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Functional outcome of proximal humerus fractures managed with PHILOS plate in adults

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Abstract:

Aim: *The aim of the present study istoevaluate the functionaloutcomeofproximalhumerus fracturestreated byPHILOSplate.* ***Methods:*** *The proposed study is a hospital based prospective study centred in YMCH,Deralaktte during the period from November 2017 to November 2019. In the proposedstudy all the cases of proximal humerus fractures admitted and operated by ORIF withPHILOS plates during the study period will be evaluated clinically and radiologicallyand the functional outcome will be assessed by Constant Murley score at the end ofstudy.* ***Results:*** *In our series of 20 patients, majority of the patients were males, with RTA beingthe commonest mode of injury in young population and domestic fall being the mostcommon mode of injury in elderly. All the fractures united with a good to excellentoutcomein70%ofthepatients.Nonunion istheonlycomplicationandtherewereno incidencesofscrewperforation,AVNandinfection.*

Conclusion: *In conclusion PHILOS plate is an advantageous implant in proximal humeralfractures due to angular stability, particularly in communited osteoporotic bones inelderlypatients, thus allowingearlymobilization.*

Keywords: *Proximal humerus fracture,Constant Murleyscore.*

Introduction :

Approximately 4% of all fractures and 26% of Humerus fractures are fractures of the proximal Humerus[1].As the osseous architecture of the humeral head has poor central cancellous bone stock, particularly in elderly patients, it leads to a high risk of fixation failure with conventional plate and screw fixation.

Therefore it has been a challenge to achieve stable fixation in three and four part fractures (13-16%) of proximal Humerus fractures[2].

There are various methods of fixation of proximal Humerus fractures like Kirschners wire, external fixation , tension band fixation , Rush pins, intramedullary nails and plating[3]but the complications with these methods are high, which include non union, malunion, avascular necrosis ,rotator cuff dysfunction/stiffness[4].

The PHILOS plate has been developed to improve screw fixation in osteoporotic bones and to minimise soft tissue dissection.It combines the principles of fixation with a conventional plate with those of locking

screws.The locked interface also provides fixed stability which helps prevent subsidence in the metaphyseal areas[5].

The fracture of the proximal Humerus is a debilitating problem since the patient would be unable to work and even carry out daily activities until the fracture heals. Hence by studying the efficacy of the proximal Humerus locking plates, we would be able to assess the functional outcome, pain, range of movements and ability to carry out the daily activities.

Materials and methods:

Aim: To study the functional outcome following open reduction internal fixation with PHILOS plate for proximal humeral fractures by evaluating pain and range of motion with regard to previous studies .

Inclusion Criteria: All skeletally mature patients presenting with displaced proximal Humerus fractures according to NEER two, three and four part fracture.

Exclusion Criteria: Patient refusal,Pathologic fractures from primary or metastatic tumours, Patients age less than 18 years, Patient not fit for surgery due to medical problem.

Methodology: The subjects for the study will be the patients fulfilling the inclusion criteria admitted in yenepoya medical college and hospital between september 2017 to september 2019. 24 cases wereselected for the study.

A detailed history was taken from patients and their attenders followed by a clinical examination. Following that radiologic assessment with X-rays –AP and or Axillary view along with/or CT scan with 3D reconstruction was done. Complete hemogram, blood grouping and Rh typing, Blood urea, Serum creatinine,Serum electrolytes, Random blood sugar, HbsAg/HCV/HIV and ECG was done.The fractures will be then classified according to Neer‘s classification.

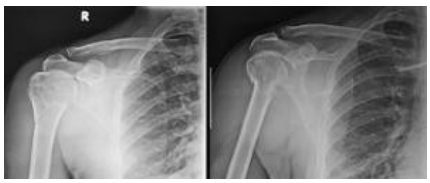


Fig 1: preoperative x rays

If the patient is fit for surgery, he/she will be operated with open reduction and internal fixation with proximal humerus locking plate under brachial block or general anesthesia.

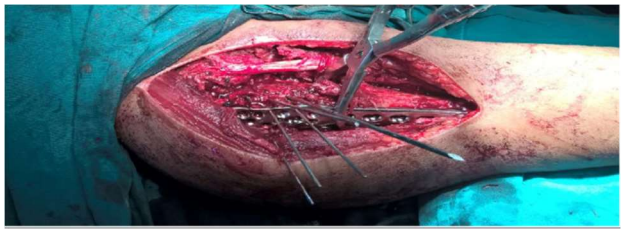


Fig 2: intraoperative procedure

Position used for the procedure is either a Beach chair or supine, and the approach used is a Deltopectoral

approach. The fracture is then reduced with k wires and reduction checked under fluoroscopy followed by final fixation by the locking plate.

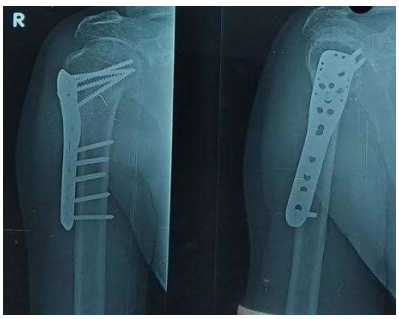


Fig 3 : postoperative x ray

Postoperatively arm pouch will be used to immobilize the operated limb and pendulum exercises as per patient‘s tolerance will be started.

Postoperative x rays will be done in AP and or axillary view to assess the reduction and stability of fracture fixation. Suture will be removed on post-op day 10 and then patient will be discharged with arm pouch and advice to continue pendulum exercises.

Patients will be followed up on OPD basis at intervals of 6 Weeks, 12 Weeks, and 6 Months postoperatively. During this period, in each visit clinicalevaluation of wound healing, pain, shoulder function and range will be done. Results will be evaluated by the use of Constant and Murley shoulder score based on pain, activities of daily living, range of motion and strength.

The data collected will be transferred into a master chart which will be subjected to statistical analysis. Suitable statistical methods will be employed for the analysis of the data.

Fig 4: functional outcome at 6 months postoperative

Results

A total of 24 patients were included out of which only 19 patients followed up and were included for the final statistical analysis. One patient was again lost in between follow up.

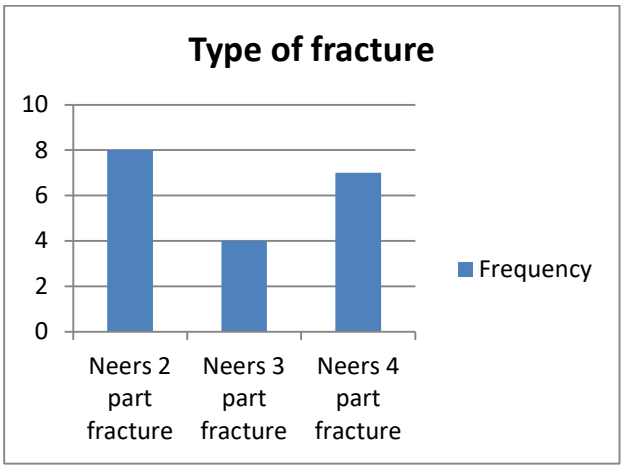
In the present study, age < 20yrs is seen in 1 patient, >80yrs is seen in 1 patient, 21-40yrs is seen in 2 patients, 41-60yrs is seen in 7 patients, 61-80yrs is seen in 8 patients.8 patients are female and 11 patients are male.

Patients injured due to fall is 8 patients and patients injured due to RTA is 11 patients and Neer’s 2 part fracture type is seen in 8 patients, Neer’s 3 part fracture type is seen in 4 patients, Neer’s 4 part fracture type is seen in 7 patients.

Table 1: Type of fracture

Fracture type	Frequency	Percentage
Neers 2 part fracture	8	42.1
Neers 3 part fracture	4	22.1
Neers 4 part fracture	7	36.8
Total	19	100

Figure 1: Type of fracture



Considering distribution of side of injury, left side injury is seen in 7patients, right side injury is seen in 12 patients. 3patientshadassociatedinjuriesnamelyfractureneckoffemur,posteriordislocationofthe shoulderandaxillarynerveinjury,16 patients had noassociated injury.

Table 2: Frequency of associated injuries

Associated injury	Frequency	Percentage
Axillary nerve injury	1	5.3

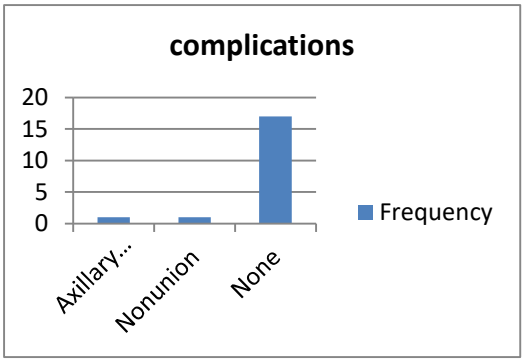
Fracture neck of femur	1	5.3
Posterior dislocation	1	5.3
None	16	84.2
Total	19	100

2 patients were found to have complications, axiliary nerve palsy is seen in 1 patient, non union is seen in 1 patient, 17 patients found no complications.

Table 3 : complications

Complications	Frequency	Percentage
Axillary nerve palsy	1	5.3
Nonunion	1	5.3
None	17	89.5
Total	19	100

Figure 2: Complications



Mean interval between injury and surgery in 3 days with a mean value of 3+/-1.453.

Onepatientwaslosttofollowup andonepatienthadnonunion.Mean duration of weeks taken for union is seen in 17.06+/-2.410

We noticed that after 6 weeks moderate results are seen in 2 patients, poor results are seen in 17 patients. Most of the patients with poor constant score, however the constant score improved subsequently by physiotherapy, functional outcome improved at 3 months and 6 months follow up.

Results of injury on 3rd month, good results are seen in 3 patients, moderate results are seen in 11 patients, poor results are seen in 5 patients.

Results of injury on 6th month, excellent results are seen in 3 patients, good results are seen in 7 patients, moderate results are seen in 7 patients, poor results are seen in 1 patient.

On comparison of results between 6 weeks and 3 months not much significant difference is noticed. On comparisonbetweenresultson3rdmonthand6thmonth, and found a p value of 0.021.

Table 4: comparison of results between 6 weeks and 3 months

Result		Results 3mn			Total	Yates chi 2	P value
		Good	Moderate	Poor			
Result (6 weeks)	Moderate	1	1	0	2	0.235	0.889
		5.3	5.3	0	10.6		
	Poor	2	10	5	17		
		10.5	52.6	26.3	89.5		
	Total	3	11	5	19		
		15.8	57.9	26.3	100		

Functional outcome at 6th month is excellent in 3 patients with no complications, good in 7 patients with no complications, moderate in 7 patients where 2 patients faced complications, poor outcome was seen in 1 patient with complications. On comparison P value is 0.316

On Comparison of scores at 6th week, 3rd month and 6th month with a p value of 0.001.

Discussion:

Proximal humerusfractures constitute about 4-5% of total fractures[1]. Majority (80-85%) of these fractures can be treated conservatively.

Othertreatment options for the fixation of proximal humerus fractures include K wires, T-buttress plate, hemiarthroplasty and semitubular plates.

In Kristiansen et al[6] in their study of 20 patients with proximal Humerus fracture treated with T-buttress plate,found that only nine reported a satisfactory or excellent result and all four part fractures resulted in poor outcomes.

PHILOS was implemented to overcome these complications. It permits indirect reduction of the articular fragments using image intensifier, thus lowering the possibility of AVN particularly in four part fractures.

However, as the need is for a good reduction, early mobilization and early fracture healing for restoring functionality of the limb, open reduction and internal fixation with locking compression plate is a preferable mode of treatment.

The present study was a one year study was carried from November 2017 to November 2019 .A total of 24 patients were included out of which only 19 patients followed up entirely and were included for the final statistical analysis.

Majority of patients in our study are from 41-80 yrs similarly, a study by Wijgman et al [7] noticed the mean age group was forty eight years.

Male to female ratio is 3:2 in our study. The reason for high incidence of males in our series is because majority of the cases, 11 out 20 were under the age of 50years.

Proximal humerus fractures show a bimodal presentation in younger individuals; males are more likely to suffer high velocity injuries. Fractures in older people are caused by osteoporosis and are more common in women.

The mode of injury observed in our study was road traffic accidents accounting for 57%, 40% patients having a slip and fall. These observations were found to be consistent with the studies in literature which revealed 45% road traffic accidents and 50% history of slip and fall[7].

The most common mode of injury in young patients is RTA and in elderly it is domestic fall.

Our study series revealed 42 % two part fractures, 21% three part fractures, 37% four part fracture. Felix Brunner et al[8] showed similar incidences except for higher incidence fracture dislocation .This is because of limited sample size and majority had RTA as the cause of trauma.

The average Constant and Murley score in our study was found to be 73.3 at followup of 6 months. Greiner et al[9] observed a Constant score of 66.2± 15.4 at the mean follow up of 45 months.They also noted that the constant score improved during the 6 months follow up (constant score 71.6±18.3) % to 12 months follow up (77.7±17.8)%.

Sharafeldin et al[10] and Robert et al[11] noted that the constant scores significantly worsened as the severity of the fracture increased .

Proximal humerus fractures are known to have complications like varus malunion, AVN, Screw perforation, subacromial impingement, infection, non union and axillary nerve palsy but we noticed only non union and axillary nerve palsy as complications in 1 patient each.We avoided elevating excessive flaps, employed shorter screws, and performed intraoperative imaging. Hence we had no incidence of infection, screw perforation and plate impingement and also avoided primary screw perforation by intraoperative imaging through complete arc of motion and also by using shorter screws at the time of surgery

Patients without any complications attained significant functional outcome as compared to patient with complication. Aggarwal et al[12] in their study encountered complication like screw back out, screw perforation, AVN humeral head, subacromial impingement, axillary nerve palsy and wound infections.

In a study by Greiner et al[9] they noticed that with longer duration of follow up, incidence of AVN was more i.e. 4 cases at 12 months and 9 cases by final follow up.

Avascular necrosis of the humeral head was reported to occur up to five years after surgery. However, our study was confined to a six-month follow-up, thus we did not discover AVN or secondary screw perforation.

Proximal humerus fractures in young are mainly high energy injuries like RTA where

as in elderly fractures are mainly due to low energy slip and fall.High-energy injuries RTA produced more comminuted three- and four-part fractures. Being a ball and socket joint of upper limb and the freedom it provides for day to day activities the demand for the better outcome for any of the proximal humerus fracture is high.

Three and four part fracture reduction is difficult considering the amount of comminution and cancellous nature of the bone which is difficult to reduce with plate and screws , in such cases it is always better to have pre operative CT scan to sort out the position of posterolateral fragment of the greator tuberosity with rotator cuff and potseromedial fragment.

In present study anchoring posterolateral fragment to anterolateral fragment is of utmost importance due to rotator cuff attachment neglecting this which might lead to flial shoulder post operatively and might lead to re exploration.

Reduction of posterolateral and posteromedial fragment with sutures and plating needs extension of deltopectoral approach anterolaterally, in young and bulky patients anterior fibres of deltoid may not allow access to posterolateral fragment through deltopectoral approach .

Placement of plate 5 to 8 mm below the greator tuberosity has been challenging in 3 and 4 part fractures which will eventually affect the functional outcome of the patient.

Limitations: limited Sample size. Follow up period was limited to only six months. Surgery was performed by multiple surgeons with varied experience and technique. Physiotherapy in the post op period was not followed by some patients due to low educational status and difficulty in commuting from far off places for follow up. PHILOS plates used in this study was not from the same company for all the patients.

Conclusion: There is a scope for shoulder replacement as a primary treatment in neer‘s type 3 and type 4 proximal humerus fractures. Proximal humerus fractures need thorough pre operative evaluation with x ray and CT so that fracture fragment can be reduced.

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