

Original Research Article

A STUDY ON SURGICAL OUTCOME OF PROXIMAL HUMERUS FRACTURE TREATED WITH PROXIMAL HUMERAL NAILING

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ABSTRACT

Background: The proximal humerus is the third most common fractured bone in the body, making up about 4%-5% of all fractures. Incidence occurs mostly after distal radius fractures and hip fractures. Fractures of the proximal humerus are more common among the elderly. Studying the outcomes of proximal humeral nailing fixation for two- and three-part proximal humeral fractures was the primary focus of this prospective observational study. This study was conducted to assess the clinical, radiological and functional outcome of treating Neer 2, 3-part proximal humerus fracture using intramedullary proximal humerus nailing and to know the advantages, disadvantages and complications of the procedure.

Materials and Methods: A prospective study was conducted in K A P V govt Medical College & MGMGH, Trichy. This study included the patients with fracture of proximal humerus requiring surgical interventions, after taking their consent, were analyzed clinically and radiologically. All the patients selected for the study were evaluated as per the history & mode of injury, necessary clinical and laboratory investigations. The pre-operative and immediate post-operative X-ray were evaluated. The patients were evaluated clinically and radiologically in their subsequent follow-up every 6 weeks till fracture union and at 1 year after surgery.

Results: The time for union (weeks) was 11 to 14 weeks in 86.66% of the participants. Most of the patients had follow-up till one year. The mean post op NEER score 75.17 ± 5.85 at 6 weeks, it was 79.63 ± 5.3 at 3 months, it was 83.23 ± 5.28 at 6 months, it was 88.5 ± 5.48 at final score. 36.67% and 63.33% of the participants had NEER 2 and 3part type of fracture injury. Among the study population with post-op complication, 10.00% of them had varus malunion, 6.67% of them had rotator cuff injury, 3.33% of them had glenohumeral protrusion. We found that 63.33% of them had excellent outcomes, 26.67% of them had satisfactory outcomes, 10.00% of them had unsatisfactory outcomes.

Conclusion: We discovered that individuals with both two and three-part fractures exhibit successful fracture union. Post-operative NEER score was improved with the patients treated. We found that there was a good outcome with a smaller number of complications found in the treatment of proximal humeral nailing.

Keywords: Proximal Humerus, NEER scores, Post-operative, Proximal Humerus Nailing.

INTRODUCTION

The proximal humerus is the third most common fracture in the body, making up about 5-6% of all fractures. Incidence occurs mostly after distal radius fractures and hip fractures. Fractures of the proximal humerus are more common among elderly. With good anatomic fracture reduction and stable primary fixation provided by proximal humeral nail fixation, patients can begin functional treatment after surgery right away without having to wait for the fracture to heal. Its prevalence has roughly tripled over the previous 30 years, coinciding with the rise of the older population. In the medical community, proximal humeral fractures are neither diagnosed or treated according to a unified set of criteria. Studying the outcomes of proximal humeral nailing fixation for two- and three-part proximal humeral fractures was the primary focus of this prospective study.

MATERIAL AND METHODS

This is a Descriptive study on “SURGICAL OUTCOME OF PROXIMAL HUMERUS FRACTURE TREATED WITH PROXIMAL HUMERAL NAILING” at the Dept. of Orthopaedics and Traumatology at MGMGH from SEPTEMBER 2020 TO NOVEMBER 2023 after obtaining informed written consent from subjects.

On admission, Advanced Trauma Life Support protocol will be followed. After proper preoperative anaesthetic checkup, assessment has to be obtained and operative management to be performed.

Study Centre

Department of Orthopaedics & Traumatology, MGMGH, TRICHY

Study Design

Descriptive study

Duration of Study

September 2020 To November 2023

Inclusion Criteria

1. Skeletally mature patients
2. Neer classification -2, 3 part fractures
3. Compound fracture (up to Grade 2)
4. Patients who are medically fit and willing for surgery

Exclusion Criteria

- Skeletally immature patients
- Neer classification -4 part fractures
- compound fracture (GRADE 3)
- Medical co-morbidity precluding surgical outcome, Non ambulatory patient, Chronic dementia

Sample Size

30

Data Collection

Method of Collection of Data

- By interview.
- By clinical using the Neer score and radiological examination.
- By analysing case papers.

- By follow up at intervals at 1.5, 3, 4.5 and 6 months.

Parameters to Be Studied

A. Clinical Parameters to be determined by Neer performance score.

B. Radiological Parameters

1. Articular congruence
2. Displacement and angulation.
3. Neck shaft angle.
4. Fracture union.

All the patients selected for the study were evaluated as per the history & mode of injury, necessary clinical and laboratory investigations. The pre-operative and immediate post-operative X-ray were evaluated. The patients were evaluated clinically and radiologically in their subsequent follow-up every 6 weeks till fracture union and at 1 year after surgery. A careful history was elicited from the patients and /or attendants to reveal the mechanism of injury and the severity of trauma. The patients were then assessed clinically to evaluate their general condition and the local injury. In general condition, the vital signs were recorded. Care was taken to detect shock and any associated injuries. Local examination of the injured arm, revealed the attitude of the limb to be flexed at the elbow, adducted at the shoulder and supported with the other hand at the elbow. Swelling, deformity, loss of function and nerve injury were looked for and noted. Palpation revealed tenderness, abnormal mobility, crepitus and of the affected shoulder. Distal vascularity was assessed by radial artery pulsations, capillary refilling, pallor and paresthesia at fingertips. Standard radiography of the shoulder, such as anteroposterior and axillary views, were obtained. The shoulder and elbow joints were included in each view. The limb was immobilized in a U-Slab with sling. Injectable analgesics were given. The operative procedure and its advantages were explained in detail to each patient and an informed consent was obtained. The patients posted for surgery were subjected to routine investigations

Patient Positioning- The patient is placed semi-reclined in” beach chair position” or supine on a radiolucent table. If closed reduction was not successful, percutaneous reduction should be performed. A small skin incision made from anterolateral border of acromion and extend distally up to 3 to 4 cm. The deltoid is split between anterior and medial raphe to expose the Sub-deltoid bursa. The supraspinatus tendon is then incised in line with its Fibers. Head-anchoring” technique is used in our cases. Two Kirschner wire joysticks were driven into the humeral head fragment. The head fragment was then manipulated into alignment with the shaft of the humerus. The low incidence of avascular necrosis of the humeral head was due to the preservation of the blood supply by the minimal invasive technique and the minimal disturbance of the fracture pattern by periosteal stripping and manipulation as in open reduction.

OPERATIVE TECHNIQUE: With the head fragment stabilised, the proper entry site of the nail could be located in the articular cartilage, around 5 mm medial to the lateral edge of the cartilage and just posterior to bicipital groove. The entry point is made with the cannulated 10mm Awl or by using the Small K-Wire with the Guide Wire Handle. Image intensification is required to identify the correct entry point. The proximal metaphysis should be reamed with the Hand Reamer. If the Hand Reamer cannot be used because of the fracture pattern or poor bone quality, use the 10mm Awl, straight to prepare the proximal metaphysis. Further reaming is not necessary with the Proximal Humeral Nail. The Nail may be inserted directly.

Postop Protocols Day 1: Shoulder supported with arm sling at all time except to exercise Pendulum exercise started AROM elbow, wrist, hand.

Day 2: Wound inspection 1st Week: PROM of shoulder, Flexion to 90°, Abduction to 90°, External rotation to 30° 2nd week: Shoulder Active assisted range of movements

Day 12: Suture Removal 4th week: Full shoulder PROM, Initiate shoulder active range of motion (AROM), Initiate gentle elbow isotonic strengthening, Initiate shoulder isometrics, encourage return to normal ADL's within lifting precaution

8th week: Early resisted ROM exercise, Shoulder full ROM 10 to 12 weeks: Shoulder strengthen and stretching exercise Radiological evaluation done at post-op day 1, 6 weeks, 3 months and 6 months.

RESULTS

Descriptive analysis was carried out by frequency and proportion for categorical variables & Mean and Standard deviation for continuous variable. Among the study population, the mean age was 46.53 ± 13.6 . 53.33% of them were male, 46.67% of them were female.

66.67% of them were RIGHT, 33.33% of them were LEFT. 73.33% of them were RTA, 26.67% of them were ACCIDENTAL FALL.

36.67% of them were 2 PART, 63.33% of them were 3 PART.

Time Interval Between Injury And Surgery, 43.33% of them were 4 days, 36.67% of them were 5 days, 16.67% of them were 3 days.

Method Of Reduction, 13.33% of them were closed, 86.67% of them were percutaneous.

Length of Incision (Cms), 56.67% of them were 3 cm, 43.33% of them were 4cm.

Duration of Surgery (Mins), 53.33% of them were 61-70 mins, 36.67% of them were 71-80 mins, 10.00% of them were 51-60 mins.

Blood Loss (ml), 33.33% of them were 70 ml, 23.33% of them were 60ml, 26.66% of them were 70 ml, 16.67% of them were 16.67%.

Fluoro Exposure (Secs), 30.00% of them were 55, 30.00% of them were 50, 20.00% of them were 45, 16.67% of them were 60.

Mean post op NEER score 75.17 ± 5.85 at 6 weeks, it was 79.63 ± 5.3 at 3 months, it was 83.23 ± 5.28 at 6 months, it was 88.5 ± 5.48 at final score.

Follow Up (Months), 33.33% of them had 11 months, 23.33% of them had 12 months, 20.00% of them had 10 months.

Time for union(weeks), 43.33% of them had 11 to 12 wks, 43.33% of them had 12 to 14 wks, 10.00% of them had 14 to 16 wks.

Post-op complication, 10.00% of them had varus malunion, 6.67% of them had rotator cuff injury, 3.33% of them had glenohumeral protrusion.

Final outcome, 63.33% of them were excellent, 26.67% of them were satisfactory, 10.00% of them were unsatisfactory.

DISCUSSION

The third most often broken bone in the body is the proximal humerus, which accounts for 5-6% of all fractures. Most frequently after hip fractures and distal radius fractures. Among the elderly, proximal humerus fractures are more frequent. proximal humerus nail offers excellent outcome with early joint mobilization and stable fixation of fracture with limited soft tissue damage. With the ageing population growing, its prevalence has almost tripled over the past 30 years. Proximal humeral fractures management is still debatable among best surgical management.

A prospective study was conducted in K A P V govt Medical College & MGMGH, Trichy. This study included the patients with fracture of proximal humerus requiring surgical interventions, after taking their consent, were analyzed clinically and radiologically. All the patients selected for the study were evaluated as per the history & mode of injury, necessary clinical and laboratory investigations. The pre-operative and immediate post-operative X-ray were evaluated. The patients were evaluated clinically and radiologically in their subsequent follow-up every 6 weeks till fracture union and at 1 year after surgery. This study was conducted to assess the clinical, radiological and functional outcome of treating Neer 2, 3-part proximal humerus fracture using intramedullary proximal humerus nailing and to know the advantages, disadvantages and complications of the procedure.

Age

Sumrein et al in their study observed that the occurrence of Proximal humerus fractures was common among patients above 60 years. However, we found that we had the mean age of the study participants was about 46.53 ± 13.652 Bergdal et al also found that the occurrence of Proximal humerus fractures was common among patients above 60 years. This difference would be due to the fact that

our study samples had got more younger study population than their study population.

Gender:

We found that more than half of the participants were males. Similarly, Lepola et al found that majority of the subjects were males in their study who had proximal fracture injury. This was further augmented by Patel et al who found similar results in their study.

NEER Classification

The proximal humerus is divided into four sections using the NEER system, which prioritises displacement above fracture line for classifying injuries. They are as follows: humeral head, greater tuberosity, lesser tuberosity, humeral shaft. Displacement is on a per-part basis. We found that most of the participants had type III NEER part proximal fractures. This was supported by the study conducted by Neer et al where they had observed the same results.

Percutaneous reduction

Percutaneous reduction is a simple procedure that produces effective outcomes for proximal humerus fractures. In this way, major cuts to the shoulder that could result in humeral head avascular necrosis are avoided. This method can be applied to both young people with healthy bones and elderly patients with osteoporosis and other pathologies. We found that majority of the participants were treated with percutaneous method. This was augmented by the previous stated studies.

Length of incision

Among the study population with Length of Incision (Cm), 56.67% of them had incision length of 3 cm, 43.33% of them had 4cm. An anterolateral skin incision from acromion is made. The kind of the fracture will determine how long the approach will be. Pure 2-part surgical neck fractures can be treated successfully with an incision that is about 3 cm long. In more difficult fracture cases when reduction and fixation of the tubercula are required, the skin incision is expanded by an additional 3–4 cm towards the distal which was augmented by Hessman et al.

Blood Loss

We observed that the blood loss in our study was less. According to the findings of a meta-analysis done by Shi et al,⁵⁹ intramedullary nails are more effective than locking plates for treating proximal humeral fractures in terms of intraoperative blood loss, operating time, fracture healing time, postoperative problems, and postoperative infection.

Radiation Exposure

In our study, the exposure of the radiation was lower. Hak et al⁶⁰ gave us an insight that the patient must be positioned as close to the image collector and as far away from the x-ray tube as feasible in order to reduce dispersed radiation. The amount of radiation exposure can be drastically reduced by moving farther away from the patient. During surgical procedures, the hands are typically exposed to the highest radiation doses, but they are much less radiosensitive than the thyroid or eyes. A surgeon should employ the hands-off technique, obtaining

fluoroscopic images only when their hands are farthest from the radiography field, to reduce exposure to their hands. Further reducing radiation exposure are lead glasses, lead thyroid shields, and lead robes.

NEER Score Post-operative

Among the study population, the mean Post-operative NEER Score 75.17 ± 5.85 at 6 weeks, it was 79.63 ± 5.3 at 3 months, it was 83.23 ± 5.28 at 6 months, it was 88.5 ± 5.48 at final score.

This was corroborated by the study conducted by Zhang et al⁶¹ where they had found that at the last follow-up, the mean NEER score was 83.2 ± 12.5 points. 81% of the results were excellent or good. In our study we found that more than 60% had excellent outcomes with respect to the treatment.

Follow-up

We found that most of the subjects were followed up till one year. Lopiz et al⁶² observed that the mean follow-up in their study subject was 14 months.

Union time: In a study conducted by Z. Pogorelič et al⁶³, the mean of 7.5 (5-12) weeks, full radiographic healing was seen in all patients. We found that majority of the subjects had union before 12-14 weeks.

Outcomes

In patients, proximal humeral nails can be used successfully to fixate comminuted and displaced proximal humeral fractures. Patients with 2-part fractures show considerably higher postoperative functional scores than patients with 3-part fractures, despite both types of fractures showing excellent fracture union results found by Greenberg et al.⁶⁴ We found that more than 60% had excellent outcomes with respect to the treatment.

Post-operative complication in the study population: We found that there was varus malunion noted as the complication in three out of thirty patients (10%) in our study. This was corroborated by the study conducted by Yoichi Koike et al where they had found that the incidence of varus malunion was only 8% among the proximal humeral fracture patients treated with nailing. In our study, we found that the rotator cuff injury was observed in two out of thirty patients.

This was similarly supported by the study conducted by Choo et al⁶⁶ who found that the prevalence of rotator cuff injury among the proximal humeral patients treated with nailing was very less.

CONCLUSION

Proximal humerus nail serves its purpose as a better option in Neer two part and 3 part Fractures with very less complications and better functional and radiological outcome. This usage of an antegrade nail with small diameter and length proves really wonderful technique with limited exposure, less soft tissue damage, preservation of periosteal blood supply and less operative time. The final outcome scores were excellent in more than 60 percentage of

cases with early restoration of shoulder movements. With proper technique the final patient outcome seems extraordinary. Meticulous attention to radiographic imaging is critical for accurate nail placement, avoiding the rotator cuff footprint, and anatomic tuberosity fixation. The choice of implant for proximal humeral fractures depends on the surgeon's expertise to manage the fracture as every fracture has its own orientation and need for reduction and to provide an early mobilization and good clinical & functional outcome to the patient.

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