



International Journal of Orthopaedics Sciences

ISSN: 2395-1958
IJOS 2016; 2(4): 210-213
© 2016 IJOS
www.orthopaper.com
Received: 03-08-2016
Accepted: 04-09-2016

Pranav Vitthal Masatwar
3rd Year PG resident,
Department of Orthopaedics,
RIMS, Imphal, Manipur, India

Chishti SN
Professor,
Department of Orthopaedics,
RIMS, Imphal, Manipur, India

Singh SN
Professor and Head,
Department of Orthopaedics,
RIMS, Imphal, Manipur, India

Maske RG
3rd year PG Resident,
Department of Orthopaedics,
RIMS, Imphal, Manipur, India

Soring D
Dilip Soring, 2nd Year PG
Resident, Department of
Orthopaedics, RIMS, Imphal,
Manipur, India

Parija D
Debasish Parija, 1st year PG
Resident, Department of
Orthopaedics, RIMS, Imphal,
Manipur, India

Correspondence
Masatwar Vitthal Masatwar
3rd Year PG resident,
Department of Orthopaedics,
RIMS, Imphal, Manipur, India

A prospective study of operative management of simple midshaft clavicular fracture with titanium elastic nail (TEN)

Pranav Vitthal Masatwar, Chishti SN, Singh SN, Maske RG, Soring D and Parija D

DOI: <http://dx.doi.org/10.22271/ortho.2016.v2.i4d.33>

Abstract

Introduction: Clavicular injury is common in active and younger age group with male preponderance. With changing trends in treatment of displaced midshaft clavicle fractures (DMCF), plating remains the standard procedure for fixation. An attracting alternative method of fixation is the titanium elastic nailing (TEN). Purpose of this study was to analyze the outcome of surgically treated displaced midshaft clavicular fracture using Intra-medullary fixation by titanium elastic nail.

Materials and method: 26 unilateral displaced midshaft clavicular fracture satisfying inclusion and exclusion criteria were operated between June 2014 to August 2016. Patients were followed up at every 4 weeks and assessed clinically and radiologically.

Result: average time of union was 10.1 weeks. Average Constant-Murley score at end of 3 months was 91.3. No case of non-union was found in our study. Most common complication was symptomatic medial nail prominence. The final outcome was excellent in 21 (80.8%) cases, good in 5 (19.2%) cases.

Conclusion: We recommend titanium elastic nail (TEN) for fixation of simple displaced midshaft clavicular fracture as it is a safe, minimally invasive surgical technique with a lower complication rate, faster return to daily activities, excellent cosmetic and functional results.

Keywords: Midshaft clavicle fracture, TENS

1. Introduction

The clavicle is the most commonly fractured bone, accounting for up to 12% of all adult fractures [1]. The incidence of nonunion of midclavicular fractures is usually quoted as being from 0.1 to 0.8%, and the mainstay of treatment has long been nonoperative. More recent data, based on detailed classification of fractures, suggest that the incidence of nonunion in displaced comminuted midshaft clavicular fractures in adults is between 10 and 15% [2].

Functional outcome of midshaft clavicle fractures is not only related to its union, but also to its length. Clavicle acts as a "strut", that keeps the upper limb away from the torso for efficient shoulder and upper limb function, 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. The recent trend is shifting towards internal fixation of these displaced midshaft clavicle fractures (DMCF).

Two operative techniques are commonly used for internal fixation of DMCF: Plate fixation and intramedullary nailing with a titanium elastic nail (TEN). Functional results after both the techniques proved to be superior compared with conservative treatment of DMCF in some recently reported prospective randomized studies [3]. The aim of our study was to study surgical management of fresh midshaft clavicle fracture with elastic intramedullary nail and to evaluate cosmetic, functional and anatomical outcome based on clinical and radiological follow up.

2. Materials and Methods

The study was done in the Department of Orthopaedics, Regional Institute of Medical

Sciences, Imphal, during the period from June 2014 to August 2016. The approval of the RIMS Institutional ethics committee (Research Ethics Board) was taken. Inclusion criteria were 1) Age >18years 2) Closed fractures 3) Robinson Classification 2B1 and 2B2 (displaced fractures) 4) No medical contradictions to general anaesthesia. Exclusion criteria were 1) Age < 18 years 2) Open fractures 3) Fracture in proximal or distal third of clavicle 4) Pathological fractures 5) Undisplaced fractures 6) Associated head injury 7) Associated with neurovascular injury 8) Established non-union from previous fracture 9) Associated acromioclavicular joint dislocation. A total of 26 patients met the criteria for inclusion. All of them were included in the study. No patients were lost to follow-up. Operative procedure: After administration of anaesthesia, the patient was placed in beach chair position with injured extremity prepared and draped from the midline to the upper arm. Care was taken to make sure that the sternoclavicular joint was accessible for the entry point. Preoperatively, the shoulder region was screened using image intensifier to

confirm this access. A vertical skin incision was made just lateral to the sternoclavicular joint. The subcutaneous fat was incised along with platysma. The pectoral fascia was divided in line with the skin incision followed by careful elevation of the underlying musculature from the clavicle. The entry point was then made using the awl and appropriate sized titanium ESIN was inserted (The size of the nail was measured using this formula = $0.4 \times$ canal diameter in mm). Attempt was made to close reduce the fracture. If the fracture could not be reduced by closed means, then a separate vertical incision was used at the fracture site to aid fracture reduction. Vertical incision was used as it is parallel to Langer's lines and minimized the risk of damage to supraclavicular nerves to avoid dysesthesia of skin and scar neuromas. At that time, the nail was used to create a path in the lateral end of the clavicle for subsequent easy access. The nail was then passed from the medial side and across the reduced fracture into the lateral end of clavicle. Wound was closed in layers and skin closure was done. Sterile dressing was done^[4].

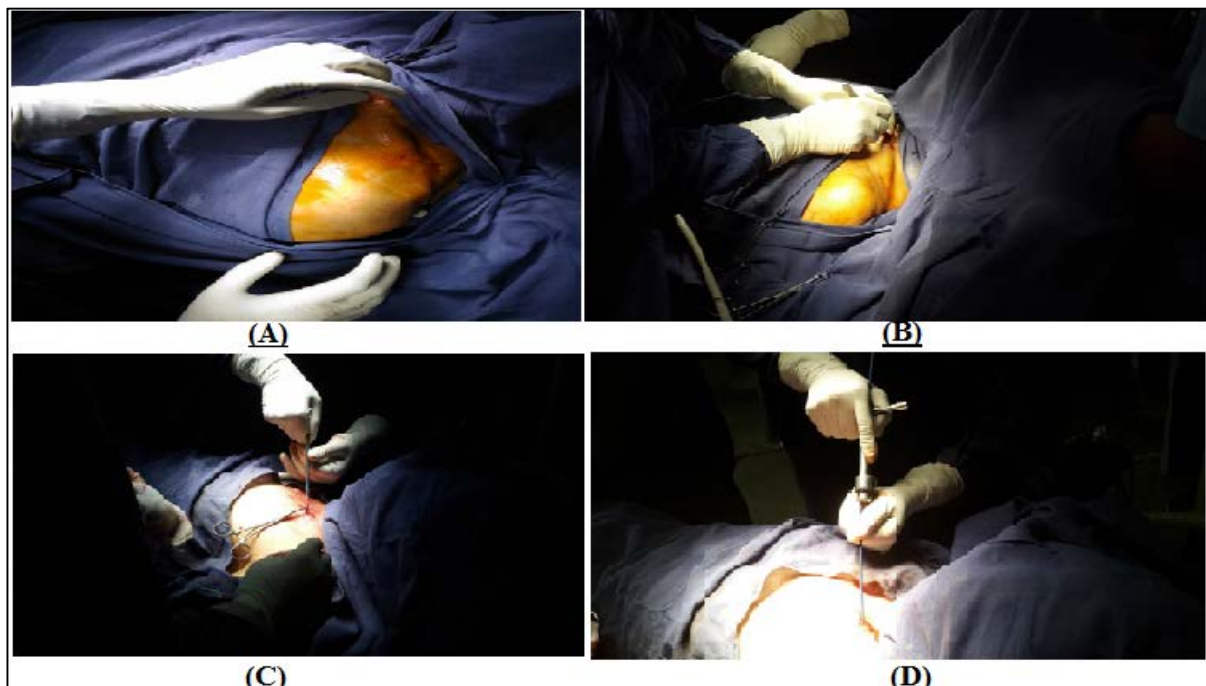


Fig 1: Showing operative procedure(A) painting and draping (B) incision (C) making hole in cortex with awl (D) inserting nail with help of T handle.

Postoperatively the operated limb was immobilized in an arm pouch. IV antibiotics were continued for 48 hrs and switched over to oral antibiotics on the 3rd day and continued till the 5th day. Wound was inspected on 3rd postoperative day and Sutures were removed on 10th postoperative day. Patient were discharged on 5th postoperative day but some patients were discharged later due to associated injuries and co morbidity. Rehabilitation was started at end of 2 weeks. Gentle pendulum exercises to the shoulder in the arm pouch were allowed but abduction was limited to 80 degrees. At 6-8 weeks active range of motion in all planes were allowed. Regular follow up for every 4 week was done. At each follow up patients were assessed clinically, radiologically and the complications were noted. Local examinations of the affected clavicle for tenderness, instability, deformity and shoulder movements were assessed. Functional assessment was done by Constant-Murley score

3. Result

In present study maximum (53.8%) patients were between 18-

30 years with average age being 32.8 years. 73.1% of patients in our study were males. Right shoulder was involved in 76.9% patients. Most common mode of injury was RTA (69.2%) followed by direct fall on shoulder(23.1%). Transverse fracture accounted for 69.2% of cases. All patients were operated as soon as patient was fit for surgery and mean time interval between trauma and surgery was 9.8 days. The average duration of surgery was 40.9 min. 69.2% of cases had blood loss less than 50ml and average blood loss during surgery was 38.1ml. Average duration of stay in hospital was 9.9 days. Out of 26 cases 10 required open reduction.

In present study 50% of patient had union in 9-10 weeks with average time of union 10.1 weeks. Average Constant-Murley score at end of 3 months was 91.3, at end of 6 months was 96.4 at end of 12 months was 98.7 and at 18 months was 99.5. There was no significant change in score after 12 months. No patient had major complication and 16 patients had minor complication. Symptomatic medial nail prominence was the most common complication seen in 53.8% cases. The final outcome was excellent in 21 (80.8%) cases, good in 5 (19.2%)

cases.

Table 1: showing outcome of patient based on Constant-Murley score

Outcome	Numberofpatients(n=26)	%
Excellent(90-100)	21	80.8
Good(80-90)	5	19.2
Fair(60-80)	0	0
Poor(<60)	0	0
Total	26	100

Table 2: showing complication encountered in our study.

Complication	Number of patients
MAJOR	
1. Nonunion	0
2. Nail perforation	0
3. Nail breakage	0
4. Infection	0
Minor	
1. Medial nail prominence	14
2. Delayed union	2
3. Ugly scar	0
4. Hypertrophic scar	0

4. Discussion

The best treatment strategy for displaced midshaft clavicle fractures remains a topic of debate. Conservative management of these fractures results in an approximately 5% nonunion rate. While non-operative management remains the mainstay of treatment for most midshaft clavicle fractures, the indications for surgery may be expanding. Recent studies have showed a poorer outcome in cases of displaced midshaft clavicle fractures that were treated non-operatively in comparison to surgically treated patients. Plating remains the standard procedure for fixation. An attracting alternative method of fixation is the titanium elastic nailing (TEN) [3]. TEN is more suitable for the treatment of simple displaced midshaft clavicle fractures because it showed similar stress distributions to those observed in the intact clavicle.

Additionally, TEN fixation has the advantages of being less invasive and providing higher patient satisfaction and a more cosmetically satisfactory appearance compared with plate fixation.

Main objective of present study was to evaluate cosmetic, functional and anatomical outcome of patients following surgical management of fresh midshaft clavicle fracture with elastic intramedullary nail based on clinical and radiological follow up.

In our study mean age was 32.8 years while Yung-feng C *et al* [5]. did a study including 41 patients and mean age was 38.3 years and Kadakia AP *et al* [6] studied 38 cases and mean age was 27.6 years. In the present study RTA was the most common mode of injury accounting for 18(69.2%) cases, fall on shoulder accounted for 6(23.1%) cases and fall on outstretched handaccounted for 2 (7.7%) of the cases. In study by Yung-feng C *et al* [5] 24(58.5%) cases were due to RTA, 11(26.8%) due to fall on out stretched hand, 5(12.2%) due to fall on shoulder and 1(2.5%) due to fall from height. Mean blood loss during surgery was 38.1 ml. In study done by Saha P *et al* [7]. Average blood loss was 40.2 ml. Mean time to union was 10.1 weeks. In a study by Shishir SM *et al* [8]. Mean time of union was 10.4 weeks and in study by Kadakia AP *et al* [6]. It was 11.3 weeks. Mean Constant-Murley score at end of 3 months was 91.3, at end of 6 months was 96.4 at end of 12 months was 98.7 and at 18 months was 99.5. There was no significant change in score after 12 months. In study done by Shishir SM *et al* [8]. Mean score was 99.58 and in study by Patil AA *et al* [9]. It was 98. In the present study, the final outcome was excellent in 21 (80.8%) cases good in 5(19.2%) cases. While in study by Subramanian SS *et al* [10] 91% had excellent result and 18% had good result. In study by Balaram R *et al* [11]. 35.7% had excellent, 57.1% had good and 7.2% had fair result.

TEN is more suitable for the treatment of simple displaced midshaft clavicle fractures because it has advantages like less soft tissue injury, shorter operating time and hospital stay, less blood loss, more cosmetic satisfaction and minor surgery needed to remove the implant.



Preoperative X-ray



Postoperative X-ray



X-ray showing full union at 12 weeks



Fig 2: Pictures showing full range of motion after complete union.



Fig 3: Symptomatic medial nail prominence (most common complication encountered in our study)

5. Conclusion

We recommend titanium elastic nail (TEN) for fixation of simple displaced midshaft clavicular fracture as it is a safe, minimally invasive surgical technique with a lower complication rate, faster return to daily activities, excellent cosmetic and functional results.

6. References

1. Shanmuganathan, Rakashekar, Kanna MR, Dheendayalan J. Clavicular fractures. In: Sivanathan S, Eugene S, Patrick W, Mark DM, editors. *Mercer's Textbook of orthopaedics and trauma*. 10th ed. London: Hodder Arnold; 2012, 288-90.
2. Lazarus MD. Fractures of clavicle. In: Buchloz RW, Heckman JD, editors. *Rockwood and Greens fracture in adults*. 5th ed. Philadelphia: Lippincott Williams and

- Wilkins, 2001, 1041-78.
3. Saha P, Datta P, Ayan S, Garg AK, Bandyopadhyay U, Kundu S. Plate versus titanium elastic nail in treatment of displaced midshaft clavicle fractures: A comparative study. *Indian J Orthop*. 2014; 48(5):87-93.
4. Jones LD, Grammatopoulos G, Kambouroglou G. Titanium elastic nails, open reduction internal fixation and non-operative management for middle third clavicle fractures: a comparative study. *Eur J Orthop Traumatol*. 2014; 24(3):323-9.
5. Yun-feng C, Zeng B, Chen Y, Wang H, Xue J, Chai *et al*. Clinical outcomes of midclavicular fractures treated with titanium elastic nails. *Can J Surg*. 2010; 53(6):379-84.
6. Kadakia AP, Rambani R, Qamar F, McCoy S, Koch L, Venkateswaran B. Titanium elastic stable intramedullary nailing of displaced midshaft clavicle fractures: A review of 38 cases. *Int J Shoulder Surg*. 2012; 6(3):82-5.
7. Saha P, Datta P, Ayan S, Garg AK, Bandyopadhyay U, Kundu S. Plate versus titanium elastic nail in treatment of displaced midshaft clavicle fractures: A comparative study. *Indian J Orthop*. 2014; 48(5):87-93.
8. Shishir SM, Lingaraj, Zachariah AP, Kanagasabai R, Najimudeen S, Ganadoss J. Antegrade flexible intramedullary nailing for fixation of displaced midshaft clavicle fractures. *IOSR-JDMS*. 2014; 13(4):29-37.
9. Patil AA, Somashekara SA, Darshan MS. Mid-clavicular fractures treated with TENS: A prospective study. *J Evid Based Med Healthc*. 2016; 3(36):1738-41.
10. Subramanian SS, Sengodan MM, Sasikumar S. Functional outcome in clavicle fractures treated by titanium elastic nail system. *Indian J App Research*. 2016; 6(8):77-80.
11. Balaram R, Sathish RK, Sandeep SK, Vijayanarasimhan V. Short term functional outcome of displaced midshaft clavicle fractures treated with TENS nailing. *RJPBCS*. 2015; 6(2):2011-6.