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A Case Series on Tens Nailing in Fracture Clavicle

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Abstract

Introduction: One of the most frequently fractured bones, the clavicle accounts for 2.6–4% of all fractures. 73% of these are displaced midshaft clavicular fractures, and 69 to 82% of these occur in the middle portion of the clavicle. For displaced clavicle fractures, including one with NV compromise and skin tenting, surgery has been recommended. Peroni published the first description of intramedullary treatment for clavicular fractures in 1950. The adoption of a TENS nail has benefits such as less soft tissue damage, a shorter surgical procedure, better cosmetic outcomes, load sharing fixation with relative stability, and abundant callus production.

Material and Methods: A prospective study of 20 patients who had TENS nailing treatment after presenting to our institute between January 2022 and June 2023 with displaced midshaft clavicle fractures was conducted. Constant Murley and DASH scores were completed for each patient at 6 and 12 weeks.

Results: All the patients achieved clinical and radiological union at a mean of 7.6 ± 2.89 weeks and 18.8 ± 5.87 weeks respectively.85% of the patient had excellent Constant Murley score on follow up. Based on the assessment parameters (Disability of Arm Shoulder and Hand) Score, the mean DASH score was 24.90 ± 3.21and16.45 ± 3.33at the end of 6 and 12 weeks respectively.

Conclusion: Midshaft clavicle fractures can be safely fixed intramedullarily utilising TENS, and in our experience, this procedure yields both good functional and aesthetic benefits.

Keywords: Clavicle, Intramedullary, Tens, Fracture

Introduction

One of the most frequently fractured bones, the clavicle accounts for 2.6–4% , of all fractures. 73% of these are displaced midshaft clavicular fractures, and 69 to 82% of these occur in the middle portion of the clavicle , . The most frequent cause of damage is a direct strike or a fall. The clavicle transmits stresses from the upper limb to the trunk and serves as a connector between the axial and appendicular skeletons. Therefore, there is a risk of symptomatic malunion, non-union, poor functional result, and cosmetic deformity with displaced or comminuted fractures. Clavicle fractures were formerly treated conservatively , but with to modern developments, better implant options, and subpar cosmetic and functional outcomes, these fractures are now surgically repaired. Numerous investigations have shown that the position of the glenoid fossa is changed by the midshaft clavicle fracture's malunion and clavicle shortening . This causes unsatisfactory outcomes and function loss by altering glenohumeral mobility and scapular rotation. Open reduction and plate fixation, intramedullary pinning with K-wire, rush nails, Knowel's pin,

Steinman pin, Haige pin, TEN, and external fixation have all been used to surgically treat clavicle fractures in the past, . According to studies, plate fixation, as opposed to nails, offers more rigid stabilisation and a stronger build, aiding early rehabilitation .

Peroni, et al. Published the first description of intramedullary fixing of clavicle fractures in the early 1950s, however titanium nails were not widely used until much later. The initial description and studies on TEN fixation of midshaft clavicle fractures were written by Jubel et al. in 2003. The novel surgical dimension was also pioneered by Rehm et al. (2003) and Mueller et al. (2008) .

A smaller skin incision and less soft tissue dissection are needed for intramedullary fixation, which leads to a more cosmetically acceptable scar and higher patient satisfaction. When compared to plate fixation, there is also less hardware prominence and a decreased rate of re-fracture. a load-sharing fixation with reasonable stability that promotes extensive callus growth.

Material and Methods

A prospective study of 25 patients who had TENS nailing treatment after presenting to our institute between January 2021 and June 2022 with displaced midshaft clavicle fractures was conducted.

At 2, 6, 12 weeks, and 6 months following surgery, or until the fracture had healed clinically and radiologically, all patients underwent postoperative reviews in the OPD. Constant Murley and DASH scores were completed for each patient at 6 and 12 weeks.

Inclusion criteria:

- Fracture of the mid shaft clavicle.
- 100% fracture displacement
- Minimum of 15 mm shortening
- Skin tenting/tethering/threatened skin breakdown
- Neurovascular compromise attributed to the fracture

Exclusion criteria:

- Fracture comminution or displaced butterfly fragment at the fracture site and Compound injuries.

Surgical Steps:

- After that, patients were put supine on a radiolucent operating table with a folded surgical drape inserted in the space between their scapulae.
- Over the medial end of the fractured clavicle, a 2 cm incision was created. Then, using an awl, the entrance point for the nail was created 1.5 cm from the sternoclavicular joint.
- The use of reduction clamps or towel clips allowed for the percutaneous reduction of fractured segments.
- Based on the diaphyseal diameter, a titanium elastic nail was chosen and installed on a Jacob's chuck.
- Under the supervision of an image intensifier, the fracture ends were aligned under direct vision before the titanium elastic nail was manually placed from medial to lateral across the fracture site.
- To minimise irritation of the soft tissues while still maintaining enough length for future extraction, the medial end of the nail was clipped close to the cortex. Following surgery, patients were placed in slings and told to refrain from heavy lifting and overhead flexion for the first six weeks. At two, six, and twelve weeks following surgery, patients went to their regular follow-up appointments. The surgeon evaluated the incision every week until the sutures were removed.
- By six weeks, the operated shoulder had reached its full range of motion.
- The patients' results were evaluated in terms of union, VAS for pain, cosmesis, and complications (infection, implant failure, non-union). The patients were followed up at 2 weeks, 6 weeks, and 12 weeks. DASH (Disability of Arm, Shoulder and Hand) and Constant Murley scores were used to evaluate shoulder function.

Results

The mean duration of operation was 30.21 ± 4.90 (range 20-40 min). The mean length of surgical scar was 1.8 cm.

Titanium Elastic nail of diameter	No. of Patients
2 mm	19
2.5 mm	6

Titanium Elastic nail of diameter of 2 mm was used in 19 (76%) patients and 2.5 mm diameter was used in 6 (24%) patients.

The mean duration of hospital stay was 2.17 ± 0.45 (range 1-4 days). Clinical union was seen at 7.6 ± 2.89 weeks (range 6-12 weeks) in all cases and the mean time for radiological union 18.8 ± 5.87 weeks (range 12-24 weeks).

Complications	Number of patients
Intra-operative	0
Post-operative	0
Late	3(medial prominence of the nail)

There was no intra-operative or immediate postoperative complication. Late complications encountered were medial prominence of the nail (3 patients).

Disability of Arm Shoulder and Hand (DASH)	Score
6 weeks	24.90 ± 3.21
12 weeks	16.45 ± 3.33

Based on the assessment parameters (Disability of Arm Shoulder and Hand) Score, the mean DASH score was 24.90 ± 3.21 (range 20-30), 16.45 ± 3.33 (range 14-25) at the end of 6 weeks and 12 weeks respectively.

Discussion

Displaced midclavicular fractures are no longer treated conservatively in the field of orthopaedics today.The gold standard for treating clavicle fractures has traditionally been plate fixation, although intramedullary nailing is always preferable to plating because it exposes less soft tissue, causes less blood loss, and causes less periosteal stripping without disturbing the fracture hematoma . Furthermore, since the nail may be removed as an OPD treatment, no additional surgery is necessary. By virtue of its inherent chemical characteristics, TEN offers all these advantages over plating along with extra benefits. Additionally, TEN has good handling properties since its elasticity modulus is closer to bone, allowing it to function using the three-point intramedullary fixing method.

Additionally, the nail may easily glide through the medullary cavity and across the fracture site because to the gliding motion of the bent flat tip.The construct's flexibility creates the optimal environment for micro motion and abundant callus production, which makes the healing process more biological.

Conclusion

According to the study, fixing displaced midclavicular fractures with the Titanium Elastic Nailing System (TENS) is a technically challenging, simple to perform surgery that results in 100% fracture union, early pain reduction, and early functional recovery. With patient satisfaction, cosmetic issues resulting from post-operative scar formation are kept to a minimum. Additionally, the rare post-operative problems are manageable.

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