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Functional outcome of surgical management of proximal humerus fracture by various modalities– a prospective study

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Abstract

Background: Proximal humerus fractures make up roughly 6% of all fractures and 26% of humerus fractures. These are the second and third most common upper extremity fractures, as well as the third most common nonvertebral fractures, behind hip and distal radial fractures. These fractures can develop at any age, although their frequency rises significantly as one becomes older. Low bone mineral density or osteoporosis, diabetes, epilepsy, or female gender are all risk factors for proximal humerus fracture. A fall on an outstretched upper extremity is the most common cause of proximal humerus fracture in older adults. In patients under the age of 50, the mechanism is frequently linked to high-velocity trauma, such as a large fall from a height, a motor vehicle accident, or athletic injuries, which result in two con-commitant soft tissue and neurovascular injuries.

Aim: To study the functional outcome of surgical management of proximal humerus fracture by various modalities.

Material and Methods: A prospective study was done on patients with proximal humerus fracture [NEER'S classification: Grade 2 to Grade 4] coming to

orthopaedic department at tertiary health care centrefor a duration of November 2020 to November 2022. Total 20 patients, were included in this study.

Patient were followed from 6 weeks to 6 months on OPD basis at intervals of 6 weeks, 12 weeks, 6 monthsand was evaluated. Findings were recorded in the proforma and entered in Microsoft Excel 2010. Data analysis was done with the help of SSPS Software version 20.0.

Results: The mean age of the patients was 41.75years. Majority of the patients 14[70%] included in the study was male. At presentation, 30 mean score was observed of pain, 16.40 mean score was observed of functioning, 15.85 mean score was observed of range of motion, and 6 mean score was observed of anatomy. Open Reduction and internal fixation[ORIF] with Philos plating was the most used surgical technique with good functional outcome while ORIF with ethibond suture, k-wire, and cancellous screw gave satisfactory functional outcome.

Conclusion: Deltoid splitting approach is a viable and easy approach for Proximal Humerus fracture fixation. This approach is useful for nailing and osteosynthesis. Operative management shows good functional results in proximal humeral fractures with fewer complications. These patients responded well to the rehabilitation program than their older counterparts.

Keywords: Proximal Humerus, Philos plate, Neers Classification, ORIF, Anova test.

Introduction

'Proximal humerus fractures make up roughly 6% of all fractures and 26% of humerus fractures. These are the second and third most common upper extremity fractures, as well as the third most common nonvertebral fractures, behind hip and distal radial fractures. These fractures can develop at any age, although their frequency rises significantly as one becomes older. Low bone mineral density or osteoporosis, diabetes, epilepsy, or female gender are all risk factors for proximal humerus fracture. A fall on an outstretched upper extremity is the most common cause of proximal humerus fracture in older adults. In patients under the age of 50, the mechanism is frequently linked to high-velocity trauma, such as a large fall from a height, a motor vehicle accident, or athletic injuries, which result in two con-commitant soft tissue and neurovascular injuries.[1]

The female to male ratio is 2:1. Fractures that are more complicated are connected with increasing age. Surgical neck, anatomical neck, greater tuberosity, and lesser tuberosity are all possible locations. A proximal humerus fracture might result in temporary incapacity and lost work hours. The importance of restoring the limb's function cannot be overstated. There has always been a wide range of opinions on how to treat shoulder fractures, resulting in frequent debates and heated debate. Furthermore, even good anatomical findings attained during operational repair may result in poor outcomes unless thorough postoperative rehabilitation is performed, which might be more difficult in the shoulder than operative procedure.[2]

According to numerous studies, 80% of proximal humerus fractures or fractures in this region are treated conservatively, with satisfactory results. However, some studies say that depending on the type of fracture and the quality of the bone, operative treatment is better. The treatment of these fractures is associated with a number of problems, morbidity, and unfavourable outcomes. They include malunion, non-union, neurovascular damage, infection, avascular necrosis, loss of shoulder motion due to adhesive capsulitis, elbow stiffness,

chronic oedema, and atrophy of the soft tissues of the immobilized limb, all of which result in minor handicap during and after healing.[3,4]

Objective

- To observe the occurrence, mechanism of injury and displacement of various types of proximal humerus fractures according to NEER's classification.
- Complications associated with surgical management of proximal humerus fractures.
- To compare the functional outcome of treatment of proximal humerus fractures.

Material and Methods

A prospective study was conducted over period of two years from November 2020 to November 2022 in Orthopaedicdepartment of Ashwini rural medical college, hospital and research Centre, Solapur. All patients admitted with proximal humerus fractures [NEER'S classification: Grade 2 to Grade 4]were included in the study. All cases of skeletally immature patients, pathological fractures, patients with distal neuro vascular deficit, polytrauma patients with an Injury Severity Score >16 and patients with shaft humerus fractures with proximal extension were excluded.

Data Collection Procedure: Patient were followed from 6 weeks to 6 months on OPD basis at intervals of 6 weeks, 12 weeks, 6 months at the institute and was evaluated.

Clinical Evaluation: During this period in each visit clinical evaluation of pain, shoulder function and range of movements were assessed and recorded. Clinically fracture was considered united when there was no tenderness at the fracture site and full shoulder function is present. Radiologically fracture was regarded as united when there is no visible fracture line. Results were evaluated by the use of NEER'S shoulder score based on pain, function, range of motion and anatomy for each case assessed and recorded.

Statistical Analysis: Data was entered in EXCEL sheet and analysed using SSPS Software version 20.0. Data was presented in the form of tables, charts and graphs and also in terms of mean, SD and percentage; and assessed by ANOVA test. P-value is set at 0.05 at a confidence interval of 95%.

Results and Observations

Present study consists of 20 patients with proximal humerus fracture.

Table 1: Age Distribution

Age (in years)	No of cases	Percentage (%)
≤ 20	1	5.00
21 – 30	1	5.00
31 – 40	8	40.00
41 – 50	6	30.00
51 – 60	4	20.00
Total	20	100

Table 1 shows distribution of cases as per age. Most of the cases were seen at 3rd decade with mean age of 41.75 years of age.

Table 2: Mode of Injury

Mode of injury	No of cases	Percentage (%)
RTA	11	55
Fall	9	45
Total	20	100

Table 2 shows mode of injury. Road traffic accident was the most common mode of injury.

Table 3: Type of fracture

Type of fracture	No of cases	Percentage (%)
Open	5	25
Closed	15	75
Total	20	100

Table 3 shows types of fractures observed in the study.

Table 4: associate injury

Associate injury	No of cases	Percentage (%)
Colles fracture	1	5.00
Fracture ribs	1	5.00
Fracture clavicle	1	5.00
Both bone forearm #	1	5.00
Nil	16	80.00
Total	20	100

Table 4 shows associated injury in the present study. COLLES fracture, fracture ribs, fracture clavicle and both bone forearm # was observed in each 1 case.

Table 5: Neer's type of fracture

Neer's type of fracture	No of cases	Percentage (%)
Two parts	12	60.00
Three parts	5	25.00
Four parts	2	10.00
Fracture dislocation	1	5.00
Total	20	100

Table 5 shows cases presented with Neer's type of fracture in present study. TWO PARTS was the most common type of fracture seen.

Table 6: Surgical Treatment

Surgical treatment	No of cases	Percentage (%)
Orif with ethibond suture	1	5.00
Orif with k-wire and cancellous screw	7	35.00
Orif with philos plating	12	60.00
Total	20	100

Table 6 shows surgical treatment used in present study. ORIF with philosplating was the most common surgical technique used.

Table 7: Clinical Union (In weeks)

Clinical union (in weeks)	No of cases	Percentage (%)
6	1	5.00
8	3	15.00
10	1	5.00
11	3	15.00
12	3	15.00
13	2	10.00
15	1	5.00
16	2	10.00
19	1	5.00
20	2	10.00
22	1	5.00
Total	20	100

Table 7 shows the duration needed for clinical union in present study.

Table 8: Radiological union

Radiological union (in weeks)	No of cases	Percentage (%)
8	1	5.00
11	1	5.00
12	2	10.00
13	3	15.00
14	2	10.00
15	3	15.00
16	1	5.00
17	1	5.00
19	1	5.00
20	1	5.00
21	2	10.00
22	1	5.00
24	1	5.00
Total	20	100

Table 8 shows the duration needed for radiological union in present study. 15.75 weeks mean duration was required for radiological union.

Table 9: Complications

Complications	No of cases	Percentage (%)
Shoulder stiffness	1	5.00
Plate Impingement	1	5.00
Varus malunion	1	5.00
Post op infection	1	5.00
No any	16	80.00

Table 9 shows post op complications observed in present study. Shoulder stiffness, Plate impingement, varus malunion and Post of infection was observed in the present study.

Table 10: Follow up neer's score

Descriptives							
Neer_score							
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
weeks	**20**	**64.90**	**2.88**	**0.64**	**63.55**	**66.25**	**61.00**
months	**20**	**82.05**	**3.03**	**0.68**	**80.63**	**83.47**	**75.00**
months	**20**	**92.30**	**2.58**	**0.58**	**91.09**	**93.50**	**85.00**
Total	**60**	**79.75**	**11.73**	**1.52**	**76.72**	**82.78**	**61.00**

In the present study at Neer's score was noted at 6 weeks, 3 months and at 6 months. At 6th month significant improvement in Neer's score was observed in all the cases with p value <0.0001***.

Discussion

Proximal humerus fractures account for nearly 6-10% and are on a rise. The management of this is controversial and is challenging task. There is a significant heterogeneity among the studies in describing the best surgical procedure in proximal humerus fracture. Nowadays, its incidence is increasing because of increase in geriatric population with osteoporosis and increased RTA in young population. 80-85% of these fractures are amenable to conservative treatment remaining 15-20% are significantly displaced and require some type of internal fixation.

In recent years, rigid internal fixation has been increasingly used in the operative cases of proximal humerus fractures by various implants. In spite of early postoperative mobilization these implant would reduce the risk of secondary reduction loss, particularly in osteoporotic bone.

Age

In the present study most of the cases i.e, 40% were seen having age from 31 to 40 years of age followed by 30%

cases had age from 41 to 50 years of age, 20% cases had age from 51 to 60 years of age and 5% each cases were observed having age less than or equal to 20 years and from 21 to 30 years of age. Age ranged from 19 years to 60 years with mean age of 47.75 years.

Gender

In the present study male cases were predominantly higher than female cases. M.F ratio was 2.33:1.

Mode of injury

In the present study 55% cases were seen having road traffic accident where 45% cases were observed either fall from height or because of slippery surface.

Fracture side

In the present study 55% cases were observed having Right side fracture and 45% cases had Left side fracture.

Type of fracture

In the present study 75% cases were observed having closed type of fracture where 25% cases had open fracture.

Associated injury

In the present study most of the cases i.e. 80% cases were observed without any associated injury. 5% each cases were observed with Colles fracture, Fracture ribs, Fracture clavicle and Both bone forearm #.

Neer's type of fracture

In the present study 60% cases were observed with TWO parts Neer's type of fracture, followed by 25% case with THREE parts, 10% cases of FOUR parts and 5% cases of Fracture dislocation as per Neer's types of fracture.

Surgical treatment

In the present study 60% cases were treated with ORIF with PHILOS PLATING surgical technique followed by 35% cases with ORIF WITH K-wire and cancellous screw and 5% cases with ORIF with Ethibond suture technique.

Clinical union

In the present study most of the cases i.e. 15% each cases were observed having clinical union at 8th week, 11th week, 12th week respectively. 10% each cases were observed having clinical union at 13th week, 16th week, 20th week and 5% each cases were observed having clinical union in 6th week, 10th week, 15th week, 19th week and 22nd week respectively.

Radiological Union

In the present study most of the cases i.e. 15% each cases were seen having radiological union in 13th week and 15th week respectively, 10% each cases were observed having radiological union in 12th week, 14th week and 21st week respectively. 5% each cases were observed having radiological union in 8th week, 11th week, 16th, 17th, 19th, 20th week, 22nd week and 24th week respectively. 15.75 weeks mean weeks was observed for radiological union.

Post op complications

In present study at post op 80% cases were seen without any complication where as 5% each cases were observed with shoulder stiffness, Plate impingement, Varus malunion and post op infection.

Pain, functioning, range of motion and anatomy scores

In present study at presentation 30 mean score was observed of pain, 16.40 mean score was observed of functioning, 15.85 mean score was observed of range of motion and 6 mean score was observed of anatomy.

Neer's score at follow up

In the present study at 6 weeks 64.90 mean score was observed as per Neer's scoring system, at 3 months it was improved to 82.05 mean score and at 6th months

92.30 mean score was observed in all cases. Statistically significant improvement was observed in Neer's score with P value < 0.0001***.

Conclusion

Deltoid splitting approach is a viable and easy approach for Proximal Humerus fracture fixation. This approach is useful for nailing (A- and B-type fractures) and osteosynthesis of fractures of the greater tuberosity. Gives easy and wide exposure of proximal humerus. Provides better exposure for suturing of rotator cuff to LCP to prevent varus collapse. This approach is associated with low incidence of mal-reduction. In this study the Functional outcome is found to be good.

Operative management with philos plate shows good functional results in proximal humeral fractures in adult's in 30 to 40 years with fewer complications. These patients responded well to the rehabilitation program than their older counterparts.

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