

# Functional Outcome of Titanium Elastic Nails for Diaphyseal Fracture of Humerus

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## ABSTRACT

**Objective:** To examine the functional outcomes of titanium elastic nails procedure in patients presented with diaphyseal fracture of humerus.

**Study Design:** Retrospective/observational study.

**Place and Duration of Study:** This study was conducted at the Orthopaedic and Trauma Surgery Department, Capital Hospital Islamabad from March 2019 to October 2019.

**Materials and Methods:** Thirty patients of both genders with ages 18 to 60 years presented with diaphyseal fractures of humerus were included. Patients detailed were recorded after informed consent. All the fractures were treated with titanium elastic nailing. Clinical and radiological parameters were analyzed pre and postoperatively. Functional outcomes were analyzed by DASH scoring system. Post-operative complications were examined. Patients were followed for 6 months after surgery.

**Results:** There were 24 (80%) male patients while 6 (20%) patients were females. Mean age of patients was 32.46±8.65 years. Road traffic accident was the most common mode of injury found in 19 (63.33%) patients. No patient had non-union. Mean union time was 2.84±1.15 months. 25 (83.33%) patients had excellent, 3 (10%) had good, 2 (6.67%) had fair and 0 patient with poor functional outcomes. 4 (13.33%) patients had postoperative complications, in which 2 patients had wound infection, 1 patient delayed union and 1 patient with elbow stiffness.

**Conclusion:** Titanium elastic nail for diaphyseal fracture of humerus is safe and effective procedure with fewer rates of complications.

**Key Words:** Diaphyseal fracture of humerus, Titanium elastic nail, Union

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## INTRODUCTION

Fractures of the humerus shaft are commonly found by orthopedic surgeons, which represent 1-2% of all fractures.<sup>1-3</sup> This fracture can be treated with functional braces/plasters or operatively. Intramedullary and frame osteosynthesis are the two modalities of internal fixation in the fracture shaft of humerus. Nails are prone to lower bending loads and are less vulnerable to fatigue failure. It serves as a device for exchanging loads and stress control.<sup>1,2</sup>

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Right at the end of a tube, cortical osteopenia is rarely seen with intramedullary nails; thus, refracture is less likely after implant removal.<sup>1</sup> Since its conception, this method of treatment has been controversial due to damage to the medullary system, possibility of fat embolism and a general lack of understanding of the biomechanical principles of intramedullary club fastening.<sup>4,5</sup> Open reduction internal fixation (ORIF) of plates and screws is the current Gold standard in operative therapy. Internal fixation with intra-medullary fixing devices is an alternative to this technique. Such tools seek to decrease DMCF penetration, enhancing cosmetic quality and compatibility while reducing the risk of infection.<sup>6</sup> Various intramedullary devices are available. Several are made of solid stainless steel while others have lightweight titanium alloys.<sup>7,8</sup> Several earlier tests have shown that titanium elastic nails are very productive with a higher union rate and a lesser difficulty rate.<sup>9,10</sup> We conducted present study with aimed to examine the radiological and functional outcomes titanium elastic nailing for diaphyseal fracture of humerus.

## MATERIALS AND METHODS

This retrospective/observational study was conducted at Orthopaedics and Trauma Surgery Department, Capital

Hospital Islamabad from 1<sup>st</sup> March 2019 to 31<sup>st</sup> October 2019. A total of 30 patients of both genders with ages 18 to 60 years presented with diaphyseal fractures of humerus were included. Patient's detailed demographics including age, sex, BMI, mode of injury, side of injury and level of fracture were recorded after informed written consent. Patients with open fracture of shaft humerus, polytrauma patients, patient not willing for surgery and patient with other injuries of the same limb were excluded. Closed reduction and internal attachment of titanium elastic nails is used to treat all patients. Titanium elastic nails may be inserted before the dot at the next section of the humerus and after the entrance at the distal end of the humerus. We used the retrograde injection procedure in the humeral shaft during our research. DASH rating systems were evaluated for clinical results such as union time, practical outcomes. Postoperative complications such as wound infection, elbow stiffness, delayed union, non-union and pain were examined. Patients were followed up for 6 months. Functional outcomes were examined at final follow-up. All the data was analyzed by SPSS 24.

## RESULTS

Out of 30 patients, 24 (80%) patients were male while 6 (20%) patients were females. Mean age of patients was  $32.46 \pm 8.65$  years. Mean BMI was  $23.28 \pm 2.44$  kg/m<sup>2</sup>. RTA was the commonest mode of injury found in 19 (63.33%) patients followed by fall from height in 6 (20%), Intrapersonal violence in 3 (10%) and 2 (6.67%) had unknown etiology. 16 (53.33%) patients had left side and 14 (46.67%) had right side fracture. 25 (83.33%) patients had middle third, 4 (13.33%) had upper third and 1 (3.33%) had lower third level of fractures (Table 1).

**Table No.1: Demographical details of all the patients**

Variable	No.	%
Gender		
Male	24	80.0
Female	6	20.0
Age (years)	32.46±8.65	
Etiology		
RTA	19	63.33
Fall from height	6	20.0
Violent Acts	3	10.0
Others	2	6.37
Fracture side		
Right	14	46.67
Left	16	53.33
Fracture level		
Middle third	25	83.33
Lower third	1	3.33
Upper third	4	13.33

Mean union time was  $2.84 \pm 1.15$  months. 4(13.33%) patients had postoperative complications, in which 2

patients had wound infection, 1 patient with delayed union and 1 patient with elbow stiffness (Table 2).

According to functional outcomes, 25 (83.33%) patients had excellent, 3 (10%) had good, 2 (6.67%) had fair and 0 patient with poor functional outcomes. Overall 93.33% patients had good to excellent and 6.67% had satisfactory functional outcomes with no severe disability (Table 3).

**Table No.2: Complications associated to procedure**

Variable	No.	%
Union (months)	2.84±1.15	
Wound infection	2	6.67
Delayed union	1	3.33
Elbow stiffness	1	3.33
Non-union	-	-

**Table No.3: Functional outcome at final follow-up**

Outcome	No.	%
Excellent	25	83.33
Good	3	10.0
Fair	2	6.67
Poor	-	-

## DISCUSSION

The diaphyseal fractures of Humerus have always been a problem since those fractures are associated with complications, such as non-union, malunion, delayed union and reduction. Diaphyseal fractures have always been a problem. For such cases surgical operation is carried out to maintain longitude in conjunction with successful joint stability, in order to reduce the proximal and distal joint rigidity. U plaster cast has been the standard way of treating the fracturing of the humerus shaft. Although this technique can have adequate outcomes, residual angulation, malrotation, joint rigidity and the inequality of the limb duration are well known.<sup>11,12</sup> In present study majority of patients 80% were males and females were 20% with mean age  $32.46 \pm 8.65$  years. These results were similar to many of other studies in which male patients were high in numbers and accounted 70% to 85% and the average age of patients was 30 years.<sup>13,14</sup> Road Traffic accident was the commonest mode of injury found in 19 (63.33%) patients followed by fall from height in 6 (20%), Intrapersonal violence in 3 (10%) and 2 (6.67%) had unknown etiology. Studies demonstrated that road traffic accident was the commonest mode of injury accounted for >50% followed by fall from height and intrapersonal violence.<sup>15,16</sup>

In our study we found that mean union time was  $2.84 \pm 1.15$  months. 4 (13.33%) patients had postoperative complications, in which 2 patients had wound infection, 1 patient with delayed union and 1 patient with elbow stiffness. A study conducted by Patel et al<sup>17</sup> reported that 90% fractures united in 12-20 weeks patients had delayed union which ultimately

united without any intervention. Two (10%) patients developed shoulder stiffness due to nail impingement. Another study by Updhaya et al<sup>18</sup> reported that 100% fractures were united with union time of 14.98 weeks in patients treated with titanium elastic nails for diaphyseal humerus fracture.

In the present study, According, to functional outcomes, 25 (83.33%) patients had excellent, 3 (10%) had good, 2 (6.67%) had fair and no patient had poor functional outcomes. Overall 93.33% patients had good to excellent and 6.67% had satisfactory functional outcomes with no severe disability. Updhaya et al<sup>18</sup> reported that 88% patients had excellent, 8% had moderate and 4% had poor functional outcomes. A study by Hwaizi et al<sup>19</sup> regarding comparison between elastic stable intramedullary nailing and conservative management in children with diaphyseal femoral fractures, in their study they enrolled 41 patients and they demonstrated that ESIN is a safe and effective approach for treating femoral shaft fractures in children; it provides better functional and radiographic outcomes than spica casting and can be used in preschool-age children. Another study by Soni et al<sup>20</sup> reported that among 15 patients treated with flexible intramedullary nailing for humeral shaft fractures all 100% patients achieved union and 100% patients had good to excellent functional outcomes.

## CONCLUSION

Titanium elastic nail method is a good option for handling diaphyseal humerus fractures in adult populations because of the minimum invasive technique, the biological union of a fracture site can be accomplished without interfering, as well as the possibility of almost no iatrogenic radial nervous damage can be minimized. But the variety of fracture type should first be considered.

### Author's Contribution:

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**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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