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Original Research Article

Management of proximal humerus fracture with plate osteosynthesis

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ABSTRACT

Background: Proximal humerus fractures account for about 4 to 5% of all fractures. They are the third most common fractures in the elderly population after hip and distal radius fractures. Regarding the treatment of proximal humerus fractures, controversies still exist whether to do conservative or operative management. Various operative procedures are carried out. A recent trend in internal fixation has moved on to locking plates. The present study is undertaken to evaluate the functional outcome and complication of proximal humerus fractures treated by Open Reduction Internal fixation using proximal humerus Interlocking plate.

Materials and Methods: A prospective study involving thirty patients who were above 18 yrs of age with proximal humerus fractures admitted to our institution were treated by open reduction, and internal fixation with locking plate were evaluated.

Results: In this study, the majority of the patients were males, elderly aged, with slip and fall being the most frequent mode of injury, resulting in 2 part and 3 part fractures of the proximal humerus. The fracture united in all and in an average of 14 weeks with excellent and satisfactory results in 28 cases (93.3%) by Neer's criteria.

Conclusion: In conclusion, the fractures of the proximal third of humerus treated by open reduction internal fixation using PHILOS plating produced excellent to satisfactory outcomes and patient satisfaction, provided there is near normal anatomical reduction of the parts and physiotherapy regime was followed by the patient.

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1. Introduction

Fractures of the proximal humerus are still unsolved fractures in many ways. Disagreement exists regarding the reliability of the classification system. The indication for surgical management continues to be modified. Fixation techniques are myriad, and none is ideal for all cases.¹ Fractures of proximal humerus are not uncommon, especially in the older age group. They have been reported to account 4% to 5% of all fractures.^{1,2} About 85% of these fractures are minimally displaced or non-displaced and are

effectively treated symptomatically with immobilization, followed by an early motion. The remaining 15% of fractures are displaced unstable and may have disruption of the blood supply. The treatment of these fractures is a therapeutic challenge. Displaced and unstable extra-articular fractures are most commonly treated by operative reduction and fixation using various techniques.³ The treatments are more controversial for articular fractures, which carry a risk of the humeral head necrosis. A review of the published result suggests that there is no universally accepted form of treatment. Conservative management may be associated with non-union, malunion, and delayed

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union resulting in painful dysfunction.^{4,5} Proximal humeral fracture, caused by trauma and having osteoporosis, requires carefully planned, individual treatment. A wide variety of treatment options have been described beginning with percutaneous fixation, non-absorbable rotator cuff-incorporating sutures, and the use of tension band devices, intramedullary nails.^{2-4,6} The use of open reduction and internal fixation methods with the more contemporary use of locking plates was advocated recently. The role of hemiarthroplasty in the treatment of these fractures has also been advocated in both the acute setting and as a delayed procedure. The Choice of technique and devices depends on the quality of bone, soft tissue, age, and patients' reliability. However, Proximal Humerus fracture fixation's goal should be a stable reduction allowing early motion of limb and complete restoration of function. This study analyzed fractures of the proximal humerus treated with the open reduction and internal fixation by plate osteosynthesis documents their clinical and functional outcome.

2. Materials and Methods

Thirty patients who were in the age group of 18 to 90 years, injured and admitted with isolated fracture upper end of Humerus during the period October 2018 to October 2020 were included in this study in our institution. All these patients were screened for fitness to anesthesia, and were subjected to Radiograph to know the type of fracture, amount of osteoporosis, associated diseases like arthritis, pre existing pathological conditions. Those patients with shoulder diseases, neuro muscular diseases, pathological fracture and any other bony injuries in the same side along with floating shoulder were excluded in this study. Open Reduction and internal fixation were performed with PHILOS plate in type 2,3,4 fractures classified by Neer's once the patient is fit for surgery in supine position and by Delto Pectoral approach. All Patients were given arm sling pouch and were allowed Passive range of movements and pendulum exercises immediately depending on their pain relief. Suture removal was done on the 10th to 14th postoperative day. Patients were followed up at an interval of 6 weeks, 3 months, and 6 months for any complications and for clinical and radiological union. At final Follow up all patients were analyzed by Neer's criteria scoring system.

3. Results

Thirty patients with closed displaced proximal humerus fracture were treated by Open Reduction and Internal fixation with locking philos plate and screws. The majority of the patients, i.e., 13 (43.3%) were from the age group of 66-90 years, followed by 11 patients (36.6%) in the 36-65 age group, 6 patients were in the age group of 18-35 years (20%). The average age of the patient was 54.9 years. The majority of the patients were males 60% and

40% were females; the ratio was of 3:2. In the majority (60%) cases, the mode of injury was fall, this includes fall from Steps or from a two wheeler on an outstretched hand. The injury from RTA (40% of cases) was high energy trauma directly or indirectly to the shoulder. The fracture occurred right in 20 patients (66.66%) and left side in 10 patients (33.33%). In our study, we had 17 (56.6%) patients with 2 part fracture, 5 (16.6%) patients with 3 part i.e., greater tuberosity and surgical neck fractures, 2(6.6%) patients with 3 part i.e., lesser tuberosity and surgical neck, and 6 (20%) patients with 4 part fractures (Figures 1, 2 and 3). Impingement of the implant with the restriction of movements was present in 1(3.3%) patient. There was 1 (3.3%) patient with varus malunion, and 1 patient with superficial wound infection but all patients had a comparatively good functional range of movements. All fracture united by 12-16 weeks interval. The final results were evaluated by Neer's scoring criteria. In our study, 9 (30%) cases had excellent results, and 19 (63.3%) had a satisfactory result. 2 (6.6%) had an unsatisfactory result at their final follwup (Figures 4, 5 and 6). The average interval between fracture and surgery was 3.06 days. The average hospital stay in our study was 12.2 days.(Table 1)



Fig. 1: Pre operative radiograph

4. Discussion

The operative treatment of proximal humeral fractures provides a therapeutic challenge for an orthopaedician. Most of the undisplaced proximal humerus fracture can be treated conservatively. Even though the injury is

Table 1: Distribution of age, sex, type of fracture and results

Distribution		Number	Percentage
Age	18-35Yr	6	20%
	36-65 yr	11	36.66%
	66-90 Yr	13	43.33%
Sex	Total	30	100%
	Female	12	40%
	Male	18	60%
Type of fracture	Total	30	100%
	Type 2	17	56.6%
	Type 3	7	23.33%
Side	TYPE 4	6	20%
	Total	30	100%
	Left	10	33.33%
Type of injury	Right	20	66.66%
	Total	30	100%
	Slip and Fall	18	60%
Neer's Score(six months Follow Up)	RTA	12	40%
	Total	30	100%
	Excellent	9 patients	30%
	Satisfactory	19 patients	63.33%
	Un satisfactory	2patients	6.6%
	Total	30 patients	100%

**Fig. 2:** Immediate post operative radiograph**Fig. 3:** Post operative radiograph 6 months follow up



Fig. 4: Clinical photograph: Flexion



Fig. 6: Clinical photograph: External rotation



Fig. 5: Clinical photograph: Internal rotation

thoroughly analyzed, and the literature is known, it is challenging to treat displaced fracture or fracture-dislocation. The functional outcome is related to the restoration of anatomical alignment. If the fracture is managed only with rest followed by early motion, a functional deficit will occur and can be associated with pain. As the fracture site is adjacent to the trunk, external support is difficult to apply effectively. Many studies have found that when left untreated, the displaced fracture of the proximal humerus has a poor functional prognosis because of severe fragment displacement.¹⁻⁵ Numerous investigators have described the different surgical treatments for displaced proximal humerus fracture. There is no consensus on the definitive treatment of displaced proximal humeral fractures, which account for 15% to 20% of fractures. In some studies, the functional outcome of conservative treatment has been unsatisfactory. A variety of classification systems are defined for the fractures. The complexity in accurately classifying the fracture creates problems in reporting outcomes, and none of the classification systems gives a clear prognosis and direction of management. Overall, open reduction and internal fixation, although not in all institutions, have yielded satisfactory outcomes. The best results are achieved if the fracture is well reduced, and a planned rehabilitation program is followed. This depends on various factors such as type of fracture, the quality of the bone, and the reduction and fixation technique. The present study was conducted to evaluate two-part, three-part, and four proximal humeral fracture results managed by open reduction internal fixation by the Philos locking plate.

In our study, most of the patients, i.e., 13 (43%), were from the age group of 65-90 years, followed by 11 patients (36%) in the 35-65 age groups. The average age of the patient was 54.9 years. The majority of the patient in our group was elderly. Neer original studies of 300 patients' average age was 55.6 years.⁷ The average age incidence in Felix Brunner et al. study was 65 years.⁸ The average age in K.N. Sharafeldin et al. study was 61.5 years.⁹ The average age in Ramchander Siwach et al. study was 65 years.¹⁰ In the present study, 60% were males, and 40% of patients were female at a male to female ratio of 3:2. K.N. Sharafeldin et al reported 9 male and 18 female in the ratio of 1:2.⁹ Ramchander Siwach et al reported in his series 12 were male and 13 were females at a ratio of 1:1.2.¹⁰ Hong-fei Shi et al reported in their series 28 were males, 48 patients were females at a ratio of 2.5:3 for the male to female.¹¹ The major cause of fracture in our study was slip and fall in 18 cases (60%), and in 12 cases (40%) the mode of injury was a road traffic accident. Rose SH et al., in their study of proximal humerus fracture, an epidemiological study reported 80% of cases the mode of injury was minor fall in patients aged above 40 years and especially in osteoporotic females.⁴ Herbert Resch et al., in their study of 27 patients with 3 part and four-part fracture, 24 patients had a history of high energy trauma.¹² In our present study fracture occurred on the right side in 20 patients and on the left side in 10 patients. In a series of 34 fractures C. Gerber reported, 16 were on the left side, and 18 were on the right side.¹³ The average interval between fracture and surgery was 3.03 days in our study. The average interval between fracture and surgery was 3.2 days in Gerber C. et al. study.¹³ 21 of 27 patients in Herbert Resch et al. study, the operation was done within the first 4 days.¹² Our study was in comparison with other studies. We had 1 case of secondary displacement and malunion and 1 case of Plate impingement and 1 case of superficial wound infection. Secondary displacement and malunion occurred in that case was at the surgical neck. It was varus deformity and anterior angulation, it was due to the comminution of underlying osteoporotic bone, which lead to varus malunion. One patient had plate impingement and limitation of abduction, due to improper plate positioning that led to impingement. One patient had developed superficial wound infection who had uncontrolled diabetes which resolved in 1 week after controlling blood sugar levels, antibiotics and regular dressings. The incidence of avascular necrosis ranges from 8% to 35% in different studies. We had no case of avascular necrosis. We had less chance of stiffness because of extensive and planned physiotherapy with stable fixation. Still, two cases went on to have a limitation of range of shoulder movements with mild to moderate pain. The final results were graded according to the Neer's scoring criteria.⁷ We had good to excellent results in 28 (93.3%) of patients treated in our institution. According to Neer's Criteria, all patients with excellent

results and satisfactory results had normal muscle function and functional range of movements. We had unsatisfactory results in 2 (6.6%) patients. One impingement case had a restriction of abduction $< 90^{\circ}$, which was considered as unsatisfactory. One more Case developed Varus malunion with restriction of movements and persistent mild pain, which was considered unsatisfactory. All fractures united by an average of 14 weeks (10 to 16weeks). There were no case of failure in our study, in comparison with other studies on surgical management of proximal humerus, we had similar results.

5. Conclusion

In the present study, thirty patients with proximal humerus fractures were managed surgically with open reduction internal fixation with locking plate. In our study, cases operated by PHILOS plating for proximal fractures has given excellent to satisfactory results. The main aim being an anatomical reduction of the fracture parts and stable fixation especially in elderly with osteoporosis. Surgery should be followed by early physiotherapy. The rehabilitation program plays an important role in the functional outcome of surgical management of proximal humerus fractures.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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