

Original Research Article

**PROSPECTIVE STUDY ON FUNCTIONAL AND
RADIOLOGICAL OUTCOME OF MIDSHAFT CLAVICLE
FRACTURE TREATED WITH TENS NAIL**

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Received: 13-12-2023 / Revised: 18-12-2023 / Accepted: 16-01-2024

ABSTRACT

Background

The clavicle is most frequently and easily fractured bone, due to direct blow or fall on the outstretched hand. With changing trends in treatment of midshaft clavicle fractures, plating was one of the standard procedure remains for fixation. Recent attracting alternative new technique of fixation is the titanium elastic nailing system (TENS). Due to lacking of prospective studies, the present study was undertaken to assess effectiveness of minimally invasive method TENS for the treatment of midshaft clavicle fracture.

Methods

The study population include 5 patients exclusively with fracture of midshaft clavicle on plain radiographs from June 2023 to November 2023 at a tertiary care centre. Most of cases were operated within 24-48 hours after trauma. Intra operatively, image intensifier was used for monitoring the manipulations and maneuvering of the nails for closed reductions of the fractures. Patients were followed for 6 months postoperatively and then titanium nails were I removed.

Result

Average age of the study population was 35.8 plus/minus 10 yrs. Most cases were operated within 24-48 hours after trauma. In 3 cases, closed reductions and nailing were done, while in 2 cases, open reductions and nailing were done. Constant score was used to assess the clinical outcome of our patients after union of the fracture. Clinical union was achieved in 3-5 weeks,

while radiographic union was achieved in 6-8 weeks. There was no post-operative infection in this study.

Conclusion

Operative interventions with TENS showed better results in regards to early functional recovery. The specific advantages of TENS over plating are that it is minimally invasive, needs lesser operative time, and early mobilization.

Keywords: Clavicle fracture, Titanium Elastic Nailing (TENS), Closed-reduction, Open reduction.

INTRODUCTION

The clavicle is most frequently and easily fractured bone, due to direct blow or fall on the outstretched hand. Among of all fractures, incidence of clavicle fractures was contributed to 3-5%.¹

Various treatment techniques are available for clavicular fractures.¹⁻⁸ An operative approach in trend. which consists of two main procedures namely open reduction & plating; and by intramedullary nailing through minimal access.^{1,3,5,8} Though plating technique is accepted as a standard technique, it has some disadvantages like large scar, higher non-union rate and difficult application as well as problem with removal. Whereas, intramedullary nailing of clavicular fractures is done by numerous techniques and multiple devices^{2,6,9-11} which have their own advantages and disadvantages.^{1,6,8,10} Nowadays, due to breakage and migration of the plate, rigid fixation is not used.¹⁰⁻¹²

Keeping above facts in mind, the present study was undertaken to assess the effectiveness of minimally invasive method Titanium Elastic Nails (TENS) for the treatment of midshaft clavicle fracture.

MATERIALS AND METHODS

The present study was conducted from June 2023 to November 2023 at a tertiary care centre. The study population included 5 patients exclusively with fracture of midshaft clavicle on plain radiographs. Titanium Elastic Nails used in this study were comparatively cheaper as compared to plates and affordable to poor patients Intra operatively image intensifier was used for monitoring the manipulations and maneuvering of the nails for closed reductions of the fractures.

Inclusion Criteria

Clavicular mid-shaft fractures with displacement of fragments more than 2 cm on plain radiographs, clavicular length shortening more than 2 cm on plain radiographs, communitated fractures, ipsilateral upper extremity injuries / fracture, multiple ipsilateral upper ribs fractures, floating shoulder and fresh closed mid-shaft clavicular fractures.

Exclusion Criteria

Old fractures, open fractures, proximal end and distal end fractures and pediatric age group (< 12 yrs).

Technique

Supine position was given on radiolucent table with small bolster beneath the scapula on operating side with C-arm at head end. Incision was made 2 cm lateral to sternoclavicular joint, and entry was made in the anterior cortex of the bone by a small bone awl. Proper anterior-posterior (AP), caudal & cranial views were taken throughout the procedure¹³. A size 2-3 mm titanium elastic nail is inserted from medial end and passed through the fracture site and advanced until the tip of the nail was engaged in superolateral cortex of lateral end of clavicle.

Overhead activity was restricted for 3 weeks. After 6 weeks when radiological union was seen, strengthening exercises were started. In this study, all the fractures healed in 6 to 8 weeks postoperatively. Patients were followed for 6 months postoperatively and then titanium nails were removed.

Constant shoulder score was used to assess the clinical outcome of our patients.¹⁴ It contains a questionnaire in which pain, activity level, arm positioning, strength of abduction, forward flexion, lateral elevation, external rotation and internal rotation are measured. The results are based on the score. > 30- Poor, 21-30-Fair, H-20-Good, <11-Excellent Statistical Analysis: Descriptive statistics such as mean, SD and percentage was used to present the data. Microsoft excel was used to prepare the tables.

RESULTS

Total 5 cases were included, out of which 3 were male and 2 were female patients. Average age of the study population was 35.8 plus/minus 10 yrs. Most of 5 cases were operated within 24-48 hours after trauma. In 4 cases, closed reductions and nailing were done, while in 1 case, open reductions and nailing were done. Titanium Elastic Nails used in this study were comparatively cheaper as compared to plates and affordable to poor patients.

Fractures with displacement between 2-5cms were operated by closed reduction and nailing, while fractures with displacement more than 5cms were operated by open reduction and nailing to form. Most of cases of extent of displacement of fractures were belongs to 2-5 cms (80%)There was no case of non-union. Two patients had scars at both the entry points and fracture sites. The remaining three patients had about 1 cm scars only at the entry points.

Table 1: Age distribution

Age	Number	Percentage
18-25	1	20
26-35	1	20
36-45	2	40
46-55	1	20

Majority of patients were belongs to the age group 36 -45 (40%), followed by 26-35 (20%) followed (20%) and 46-55 (20%).

Table 2: Sex distribution

Sex	Number	Percentage
Male	3	66.66%
Female	2	33.33%

Male patients (66.7%) were dominant in the study

Table 3: Distribution of side of injury Side of injury

Side of injury	Number	Percentage
Right	3	66.66%
Left	2	33%

Majority of side of injury were found right side (66.7%).

Table 4: Distribution of extent of displacement of fractures

Extent of displacement of fracture (cms)	Number	Percentage
<2cm	0	0
2-5 cm	3	66.66
>5cm	2	33.3

Most of cases of extent of displacement of fractures were belongs to 2-5 cms (66.66%)

DISCUSSION

Clavicular fractures are very frequent and account for approximately 2.6% of all fractures, majority of them (80-85%) occur in the midshafts.^{15,16}

TENS is a very simple and reliable technique infixation of displaced midshaft clavicular fractures. Operative time is 25-30 minutes which is less as compared to plating where 55-60 minutes is needed.

The strength of this study is that with minimal invasive technique, midshaft clavicular fractures are fixed by closed nailing or minimal open reduction at fracture site.

The limitations of this study were the need of image intensifier to confirm the position of nail and a radiolucent table.

This method of management of midshaft clavicular fractures has got many advantages over open reduction and plating like minimally invasive technique, less operative time, decreased postoperative morbidity, faster recovery and cosmetically better scar.

The present study shows that management of midshaft clavicular fractures treated by closed nailing is definitely a novel approach. Titanium nails are cheaper as compared to plates and easily affordable to poor patients. TENS would be choice of treatment modality in midshaft clavicular fractures displaced more than 2 cms and patients requiring early mobilization in form of overhead activity and early return to his normal activities. Overhead activity was started 3 weeks postoperatively. With conservative methods, patients have to wear clavicular braces for minimum of six weeks, delaying rehabilitation programme. Duan and his colleagues concluded that there were no significant differences of outcomes between plating and intramedullary nailing, but plating had a higher complication rate than nailing¹.

In Mulleret al⁶ study, 31 midshaft clavicular fractures treated by intramedullary nailing with titanium elastic nail system(TENS), found that intramedullary fixation of midshaft clavicle fractures with Titanium elastic nails was a safe, minimally invasive with Fexcellent cosmetic and functional results

Zhang B and his colleagues¹⁵ in 2015, showed that intramedullary nailing has more advantages as compared to plating with a reduced surgery time, a shorter incision, rapid union time, better shoulder function recovery at 6 months and fewer complications of symptomatic hardware, refracture after hardware removal and hypertrophic scar.

CONCLUSION

The specific advantages of TENS over plating are that it is minimally invasive, needs lesser operative time, is cosmetically better and early mobilization. However, with the shorter operative times and better cosmetic appearances, titanium elastic nails are the treatment of choice in displaced midshaft clavicle fractures.

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