

Tens Nailing in Fracture Clavicle – A Case Series

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Abstract

Introduction: Clavicle is one of the most commonly fractured bones accounting for 2.6 – 4% of all the fractures. 69 – 82% of these occur in middle third of clavicle, 73% of which are displaced midshaft clavicular fractures. Surgery has been indicated for displaced fractures of clavicle, one with NV compromise and skin tenting. Intramedullary fixation for clavicular fractures was first described by Peroni in 1950. The use of a TENS nail carries advantages of less soft tissue compromise, less operative time, better cosmetic results, load sharing fixation with relative stability that encourages copious callus formation.

Material and Method: A prospective review of 20 patients who presented to our institute between January 2021 and June 2022 with displaced midshaft clavicle fractures and treated with TENS nailing was carried out. All the patients had Constant Murley score and DASH score, which were done at 6 and 12 weeks.

Results: All the patients achieved clinical and radiological union at a mean of 19.6 ± 6.67 . 80% 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 25.03 ± 3.36 (range 20-30), 18.56 ± 3.46 (range 14-25) at the end of 6 weeks and 12 weeks respectively.

Conclusion: The intramedullary fixation using TENS of midshaft clavicle fractures is a safe minimally invasive technique in indicated cases and in our hands, it provides good functional outcome and cosmetic results.

Keywords: Tens, Clavicle, Fracture, Intramedullary

Introduction

Clavicle is one of the most commonly fractured bones accounting for 2.6 – 4% of all the fractures. 69 – 82% of these occur in middle third of clavicle, 73 % of which are displaced midshaft clavicular fractures. A direct blow or fall is the most common mechanism of injury. Clavicle acts as a connecting link between the axial and the appendicular skeleton, while also transmitting forces from upper limb to the trunk. Thus, displaced or comminuted fractures carry a risk of symptomatic malunion, nonunion and poor functional outcome with cosmetic deformity. Clavicle fractures were treated with a conservative approach in the earlier days but due to recent advances, better implant choices and poor cosmetic as well as functional results these fractures are treated surgically. Various studies have demonstrated that malunion of a midshaft clavicle fracture with shortening of the clavicle alters the position of the glenoid fossa. This alters glenohumeral mobility and scapular rotation, leading to unsatisfactory results and loss of function. Till date, clavicle fractures have been surgically treated by open reduction and plate fixation, intramedullary pinning with K-wire, rush nails, knowel's pin, Steinman pin, Haige pin, TEN and external fixation. Studies suggest that plate fixation provides more rigid stabilization and stronger construct, facilitating early rehabilitation, as compared to nails.

Intramedullary fixation of clavicle fractures was first described by

Peroni, et al. in early 50^s but the use of Titanium nail as intramedullary device came late. Jubel et al. in 2003 first described and published several papers on fixation of midshaft clavicle fractures with TEN. Rehm et al. and Mueller et al. also pioneered towards this new surgical dimension.

Why nail clavicle

Intramedullary fixation requires a smaller skin incision and minimal soft tissue dissection which results in a cosmetically acceptable scar and greater patient satisfaction. There is also less hardware prominence and a lower re-fracture rate when compared with plate fixation. Load sharing fixation with relative stability that encourages copious callus formation.

Material and Methods

A prospective review of 20 patients who presented to our institute between January 2021 and June 2022 with displaced midshaft clavicle fractures and treated with TENS nailing was carried out.

All the patients were reviewed postoperatively in the OPD at 2, 6, 12 weeks and 6 months or until the fracture had healed clinically and radiologically. All the patients had Constant Murley score and DASH score, which were done at 6 and 12 weeks.

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Figure 1: ?

OUTCOME	n = 20	%
EXCELLENT	16	80
GOOD	4	20
FAIR	0	0
POOR	0	0
TOTAL	20	100

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

Patients were then positioned supine on a radiolucent operating table with a folded operative drape placed between both scapula.

A 2 cm incision was made over the medial end of the fractured clavicle.

The entry point for the nail was then made 1.5 cm from the sternoclavicular joint using an awl.

Fractured segments were reduced percutaneously with the help of



Figure 1: ROM At 2 Months

reduction clamps/ towel clips.

A titanium elastic nail, selected based on the diaphyseal diameter, was mounted on a Jacob's chuck.

The fracture ends were aligned under direct vision and the titanium elastic nail inserted by hand in an unreamed fashion from medial to lateral across the fracture site under image intensifier guidance.

The medial end of the nail was cut close to the cortex to minimize soft tissue irritation yet leaving sufficient length for extraction later.

Post-operatively, patients were immobilized in a sling and instructed to avoid overhead abduction and heavy lifting for the first six weeks.

Patients then attended scheduled follow-up visits at two, six and 12 weeks post-operatively. The wound was assessed by the surgeon weekly till suture removal.

Full ROM of the operated shoulder was started by 6 weeks.

The patients were followed up at 2 weeks, 6 weeks, 12 weeks and the outcomes were assessed in terms of union, Visual analog scale for pain, cosmesis, complications (infection, implant failure, nonunion).

Shoulder function was assessed using DASH (Disability of Arm, Shoulder and Hand) score and Constant Murley score.

Observations and Results

The mean duration of operation was 29.76 ± 5.70 (range 20-40 min).

The mean length of surgical scar was 1.5 cm.

In 16 (80%) patients Titanium Elastic nail of diameter of 2 mm was used and in 4 (20%) patients nail with 2.5 mm diameter was used.

The mean duration of hospital stay was 1.76 ± 0.53 (range 1-3 days).

Clinical union was seen at 7.3 ± 3.06 weeks (range 6-12 weeks) in all cases and the mean time for radiological union 19.6 ± 6.67 weeks (range 12-24 weeks).

There was no intra-operative or immediate postoperative



Figure 1: Pre operative X ray

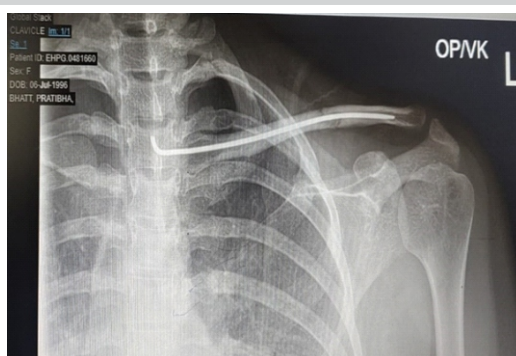


Figure 1: Post operative X ray

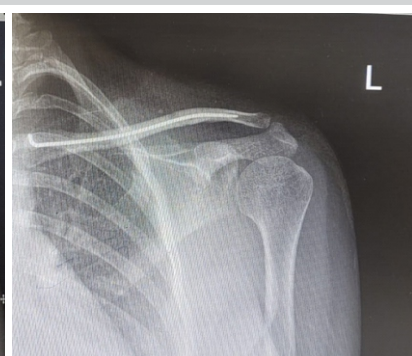


Figure 1: 2 months Post op

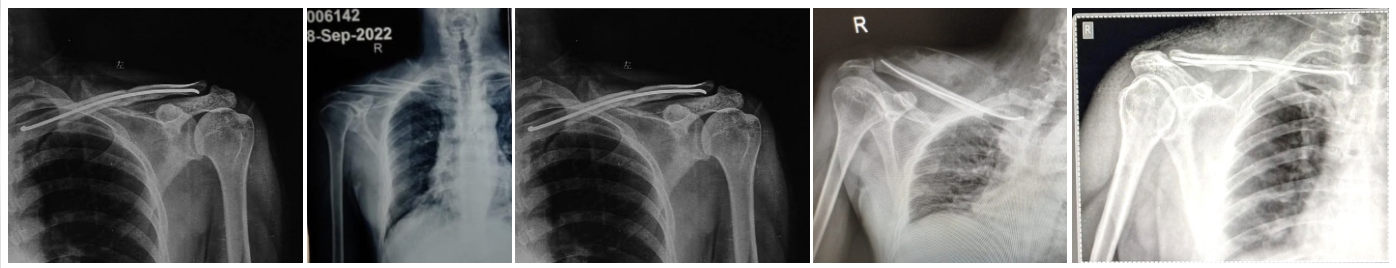


Figure 2: The post operative X-ray after 4 weeks of one of our patient 46 year Male with mid shaft fracture of clavicle

complication. Late complications encountered were medial prominence of the nail (2 patients).

Based on the assessment parameters (Disability of Arm Shoulder and Hand) Score, the mean DASH score was 25.03 ± 3.36 (range 20-30), 18.56 ± 3.46 (range 14-25) at the end of 6 weeks and 12 weeks respectively.

Discussion

In the today's arena of Orthopaedics, displaced midclavicular fractures are no longer treated conservatively.

Plate fixation has been considered as gold standard for clavicle fractures but intramedullary nailing is always superior to plating in terms of minimal soft tissue exposure, minimal blood loss, minimal periosteal stripping without disturbance the fracture hematoma.

Moreover, removal of the nail can be done as an OPD procedure and so no second surgery is required.

TEN provides all these advantages over plating with additional advantages by virtue of its intrinsic chemical properties. Also, the suitable handling characteristics of TEN because of its modulus of

elasticity being nearer to bone help it to work on the basis of 3 point intramedullary fixation principle.

Moreover, the gliding mechanism of the bent flat tip of the nail provides easy passage of the nail through the medullary cavity and across the fracture site.

Elasticity of the construct allows ideal circumstances for micro motion and copious callus formation thereby making the healing process more biological.

Conclusion

The study shows that fixation of displaced midclavicular fractures with Titanium Elastic Nailing System (TENS) is a technically demanding, minimally invasive and easy to do procedure which gives early pain relief, early functional recovery and 100% rate of fracture union.

Cosmetic problems due to post-operative scar formation in minimum with patient's satisfaction. Moreover, the post-operative complications are few and can be treated easily.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

Conflict of Interest: None, **Source of Support:** None

References

- Postacchini F, Gumina S, De Santis P, Albo F. Epidemiology of clavicle fractures. *J Shoulder Elbow Surg.* 2002; 11(5):452–6. PMID: 12378163
- Nordqvist A, Petersson C. The incidence of fractures of the clavicle. *Clin Orthop Relat Res.* 1994; (300):127–32. PMID: 8131324
- Nonoperative treatment compared with plate fixation of displaced midshaft clavicular fractures. A multicenter, randomized clinical trial. *J Bone Joint Surg Am.* 2007; 89(1):1–10. doi: 10.2106/jbjs.f.00020 PMID: 17200303
- Houwert RM, Wijdicks FJ, Steins Bisschop C, Verleisdonk EJ, Kruijt M. Plate fixation versus intramedullary fixation for displaced midshaft clavicle fractures: a systematic review. *Int Orthop.* 2012; 36(3):579–85. doi: 10.1007/s00264-011-1422-4 PMID: 22146919
- Assobhi JE. Reconstruction plate versus minimal invasive retrograde titanium elastic nail fixation for displaced midclavicular fractures. *J Orthop Traumatol.* 2011; 12(4):185–92. doi: 10.1007/s10195-011-0158-7 PMID: 21948051
- Zlowodzki M, Zelle BA, Cole PA, Jeray K, McKee MD. Treatment of acute midshaft clavicle fractures: systematic review of 2144 fractures: on behalf of the Evidence-Based Orthopaedic Trauma Working Group. *J Orthop Trauma.* 2005; 19(7):504–
- PMID: 16056089 7. Kontautas E, Pijadin A, Vilkauskas A, Domeika A. Biomechanical aspects of locking reconstruction plate positioning in osteosynthesis of transverse clavicle fracture. *Medicina (Kaunas).* 2012; 48(2):80–3. PMID: 22491383.
- Zlowodzki M, Zelle BA, Cole PA, Jeray K, McKee MD, Evidence-Based Orthopaedic Trauma Working G. Treatment of acute midshaft clavicle fractures: systematic review of 2144 fractures: on behalf of the EvidenceBased Orthopaedic Trauma Working Group. *J Orthop Trauma.* 2005; 19(7):504–507.
- Grassi FA, Tajana MS, D'Angelo F. Management of midclavicular fractures: comparison between nonoperative treatment and open intramedullary fixation in 80 patients. *J Trauma.* 2001; 50(6):1096–100.
- Leppilahti J, Jalovaara P. Migration of Kirschner wires following fixation of the clavicle—a report of 2 cases. *Acta Orthop Scand.* 1999; 70(5):517–519.
- Lyons FA, Rockwood CA, Jr. Migration of pins used in operations on the shoulder. *J Bone Joint Surg Am.* 1990; 72(8):1262–1267.
- Naidoo P. Migration of a Kirschner Wire from the clavicle into the abdominal aorta. *Arch Emerg Med.* 1991; 8(4):292–295.

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