

Original Research Article

Evaluation of functional outcome of diaphyseal fractures of shaft humerus treated with closed interlocking nail in adults

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ABSTRACT

Background: Humeral shaft fractures are those fractures of the diaphysis of the midshaft that do not involve the proximal or distal articular joints. Humerus fractures have a substantial impact on personal function and well-being and are one of the causes of excessive mortality among the elderly. The aim and objective of the study was to study the functional assessment after interlocking nailing in fractures of shaft humerus.

Methods: A retrospective clinical study was done on 20 patients with shaft humerus fractures treated with intramedullary nailing by orthopaedic surgeons at a tertiary care centre in the Department of Orthopaedics, Indian Institute of Medical Science and Research, Noor hospital, Jalna between January 2020 to July 2020 (DASH Score being calculated till January 2021). The DASH score was assessed 6 months post-operative day of surgery.

Results: For all the operated patients clinical, physiological and ortho-radiological assessment were performed to observe and evaluate fracture stabilization, reduction, fracture healing and callus formation, functional evaluation done with DASH scoring system.

Conclusions: Closed intramedullary nailing is safe and reliable technique to fix humeral shaft fracture. It provides early fracture consolidation, with high union rate, with advantage of early mobilization of the involved limb.

Keywords: Shaft humerus fractures, Intramedullary nailing, DASH score

INTRODUCTION

Humeral shaft fractures are those fractures of the diaphysis of the midshaft that do not involve the proximal or distal articular joints. Humerus fractures have a substantial impact on personal function and well-being and are one of the causes of excessive mortality among the elderly.

The healing capacity of the bone is quite evident in our literature with primary intention.¹ And it is also evident that the results of these are successful in terms of union but also can cause secondary complications like Shortening, mal-alignment and stiffness. Thus intervention is an important modality in the treatment protocol of these type of fractures.²

The main two modalities of internal fixation of humerus are plate osteosynthesis and intramedullary nailing. Fixation with plate comes with its own set of drawbacks such as extensive dissection, cortical osteopenia occurring adjacent to the ends of plate and risk of mechanical failure.³⁻⁵ Biomechanically, intramedullary nail is a better implant as nails are less likely to fail due to smaller bending loads.^{6,7}

Closed reduction and Nailing using intramedullary fixation preserves the fracture hematoma, which is extremely essential for early fracture consolidation.^{5,8} With interlocking mechanism they achieve rotational stability and provide early mobilization thus leading to decreased morbidity.⁹ Financial burden also decreases as there is a

decreased requirement of hospital stay and early resumption of their day to day activities.

The available bibliographic resources report that the general incidence of humeral shaft fractures constitute 1% to 2% of all fractures occurring in the human body.¹⁰⁻¹² Upto the age of 60 years, diaphyseal humeral fractures occur equally in men and women and the incidence does not seem to increase with age. After the age of 60 years, 80% of patients are women and humeral shaft fractures become more frequent.¹³⁻¹⁷

Etiology

The most common reason for a humeral shaft fracture is a fall, followed by motor vehicle accident.¹³⁻²⁰ Other causes that account for less than 10% of humeral shaft fractures include sporting activities, working accidents, fall from height, violence, and bone pathology. Pathologic and open fractures of the humeral shaft are uncommon (1.3% to 8% and 1.2% to 5% of all diaphyseal humeral fractures, respectively).^{13,14,17,19}

METHODS

This retrospective clinical study was conducted on 20 patients with shaft humerus fracture. Shaft humerus fracture was treated with intramedullary nailing by orthopaedic surgeons at a tertiary trauma care centre in the Department of Orthopaedics, Indian Institute of Medical Science and Research, Noor hospital, Jalna 431202 between January 2020 to July 2020 (DASH Score being calculated till January 2021). Fracture patterns were classified on basis of AO/ASIF classification of shaft humerus fractures.²¹

Inclusion criteria

Patients >18 years of age. Shaft humerus diaphyseal fractures. Closed Fractures. Fracture not more than 3 weeks old.

Exclusion criteria

Neurovascular compromise. Open fractures. Fractures extending to interarticular surface of joints. Non-union fractures. Polytrauma (associated injuries).

Surgical methodology

Preoperative planning

Pre-Operative Investigations. And A dose of IV antibiotics (Injection cefuroxime) was given 30 mins before the surgery.²²

Operative procedure

Antegrade intramedullary nailing of humeral shaft fractures.

Post-operative

Active elbow and shoulder movements was encouraged from 2nd day post-operative.

Suture removal done after 10-12 days. Radiographs be taken in both Anteroposterior and Lateral views and Signs of union looked for. Union of fracture was defined as formation of bridging callus on two radiographic antero-posterior and lateral views and clinically defined as no pain at fracture site. We used DASH Score for clinical and functional assessment 6 months post-operatively.²³ The collected data were coded then entered and analysed using the Statistical package for social science (SPSS) version 22. Simple graphs were used to illustrate some information.

RESULTS

20 patients with shaft humerus fractures presenting within 3 weeks of clinical injury who were operated between Jan 2020 and July 2020 qualifying the inclusion and exclusion criteria were included in this retrospective study. All the Surgeries were done by operating surgeons of our department in IIMSR medical college.

The functional assessment was done with the help of DASH score.

Distribution according to age and sex

The mean age of patients was 34.9 years (range 18–60 years).

Table 1: Demographic distribution.

Age group (in years)	Gender		Side	
	Male	Female	Right	Left
18-30	4	2	5	1
31-40	6	2	4	4
41-50	2	1	2	1
51-60	1	1	1	1

Distribution according to sex

There were 14 males and 6 females. Males were dominant in this case study.

Table 2: Distribution of mode of injury.

Mechanism of injury	No. of patients	Percentage
Road traffic accident	16	80
Fall	3	15
Assault	1	5

Side of injury (fracture)

Right side being more common than Left Side. Right side being affected in 12 (60%) patients and left side being affected in 8 (40%) patients (Table 1).

The mechanisms of injury included Road traffic accident in 16 (80%), fall when walking and from height in 3 (15%), assault in 1 (5%). Road traffic accident was the most common cause of injury (Table 2).

The standard AO/ASIF classification was used.

A1- 1 (5%), A2-1 (5%), A3-9 (45%), B1- 1 (5%), B2-4 (20%), B3- 1 (5%), C1- 1 (5%), C2- 1 (5%), C3- 1 (5%).

The average time for radiological healing was 13 weeks.

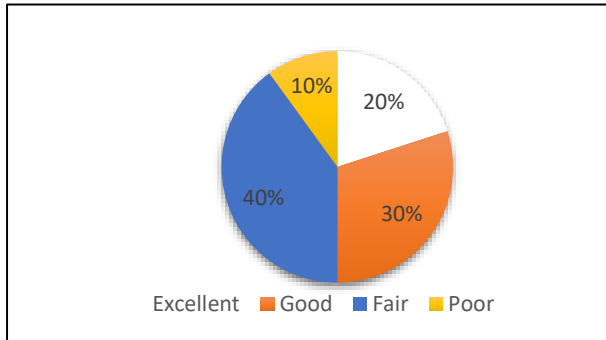


Figure 1: DASH score.



Figure 2: Post-operative x-ray lateral view.



Figure 3: Post-operative X-ray anteroposterior view.

The DASH score was calculated at the end of full functional recovery. Scores were as follows: excellent: 4, good: 6, fair: 8 and poor: 2.

DASH score of 0-20 was taken as excellent, 21-40 as good, 41-60 as fair, and above 61 was taken as poor. The average DASH score of the whole series was 35.4 (Figure 1).

DISCUSSION

In our study 20 patients of fracture shaft humerus of different age groups were selected. Average age group is 34.9 years (range 18–60 years). In Lin: 48 years (range 21–76 years) and in Rommens et al: average age was 43.8 years (range 15.5–97.3 years).^{24,25} Prevalence of fracture shaft humerus was more in males than in females. Prevalence of fracture shaft humerus was more in the younger age group.

The sex distribution being 70/30 in our study and in Rommens et al: 50/50, Lin:29/19 for males and females respectively.^{24,25} Prevalence of fracture shaft humerus was more in males than in females in our study.

In our study the mechanisms of injury included Road traffic accident, fall when walking and from height, assault. Road traffic accident was the most common cause of injury.

While in the study conducted by Rommens et al, they were Road traffic accident, accident at home, sports, accident at work, fall and also Road traffic accident was the most common cause of injury.²⁵ Similarly, in studies conducted by Bell, Lin and Tingstad, road traffic accident was the most common cause of injury.^{24,26,27}

In most of the studies, humeral shaft fractures were of category A of AO classification system similar to ours in which 11 (out of 20) were A, Lin: 34 (out of 48), Rommens et al 25 (out of 39) were Category A of AO Classification.^{24,25} Majority of patients in our study were having fracture shaft humerus in middle 1/3rd region similar to other studies.

In our study the average time for radiological union was 13 weeks. Rommens et al, it was 13.7 weeks. Lin in 8.6 weeks for radiological healing.^{25,27}

The study conducted by us resulted in giving us the functional outcome from 20 patients as excellent in 4, good in 6, fair in 8, poor in 2 patients. The average DASH score was 35.4. In study conducted by Rommens et al, the functional outcome being 84.6% excellent, 10.3% moderate and 5% poor. For the Study by Petsatodes et al, 87.5% excellent, 7.7% fair and 5% poor.^{25,28}

CONCLUSION

The DASH scoring system is a very useful tool to measure the function of the upper limb, developed by the American Academy of Orthopaedic Surgeons (AAOS). Based on the data and using this functional scoring system, we summarize that, essentially all closed humerus shaft fractures extending between 2 cm from surgical neck to 3 cm proximal to olecranon fossa can be stabilized by antegrade closed intramedullary interlock nailing. Long butterfly fragment consolidate early at 4-6 weeks as closed nailing is done. At the end of our study, we conclude that,

closed intramedullary nailing is safe and reliable technique to fix humeral shaft fracture. It provides early fracture consolidation, with high union rate, with advantage of early mobilization of the involved limb.

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