A Study on surgical management of distal humerus fractures in adults by open reduction and internal fixation

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ABSTRACT

Distal humerus fractures represent one of the most complicated and challenging fractures in the upper extremity. Distal humerus fractures in adults are difficult fractures to treat because of significant comminution and they are rare fractures which prevents the individual surgeon from accumulating sufficient personal experience to critically evaluate the results of the treatment.

Aims & Objectives:
1. To evaluate the role of operative management in distal humerus fractures.
2. To follow up & evaluate results on patients operated upon and note the functional outcome and complications.

Patients and Methods: The present study is a prospective study of 30 cases of Distal humerus fractures (AO Type 13.A, 13.B and 13.C, 12 male and 18 females, age ranging from 20 to 70) treated by open reduction and internal fixation over two years, from September 2016 to August 2018 was conducted in department of orthopaedics, Prathima institute of medical sciences, Karimnagar. All patients were selected among admissions, operated and results were assessed clinically and radiographically. The functional evaluation of the results Cassebaum’s scale has been chosen. The follow up period ranges with average of 7 months and patients were assessed for functional capacity and radiological fracture healing capacity periodically every 4 – 6 weeks and complications noted.

Results: Outcome of surgical management of distal humerus fractures in adults by open reduction and internal fixation was evaluated using Cassebaum scale it was observed that 47% cases presented with excellent outcome, 30% cases presented with good outcome, 20% cases presented with fair outcome, 1% cases presented with poor outcome. In the present study 7% patients had superficial wound infections with hardware pain and 7% patients had presented with hardware pain and 3% delayed union 3% ulnar neuropathy, respectively.

Conclusion: The concept of open reduction and internal fixation of fractures of the distal humerus with dual plates is very valuable, in restoring articular surface and early rehabilitation which decreases morbidity, resulting good functional outcome.

Keywords: distal humerus fracture, Cassebaum’s scale, open reduction and internal fixation, dual plates, AO: Arbeitsgemeinschaft Fur Osteosynthesefragen.

INTRODUCTION

Distal humerus fractures represent one of the most complicated and challenging fractures in the upper extremity. Distal humerus fractures in adults are difficult fractures to treat because of significant comminution and they are rare fractures which prevents the individual surgeon from accumulating sufficient personal experience to critically evaluate the results of the treatment. The results of managing these fractures non-operatively are limited by failure to get anatomical reduction and early mobilization, which often results in painful stiff elbow and/or pseudarthrosis. Hence an operative management with anatomical reduction of the fragments becomes the treatment of choice for these fractures1. The complex three-dimensional geometry of the distal humerus poses a considerable challenge to reconstruction2.

The distal humerus fractures are rare fractures constituting 2% of all body fractures. Watson and Jones3 wrote “few fractures are more difficult to treat” while describing them, thus describing their complexity. The forearm musculature originating on the condyles tends to produce rotational displacement even when closed reduction is achieved. The only reliable method for restoring the normal alignment and contour of the distal humerus is operative exposure and direct manipulation of fracture fragments. However, fixation of fracture fragments must be stable enough to allow motion while ensuring union. In most cases open reduction with stable rigid internal fixation is required to fulfil the above goal.

The recommendations for treatment have ranged widely from essentially no treatment to operative reduction and extensive internal fixation. In some of these fractures particularly those with intra articular comminution, anatomical restoration of the articular surface cannot be adequately achieved or maintained through manipulative reduction alone.
Cancellous screws. The follow up period ranges between 20 weeks to 40 weeks with average of 7 months and patients were assessed for functional capacity and radiological fracture healing capacity periodically every 4 – 6 weeks. For functional evaluation of the results Cassebaum’s scale has been chosen.

INCLUSION CRITERIA

1. Those patients who are above the age of 20 years and managed surgically were included in the study.
2. Patients presenting with isolated distal humerus fractures with or without osteoporotic changes were included in the study.
3. Both closed and open distal humerus (Grade I & II) fractures were included in the study.

EXCLUSION CRITERIA

1. Children with distal humerus fractures in whom, growth plate is still open.
2. Patients lost in follow up.
3. Patients managed conservatively for other medical reasons.
4. Patients medically not fit for surgery.
5. Pathological fractures.
6. Incomplete and undisplaced fractures in adults.
7. Grade III compound fractures excluded.

SURGICAL PROCEDURES:

A straight posterior Campbell incision is used with slight radial deviation across the tip of the olecranon. The ulnar nerve is then identified and tagged with a vessel loop (umbilical tape). For adequate exposure of the distal condyles, an olecranon osteotomy is required. An intra-articular osteotomy is done after a predrilling of olecranon two or three drills, to avoid intraarticular comminution, because direct visualization of the articular surface is necessary for an exact anatomic reduction. A transverse or chevron intra articular osteotomy will be done. The osteotomy is completed with an osteotome used as lever to crack through the articular surface. Before the osteotomy, it is helpful to predrill the olecranon for the fixation preferred.

ANATOMIC REDUCTION AND STABLE FIXATION OF THE CONDYLES:

The first step is to anatomically reduce the articular surface; provisional stabilization can be accomplished with K wires or a bone holding forceps. Once this is accomplished, the condyles are held together with lag screw fixation. When there is no intra articular comminution, it is easier to drill from inside out through the capitellum to center the lag screw before anatomic reduction.

This will allow the lag screw to be in the proper position for optimal stabilization of the condyles. The condyles then are reduced and drilled from the capitellum into the trochlea. A 4mm cancellous screw then is placed, making sure the threads completely cross the fracture line. Those fractures with intra articular comminution are much more difficult. The intercondylar distance must be maintained, even in the face of the intracondylar comminution. The condyles are held together with a non-lag screw to prevent narrowing of the
intercondylar distance. A defect between condyles then can be spanned by a corticocancellous bone graft. Additional, small articular fragments can be held in place with countersunk screws.

The next step is to anatomically reattach the condyles to the humeral shaft. Temporary fixation is achieved with crossed K wires. Stable fixation is achieved by using two plates or sometimes only one plate or multiple cancellous, cortical screws or simply k wires depending on stability that is achieved at surgery.

The ulnar or medial plate is placed along the medial surface of the distal humerus, and the radial or lateral plate is placed along the posterior surface of the distal humerus, or lateral border of the humerus.

This construct will provide optimal biomechanical stability. To avoid fixation failure before bone healing, a cancellous bone graft is recommended for bone defects and comminution and is placed at this time. The olecranon osteotomy then reduced and fixation applied, commonly used are either two k wires or 6.5mm cancellous screw each with tension band wire.

After adequate stable fixation has been achieved, the elbow is placed through a range of motion. If olecranon impingement limits extension, a portion of the tip maybe excised. It is important to assure that the olecranon and the coronoid fossae are not compromised by bone fragments or hardware.

Followup & evaluation:

Post operative care included analgesia, limb elevation, antibiotics (ceftriaxone / amikacin and metrogyl)) for three days. Primary dressing on second day. Physiotherapy which includes, finger movements at the time of discharge (on 3rd day). Slab applied for 10 days till suture removal and graded physiotherapy started after the suture removal. The check x-ray taken after 2 days and the follow up x-rays after 3 weeks , 3 months and final movement evaluation at 7 months.

The follow up period ranges between 20 weeks to 40 weeks with average of 7 weeks and patients were assessed for functional capacity and radiological fracture healing capacity periodically every 4 – 6 weeks.

For functional evaluation of the results Cassebaum’s scale has been chosen.

THE RATING SYSTEM OF CASSEBAUM

Excellent: Extension deficit of 15° or less and flexion to 130o or more
Good: Extension deficit of 15o to 30o and flexion of 120o-130o
Fair: Extension deficit of 30o- 40o and flexion to 90o-120o
Poor: Extension deficit of 40o or more and flexion to less than 90o

The data on elbow motion was combined with the patient’s subjective symptoms to provide an overall functional rating. An excellent rating was given for a symptom free elbow with a normal or nearly normal range of motion, a good overall rating for good or excellent elbow motion with some subjective symptoms; a fair rating for a fair range of motion of the elbow with or without symptoms; and a poor rating for both limited mobility and limited function.

COMPLICATIONS

No surgery is without complications, like wise complications do occur with surgery of intercondylar fractures also. These include:

EVALUATION:

Outcome of management of distal humerus fractures in adults was evaluated using Cassebaum scale. It was observed that 47% cases presented with excellent outcome, 30% cases presented with good outcome, 20% cases presented with fair outcome, and 3% cases presented with poor outcome.

<table>
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<th>OUTCOME</th>
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<td>3%</td>
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<tr>
<td>TOTAL</td>
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Table 1. Outcome of management of distal humerus fractures in adults.

DISCUSSION:

Fractures of the distal humerus in adults are difficult to treat because of their rarity and associated significant comminution. The results of managing these fractures non-operatively are limited by failure to get anatomical reduction and early mobilization, which often results in painful stiff elbow and/or pseudarthrosis. Hence an operative management with anatomical reduction of the fragments becomes the treatment of choice for these fractures. The management of intercondylar and comminuted intra-articular distal humerus fractures has been controversial.

The critical factors for successful outcome remain those advocated earlier by Cassebaum. These include meticulous surgical technique, stable internal fixation, and early controlled post-operative mobilization. The careful identification and temporary fixation of the articular fragments with Kirschner wires enables the surgeon to accurately assess the anatomy of individual fracture and to tailor the placement and type of internal fixation to meet each fracture's unique requirements.

CONCLUSION:

Most of Distal humerus fractures are extra articular fractures which demands careful evaluation, classification of fracture type and pre-operative planning. Operative treatment with rigid anatomical internal fixation should be the line of treatment for extra articular and intercondylar fractures, more so in young adults as it gives best chance to achieve good elbow function. During open reduction & internal fixation, anatomical restoration of articular surface should be given prime importance. Early post-operative mobilisation by active assisted exercises and physiotherapy is must for good functional outcome. The concept of open reduction and
internal fixation of fractures of the distal humerus with dual plates is very valuable, in restoring articular surface and early rehabilitation which decreases morbidity, resulting good functional outcome. Single column fixation of extra articular distal humerus fractures by precontoured distal humerus locking plates also yielded excellent outcome in our study.

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