Original Article

Proximal Humerus Fratures

Closed Reduction and Percutaneous Pinning in Proximal Humerus Fratures- Assessment of Results Using Constant-Murley Shoulder Scoring Scale

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ABSTRACT

Objective: The aim of the study was to assess the results of closed reduction and percutaneous pinning in proximal humerus fracture using Constant-Murley shoulder outcome scoring scale

Study Design: Experimental study.

Place and Duration of Study: This study was conducted at KMSMC/AIMH and National Bones and Joints Hospital Sialkot from July 2013 to Dec 2014.

Materials and Methods: 20 patients having proximal humerus fractures were operated and closed reduction and percutaneous pin fixation was done. Out of 20 patients, 11 patients (55%) were male and 9 female (45%). Right side was involved in 14 patients (70%) and left side in 6 patties (30%). Age ranged b/w 30-50 years with an average age of 38.4 years. Mechanisms of injury were RTA in 10 patients(50%), fall from height 6 patients(30%), fall while walking/stair climbing 4 patients (20%). The follow up ranged from 6-18 months with an average follow up of 9 months.

Results: The patients were assessed postoperatively at the end of follow up using Constant-Murley shoulder outcome scoring scale. 12 patients (60%) had excellent, 5 patients (25%) good, 2 patients (10%) fair and 1 patient (5%) had poor result. The mean Constant-Murley score at the end of follow up was 88.2 points. The complications observed were; pin track infection 3 patients (15%), loosening of pin 2 patients (10%), mild fracture displacement 1 patient (5%) and shoulder stiffness 2 patients (10%), Whereas, deep wound infection, avascular necrosis, hetrotophic ossification and neurovascular injury were not seen in this study. All the fractures unite satisfactorily b/w 8-14 weeks with an average of 10 weeks postoperatively.

Conclusion: Closed reduction and percutaneous pin fixation in displaced fractures of proximal humerus is safe and effective procedure with negligible complications and should be adopted as the first line of treatment if facilities are available.

Key Words: Proximal humerus fracture, closed reduction, pinning, Constant-Murley scoring scale.

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INTRODUCTION

Proximal humeral fractures are the third most common fractures after hip and distal radius fractures.[3,6,9,17] The incidence of proximal humerus fractures typically increases after 50 years of age in women and 70 years in men. Based on recent literature the age and sex specific incidence rate of proximal humeral fractures varies from 10-300 per 100,000 people in different populations. [6,17,27,40]

Proximal humeral fractures account for almost 4-5% of all fractures. These fractures have dual age distribution, occuring in young individuals following high energy trauma or in older patients aged >50years with low velocity injuries like simple fall.[1,7,24,26] The management of proximal humeral fractures can be divided into 2 categories: conservative Vs surgical. Undisplaced fractures or fractures with minimal displacement and stable fractures can be treated conservatively with closed reduction and immo-bilization followed by early mobilization through exercise and physical therapy. Cornell[8], Hawkins, et al[15], Herscovici, et al[16], Koval, et al[26], Neer [32].

Open reduction and internal fixation involves extensive soft tissue damage and there is chance of damage to the vascular supply, avascular necrosis, implant failure due to poor quality of bone, nonunion, pseudarthrosis and shoulder stiffness. Brooks, et al[5], Jaberg et al[21].

Various methods of osteosynthesis havebeen suggested for proximal humeral fractures which include: external fixation, closed reduction and percutaneous pinning, open reduction and plating either by compression plates, T-plates, philos plate, fixed locking plate etc.,

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open reduction and tension band wiring, Anterograde/ retrograde nailing, hemiarthoplasty or total shoulder replacement. Each method has got its own advantages and disadvantages with different degree of complications. The purpose of intervention is to stabilize the fracture site to aid in better union, reduce pain and return to the preinjury level of activities. Failure to achieve fracture union can lead to impairment of function and weakness of shoulder muscles. Entrapment of soft tissues such as; long head of biceps tendon, deltoid muscle or neurovascular structures between the fragments is uncommon. The possibility of biceps tendon entrapment is only with 100% anterior displacement of shaft fragment. The humeral shaft fragment maybe button-hole through the capsule or the periosteum becoming entrapped in muscle and in this particular situation open reduction is indicated. [2,4,5,8,9,20,21,25,27,35,38]

About 80% of proximal humeral fractures can be treated conservatively. Bengner, et al[3], Horak and Nilsson[14], Leyshon RL[30], Olerud P[33], Williams GR, et al[42], Fjalestad T, et al[11]

Plate fixation is often difficult due to multiple fragments and poor quality of bones whereas intramedullary nailing also has potential risk of violating the rotator cuff or elbow function. [27,31,34,36]

Closed reduction and percutaneous fixation is considered to be a reliable method in achieving good results in carefully selected patients, although it is less rigid biomechanically than the plate and screw construct, but can be used effectively in good quality bone. Percutaneous fixation technique has advantages over open reduction and internal fixation because there is no soft tissue damage and no chance of iatrogenic avascular necrosis.[19,22,27,43]

Unfortunately not much local data is available to ascertain the local results. This study was conducted to assess the efficacy of the procedure according to our circumstances.

MATERIALS AND METHODS

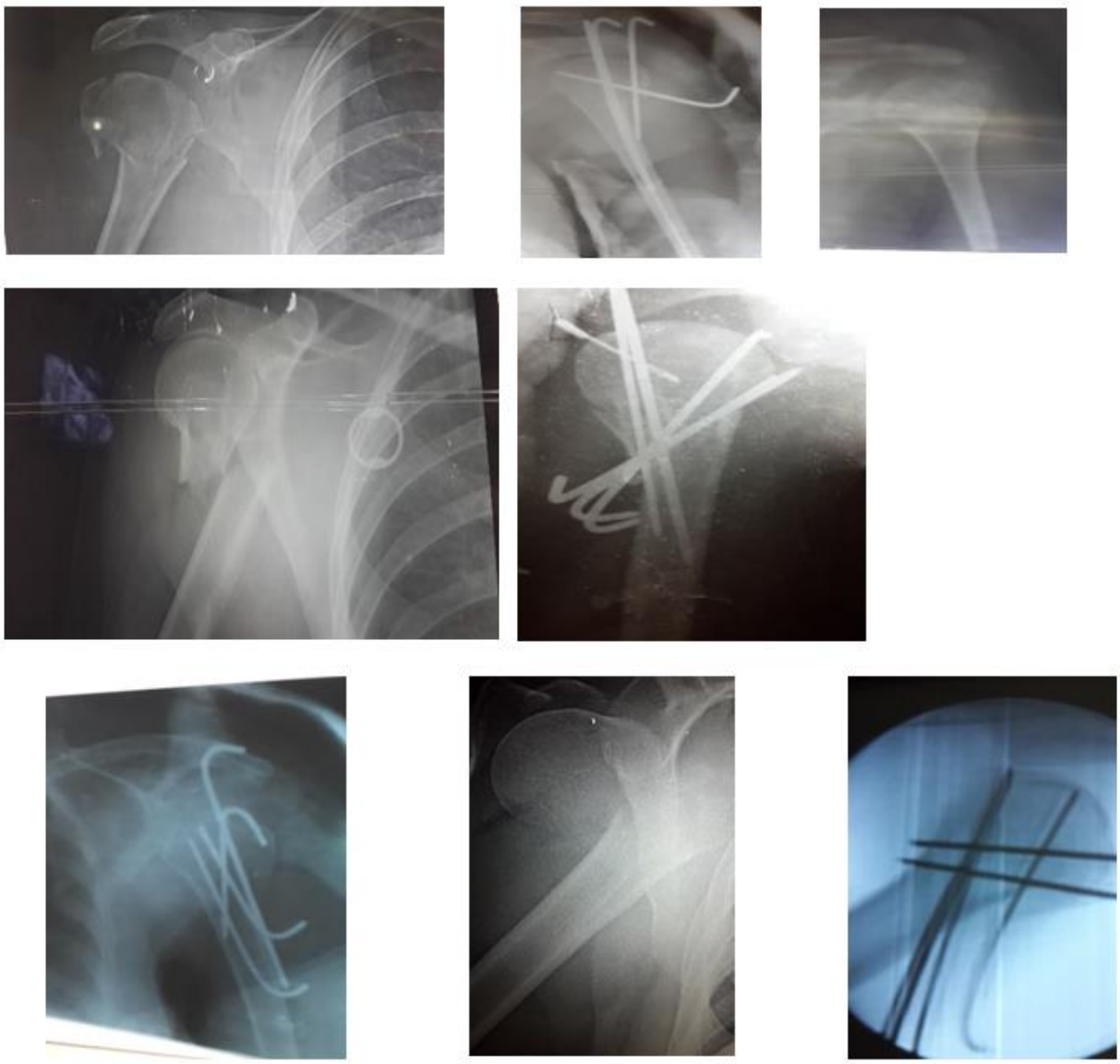
20 patients were selected and operated upon for study at KMSMC/AIMH/National hospital from July 2013 to Dec 2014. Out of 20 patients 11 patients (55%) were male and 9 patients (45%) were female. The age ranged from 30-50 years with an average age of 38.4 years. Right side was involved in 14 patients (70%) and left in 6 patients(30%). The mechanism of injury was RTA in patients (50%), fall from height 6 patients(30%), fall while walking/stairclimbing 4 patients (20%). The inclusion criteria was closed fracture; displaced or undisplaced, single or 2-3 parts fracture, whereas severely comminuted fractures with marked osteoporosis, compound fractures, polytrauma patients along with abdominal or chest injury, patient unfit for anesthesia having different medical problems were excluded from the study. Prophylactic antibiotics were given to all the patients. In all the patients closed reduction and percutaneous pin fixation was done and were discharged on the 2nd post-operative day and were followed up; weekly for 1 month, then fortnightly for 3 months, then after every 3 months till completion of follow up. All patients were encouraged to have gentle range of motion exercises especially forward flexion and backward extension in order to avoid shoulder stiffness. K-wires were removed after 6-8 weeks of surgery depending upon the state of union. Patients were followed up from 6-18 months with an average follow up of 9 months. All patients were assessed postoperatively using Constant-Murley shoulder outcome scale as per recommendation of European Society of Shoulder and Elbow surgery (ESSES). The score system consists of 4 variables that are used to assess the shoulder function. The subjective variables include pain (15 points), activities of daily living-sleep, work, recreation (20 points) and Objective variables include range of motion-forward elevation, abduction, internal rotation and external rotation (40 points- 10 points each) and strength (25 points). The score was graded according to total points obtained by the patient taking the normal side of the patient as standard (100 points). A score b/w 85-100 was graded as excellent, 70-85 as good, 60-70 fair and <60 points as poor result.

RESULTS

Mean Constant-Murley score of patients at the mean follow up of 9 months was 88.2 points. 14 patients (70%) had excellent, 4 patients (20%) had good, 1 patient (5%) fair and 1 patient (5%) had poor score at the end of follow up.

The fracture union time ranged from 8-12 weeks with an average of 10 weeks postoperatively. The satisfactory healing of fracture site occured in all patents. The mean postoperative range of motion points at the end of follow up by Constant scale was 34 points (range 24-40 points). The mean forward flexion was 170^0 (range $120\text{-}180^0$) and mean abduction was 165^0 (range $110\text{-}180^0$).

The complications observed were; pin track infection 3 patients (15%), loosening of pin 2 patients (10%), mild fracture displacement 1 patient (5%) and shoulder stiffness 2 patients (10%), Whereas, deep wound infection, avascular necrosis, hetrotophic ossification and neurovascular injury were not seen in this study.



Photographs: Closed Reduction and Percutaneous Pinning in Proximal Humerus fractures.

DISCUSSION

Different surgical treatments are available for the management of closed proximal humeral fractures in the literature which involve both, the non-operative as well as operative methods like open reduction and internal fixation with conventional plate, T plate, locking compression plate, Philos plate, external fixator either Hoffman type or JESS type (Joshi external stabilizing system), closed reduction and K wiring, percutaneous screw fixation or tension band fixation. [1,2,4,8,12,17,20,24,25,27,33,41]

Each procedure has its own limitations and complications with certain advantages over others. A major disadvantage to the nonoperative treatment is the failure to obtain early mobilization which results in high rate of shoulder stiffness and pain; Malunion and nonunion are also likely to be associated with this type of treatment. Cordasco RH[10], Hodgson SA, et al[19], Jakob RP, et al[22], Zyto K, et al[43]

Fjalstadt, et al[11] reported his results of 50 patients with 3 and 4 parts fracture humerus in which he compared the results of conservative treatment with angular stable interlocking implants. According to his report after 12 months follow up there was no significant difference inbetween the two groups. However, there were certain limitations in his study which include small sample size and short follow up.

Zyto R, et al[43] compared conservative treatment with tension band osteosynthesis in type 3 and 4 part fractures of proximal humerus. He reported that optimal functional ability was regained within first 12 months although the follow up period lasted for 5 years. The main complications noted in his study were in the surgical group, in which despite improved positioning and reduction, the functional outcome as measured by

subjective assessment of function at 12 months and at final follow up was not different b/w the two groups.

The disadvantage of open internal fixation is difficulty in achieving rigid fixation in osteoporotic, cancellous bone of proximal humerus. Similar problems are also encountered in case of severe communition in relatively young patients as well. Cortical bone in osteoporotic and comminuted situation provides weak purchase to the screws. Presence of comminution provides difficulty to internal fixation and there is increased chance of complications due to hardware loosening and pull out of screw. Moreover there is extensive soft tissue dissection, blood loss, more chance of avascular necrosis and more joint stiffness which leads to poor results. [5,7,10,20,24,27,29]

Use of external fixators like Hoffman have also been reported by many authors but due to bulky Steinmen pins, increased risk of soft tissue injury, intra-articular penetration and moreover limited space for the application of pins in different planes has limited its use. The JESS (Joshi external stabilizing system) has also been reported in which small K wires are used in different planes which add to rotational stability to reduce fracture and has lower risk of soft tissue, neural and vascular injury. [5,8,12,34]

Stableforth, et al[39] reported his results of 32 patients treated with hemiartoplasty Vs conservative treatment. According to his report; the results of surgical intervention were better as compared to conservative treatment using closed reduction and sling application at 6 months follow up with reference to pain and power. In the literature implant failure and loss of primary fixation have been reported in 2.7 to 13.7% of cases following open reduction and internal fixation using locking plates in proximal humeral fractures. Recent trend is shifting away from open reduction and internal fixation to closed reduction and percutaneous fixation as this method has definite advantage of being less invasive, less soft tissue damaging and with a lower complication rate. Another complication associated with ORIF is the increased risk of avascular necrosis of humeral head due to the impairment of anterior circumflex humeral artery and consective devascularization of humeral head which leads to functional impairment. Percutaneous pinning is the best alternative to other operative treatments. [2,10,21,28,29,31,36,42]

In our study the mean Constant-Murley score was 88.2 points at the mean follow up of 9 months with 14 patients (70%) having excellent, 4 patients (20%) good, 1 patient (5%) fair and 1 patient (5%) poor results. Overall 90% of the patients were satisfied with this procedure. Kettler et al reported a constant score b/w 52-72 points with ORIF using Phillos plate whereas, Hunter et al reached a mean Constant score of 55 points. Rosa et al[37] reported a Constant score b/w 33-84 points using two elastic smooth pins inserted through.[24,25,37]

Pin track infection was the most common complication observed in this study. We noted loosening of pin in 2 patients, fracture displacement (1-2mm) in 1 patient, shoulder stiffness in 2 patients; whereas other complications like wound infection, avascular necrosis, nonunion, were not observed in the study.

CONCLUSION

Displaced proximal humeral fractures can be treated with closed reduction and percutaneous pin fixation successfully with excellent results. It is the safe and effective method with negligible complications and should be adopted as the first line of treatment if facilities are available.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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