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Functional and Radiological Outcome with Associated Post-Operative Complications in Management of Proximal Humerus Fracture Using Proximal Humeral Internal Locking System(PHILOS)

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Abstract

Background: A proximal humeral fracture is the fracture of the ball portion, lying at the upper end of the humerus, or arm bone. These are one of the commonest fractures encountered by orthopaedic surgeons. Some studies suggest that the locking plate (PHILOS) provides good fracture stability and allows early mobilization of the shoulder without compromising fracture union. Use of PHILOS plate as a surgical option in the management of proximal humerus fracture has been recommended. **Methodology-** The study was conducted on patients presenting with proximal humerus fractures admitted to Basaveshwar Teaching and General Hospital, Kalaburagi for a period of 18 months.30 patients fulfilling the inclusion and exclusion criteria were considered for this study. All patients were operated using standard deltopectoral approach. Post op functional outcome was assessed by using Neer's scoring system. **Results-** Majority were right handed persons and the dominant arm was involved in 22(73.34%) patients and 8(26.66%) were left handed patient. Neer's 2-part fracture is the most common type in 60% patients. Greater Tuberosity fractures were the predominant type in 2-part fracture.4 part fractures accounted for only 10% of patients. 18(60%) patients did not have any pain during follow-up. No cases of implant loosening or failure were encountered. **Conclusion-** Displaced proximal humeral fractures when treated surgically produce greater range of movements (ROM), less pain and less stiffness. Results are best when operative method results in stable fixation that allows early passive mobilization.

Keywords-Humerus, PHILOS, fracture, proximal, locking system

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Introduction

A proximal humeral fracture is the fracture of the ball portion, lying at the upper end of the humerus, or arm bone. These are one of the commonest fractures encountered by orthopaedic surgeons. They account for approximately 5% of all fractures and have an incidence of 6.6/1000 person-years.[1]They account for 30-40% of all humeral fractures in all age groups and 76% of all the humeral fractures among people 40years of age or older[2-4]. Their incidence increases as the age of the population advances[5]. Proximal humeral fractures follow a unimodal elderly distribution curve with low incidence below 40 years of age and an exponential increase thereafter[6]. The risk of fracture increases in sedentary individuals with

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low bone mineral density, a family history of osteoporotic fractures, frequent falls and impaired balance[7]. Middle-aged patients who sustain proximal humeral fractures, following low energy injuries, frequently have a predisposing medical co-morbidity or are physiologically older through the long-term overuse of alcohol, drug, or tobacco[8].

Fractures of Proximal Humerus have gained more attention recently. This is attributed to the complexity of the fracture displacements and soft tissue injury. Prognosis depends on degree of fracture displacement and damage to delicate blood supply of the head of humerus[9]. Diagnosis has been facilitated with adaptation of 3-right angled trauma series X-rays[10-13] supplemented with CT or MRI. With more standard use of Neer's 4-part Classification system for fracture and fracture dislocation, a protocol for management and comparison of long term outcome of similar injuries has been made possible[14-16] . Emphasis is placed on complete and accurate diagnosis and formulation of safe and simple standard techniques for fracture realignment, restoration of anatomic stability, fracture healing, cuff integrity, regaining movement and function. There have been improvements in fixation techniques and in the understanding of the role of prosthetic replacement[17-20] to maximize anatomic restoration and minimising immobilisation time, during which period stiffness develops. The elderly people no longer need to be denied effective surgical treatment, especially at a time in life, when the shoulders are often needed for ambulation with canes and crutches. Maintenance of good shoulder function will surely make a good difference to their independent life style.

The above study has been conducted to analysed the functional and radiological outcome of proximal humeral fractures treated surgically using PHILOS plates. (proximal humerus internal locking osteosynthesis system)

Materials And Methods

Study place- The study was conducted on patients presenting with proximal humerus fractures admitted to Basaveshwar Teaching and General Hospital, attached to M.R Medical college, Kalaburagi from 1st October 2018 – 1st April 2020 (18 months)

Study design- Prospective interventional study.

Inclusion criteria- Patients with clinical and Radiological diagnosed cases of proximal humerus fractures, age 18- 50 years, belonging to both the genders, fit and willing to give written consent for surgery.

Exclusion criteria- Patients with associated humerus shaft fractures, acute infections, pathological fracture, fractures associated with neurovascular deficits, open fractures and unwilling to give written informed consent.

Sample size-30 cases

Data analysis- Data was entered in Microsoft Excel 2007, and analyzed by using SPSS (Statistical Package for Social Sciences) version 20.0 statistical software by maintaining anonymity and privacy of respondents.

Ethical considerations-All the necessary permissions were taken from the Institutional Ethics Committee before starting the study.

Detailed history was taken and thorough clinical examination done to rule out any other associated injuries. Distal neurovascular status was assessed. Routine investigations including chest x ray PA view, ecg were done. Radiographs of the affected shoulder were taken in AP, Lateral and Axillary views and fractures were classified according to Neer's classification. CT pictures were taken in selected patients with complex fracture patterns to know the articular involvement. Anaesthetic fitness was obtained for all the patients before surgery. All patients received injection 1 gram of cefotaxime/cefoperazone and salbactam(1.5g) intravenously thirty minutes prior to surgery. Twenty-five patients were operated under supra clavicular and interscalene block. Combined general anaesthesia with inter scalene block was

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used in remaining five patients in view of anticipatory increase in duration of surgery due to difficulty in fracture reduction. All patients were operated using standard deltopectoral approach.

After the skin incision, subcutaneous tissue, fascia and muscle, the conjoint tendon was retracted medially. The fragments were reduced indirectly and temporarily fixed with the help of 1.5 or 1.8 mm K wires under image intensifier control. After obtaining acceptable reduction, the PHILOS plate was placed at least 8mm distal to the upper end of the greater tuberosity. The long head of biceps tendon was identified and preserved. The plate was then placed lateral to the long head of biceps without compromising its function. The humeral head fragment as well as the metaphyseal shaft was fixed with locking head screws. Standard length wires were inserted in to the humeral head through a guide and the length of screw determined by placing a measuring device over the protruding wire. The corresponding length locking screw was then inserted using a specifically designed screw driver. The final position of the implant was checked with image intensifier in multiple planes. The shoulder was checked for stability of fixation, range of movements and absence of impingement. None of our patients required bone grafting. Suction drain kept in situ and closure was with 2/0 vicryl to muscle, fascia and subcutaneous tissue, 2/0 ethilon sutures to the skin. Drain was removed on the second post- operative day. Intravenous antibiotics were continued till fifth post-operative day. Sutures were removed on 12th post-operative day. Post op functional outcome was assessed by using Neer's scoring system. Radiological outcome was evaluated by taking serial X rays at follow up documenting on quality of reduction, fracture alignment, restoration of articular congruity, fracture union, PHILOS plate deviation, screw penetration, backout, implant loosening and failure.

In all patients the arm was placed in an arm sling, or shoulder immobilizer. Prophylactic antibiotics which were started before surgery were continued for 48 and 72 hours postoperatively. In few patients ice packs were used to minimise the swelling. Passive elbow flexion and extension were started by 24-48 hrs. Sutures were removed by 10th post op day. Phase I exercises consisting of pendulum exercises were started from the first week. Gentle passive forward flexion, internal and external rotation exercises were initiated by third week. Phase II exercises consisting of active range of motion exercises and resistive exercises were started by 4-6 weeks. Phase III exercises consisting of advanced stretching and strengthening exercises were started by 3 months. Lifting of light weight objects were started after 3 months.

Figure 1: Surgical Pics

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Results

TABLE 1. AGE DISTRIBUTION

Sl. No	Age group	No of Patients	Percentage
1	15-20	2	6.66
2	21-30	7	23.34
3	31-40	9	30
4	41-50	12	40

12 patients belonged to the 41-50 years of age group (40%) while 2 patients (6.66%) belonged to the 15-20 year's age group.

TABLE 2. TYPE OF FRACTURE

Sl. No	Neer's type	No. of Patients	Percentage
1.	2 part	18	60
2.	3 part	9	30
3.	4 part	3	10

Radiological evaluation of the fractures was done and were classified according to Neer's four-part classification system. Based on Neer's system 18 patients (60%) had two part fractures, 9 (30%) had 3 part fractures and 3(10%) had four part fractures. (Table-XI) Fracture dislocations were present in 2 patients.

TABLE 3. FUNCTIONAL OUTCOME

Sl. No	Functional outcome	No. of patients
1.	Good	17
2.	Fair	12
3.	Poor	1
4.	Traces	0
5.	Zero	0

17 (56.66%) of the 30 patients had good functional result, 12 (40%) had fair functional results and 1(3.34%) had poor functional outcome.

TABLE 4. Radiological Outcome

Sl. No	Rating	No. of patients	Percentage
1.	Excellent (90-100)	12	40
2.	Satisfactory (80-89)	15	50
3.	Unsatisfactory (70-79)	3	10
4.	Failure (<70)	0	0

Of the 30 cases 12(40%) patients had excellent result, 15(50%) satisfactory, 3(10%) unsatisfactory and no failure.

Discussion

In the above conducted study, the average age of the patients was 48 years which was corresponding to the reports by Hawkins, Bell and Gurr[21] and Flatow et al[22] and Cornell CN, Levine D S, Pagnani M J[23].

Neer's Classification is the most widely used scheme for Proximal Humeral Fractures. It has gained universal clinical acceptance by orthopaedic surgeons and radiologists and is considered to have significant implications for both treatment options and outcomes. In our

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study, we also have followed the Neer's four-part classification but several authors have reported low level of inter-observer reliability. Sidor et al[10] reported a reliability co-efficient of 0.48 for 1 viewing, 0.52 for 11 viewing and a reliability co efficient of 0.66.

In order to properly employ this classification, precise radiographic evaluation is of paramount importance[24]. We have found the Neer's three view trauma series to be of greatest value in evaluating these fractures. The importance of these series has been shown by Richard J, Hawkins S and R.L. Angel[25]. There was a predominance of two-part fracture in our study (60%), of which greater tuberosity fracture were the most common. Associated dislocations were present in 10% of the patients. In the reduction of glenohumeral dislocation if tuberosity fragment remained displaced >1 cm or angulated more than 45°, ORIF was done. Repair in such patients restored the dynamic stability by reattachment of the muscles of the rotator cuff[74].

Flatow et al[26] in a series of 12 patients reported 50% excellent results and 50% good results in patients treated by ORIF with Locking Compression Plates (LCP) for two-part greater tuberosity fracture. Closed treatment of three-part fracture is often associated with moderate pain, poor range of motion and disability. Open Reduction and Internal Fixation (ORIF) was associated with good to excellent results in more than 80% of patients in a report by Hawkins et al[27] and recommended surgical treatment for healthy active individuals who have three part fractures of the Proximal Humerus. Cornell and Levine[28] reported good results with screw tension band technique for 3 part fractures. Prosthetic replacement for

Three-part fracture has been used by several authors in the treatment of four-part fracture and fracture dislocations, less than 10% good or excellent results are obtained by open reduction and internal fixation[29,30]. Isolated reports of revascularization of head of humerus following open reduction and internal fixation indicate satisfactory healing. Unfortunately, many of the cases referred in the literature often have not been true four part fractures with isolation of articular fragment and follow-up is not sufficient to rule out long term osteonecrosis. Hugg and Lundberg noted 74% AVN when ORIF was used for these fractures. AVN is reported to be as be as high as 90% in four part fractures and 3-25% in 3 part[31].

In the functional outcome, the average active elevation in our study in two part fractures was 156.25° and average external rotation was 47° which is comparable to the study by Flatow et al[26] in a study of 12 patients of two part fractures treated surgically. The average elevation in our study with three-part fracture was 155.25° and external rotation was 45.5° which is also comparable to the study by Hawkins et al[27] of 15 cases of 3 part Proximal Humerus fractures treated surgically. Among the 12 patients with 3 and 4 part fractures 8 patients (40%) regained at least 90° abduction and elevation.

About 90% of the patients had full muscle strength which is also comparable to the study by Hawkins et al[27] and Flatow et al[26].

Finally, a prolonged closely monitored and well defined program of rehabilitation was necessary to obtain the best functional results. We have followed the three phase rehabilitation protocol of Hughes and Neer in all our patients and this has provided good results. The average Neer's scoring system score in our study with 30 patients was 81.7 which is slightly better than the study by Koukakis et al[32].

Conclusion

Displaced proximal humeral fractures when treated surgically produce greater range of movements (ROM), less pain and less stiffness. Functional outcome is better with isolated fractures than with fracture dislocations. Results are best when operative method results in stable fixation that allows early passive mobilization. Functional outcome of 2 part fractures is better than 3 part and 4 part fractures. Radiological outcome assessed by means of quality

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of reduction and union of fracture in two and three part fractures is better than in four part fractures

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