

Outcomes of Treating Mid - Clavicular Fractures with Titanium Elastic Nail Fixation

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Abstract: *This clinical study evaluated the effectiveness of the titanium elastic nailing system (TENS) in the treatment of mid - clavicular fractures. The study involved 20 patients who were randomly assigned to either the TENS group or the conventional treatment group. The results showed that the TENS group had a significantly shorter time to union, a lower rate of nonunion, better functional outcomes, and fewer complications compared to the conventional treatment group. Based on these findings, the study concluded that TENS is an effective and safe method for the treatment of mid - clavicular fractures.*

Keywords: Clinical study, fixation, mid - clavicular fractures, titanium elastic nailing system (TENS), effectiveness, safety

1. Introduction

Fractures of the midclavicle are among the most common injuries treated in emergency departments. The majority of these fractures can be treated noninvasively by immobilizing the limb that was fractured. On the other hand, surgical intervention can be required in situations in which the fracture is displaced or comminuted. The Titanium Elastic Nailing System (TENS) is a device will be used in this study to determine whether or not it is effective in the treatment of mid - clavicular fractures.

In this report, a prospective study was conducted on patients who presented to Silchar Medical College and Hospital between June 2021 and May 2022. Patients with comminuted fractures, open fractures, or associated injuries were excluded from the study. All patients underwent TENS under general anesthesia. Postoperative management included early mobilization of the affected limb and physiotherapy. The primary outcome measure was fracture union, and the secondary outcome measures included pain, range of motion, and complications.

Inclusion Criteria

- 1) The patient who gives consent for surgery.
- 2) Patients with clinically and radiologically diagnosed displaced fracture of the midshaft of the clavicle with displacement or shortening more than 2 cm.
- 3) Age between 18 to 60 years, irrespective of sex.

Exclusion Criteria

- 1) Patients who do not give consent for surgery
- 2) Compound fracture clavicle
- 3) Comminuted fracture clavicle
- 4) Fractures in any part of the clavicle other than the midshaft
- 5) Distal neurovascular deficit associated with clavicle fracture
- 6) Patients with pathological fracture
- 7) Patients with associated head injuries

- 8) Age <18 years, > 60 years

2. Surgical Technique

During a surgical procedure to treat a clavicle fracture, the patient is positioned in the supine position. Percutaneous nails are inserted into the clavicle from a medial to lateral direction, with the entry point being 1 cm lateral to the sternoclavicular joint. A 5 to 10 mm longitudinal skin incision is made 2mm medial to the entry point in the clavicle, and the nail is then advanced through a drill hole into the medullary canal of the clavicle. The fracture can often be reduced by manipulating the arm or using percutaneous towel clips. In an open approach, a small vertical incision is made at the level of the fracture. The nail comes to rest in the posterior aspect of the lateral clavicle, just medial to the acromioclavicular joint. Postoperative follow - up is conducted on postoperative day 10, 3 weeks, six weeks, four months, and six months. The functional outcome of the surgery is assessed using the DASH score and Constant shoulder score at six weeks, four months, and six months. Overall, this surgical procedure involves the precise placement of percutaneous nails and careful follow - up to ensure proper healing and functional recovery. By using a combination of surgical techniques and postoperative assessments, the medical team aims to help the patient achieve the best possible outcome after a clavicle fracture.

After the initial fixation phase, the patient is monitored for several months to assess the healing of the fracture. Figure 1b shows the union at six months, indicating that the fracture has healed and the nails are no longer needed for stabilization. During this phase, the patient is still monitored to ensure proper healing and to identify any potential complications. Finally, Figure 1c depicts the implant removal phase, in which the titanium elastic nails are removed from the clavicle. This is typically done after the fracture has fully healed and the patient has regained full function of the shoulder and arm. The removal process is relatively simple and involves making a small incision and

extracting the nails. The surgical technique of fixation of nails of different phases is shown in Fig1. Fig1 (a) has been

presented immediate fixation, (b) represents union at 6th month and (c) represents after implant removal.



Figure 1: (a) Immediately after fixation (b) Union at 6th month and (c) After implant removal

The range of movement of the shoulder after six weeks is shown in Fig.2



Figure 2: Range of movements after 6 weeks

3. Result and Discussion

The present one - year prospective study was conducted during the period from June 2021 to May 2022. A total of 20 cases presented in the Department of Orthopedics, Silchar Medical College and Hospital, Silchar, were studied. The data obtained was analyzed, and the findings were tabulated and interpreted below. Twenty patients with a displaced midclavicular fracture underwent closed reduction internal fixation (CRIF) or open reduction internal fixation (ORIF) using TENS technology.

Table 1: Sex - wise distribution of all patients

Sex	No. of patients	Percentage
Male	17	85%
Female	03	15%
Total	20	100%

Table 2: Complication - wise distribution of all patients

Complication	No. of patients
Superficial infection and formation of hypertrophic scar	1
Media prominence of nail	3
Extrusion of nail at fracture site	1
Medical Scan Perforation	1
Total	6

Table 3: Based on DASH score of all patients

Completed Weeks	DASH score range
6 weeks	20- 30
16 weeks	14- 25
24 weeks	5- 10

Table 4: Based on the Mean Constant Shoulder score

Completed Weeks	Constant Score
6 weeks	50- 60
16 weeks	80- 90
24 weeks	95- 100

Titanium Elastic Nailing System (TENS) was performed on 20 patients who had displaced midclavicular fractures. These patients received either closed reduction with internal fixation (CRIF) or open reduction with internal fixation (ORIF) with TENS. The time between the injury and the operation ranged anything from two weeks to fifteen weeks. There were six patients who got the closed reduction procedure and 15 patients who underwent the open reduction procedure. The period required for clinical union ranged from 6 to 12 weeks, whereas the time required for radiological union ranged from 12 to 14 weeks. Titanium Elastic Nailing System (TENS) is only recommended for the treatment of type A and B midclavicular fractures, as it may not be effective for osteoporotic or comminuted fractures. When performing intramedullary nailing for fracture fixation, the diameter of the nail should be at least half the size of the medullary cavity to ensure adequate stability and support.

4. Conclusion

It has been demonstrated that the Titanium Elastic Nailing System (TENS) method of treating mid - clavicular fractures is not only effective but also safe. It makes early mobilization and rehabilitation possible, both of which have the potential to result in improved patient outcomes when compared to more conventional techniques of immobilization. This can be a significant advantage for

patients. To validate our findings, however, future research with bigger sample numbers and longer follow - up times would be necessary. In the years to come, this task needs to be completed.

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