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ORIGINAL ARTICLE

MANAGEMENT OF DISTAL DIAPHYSIO METAPHYSEAL JUNCTION HUMERUS FRACTURES WITH SINGLE COLUMN POSTEROLATERAL LCP- OUR RESULTS

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ABSTRACT: Fracture of the distal humerus are complex and challenging injuries to treat. In this study we used distal humeral posterolateral LCP system, which is an anatomically shaped angular stable system. The purpose of this retrospective study was to evaluate clinical outcome after ORIF with posterolateral LCP plate. **METHODS:** 24 Consecutive patients with distal humerus fractures treated with posterolateral LCP between October 2010 to December 2014. 20 patients had complete follow up of 20 months, patients evaluated both clinically & radiologically & VAS & DASH score were used. **RESULTS:** All patients except 4 regained full range of movements, 2 patients lost 5° of extension & 1 patient 10° of extension. No loss of flexion in any patient. One patient had failed fixation who had stated early manual labour.

KEYWORDS: Posterolateral LCP, Distal.

INTRODUCTION: Fractures of the distal humerus are complex and challenging injuries to treat. Extra articular Supracondylar fractures in adults comprise 16% humeral fractures.[1] In spite of this there are few studies regarding managing this fractures. Since conventional management protocols for distal humeral Extra articular fractures (eg. Conservative/ double column plating) are often associated with complication. We aimed to describe our experience of using the posterolateral locking compression distal humerus plate. The main goal of treatment of Extraarticular distal humerus fractures is to restore alignment and achieve stable fixation to allow for early elbow range of motion (ROM). Many authors have advocated managing these fractures surgically with open reduction and internal fixation & immediate elbow movement.[2,3]

The anatomy of the distal humerus makes plate osteosynthesis challenging. Most studies recommend using 4.5mm low contoured DCP plate with four bicortical screws proximal & distal to fracture.[4,5] This however, may not be possible for humeral dia-metaphyseal region fractures as a result of insufficient space distally for adequate fixation & the risk of plate impingement on the olecranon fossa. Moron proposed the use of an oblique posterior plate at 5° to 8° angle off centre from long axis of humerus to obviate this problem.[6]

Although this reduced the risk of impingement and improved distal fixation, the obliquity of plate limited proximal fixation, especially if the fracture was comminuted or had proximal segmental extension. The plate we used in this study is a 3.5mm small fragment precontoured extra –articular posterolateral distal humeral locking compression plate (LCP) with distal angular offsets that allow the plate to contour the lateral column of the humerus. Therefore increasing fixation at the same time as extending proximally up the centre of diaphysis.

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MATERIAL AND METHODS:

THE IMPLANTS: The locking compression extra articular distal humerus plate also known as (Fig. 1) the same plate which we used for intra articular fractures of distal humerus but with a longer length were used in our cases**,** is an anatomically shaped angular stable fixation system. The plate has optimised angles within distal screws holes and increased hole density at the distal portion. Additionally the plate has as angular offset, which allows it to contour to the postero lateral column, thereby avoiding impingement on the olecranon fossa.

The aim of the respective study was to evaluate the early clinical and radiographic results after open reduction and single column fixation of fractures of the distal humerus with single column posterolateral distal humerus LCP plate.

SURGICAL TECHNIQUE: Surgery was performed with the patient in lateral position and under general anaesthesia. The injured arm was placed on support allowing elbow flexion up to 120°. The modified posterior approach to the distal humerus was used in all and longitudinal midline skin incision (Fig. 2) was made in the posterior aspect of the upper arm curving distally around the olecranon.[7] A lateral window was created lateral to the triceps tendon & was never split and proximally the interval between the long & lateral heads of triceps was carefully dissected (fig. 3) & radial nerve identified in all cases. No tourniquet was used in all cases.

Reduction of the fracture was performed first and held with k-wires then distal humerus LCP was placed and fixed with combination of 3.5mm cortical working and locking screws where necessary under fluoroscopic imaging, care was taken not to impinge on the olecranon fossa and the plate was taken as for distally down the lateral column as necessary for stable fixation.

PATIENTS: Between October 2010 to December 2014, 24 consecutive patients (18 men & 6 women) with extra articular distal humeral fractures operated at Sapthagiri Institute of Medical Sciences and Research Centre were included in study.

Inclusion criteria included skeletally mature patients with closed or open fractures of distal humerus (A O type A). The patients mean age at the time of presentation 36 yrs (Range: 18 to 60yrs) of the 24 patients 15 were due to motor vehicle accidents, 9 were due to fall, majority (60%) had isolated humeral injury, remaining 40% had other injuries in the body, nearly 60% fractures were comminuted with long butterfly fragment. 4 patients had radial nerve injury, one patient had median nerve injury. The mean time duration between injury and surgery was 1 day. The mean follow-up time was 9 months.

Out patients follow-up examinations were at 2 weeks, 6 weeks & 12 weeks post-operatively & continued until fracture Union and discharge from physiotherapy. Radiographic follow-up included standard anteroposterior & lateral radiographs looking for fracture reduction, fracture union & hardware loosing & failure. Clinical follow-up included measurements of elbow range of motion, patient satisfaction, visual analog scale (VAS), & DASH score.

RESULTS: The mean time from injury to definite fixation was 24 hours. The mean time to fracture union was 12 weeks, where union was defined as the absence of pain on physical examination & radiographic signs of bone bridging on two orthogonal views. We successfully followed up 20 patients as average of 20 months post-operatively, the remaining 4 patients were lost to follow up for various reasons.

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All the patients except 4 regained full range of movement, 2 patients lost 5° of extension, 1patient lost 10° of extension. There was no loss of flexion in any patient. One patient had failed fixation who had started early manual labour without surgeon's advise, he was again operated with re-osteosynthesis with additional medial plate and bone graft & recovered fully. Two patients had intra-operative neuropraxia & recovered completely after 3 months, one patient had superficial wound infection and no patient had any deep infection, one patient required hardware removal due to symptomatic irritation.

DISCUSSION: Distal humerus are very challenging to treat. They are commonly comminuted with long butterfly fragment, occur in osteoporosis and have complex anatomy with limited options for internal fixation. Extraarticular humerus fractures can potentially be treated non-operatively in functional brace.[8] It is however, cumbersome & difficult for patients initially & has been associated with both skin problems and mal-alignment.

Operative treatment has been shown to provide none predictable alignment & immediate fracture stability, allowing early elbow mobilization at the risk of complication such as iatrogenic nerve injury, infection, olecranon impingement & hardware loosening. Although iatrogenic nerve injury is relatively uncommon in the treatment of humeral shaft fractures, plate osteosynthesis of distal third injuries plate. The nerve at greater risk as a result of use of posterior approach to identify & mobilize the nerve.

Recent data from Finnish National Health Registry indicate a substantial increase in the number & incidence of distal humerus fractures[9] stable fixation of humeral dia-metaphyseal junction fractures is challenging with standard 4.5mm LCP construction.

Most authors recommend using a 4.5mm low contoured dynamic compression plate (LC-DCP) with 4.5mm diameter screws and obtaining eight cortices of purchase, both proximal and distal to the fracture. However, adhering to these principles becomes difficult in distal humeral shaft fractures, especially those around the metaphyseal transition zone between the shaft and Supracondylar ridges, Shatzkar & Tile advised plating the humerus posteriorly in order to utilize the flat posterior surface to achieve adequate distal fixation.[10] However, fractures at metaphyseal junction are problematic because, plates of adequate length can impinge on the olecranon fossa.

Moran attempted to solve this dilemma by using an oblique posterior plate orientation with 5-8 angle off centre from one axis of the humerus and angling the most distal screw proximally while improving distal fixation, the obliquity of the plate limited proximal fixation, which was problematic in comminuted or segmental fractures.[6] In 2005, Levy reported excellence results in 15patiens using an alternate method of osteosynthesis with a modified lateral tibial head buttress plate.[11] This modified synthes plate had on angular offset of 22°, which allowed the plate to contour to the posterolateral column and also to extend proximally up the humeral shaft.

Jawa et al published a retrospective study of forty patients who had sustained distal third diaphyseal fractures of the humerus and had follow up for a minimum of 6 months or until healing of fracture. All fracture in this group healed with <10° of angular deformity.[12]

This study evaluated clinical outcomes after ORIF of extraarticular distal humerus fracture with a single lateral column plate. The results confirm our hypothesis that adequate fixation and satisfactory functional outcome may be achieved with this device. The mean range of movement was 10-120° at the last follow up examination and no patients having flexion contracture greater than 20°.

Early physical therapy and ROM exercises were imitated immediately after suture removal on 14th day in all of our cases to mitigate such contractures.

The DASH score revealed a good subjective overall with average value of 30 points with 10 points as the worst possible score result. This is comparable to the mean DASH score found in modern series of distal humeral fractures that have been reported to range from 18.5 to 46.1 points including mild to moderate residual impairment.

With regard to neurologic injury the patients who had a radial nerve palsy present preoperatively had continuity of the nerve confirmed at surgery and all regained radial nerve function by 12 weeks follow up visit. Even the 3 cases with intra-operative neuroproxial injury recovered completely.

Wenzl et al found that using the limited contract dynamic compression plate (LC-DCP) for internal fixation with locking screws demonstrated high consolidation rates as low complication rate,[13] we feel that the posterolateral distal humerus LCP plate is reliable implant for the treatment of distal humerus fractures.

The limitations of this study include the small sample size and 4 patients lost to follow up which is very high. In addition only one type of plating was tested, so no direct comparison may be made with other plating systems or techniques such as double plating.

CONCLUSION: The use of 3.5mm small fragment precontoured posterolateral LCP has been shown to successfully treat distal third humerus fractures, allowing fixation from proximal to distal metaphyseal junctions. The advantage of this plate is that the distal contour the risk of olecranon impingement, it has a low profile reducing soft tissue irritation and it has a high density of distal locking options to maximize fixation. This plate is currently our treatment of choice for these fractures & highly recommended.

In summary, treating extraarticular distal humeral fractures with plate osteosynthesis is often challenging because of risk of centrally located posterior plates impinging on the olecranon fossa limiting distal inadequate fixation leading to loss of fixation many times. The use of these posterolateral LCP obviates this problem. The distal aspect of the plate contour around lateral column allowing for insertion of up to five locking screws into distal fragment out of 24 patients & 20 patients of complete follow up only one patient needed revision plating & bone grafting.

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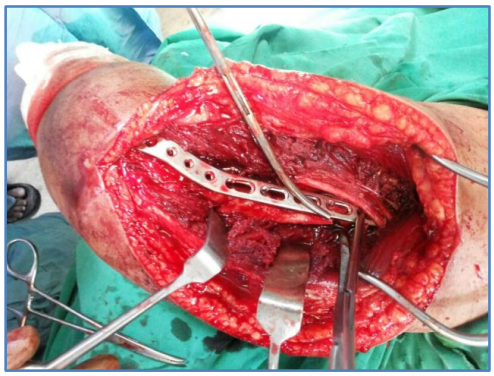

Figure 1

Figure 2

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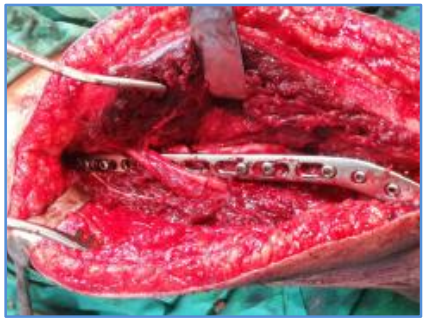

Figure 3

Figure 4

Figure 5

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