Outcome of Fracture Shaft Humerus Treated with TENS

Dayanand Manjunath*, Deepak Shivanna, Amit Verma, Ramachandra and Rohan Nambiar

Bangalore Medical College and Research Institute, Bangalore

Abstract: *Introduction:* Diaphyseal fractures of humerus accounts for 3% of all fractures. Though conservative treatment is popular it has its own limitations. Choice of surgical interventions ranges from plate osteosynthesis to Intramedullary nail that have their own merits and demerits. Hence a study was done to assess the outcome of treatment of Diaphyseal fractures of humerus treated by TENS nailing.

Material and Methods: This is a prospective study of 20 adult patients with closed diaphyseal fracture of humerus treated with closed reduction and internal fixation with TENS nail between 2010 to 2013. Average follow up was 6 months**.** The fracture union was assessed clinically and radiologically. The functional result was evaluated with DASH scores.

Results: Of the 20 cases that were treated 85 percent of them had fractures in the middle third. 60 percent of the fractures were transverse and 15 % were oblique. Majority of fracture (75 %) united in 10 weeks and 20% non union. The complications encountered in our series were non union in 4, Superficial infection in 2, 1 implant failure and stiffness of the elbow in 2 cases. 65 % of the patients had DASH Scoring in range of 10-30.

Conclusion: Though nonunion rates are high. TENS provides relative stability but maintains the biological environment at the fracture site which merits over open reduction. Its effectiveness in the oblique and spiral fractures where stability of reduction and compliance of the patient has a bigger role in the postoperative period is questionable.

Keywords: TENS, humerus fracture.

1. INTRODUCTION

Diaphyseal fractures of humerus accounts for 3% of all fractures [1]. The basic goal of management of diaphyseal fractures of hummers in adults is to achieve union and restore good function. Fracture of humerus is one of the most challenging fracture of upper limb to be treated keeping in mind of the compliance of the patient, its response to various types of treatment available. Conservative treatment though popular has its demerits such as prolonged limb immobilization, joint stiffness, the need for good compliance of the patient and regular hospital visits. This can be quite challenging in unstable fractures (spiral/long oblique), comminuted fractures, segmental fractures, pathological fractures, fractures which may require surgical intervention. Choice of surgical interventions ranges from plate osteosynthesis to Intramedullary nail that have their own merits and demerits.

Despite technical improvements of humeral IM nails, and the locking Nails, one of the common complication noted was the shoulder joint impingement and stiffness. The common complication associated with Dynamic compression plating was the extensive muscle dissection necrosis, non union, cortical bone necrosis and iatrogenic radial nerve palsy. Hence even after so many technical improvements and related anatomy, the treatment for humeral fracture fixation is still controversial . One of the recent implant techniques adopted is surgical correction of fracture by titanium elastic nails even though the principle of fixation is same as the earlier elastic nail that was developed by Kuntscher. Titanium Elastic Nailing is done by closed reduction and internal fixation. In this study we are going to study the effectiveness, clinical and functional outcome of the diaphyseal fracture of humerus treated by titanium elastic nails in adult age group.

The aims of the study was to assess the outcome of treatment of Diaphyseal fractures of humerus treated by TENS nailing in adults.

2. MATERIALS AND METHOD

A Prospective study of 20 patients with closed diaphyseal fracture of humerus was treated with closed reduction and internal fixation with TENS nail between 2010 to 2013. All patients between the age of 18 to 60 years who were fit for surgery and gave informed consent were taken up for surgery. Necessary ethical clearance was taken from local ethical committee. Pathological fracture, open fractures and patients having ipsilateral fractures in upper limb were excluded from the surgery. All patients underwent closed reduction and internal fixation with titanium elastic nail system. Follow up was done for 1 to 9 month with average follow up 6 months**.** The fracture union was assessed clinically and radiologically. The functional result was evaluated with DASH scores.

*Address correspondence to this author at the Bangalore Medical College and Research Institute, Bangalore; E-mail: drdayanand.m@gmail.com

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3. SURGICAL PROCEDURE

All the patients were operated in supine position under supraclavicular block or general anesthesia under image intensifier control. The entry point of the nail was done with a small longitudinal incision by palpating the supracondylar ridge. The distal insertion point is located 1-2 cm above the lateral supracondylar ridge. Intramedullary cavity was opened with an awl. First nail was passed through the entry point made and passed till the fracture site then second entry was made in the same way at 1cm proximal and 0.5 cm medial to the first entry and the nail of the same size used earlier was introduced and reached fracture site. Fracture was reduced under image intensifier guidance and both the nails were pushed across the fracture site one by one. The wounds were closed accordingly and an U slab was applied for 2 weeks after surgery. Further 4 weeks of Functional cast brace was applied for added stability. Follow up was done as per the protocol set forth.

4. RESULT

While assessing results of this study more stress was given to functional recovery and early return to the prefracture state. A total of 20 cases of fresh diaphyseal fracture of humerus were treated with closed reduction and internal fixation. Patients between the age of 18 to 60 years from both the genders were taken. 55 percent of the patients were between the 3rd and 4th decade. There was a male predominance of 85%. 80 % of patients came with the history of road traffic accident. 85 percent of our cases were in middle third. 60 percent of the fractures were transverse and 15 % were oblique. Majority of fracture (75 %) united in 10 weeks followed by 25% in 16-20 week and 5 % in 20-24 week. The remaining 20 % had gone in for non union for which implant removal, open reduction internal fixation with dynamic compression plating and grafting was done. There was a co relation of non union with the site of fracture. Spiral and oblique fracture in our series had more chance of non union. This can be attributed to relative stability that the TENS gives at the fracture site. The complications encountered in our series were 4 cases of non union, 2 cases of superficial infection, 1 implant failure and stiffness of the elbow in 2 cases. Union of the fracture was judged clinically by the lack of pain or tenderness at the fracture site and by assessing serial radiographs for presence and consolidation of the bridging callus. DASH Scoring was done for all cases at the end of 6 months. 65 % of the patients scored the points in the range of 10-30. 10% of them were in the range of 51-60 and patients with non union were not able to be evaluated.

5. DISCUSSION

Concepts in the management of fracture treatment of humerus is changing to keep pace with the increasing severity and complexities of the fracture. Though conservative treatment is one of the popular treatment for diaphyseal fracture they have their own limitations. The aim of treatment in these fracture is to achive length and alignment by producing a favorable environment for bone and soft tissue healing.

Our study demonstrates that biological fixation with minimal soft tissue intervention at the fracture site is also an viable option in the treatment of diaphyseal fractures of the humerus. 85% of them were in the middle as compared to Strong GT *et al*. [1] where 64.2% had midlle third fractures.

Our series had 80 % union rate but 20 percent have gone in for non union, which is on a higher side when compared to study by Hall and Pankovich,[5] flexible nailing with Ender nails in 89 humeral shaft fractures was studied over a 6-year period. The study's outcome measures included time to union and the frequency of complications. Average time to union was 7.2 weeks, a duration similar to that seen in conservatively treated fractures—the literature suggests a range of 6.2 to 9.4 weeks for those treated nonoperatively [5-8]. Healing rates were high and nonunion was rare in the study population, occurring only once. Other studies have demonstrated different, but favorable, experiences with flexible nailing [5,8]. Chen *et al.*[4] reported the average time to union of acute humeral shaft fractures treated with Ender nails to be 10.5 weeks, higher nonunion rates (6.8%). Despite this, the authors felt their results satisfactory and comparable with other series investigating the surgical fixation of humerus fractures, in which nonunion rates ranged from 4% to 25% [4]. Zatti *et al*. [7] also endorsed their use because no difference was observed in the time to union between fractures treated *via* plate osteosynthesis and those with flexible nailing (11 weeks). Distraction is a well-documented cause of nonunion. Flexible nails that do not adequately fill the canal may lead to hypertrophic nonunion because of excessive motion at the fracture site. Other factors have also been implicated. A study Andrew *et al.* [9] showed higher rates of non union with TENS nailing similar to our results.

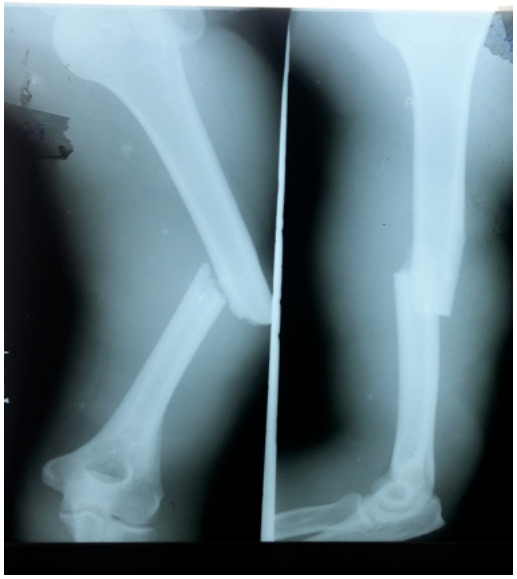

Figure 1: Fracture shaft Humerus.

Figure 2: Immediate post op with TENS.

Figure 3: Union.

Figure 4: Implant Failure.

Figure 5: Non Union with TENS.

The unusual high nonunion rates can be attributed to the factor of relative stability in fixation of the fracture by TENS nail especially in oblique and spiral fractures and poor compliance of the patients in terms of rehabilitation. In the nutshell we had 80 % of the patients who were having excellent to good results but requires study with larger number of subjects.

CONCLUSION

The study showed that TENS nailing in Diaphyseal fracture of humnerus in adults is an viable mode of intervention in a select number of cases but however the stress have to be given on the post operative follow up . The advantage of closed reduction and minimal or least intervention of soft tissues at the fracture site scores over other methods of open reduction and internal fixation. Complications related to shoulder cuff, nerve injuries encountered by other methods can be completely avoided. TENS provides relative stability but maintains the biological environmen at the fracture site which merits over open reduction. Other advantages of TENS nailing is its simple and minimal instrumentation, safe and a minmally invasive procedure. However the word of caution is its viability to use in the oblique and spiral fractures where stability of reduction and compliance of the patient has a bigger role in the postoperative period. The limitaion of the study was the number of patients in the series is less and thus demands more studies with large numbers and also to find a viable minimally invasive operating procedure for short oblique and spiral fractures.

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