

Original Research Article

Clinico-radiological and functional outcome of Neer's 2 part, 3 part and 4 part proximal humeral fractures in elderly treated by conservative management in a tertiary care centre of North India

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ABSTRACT

Background: Treatment of proximal humeral fractures is challenging. Despite a rising incidence in proximal humeral fractures, there is still no evidence for the best treatment option, especially for the elderly patients. The aim of this prospective study was to evaluate the radiological in terms of union and functional outcome in terms of pain, range of motion of conservatively managed proximal humeral fractures in elderly patients.

Methods: This was an observational prospective study of 35 patients aged above 65 years with proximal humeral fractures including 2 part, 3 part and 4 part based on Neer's classification, treated by conservative method. Functional outcome was assessed by using Constant score at follow up of 1 year.

Results: Out of 35 patients, 21(60%) were female and 14 (40%) were male with mean age of 76.8 (range 65 to 91years). On the basis of Neer's classification, majority of patients (15, 42.8%) had 3 part fracture. Radiological union was achieved within 13 to 24 weeks, with an average of 18.4 weeks. Out of 35, 5 (14.3%) had excellent outcome, 8 (22.8%) had good functional outcome, 16 (45.7%) had moderate outcome, 6 (17.14%) had poor outcome. The results were comparable with the existing literature.

Conclusion: In the present study, our data shows that the proximal humeral fractures can be effectively managed conservatively in the elderly patients. Two part fractures have best functional outcome and four part fractures have highest rate of complications.

Keywords: Proximal humeral fracture, Neer's classification, Conservative management, Visual analogue scale, Constant score, Elderly

INTRODUCTION

Proximal humeral fractures account for 4 to 6% of all fractures.¹⁻³ Proximal humeral fractures are among the most common fractures in the elderly population.⁴ There is high incidence of proximal humeral fractures due to increasing life expectancy and the consequent rise of osteoporotic bone fractures.⁵ According to Neer's classification, PHF's are classified as 1 part, 2 part, 3 part and 4 part fractures, with three part and four part containing more number of displaced fragments.⁶ In

minimally displaced or undisplaced fractures, the treatment is conservative. For three part and four part fractures, the treatment options are both conservative and operative.⁷⁻⁸ Operative treatment is associated with higher risk of complications due to the implant or the surgical procedure.⁹ In the recent studies, the results do not support the surgical treatment for patients with displaced fractures of the proximal humerus, Rangan et al.¹⁰ Till date, research has not been able to identify the evident and reliable differences in the outcome of operative and conservative treatment, and the management remains

controversial.¹¹⁻¹³ Similar observations were reported by the Cochrane review.¹⁴

Aim

The aim of this study was to evaluate the clinico-radiological and functional outcome of Neer's 2, 3 and 4 part humeral fractures treated with conservative method.

METHODS

This was an observational prospective study of 35 patients (n=35) satisfying the inclusion criteria treated by conservative method from June 2019 to May 2021 done at the Post graduate department of orthopaedics, Government medical college, Jammu. Patients satisfying the selection criteria were included in the study after proper history, clinical examination and written informed consent for undergoing the study. The fractures were classified on the basis of on Neer's classification.^{15,16} The data was analysed by appropriate statistical methods. Functional outcome was evaluated by Constant Score at 1 year follow up, and was compared with the existing literature.¹⁷ Pain was evaluated by visual analogue scale.¹⁸

Inclusion criteria

Patients with closed proximal humeral fracture including two, three and four part fractures within 2 weeks, with age more than 65 years were included in the present study.

Exclusion criteria

Fractures presenting after 2 weeks, minimally displaced fractures, isolated greater tuberosity fractures paediatric fractures, open fractures and pathological fractures, fractures with neurovascular injury, patients with neurological disorders.

Investigations

Appropriate radiological investigations were done in the form of antero-posterior and axillary views and fractures were classified according to Neer's classification. Adjacent joint X-rays were also done. In doubtful and complex fractures, CT scan was also done.

Technique

Patients with proximal humeral fractures were treated by immobilizing the shoulder in an arm pouch. Oral analgesics, calcium and vitamin D supplements were given.

Follow up

Patients were assessed clinically and radiologically at 2 weeks, 6 weeks, 3 months, 6 months and 12 months.

Physiotherapy was started at 2 to 4 weeks after immobilization.^{11,19-21} Passive exercises were started at 2 weeks and active exercises at 4 weeks. Fracture healing was judged by both clinical (pain and motion at fracture site) and radiological (bridging callus filling the fracture site or trabeculations across the fracture site). At each follow up, functional evaluation of the patient was done to note the range of movements, at the shoulder and elbow, any pain, deformities, and any residual complaint. The occurrence of the complications in treatment like shoulder pain, elbow pain, stiffness, swelling of the shoulder and elbow was noted. After two weeks, X-rays were taken again to check for position of the fracture, head, neck and shaft, and evidence of radiological union. After 3 months, patients were assessed by Constant score which includes severity of pain, activities of daily living, range of motion in terms of forward elevation, lateral elevation, internal rotation and strength. Subsequently, the patients were followed at above mentioned time intervals till 1 year.

Assessment

The Constant-Murley score (CMS) is a 100 point scale composed of number of score parameters. The test is divided into four subscales: pain (15 points), activities of daily living (20 points), strength (25 points), and range of motion: forward elevation, external rotation, abduction and internal rotation of the shoulder (40 points). The higher the score, the higher the quality of the function.

Statistical tool

As this study was not a comparative study, simple statistical methods of mean and percentage were used.

RESULTS

The total number of cases in the present study were 35, out of which 21(60%) were female and 14 (40%) were males, with mean age of 76.8 with range 65 to 91 years. In the present study, the major mode of trauma was fall from standing height in 22 (62.8%) of the cases, followed by road traffic accident in 7 (20%) cases, fall from stairs in 4 (11.4%) and assault in 2 (5.7%) patients. Out of 35 patients, 20 (57.2%) had trauma of the left side and 15 (42.8%) had trauma of the right side. On the basis of Neer's classification, 15 (42.8%) patients had 3 part fracture, 12 (34.3%) patients had 2 part fracture and 8 (22.8%) patients had 4 part fracture. In the present study, 16 patients reported on the same day of injury, 4 patients reported after one day, 4 patients after 2 days, 11 patients reported after 1 week of trauma. Mean delay between the trauma and the start of treatment was 4.2 days. Out of 35 cases in the present study 8 patients had associated injuries. 2 cases had rib fracture, 1 patient had head injury, 1 had ipsilateral clavicle fracture, 1 had ipsilateral olecranon fracture, 1 patient had ipsilateral colles fracture, 1 had same tibia and 1 had same side femur fracture. All associated injuries were dealt accordingly.

Table 1: Following parameters were studied.

Parameter	N	%
Mode of injury		
Fall from standing height	22	62
RTA	7	20
Fall from stairs	4	11.4
Assault	2	5.7
Neer's type		
Two part	12	34.3
Three part	15	42.8
Four part	8	22.8
Sex		
Female	21	60
Male	14	40
Side		
Left	20	57.2
Right	15	42.8
Duration of injury		
Less than 1 week	24	68.6
More than 1 week	11	31.4

Table 2: Functional outcome in terms of Constant score at final follow up.

Constant score	N (%)	Two parts	Three parts	Four parts
Excellent	5 (14.3)	4	1	0
Good	8 (22.8)	5	2	1
Moderate/fair	16 (45.7)	3	10	3
Poor	6 (17.1)	0	2	4
Total	35 (100)	12	15	8

*fracture types

Table 3: Comparison of age and follow up with previous studies.

Study	Mean age (years)	Follow up (months)
Fjalestad et al 2012. ¹³	73.1	12
Boons et al 2012. ²¹	76.4	-
Zyto et al 1997. ²⁵	74	-
Canbora et al 2013. ²⁹	78±8.6	18.2±4.07
Marieke et al 2017. ³²	77±7.0	47±30.3
Present study	76.8	12-18

Clinico-radiological consolidation

Fractures were assessed clinically when painless, unaided movements were possible and there was no tenderness. Mean duration of clinical union was 13.2 weeks.

Functional evaluation

In the present study, at 1year follow up, 22 patients had no pain, 8 patients had pain at extreme of movements and

5 patients had significant pain evaluated by visual analogue scale. Pain severity was more with 4 part fractures. The outcome was better in relatively younger and in patients with lesser number of fracture fragments, based on Neer's classification. Our results were similar to previous studies, Rahul et al.²²

Table 4: Comparison of time of radiological union with previous studies.

Study	Average time of union (weeks)
Rahul B et al 2015. ²²	19.52 (range: 17-23)
Seung-Gil Back et al 2013. ³⁰	12.8
Canbora et al 2013. ²⁹	20.8±2.8 (range: 16-24)
Present study	18.4 (range: 13-24)

Table 5: Comparison of range of motion with previous studies.

Study	Mean flexion	Mean abduction
Boons et al 2012. ²¹	94	87
Oleurd et al 2011. ¹¹	111	106
Zyto et al 1998. ⁷	More than 90	More than 90
Present study	105	102

Complications

In the present study of 35 patients, complications were observed in 12 (34.3%) patients. Stiffness was observed in 4 patients, 2 patients had osteonecrosis, varus malunion was observed in 3 patients, varus collapse in 2 patients and persistent shoulder pain in 1 patient, No neurovascular complications were observed. The higher the number of fractured fragments and greater the age, the higher were the complications observed.

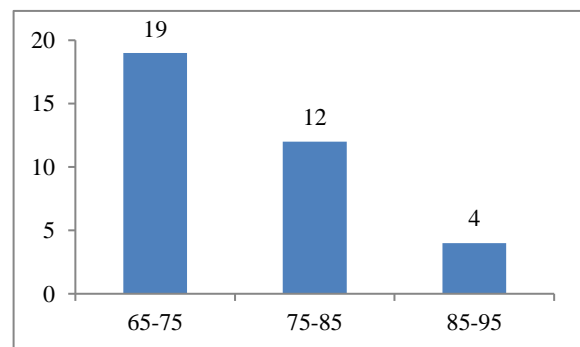


Figure 1: Age distribution of proximal humerus fractures (n=35).

DISCUSSION

The treatment for proximal humeral fractures is controversial. Studies have shown that both operative and

non operative methods give comparable results in elderly patients. The study given by Rangan et al in the PROFHER randomized clinical trial showed that there was no significant difference in the Oxford shoulder score in the surgical and non surgical group of patients.¹⁰ In the present study, maximum incidence (N=19, 54.3%) was observed in seventh decade of life.

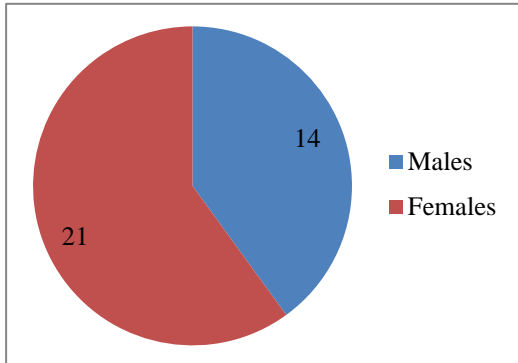


Figure 2: Sex distribution (n=35).



Figure 3: X-ray showing Neer's type 3 PHF.



Figure 4: X-ray showing Neer's type 3 PHF at 6 weeks follow up.

The mean age was 76.8 years, which had similar results to previous studies. In the present study, 14 (40%) were males and 21(60%) were females. In females, the incidence of trauma was also reported higher than males in the previous studies Rangan et al, Oleurd et al, Stableforth et al, Soler-Peiro et al.^{10,11,23,24} Fractures were more common on the left side than on the right side

which were in agreement with previous studies Yuksel et al, Rahul et al, Zyto et al, Torrens et al.^{20,22,25,26}



Figure 5: Showing forward flexion at final follow up.

In the present study, the major mode of trauma was fall from standing height in 22 (62.8%) of the cases, followed by road traffic accident in 7 (20%) cases, fall from stairs in 4 (11.4%) and assault in 2 (5.7%) which were in agreement with previous studies, Rangan et al and Soni et al.^{10,27} In the present study, on the basis of Neer's classification, most common fracture type was 3 part, followed by 2 part and 4 part. Similar observations were reported by previous studies, Zeigler et al and Canbora et al.^{28,29} Radiological union was achieved within 13 to 24 weeks, with an average of 18.4 weeks. Similar observations were made by Rahul et al Canbora et al and Back et al.^{22,29,30} Malunion was observed in 5 patients. The functional outcome was assessed on the basis of Constant score at 1 year follow up. Out of 35, (N=5, 14.3%) had excellent outcome, (N=8, 22.8%) had good functional outcome, (N=16, 45.7%) had moderate outcome, (N=6, 17.14 %) had poor outcome. The mean Constant score in the present study in two part fracture was 71.5 which was graded as good outcome. In three part fractures, the mean score was 59.5 graded as moderate, and in four part fractures it was 51.2 which was graded as poor. Similar results were given by previous studies; Zyto et al (for 3 part fractures=59, for 4 part fractures=47), Soler-Peiro et al (for 3 part fractures=64.5, for 4 part fractures=54.9) and Launonen AP et al.^{24,31} for 2 part fractures (Mean CS=66). The Constant score was higher in relatively less elderly patients and patients with two part fractures as compared to the complex fractures in the present study, overall range of CS was 35 to 91. In the present study of 35 patients, complications were observed in 12 (34.3%) patients. Our results were similar to the existing literature; Oleurd et al Boons et al and Zyto et al.^{11,21,25}

Limitations

Limitations of present study were it was a non-randomised study. The sample size was less. Our study is not a comparative study. The Constant scoring system is based on both subjective and objective parameters. The subjective parameters can lead to subjective bias.

CONCLUSION

The treatment of proximal humeral fractures remains challenging. In the present study, our data shows that the proximal humeral fractures can be effectively managed conservatively in the elderly patients. Among the various fracture types, two part fractures have best functional outcome and four part fractures have highest rate of complications. The conservative management is best suited in elderly patients as the osteoporotic bone does not favour towards surgery, also the functional demand is less, complications related to co-morbidities, surgery and anaesthesia are more. The patient needs to be kept for follow up and physiotherapy at regular intervals. Patient compliance is essential for best outcome.

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Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

- Buhr AJ, Cooke AM. Fracture patterns. *Lancet*.1959;1(7072);273:531-6.
- Knowelden J, Buhr AJ, Dunbar O. Incidence of fractures in persons over 35 years of age. A report to the M.R.C. Working party on fractures in the elderly. *Br J Prev Soc Med*. 1964;18(3):130-41.
- Court-Brown CM, Garg A, McQueen MM. The epidemiology of proximal humeral fractures. *Acta Orthop Scand*. 2001;72(4):365-71.
- Court -Brown CM, Caesar B. Epidemiology of adult fractures: A review. *Injury*. 2006;37(8):691-7.
- Bengner U, Johnell O, Redlund-Johnell I. Changes in the incidence of fracture of the upper end of the humerus during a 30-year period. A study of 2125 fractures. *Clin Orthop Relat Res*. 1988;231:179-82.
- Hanson B, Neidenbach P, de Boer P, Stengel D. Functional outcomes after nonoperative management of fractures of the proximal humerus. *J Shoulder Elbow Surg*. 2009;18 (4):612-21.
- Zyto K. Non-operative treatment of comminuted fractures of the proximal humerus in elderly patients. *Injury*.1998;29(5):349-52.
- Bell JE. Trends and variation in incidence, surgical treatment, and repeat surgery of proximal humeral fractures in the elderly. *J Bone Joint Surg Am*. 2011; 93(2):121-31.
- Clavert P, Adam P, Bevort A, Bonnomet F, Kempf JF. Pitfalls and complications with locking plate for proximal humerus fracture. *J Shoulder Elbow Surg*. 2010;19(4):489-94.
- Rangan A, Handoll H, Brealey S, Jefferson L, Keding A, Martin BC, et al. Surgical vs. nonsurgical treatment of adults with displaced fractures of the proximal humerus the PROFHER randomized clinical trial. *J Am Med Assoc*. 2015;313(10):1037-47.
- Olerud P, Ahrengart L, Ponzer S, Saving J, Tidermark J. Internal fixation versus nonoperative treatment of displaced 3-part proximal humeral fractures in elderly patients: a randomized controlled trial. *J Shoulder Elbow Surg*. 2011;20 (5):747-55.
- Sanders RJ, Thissen LG, Teepen JC, van Kampen A, Jaarsma RL. Locking plate versus nonsurgical treatment for proximal humeral fractures: better midterm outcome with nonsurgical treatment. *J Shoulder Elbow Surg*. 2011;20 (7):1118-24.
- Fjalestad T, Hole MO, Hovden IA, Blucher J, Stromsoe K. Surgical treatment with an angular stable plate for complex displaced proximal humeral fractures in elderly patients: a randomized controlled trial. *J Orthop Trauma*. 2012;26 (2):98-106.
- Handoll HH, Brorson S. Interventions for treating proximal humeral fractures in adults. *Cochrane Database Syst Rev*. 2015;11:CD000434.
- Neer CS. Displaced proximal humeral fractures. *J Bone Jt Surg*. 1970;52:1077-89.
- Neer II CS. Displaced proximal humerus fracture. Part II. Treatment of 3 part and 4 part fracture displacement. *J Bone Joint Surg*. 1970; 52-A:1090-103.
- Constant CR, Murley AHG. A clinical method of functional assessment of shoulder. *Clin Orthop Rel Res*. 1987;214:160e4.
- Jensen MP. Interpretation of visual analogue scale ratings and change scores. *J Pain*. 2003;407-14.
- Olerud P, Ahrengart L, Ponzer S, Saving J, Tidermark J. Hemiarthroplasty versus nonoperative treatment of displaced 4-part proximal humeral fractures in elderly patients: a randomized controlled trial. *J Shoulder Elbow Surg*. 2011;20(7):1025-337.
- Yüksel HY, Yilmaz S, Akşahin E, Celebi L, Muratli HH, Biçimoğlu A. The results of nonoperative treatment for three and four-part fractures of the proximal humerus in low-demand patients. *J Orthop Trauma*. 2011;25:588-95.
- Boons HW, Goosen JH, van Grinsven S, van Susante JL, van Loon CJ. Hemiarthroplasty for humeral four-part fractures for patients 65 years and older: a randomized controlled trial. *Clin Orthop Relat Res*. 2012;470(12):3483-91.
- Rahul B, Utkarsha J, Vikram K, Sanjay D. Comparative study of management of proximal humerus in elderly by conservative method versus operative locking compression plate. *J Pharm Biomed Sci*. 2015;05 (11):831-8.
- Stableforth PG. Four-part fractures of the neck of the humerus. *J Bone Joint Surg Br*. 1984;66(1):104-108.
- Soler-Peiro M, Garcia-Martinez L, Aguilera L, Perez- Bermejo M. Conservative treatment of 3-part and 4-part proximal humeral fractures: a systemic review. *J Orthopaed Surg Res*. 2020;15:347.

25. Zyto K, Ahrengart L, Sperber A, Törnkvist H. Treatment of displaced proximal humeral fractures in elderly patients. *J Bone Joint Surg Br.* 1997;79:412-7.
26. Torrens C, Corrales M, Vila G, Santana F, Caceres E. Functional and quality-of-life results of displaced and non-displaced proximal humeral fractures treated conservatively. *J Orthopaed Trauma.* 2014;28(7): e178-9.
27. Soni R, Patel A, Patel V, Jha A, Golwala P. Study of outcomes of the proximal humerus fractures treated by various modalities. *Int J Orthopaed Sci.* 2018;4(1): 41-4.
28. Ziegler et al. Evaluation of the Constant score: which is the method to assess the objective strength?. *BMC musculoskeletal Disord.* 2019;20:403.
29. Canbora MK, Kose O, Polat A, Konukoglu L, Gorgec M. Relationship between the functional outcomes and radiological results of conservatively treated displaced proximal humerus fractures in the elderly: A prospective study. *Int J Shoulder Surg.* 2013;7:105-9.
30. Seung-Gil B, Chang-Wug O, Young-Soo B, Jong-Keon O, Joon-Woo K, Jong PY, et al. The result of conservative treatment of proximal humerus fracture in elderly patients. *J Korean Fract Soc.* 2013;26(4):292-8.
31. Launonen AP, Sumrein BO, Reito A, Lepola V, Paloneva J, Jonsson KB, et al. Operative versus non-operative treatment for 2- part proximal humerus fracture: A multicenter randomized controlled trial. *PLOS Med.* 2019;16(7): e1002855.
32. Marieke EB, Inge HFR, Mostafa El-M, Klaus WW. Outcomes of operative and nonoperative treatment of 3- and 4-part proximal humeral fractures in elderly: a 10-year retrospective cohort study. *Eur J Trauma Emerg Surg.* 2019;45:131-8.

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