ORIGINAL ARTICLE

Titanium Elastic Nail System: A Practice Based Study on Fractures of the Humerus Shaft

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ABSTRACT

Aim: To evaluate the functional outcomes of titanium elastic nail system in fractures of humerus.
Study Design: Prospective study
Place and duration of study: Orthopedic Department, King Fahad General Hospital, Jeddah, Kingdom of Saudi Arabia from 1st July 2017 to 30th2019.
Methodology: Fifty patients with mature skeleton mature with closed fractures of shaft/distal one third of humerus managed through titanium elastic nailing system were included where as other types of fractures and immature skeleton patients were excluded.The surgical techniqueused was the antegrade/retrograde entry points elastic nails for managing the mid-shaft fracture whereas the fractures of the distal one third fractures were managed with antegrade entry point. Immobilization was achieved with sling over 2-3 weeks and analgesics were used for pain management with a postoperative follow up on 2nd,6th and 12th weeks while radiographic union as well as range of movement was assess even after one year.
Results: There were 50 patients enrolled in this study and followed up for one year out of which male patients were 74% and females were 26% and the mean age of our patients was 27±4years. Polytrauma patients were in majority with 60%, bending wedge fractures were 19%, oblique fractures were 15% and rest were of transverse nature. The union rate was 98% with the union time of 8-16 weeks. Non-union was observed in one patient (2%) that was repeated with plate osteosynthesis. Functional range of motion at shoulder and elbow joints was achieved in 47(94%) in patients while elbow stiffness was seen in 3(6%) patients requiring manipulation under anesthesia, radial nerve damage was seen in 3(6%) patients post-operatively and both recovered during the follow up period.
Conclusion: The mention technique was found to beacceptable method for managing the mid-shaft fractures and distal third fractures of humerus with excellent union and nice functional outcomes and less complication rates.
Keywords: Titanium elastic nail, Shaft fractures, Union, Functional outcomes

INTRODUCTION

Fractures of humerus are 3% in all cases of fractures and mid shaft fractures are more common among them accounting for 60% and males are affected around 20-30years age range while females are affected at an advanced age of 60 to 80 years.[1] Fractures of humerus can be divided into open fractures or closed fractures and Type A fractures which are simple fractures further subdivided as spiral, oblique and transverse fractures, Type B fractures which are Wedge fractures that are either intact or fragmentary and Type 3 fractures are multifragmentary in nature.[2]

Humeral shaft has many arm muscles around it along with important blood vessels (brachial artery and brachial vein) and many nerves like, median, ulnar and radial nerve.[2]Mostly humeral fractures occur as a result of various forms of trauma (fall and vehicle accidents) and falls are mostly responsible for fractures in elderly.[3] Mid shaft fractures involve the radial nerve injury which occurs 18% of the closed mid-shaft or distal shaft fractures whereas this nerve injury is 60% in open fracture and presents as wrist drop.[4,5] Though clinical examination will rule out loss of sensation andvascular compromise but many blood investigations and radiological imaging are further required.The humeral shaft fractures mostly are unstable and the non-surgical (conservative) treatment that is the reduction and splint are the standard which is associated with an alignment and unionrate of 90% within 10 to 12 weeks except transverse and comminuted fractures which take little longer duration to heal as compared to spiral or oblique fractures[6,7]. The reduction should not be performed without sufficient analgesia and without assessingany injury to the overlying skin. Splint should be applied along with the immobilization of the elbow joint and the shoulder joint. However in certain conditions operative management becomes a definite need like neurovascular compromise, fractures of open and comminuted nature, non-tolerant patient to splint or cast over a long duration, multiple fractures and in cases where conservative measures have been failed.Operative management is more in practice now daysdue to early healing and better union.

It takes almost 4 months for fractures of humeral shaft to heal with 1-12% chances of nonunion specially the transverse fractures and other conditions like old age, diabetes and obesity. The surgery may develop certain complications like non-union, angulation, limited range of motion, Infection and nerve injury. Injury to radial nerve occurs in 20% patients and may resolve in 6months. The best management is based on the team consisting on

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orthopedic surgeon, an emergency physician, a nurse, a radiologist and a physiotherapist.

MATERIALS AND METHODS

It was a prospective study conducted at Orthopedic Unit of the King Fahad General Hospital, Jeddah, Kingdom of Saudi Arabia from 1st July 2017 to 30th June 2019. Patients included were with mature skeleton mature with closed fractures of shaft/distal one third of humerus managed through titanium elastic nailing system where as other types of fractures and immature skeleton patients were excluded. There were 50 patients enrolled but only 32 patients followed up for one year where as those patient who did not appeared for follow up examination were also excluded and considered as dropouts of the study. The surgical technique used was the antegrade/retrograde entry points elastic nails for managing the mid-shaft fracture whereas the fractures of the distal one third fractures were managed with antegrade entry point. Two different oval holes were used as an entry for each nail. Two nails of the same size were inserted and assessed to fill two thirds of the canal. Nail ends were manipulated to sit in a divergent position. Immobilization was achieved with sling over 2-3 weeks and analgesics were used for pain management with a postoperative follow up on 2nd ,6th and 12th weeks while radiographic union as well as range of movement was assess even after one year

RESULTS

Male patients were 74% and females were 26% and the mean age of our patients was 27±4 years. Poly trauma patients were in majority with 60%, bending wedge fractures were 19%, oblique fractures were 15% and rest were of transverse nature.

Table 1: Nature of various fractures of humerus

Nature of different cases	No.	%
Poly trauma	30	60.0
wedge fractures	10	20.0
oblique fractures	8	16.0
Transverse nature	2	4.0

Table-2: Various outcomes of study

Nature of different cases	No.	%
Union Rate	49	98.0
Non Union	1	2.0
Functional range of motion	47	94.0
stiffness was seen in	3	6.0
Radial nerve damage	3	6.0

Fig 1: Pie chart of gender distribution

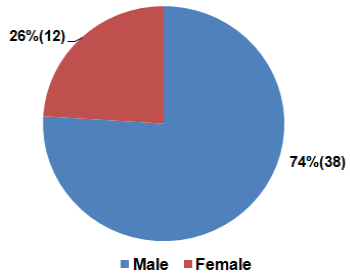
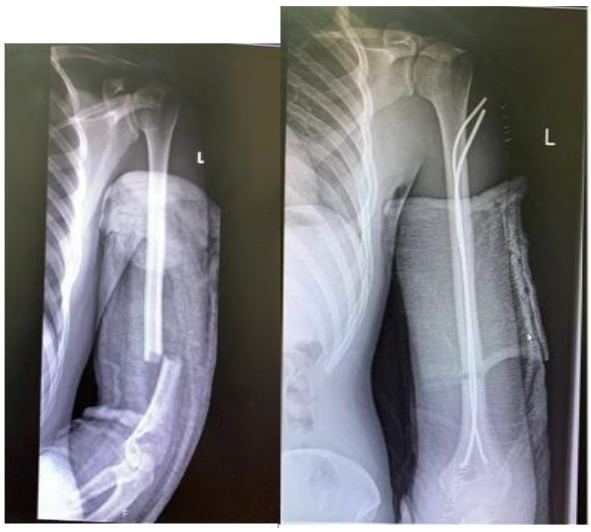


Fig-2: Pre and post-operative view on x-ray

The union rate was 98% with the union time of 8-16 weeks. Non-union was observed in one patient that was repeated with plate osteosynthesis. Functional range of motion at shoulder and elbow joints was achieved in 47(94%) in patients while elbow stiffness was seen in 2(6%) patients requiring manipulation under anesthesia, radial nerve damage was seen in 3(6%) patients post-operatively and both recovered during the follow up period.



DISCUSSION

The treatment of humerus shaft and distal third fractures continues to be challenging and controversial. Throughout the years of practice, many options were introduced to treat these fractures either conservatively or operatively. Operative options were variable including plat osteosynthesis and intramedullary nailing and elastic nail fixation. Elastic nail fixation showed 80% union rates with a normal shoulder function and there were no iatrogenic radial nerve injury Verma et al[8] titanium elastic nails showed 100% union rate at 14.98±4.08 weeks, with no radial nerve injury and 1 case of poor shoulder ROM. Upadhyay et al[9] reported the Titanium elastic nail system as an easy, biologically acceptable method of treating mid shaft and distal third humerus fractures with an evidence of excellent union rates, good functional outcome and a lower complication rates compared to standard treating methods. In this study we chose to use titanium elastic nail system to assess the radiological outcome in treating these fractures and the functional outcome through range of motion. Kumar et al[10] reported infections and radial nerve injury of transient nature in 13.3% of patients treated through plate osteosynthesis that was inconsistent with our finding.

Rosenbaum et al[11] reported 8-10% cases of non-union following the use of flexible nail. In a study by Sleman[12] there was no case of nonunion reported using titanium elastic nail for diaphyseal fractures and our findings were consistent with that Sleman.[12]A comparative outcome based study by Modi et al[13] between titanium elastic nail and plate in shaft fractures found that the results were quitesatisfactoryfor titanium elastic nail in terms of

union rates, union time and complication rates but limited to fractures of middle one third.

CONCLUSION

The titanium elastic nail system is an acceptable technique in the management of mid-shaft and distal third humeral fractures with excellent union and nice functional outcomes and less complication rates

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