

Outcome of Open Reduction and Internal Fixation Using Plate Versus Closed Reduction and Percutaneous Fixation Using K-Wires for Treatment of two Part Proximal Humerus Fracture

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ABSTRACT

Aim: To compare the outcome of open reduction and internal fixation (ORIF) using plate and closed reduction (CR) and percutaneous fixation using K-Wires for treatment of proximal humeral fractures.

Study design: Randomized controlled trial

Duration & place of study: Department of Orthopaedics, Pak Red Crescent Medical College & Hospital, Dina Nath, Kasur presented over a period of twelve months from 01-04-2013 to 31-03- 2014.

Methods: One hundred and fifty three patients presented with proximal humeral fractures. Patients having low energy closed proximal humerus displaced two part fractures were included. Those patients who have pathological fracture or a previous fracture of the same proximal humerus, major nerve injury, located fracture of the major or minor and closed reduction falls were excluded from the study.

Results: Range of motion (flexion) and (abduction) in terms of post surgery was 108.25 ± 6.71 in CR with k-wire and ORIF it was 510.25 ± 11.69 with a p value of 0.001 which is significant.

Conclusion: Proximal humerus locking plate gives stable fixation with minimal implant problems and enabled early range-of motion exercises to achieve acceptable functional results for 2-part fractures compared with K-wire fixation.

Keywords: Proximal, Humerus, Fracture, Conservative, Operative, Locking plate

INTRODUCTION

The treatment option for displaced surgical neck and or greater tuberosity proximal humerus fractures remains the matter of debate¹. Non-operative treatment modality can be opted for minimally and non-displaced fractures, which account for the majority of proximal humerus fractures, as the stability is provided by intact rotator cuff musculature and adjacent soft tissue structures². The proximal humerus fracture is the most common fracture after the fracture of hip and distal radius in elderly patients which is about 4% of all fractures³. Most of these fractures happen to occur in elderly osteoporotic female patients and are non or minimally displaced.⁴ A comprehensive study by Palvanen et al⁵ demonstrated an increase in the annual fracture rate of 13.7% per year over the past 33 years. In this era of high incidence of such fractures the most effective treatment modality in terms of functional outcome, pain and rehabilitation time, as well as the economical impact is yet to be deterrent⁶.

Closed reduction with percutaneous pin fixation has been used to treat displaced two-part surgical

neck and, to a lesser extent, extra-articular three-part fractures. The advantage of this technique is that it produces little disruption of the soft tissue envelope surrounding the fracture and is associated with no residual hardware. However, this technique can not produced optimal stability biomechanically⁷. Moreover there is significant risk of injury to the radial and axillary nerves⁸. Additionally, pins left outside the skin are susceptible to infection and all eventually require a second procedure for removal. However, open reduction and internal fixation with a locked plate also has its disadvantages⁹. The deltopectoral approach, which is used to expose all fracture fragments and place the plate on the lateral metaphyseal bone of the proximal humerus, often requires an extensive soft tissue dissection that may devascularize fracture fragments and/or lead to postoperative stiffness¹⁰.

PATIENTS AND METHODS

This randomized controlled trial study was carried out at Department of Orthopaedics, Pak Red Crescent Medical College & Hospital, Dina Nath, Kasur. Total 500 patients with humeral fractures presented over a period of twelve months from 1st April 2014 to 31st March 2015. Out of which 153 patients presented with proximal humeral fractures. Eighty patients out of the last, were enrolled in this randomized controlled trial 40 underwent CR and percutaneous

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K-Wires fixation and 40 underwent ORIF with locking plate, who matched the inclusion and exclusion criteria. Patients having low energy closed proximal humerus displaced two part fractures in which the fracture line emerges through the surgical neck in patients more than 18 year of age were included. Those patients who have pathological fracture or a previous fracture of the same proximal humerus, other injury to the same upper limb requiring surgery, major nerve injury and open fracture and located fracture of the major or minor or tubercle, any medical condition that excludes surgical treatment and closed reduction falls were excluded from the study. Data analysis was done using SPSS 18.0. Success of randomization was checked by significance of other variable between the two groups. The level of significance was set at $P < 0.05$.

RESULTS

Our study compared the two groups in terms of postoperative range of motion (ROM). Range of motion (flexion) in terms of post surgery 6 weeks

duration was 108.25 ± 6.71 in CR with k-wire with a p value of 0.001 which is significant and for ORIF it was 510.25 ± 11.69 with a p value of 0.001 which is significant. At 12 weeks duration it was 120.25 ± 8.31 in CR with k-wires with a p value of 0.001 which is significant and for ORIF it was 138.25 ± 12.17 . At 24 weeks it was 138.25 ± 7.64 for CR with k-wire and for ORIF it was 156.00 ± 8.10 with a p value of 0.001 which is significant. Range of motion (abduction) in terms of post surgery 06 Weeks duration was 97.50 ± 7.42 in CR with k-wire with a p value of 0.001 which is significant and for ORIF it was 102.75 ± 8.46 with a p value of 0.001 which is significant. At 12 weeks duration in CR with k-wire was 112.25 ± 7.50 with a p value of 0.001 which is significant and for ORIF it was 124.50 ± 10.75 with a p value of 0.001 which is significant. At 24 weeks it was 129.38 ± 7.26 for CR with k-wire with a p value of 0.001 which is significant and for ORIF it was 147.00 ± 10.17 with a p value of 0.001 which is significant.

Table 1: Comparison range of flexion and abduction in patients who underwent ORIF with plating

Data	CR with K-Wire	ORIF with plating	P value
ROM (Flexion) in terms of post surgery duration			
6 Weeks	108.25 ± 6.71	510.25 ± 11.69	0.001
12 Weeks	120.25 ± 8.31	138.25 ± 12.17	0.001
24 weeks	138.25 ± 7.64	156.00 ± 8.10	0.001
ROM (Abduction) in terms of post surgery duration			
6 Weeks	97.50 ± 7.42	102.75 ± 8.46	0.001
12 Weeks	112.25 ± 7.50	124.50 ± 10.75	0.001
24 weeks	129.38 ± 7.26	147.00 ± 10.17	0.001

DISCUSSION

Treatment of proximal humerus fractures has been revolutionized by locked plating. Previous instrumented fixation methods, including rods, nails, pins, and plates and screws, were often limited by inadequate purchase into the humeral head. Locked plating provides more rigid fixation into the metaphyseal bone and consequently allows for earlier mobilization, which theoretically decreases postoperative stiffness. Before the advent of locked plating, minimally invasive techniques were limited to extra-articular diaphyseal or metaphyseal fractures or nondisplaced articular fractures amenable to isolated screw or pin fixation. Locked plating not only has afforded more effective stabilization of fractures with poor cortical bone, such as metaphyseal fractures or osteoporotic fragility fractures, but has allowed plating of these fractures through smaller incisions. Locked plating has prompted a growing trend toward obtaining stable fracture fixation through minimally invasive techniques. As the axillary nerve is

consistently 5cm-7cm distal to the lateral edge of the acromion, percutaneous plate fixation is ideally suited to fractures involving the proximal humerus. Through the proposed incision, the axillary nerve can be palpated easily and protected. With these precautions, MIPO may be safer than other techniques, such as percutaneous pinning, in which screws or pins may be blindly inserted adjacent to the axillary nerve. Evidence suggests that minimally invasive techniques also pose less risk to the vascular supply of the humeral head. In a cadaveric study of MIPO, Gardner and colleagues demonstrated preservation of the humeral head arterial supply, which included the ascending branch of the anterior humeral circumflex vessel and an unnamed posterior branch, when the plate was placed in the "bare spot" on the proximal lateral region of the humerus. Wanner et al¹¹ and Esser et al¹² reported excellent results in 22 out of his 26 patients of three part and four part fractures of proximal humerus treated with a modified clover leaf plate. Wijgman et al¹³ reported good to excellent

results in 87% of their 60 patients with three or four part proximal humeral fractures operated with a T-buttress plate and cerclage wires. Paavolainen et al⁵ reported satisfactory results in 74.2% of their 41 patients with severe proximal humerus fractures treated with plate and screw devices. However all these authors found poor results in 4 part fractures and recommended a prosthetic replacement in such patients. Several clinical studies have corroborated the benefits of minimally invasive vs standard K-wire techniques in limiting fracture reduction and maintain the contour of humeral head^{8,9,10}. Another advantage of this technique is the ability to obtain a “good” reduction of the greater tuberosity. Several authors have indicated that attaining anatomical reduction of the greater tuberosity is important to the ultimate outcome after proximal humeral fractures.^{5,6} We feel that this technique, which provides ample exposure to the greater tuberosity, allows for reduction of all fracture fragment

CONCLUSION

Proximal humerus locking plate gives stable fixation with minimal implant problems and enabled early range-of motion exercises to achieve acceptable functional results for 2-part fractures compared with K-wire fixation.

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