkların 8'i (%40) açık olup bunun Gustilo-Anderson sınıflandırmasına göre 6'sı (%30) Tip 3A ve 2'si (%10) Tip 3B idi. Tüm kırıklar redüksiyon sonrası 2 plak ile tespit edildi. Hastalarda %25 oranında yüzeysel yara enfeksiyonu, %5 oranında heterotopik ossifikasyon saptandı.

Sonuç: Erişkin distal humerus C3 tipi kırıklarda anatomik redüksiyon ve 2 plakla tespit ve sonrasında erken eklem hareketine başlanması, komplikasyonları azaltan ve öncelikle düşünülmesi gereken bir tedavi yöntemidir.

Anahtar Kelimeler: Distal humerus kırıkları, eklem içi kırık, iki plakla tespit.

ABSTRACT

Background: The results of intra-articular comminuted distal humeral fractures, which have been treated by open reduction and dual plate fixation, are compared in this study with previously published results.

Methods: At Uludag University Faculty of Medicine Department of Orthopaedics and Traumatology, between 1995 and 2002, the results of 20 cases were evaluated in patients with intra-articular comminuted distal humeral fractures, who had been treated by open reduction and internal fixation.

Results: Eleven (55%) cases were male, nine (45%) were female and mean age was 40.6 (range; 18 to 76). All fractures were C3 type according to AO/ASIF classification. Eight (40%) cases were open fractures and of these, six (30%) were type 3A and 2 (10%) were type 3B on the Gustilo-Anderson classification. All the fractures were fixed with dual plate after open reduction. In 25% of the cases, superficial wound infection was observed and in 5% heterotopic ossification.

Conclusion: In adult distal humeral fractures of type C3, stabilization by dual plate, following open reduction and early commencement of joint movements, has fewer complications and should be the preferred method of treatment.

Key Words: Distal humeral fracture, intra-articular, dual plate fixation.

INTRODUCTION

Due to the inherent nature of intra-articular comminuted distal humeral fractures, there may be serious complications. Relevant experience is necessary for the successful management of these fractures because of delicate and complex anatomy of the area and proximity to nerves and vessels.

These fractures often occur in the axial loading area of the elbow(1). They are classified according to the proximity of the fracture to the joint and the degree of comminution, the displacement and/or rotation of the fragments and the distance of the fracture line from the joint and orientation(2,3,4). The age of the patient and bone density play a

major role in selecting the type of treatment for these fractures. Conservative methods such as traction, casts, brace, collar and cuff(5,6) may be used or ligamentotaxic reduction as temporary external fixation(5).

As within all intra-articular fractures the chosen method of treatment should be the one that restores full range of movement in the elbow joint. Therefore open reduction and internal fixation is the most commonly used method.

In this study the results of adult intra-articular comminuted distal humeral fractures treated by open reduction and dual plate fixation are compared with previously published results.

MATERIAL AND METHODS

Between 1995 and 2002 the results of 20 cases of intra-articular comminuted distal humeral fractures treated by open reduction and internal fixation were evaluated.

On admittance to the emergency department, any additional life threatening injury had priority in the treatment. After evidence of fracture that observed on X-ray, a splint was applied and the patient was prepared for surgery.

All the fractures were classified under the AO/ASIF(2) system and the open ones also underwent Gustilo-Anderson classification(7). Tetanus prophylaxis was started to the open fractures and antibiotherapy was commenced in all cases (first generation cephalosporin + aminoglycoside).

All patients were positioned prone or lateral. Debridement and irrigation was carried out in open fractures and to prevent contamination sterile draping was re-applied.

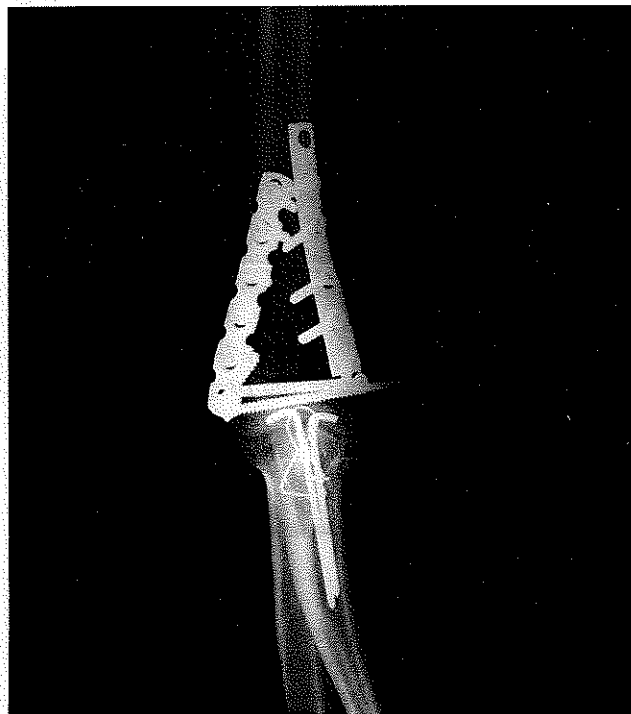


Figure 1 A

In all cases a curved lateral dorsal incision was made to locate and spare the ulnar nerve then in order to view the fracture area easily, a transverse olecranon osteotomy was performed.

To restore the articular surface fragments, temporary K-wires and 4 mm screws were used and fixed medially to the medial column with 1/3 tubular or semitubular plate and posteriorly to the lateral column with DCP or 3.5 mm reconstruction plates (Figure 1). In cases where implants invade the cubital tunnel an anterior transposition of the ulnar nerve was performed. Elbow movements were started on the third day postoperatively and these were evaluated according to Cassebaum criteria(8).

RESULTS

In this study of 20 cases, 11 (55%) were male and 9 (45%) female with a mean age of 40.6 years (range; 18 to 76). The causes of injury were in 13 cases, (65%) traffic accidents and in seven (35%) cases falling from height. In total, 12 (60%) were closed fractures and eight (40%) open. Additional injuries were seen in six (30%) of the closed and two (10%) of the open group (Table 1). Eleven (55%) were dominant extremity fractures.

All the fractures were classified under AO/ASIF(2) as type C3. Of the eight (40%) open fractures, six (30%) were

Table 1: Additional injuries

Additional injuries	n	%
Head trauma	1	5
Chest trauma	2	10
Abdominal trauma	1	5
Long bone fractures	4	20
Total	8	

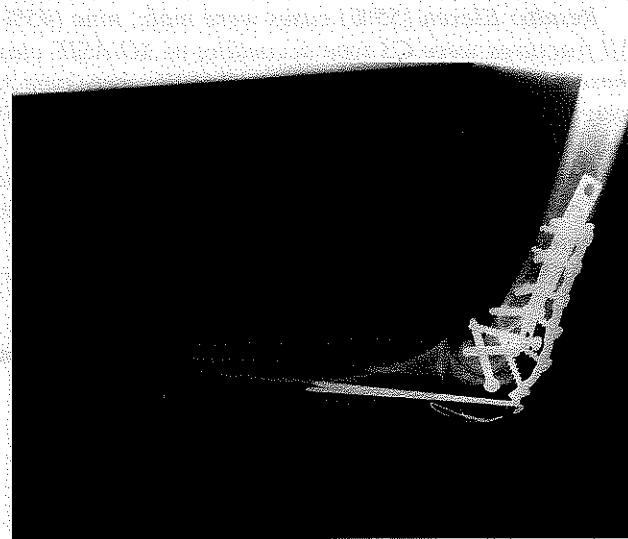


Figure 1 B

Figure 1: Postoperative anteroposterior (A) and lateral (B) radiographies of type C3 fracture.

type 3A and two (10%) type 3B. All the cases underwent surgery on an average of 3.4 days post trauma (range; 1 to 15). In two cases with type 3B fracture, the wound was closed with a split thickness skin graft and with a radial artery pedicle forearm flap in each cases.

With the exception of one type 3B open fracture case, all the patients were started on movements for the broken elbow on average 3.8 days (range; 2 to 7) postoperatively. The follow-up period averaged 37.1 months (range; 4 to 60) and all cases showed complete fusion on an average of 4.1 months. At an average of 4.3 months (range; 3 to 6) postoperatively all patients were able to return to their normal daily activities.

In patients with open fractures, superficial wound infection was observed in 5 (25%) cases but this was completely resolved by antibiotics. Heterotopic ossification occurred in one case (5%) and although the heterotopic bone was excised this case yielded a poor result in terms of range of motion.

With reference to Cassebaum criteria(8) the range of elbow movement results were 45% very good and good, 40% fair and 15% poor (Table II). Three (15%) patients reported pain during normal daily activities and 4 (20%) experienced occasional pain.

DISCUSSION

Among all fractures in the distal humeral area, the treatment of C3 types continues to be problematic. Special attention must be given to the complications, such as loss of motion, non-union, heterotopic ossification, nerve lesions and infection(9). It is our opinion that for distal humeral fractures, the AO/ASIF classification system is the most effective one both for preoperative planning and prognosis. In this study type C1 and C2 distal humeral fractures were not included. Fractures in the distal humeral area are often of the C type (10-13) and within the subgroups the most common is the comminuted C3 type(5). Webb(5) states that of C3 41% are open fracture. In our study 38% of the C3 type fractures were open and all of these were caused by high impact injuries such as traffic accidents.

Table II: The results of elbow range of motion according to Cassebaum(8)

Functional results	Closed fractures n (%)	Open fractures n (%)	Total
Very good	3 (15)	0 (0)	3 (15)
Good	4 (20)	2 (10)	6 (30)
Fair	4 (20)	4 (20)	8 (40)
Poor	1 (5)	2 (10)	3 (15)
Total	12 (60)	8 (40)	20

It is widely accepted that to expose the intricate nature of the elbow joint, a posterior approach is the most suitable way. For successful anatomic restoration in C3 fractures, open reduction enabling a full view of the area is undoubtedly the most important initial step. Zaveri et al(14) state that for reduction of such intercondylar fractures, transolecranon osteotomy gives a much better exposure of the area than the triceps splitting approach. McKee et al(15) state that after either the necessary olecranon osteotomy or triceps splitting, the elbow extension strength is reduced by 25%. In this study transolecranon osteotomy was performed as the most suitable approach for anatomic reduction.

It is known that a V-shaped olecranon osteotomy simplifies reduction with more stability(16). In this study transverse olecranon osteotomy was used and in all cases the osteotomy site fused without any problems. Rigid fixation of the osteotomy site allows to not only the fusion of the fracture but to also an early start to elbow movement.

Fixation by dual plate is accepted as the most effective method of stabilizing these fractures(17-19). Therefore in this study all fractures were stabilized in this way by dorsal dual plate. This rigid fixation, together with a program of exercise, yielded good results even in the older age range with lower bone density(16,20,21).

The reported rate of all infection for distal humeral fractures is 2-10%(22-24). Although superficial wound infection rate is 25% in this study, this should be due to causes of injury; for example the cases of traffic accidents that resulted with open fractures. High impact injuries cause comminuted fractures, severe soft tissue damage and disrupt the skin continuity thus leading to an increase in possible complications.

Following internal fixation of intra-articular distal humeral fractures Gupta(25) reported a result rate of 37% in the excellent category. In the older age group with primary total elbow prosthesis results of 95.2% very good and good have been published(26). Following internal fixation of intra-articular comminuted distal humeral fractures, according to objective criteria 70% experienced persistent pain and 40% were unable to resume their previous activities(14,27). In this study elbow range of motion yielded results of 45% very good to good. Kinik et al(20) having used dual plate fixation on distal humeral fractures achieved an elbow range of motion result of 68.6% in the very good to good range. However, those results cannot be compared with this study as all type C, even the simpler subgroups of C1 and C2 were included.

We conclude that in adult distal humeral fractures of C3 type, open reduction, dual plate fixation and early commencement of an exercise program to regain elbow range of motion reduce the possible complications and is therefore the preferred method of surgery.

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