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FUNCTIONAL OUTCOMES OF INTRAMEDULLARY FIXATION WITH TITANIUM ELASTIC NAILS IN DIAPHYSEAL FRACTURES OF HUMERUS IN ADULTS

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Abstract:
Objective: This study was carried out to explore the functional outcome of intramedullary fixation with titanium elastic nails in diaphyseal fractures of humerus in adults.

Materials and methods: This prospective observational study was carried out at the trauma centre and emergency department Quetta from January 2022 to November 2023 after taking permission from the ethical committee of the institute. Adults of both genders with diaphyseal humerus fractures presenting between the ages of 18 and 60 were included. Patients with open shaft humerus fractures, radial nerve palsy, peri-prosthetic fractures, polytrauma, pathological fractures, and refusals to undergo surgery were excluded. All patients underwent closure reduction and titanium elastic nail internal fixation. For data analysis SPSS version 23 was used.

Results: A total of 40 patients were enrolled in this study out of which 32(80%) were male and 8(20% were females. 34 individuals (85%) reported complete union, 4 (10%) revealed delayed union, and 2 (5%) had non-union. According to the DASH grading method, 5(12.5%) patients had mild to moderate disability, whereas 33 (82.5%) patients showed no disability at all. In two individuals with a non-union fracture, the DASH score was not calculated. Among the various complications that we identified in our study were superficial infection 15(37.5%), followed by delayed union 10 (25%) elbow stiffness 10(25%) and non-union 5(12.5%).

Conclusion: The current study evaluated that management of diaphyseal humerus fracture with titanium elastic nail system was a safe and good choice for fixation. The use of titanium elastic nail systems to treat diaphyseal humerus fractures is minimally invasive, union is effected without altering the biology of the fracture site, and there is a decreased risk of iatrogenic radial nerve damage especially AO Type 12. A1, A2, A3).When choosing this approach, it vital to consider the type of fracture.

Key words: Humerus, titanium elastic nails, intramedullary fixation, diaphyseal fractures.

Introduction

Three to five percent of all humeral fractures are diaphyseal humeral fractures.(1) For these fractures, treatment options include both conservative and surgical therapies.(2) There are disadvantages of conservative therapy, such as prolonged limb immobilization, ongoing cooperation, and follow-ups.(3) Two benefits of closed interlocking nailing include fewer periodontal stripping and biological fixation with fracture hematoma preservation.(4)The gold standard for bone union has traditionally been plate osteosynthesis, which has always shown positive outcomes. In the majority of cases, non-operative therapy for uncomplicated humeral shaft fractures results in good consequences.(5) After conservative therapy, as many as ten percent of the aforementioned fractures may not heal, and treating this can be exceedingly difficult.(6) Treatment of simple humeral shaft fractures via dynamic compression plate restoration or intramedullary (IM) nailing have acquired favor in recent years.(7) Recently, this IM nailing procedure for humeral fractures and non-unions was accepted as an effective method.(8) Applying elastic nail method to the medullary canals of long bones was founded on the idea of three-point fixation.(9) It was first employed to treat long bone fractures in the lower extremities, but it soon became well-liked as a fracture fixing technique for long bones as well as a fracture of the of the humerus.(10) The primary treatment for pediatric diaphyseal humerus fractures is titanium elastic nailing. Closed flexible intramedullary nailing with titanium elastic nails, as opposed to open reduction and fixation procedures, may theoretically be superior to any other surgical method of fixation because it prevents growth plate disruption, and provides relative stability and functional reduction without disturbing fracture hemorrhage. Substantial functional reduction, fracture hematoma preservation, relative axial stability, thick periosteal covering, and sufficient blood supply to the femoral diaphysis are all anticipated to improve healing and avoid deformity.(11) The purpose of this study was to evaluate Functional outcomes of intramedullary fixation with titanium elastic nails in diaphyseal fractures of humerus in adults.

Materials and method

This prospective observational study was carried out at the trauma centre and emergency department Quetta from January 2022 to November 2023 after taking permission from the ethical committee of the institute. Adults of both genders with diaphyseal humerus fractures presenting between the ages of 18 and 60 were included. Patients with open shaft humerus fractures, radial nerve palsy, peri-prosthetic fractures, polytrauma, pathological fractures, and refusals to undergo surgery were excluded. A complete medical record was obtained, comprising information on age, gender, place of residence, kind of fracture, side implicated in the fracture, and severity of the fracture. Every patient was treated with internal fixation using titanium elastic nails and closed reduction. Titanium elastic nails can be implanted either retrogradely, with the point of entrance at the distal end of the humerus, or antegradely, with the point of entry at the proximal end. In our investigation, 2mm and 4mm titanium elastic nails were employed in a retrograde method. Every individual was monitored at week 1, week 3, month 3, and month 6. All of the patients had clinical evaluations for pain, range of motion, and fracture union radiographic testing over the follow-up period. For data analysis SPSS version 23 was used. For continuous variables, the mean and standard deviation were recorded; for categorical data, frequency and percentages are given.

Results

A total of 40 patients were enrolled in this study out of which 32(80%) were male and 8(20% were females. The demographic features of the participants are shown in the **table 1.** 34 individuals (85%) reported complete union, 4 (10%) revealed delayed union, and 2 (5%) had non-union. The average (standard deviation) time for fracture union was 9.12 (1.99) weeks. According to the DASH grading method, 5(12.5%) patients had mild to moderate disability, whereas 33 (82.5%) patients showed no disability at all **(table 2).** In two individuals with a non-union fracture, the DASH score was not

calculated. Among the various complications that we identified in our study were superficial infection 15(37.5%), followed by delayed union 10 (25%) elbow stiffness 10(25%) and non-union 5(12.5%).as shown in **fig 1.** Frequency of type of fractures evaluated in our study participants are shown in **fig 2**.

Discussion

Assessing the functional results of flexible intramedullary nails applied for the treatment of adult humeral shaft fractures was the primary objective of this research. It has long been a concern to reduce humeral fractures of the diaphyseal since these fractures might result in non-union, delayed union, and mal-union. Surgeons use operative method to prolong and align the patient's active joint mobility in order to prevent proximal and distal joint stiffness after humerus fractures.in the current study males were 32(80%).Male participants experiencing diaphyseal humerus fractures were reported in greater numbers than female patients in a prior research carried out by Sarwar et al. (11) The individuals we treated ranged in age from 1.27 to 36.22 years on average. A maximum number of patients in the age group of 20 to 50 years old who had diaphyseal humerus fractures was recorded by other studies. (12) In our study, traffic accidents accounted for the majority of fractures, affecting 32 (80%) patients. Falling affected 6 (15%), violent acts accounted for 1 (2.5%), and other causes were noted in 1 (2.5%) of the patients. In numerous studies, falls from a height were the primary cause of diaphyseal humerus fractures, after traffic accidents.(13, 14) Frequency of individuals in transverse 24(60%), oblique 6(15%) spiral 3(7.5%) segmental 2(5%) and comminuted were 5(12.5%).In participants with diaphyseal humerus fractures, transverse fractures accounted for the majority of fracture types (61.54%), according to a previous study by Yousef et al.(15). The current study explored that the majority of the patients had complete union 34(85%) 4 had delayed union (10%), and two patient (5%) had non-union. The 80–95% fracture union rate reported in the study is comparable to what we found.(16) According to the DASH grading method, 5 individuals (12.5%) were mild to moderate disables , while 33 (82.5%) showed no disability at all. Disability based on the DASH rating system was observed in a previous study by Amit et al. in patients treated with titanium elastic nail therapy for diaphyseal humerus fractures. They reported no disabilities in sixty-five percent of the patients and mild-to-moderate disability in 20% of the patients.(17) Our study revealed a number of complications, including superficial infections 15(37.5%), non-union 5(12.5%), delayed union 10(25%) and elbow stiffness in 10 participants (25%) correspondingly . These results are consistent with other research that described complications such as non-union, delayed union, elbow stiffness, and superficial infections in patients with diaphyseal humerus fractures treated with titanium elastic nail technique. (17)In order to draw resilient conclusions, more research with a larger sample size and a longer follow-up time is necessary because the sample size in our study was relatively small.

Conclusion

The current study evaluated that management of diaphyseal humerus fracture with titanium elastic nail system was a safe and good choice for fixation. The use of titanium elastic nail systems to treat diaphyseal humerus fractures is minimally invasive, union is effected without altering the biology of the fracture site, and there is a decreased risk of iatrogenic radial nerve damage especially AO Type 12. A1, A2, A3).When choosing this approach, it vital to consider the type of fracture.

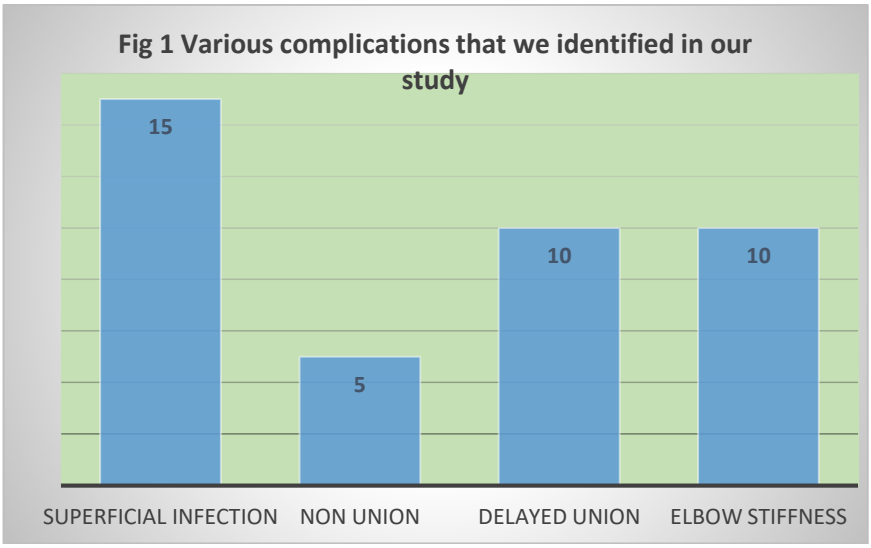
Table 1: Demographic characteristics of the participants

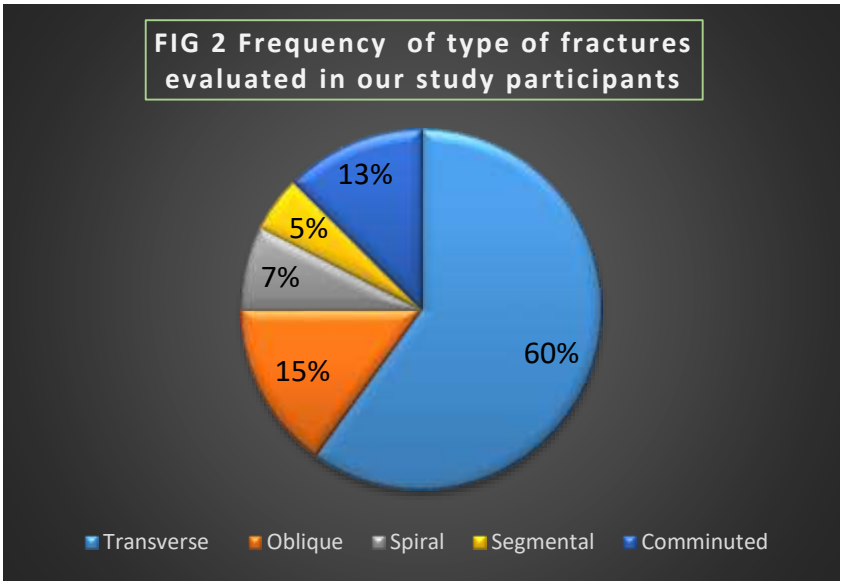
Parameter	Category	N (%)
Sex	Male	32(80)
	Females	8(20)
Age in years	18-30	12(30)
	31-40	10(25)
	41-50	10(25)
	51-60	8(20)
Area of residence	Urban	24(60)
	Rural	16(40)

Cause of fracture	Road traffic accident	32(80)
	Fall	6(15)
	Violent act	1(2.5)
	Others	1(2.5)
Fracture side	Right	29(72.5)
	Left	11(27.5)

Table 2: Union time, functional outcomes and complications

Parameter	Category	N (%)
Fracture union time	5 t0 10 weeks	13(32.5)
	11 to 16 weeks	23(57.5)
	Greater than 16 weeks	4(10)
Type of union	Complete union	34(85)
	Delayed union	4(10)
	Non-union	2(5)
	Mild-moderate union (31 –60)	5(12.5)
	Severe (> 60)	----





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