

MID-SHAFT CLAVICLE FRACTURE MANAGEMENT A COMPARATIVE ANALYSIS BETWEEN PLATING VERSUS TITANIUM ELASTIC NAIL SYSTEM

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Abstract

Background: Clavicle fracture is one of most common bony injuries in our country. Despite of high frequency, choice of proper treatment is still a controversy. So a comparative randomized analysis was planned to compare Plating verses TENS for clavicle fractures management. **Materials and Methods:** Study was conducted in Department of Orthopaedics, SriLakshmi Narayana Institute of Medical Science, and Pondicherry from July2023 to November 2023. Patients aged from 20-45 years with closed displaced were included in study. Patients were randomized in two groups-One group (6 patients) treated with TENS and second group (6) with plate. Outcome assessed by pain VAS score, Constant & Murley score, DASH score, cosmetic result, radiological fracture healing time. **Result:** Mean fracture union time in TENS group was 10.4+2.1 weeks and in plate group 12.4±3.16 weeks. Mean pain VAS score in TENS group was 2.16±0.51 and in plating group 3.11±0.8 (p=0.023). Tens group were cosmetically more satisfied than plate group. **Conclusion:** Our study found that patients treated with TENS showed excellent outcome in 72% cases while 52% in plating group for displaced mid-shaft clavicle fracture. Patients in TENS group better in terms of Constant & Murley score and DASH score than treated with plate.

INTRODUCTION

Clavicle fracture is one of the most common bony injuries. A weak spot in mid clavicular region accounts for most of fractures. Despite of high frequency, choice of proper treatment is still a challenge for orthopaedic surgeon. In particular it is uncertain whether surgery produces better outcomes than conservative management. So we took up this study planning to compare Plating verses Titanium Elastic nail System (TENS) For clavicle fractures and compare the incidence of non-union, Shortening, functional outcome, cosmetic aspects and other complication.

MATERIALS AND METHODS

The Study was conducted in department of orthopaedics, Sri Lakshmi Narayana Institute of Medical Science, Pondicherry from January 2023 to April 2023.

Inclusion Criteria

1. Aged from 20-45 years
2. Closed displaced and isolated fracture of middle third clavicle

Exclusion Criteria

1. Those that was not medically fit for surgery
2. Previous pathological fracture,
3. Neurovascular deficits,
4. Concomitant injury, with previous fracture clavicle non-union
5. Patients did not give consent

Patients coming to the emergency department of orthopaedics OPD of Sri Lakshmi Narayana Institute of Medical Science, Pondicherry within the study period and who qualified the inclusion criteria were randomized in two groups- One group were treated with TENS and second group with plate. Simple randomization was used for patient's allocation to groups. During the study period 18 clavicle fractures, which require surgical treatment were analysed. Out of which only 12 cases of mid clavicle fracture was included in this study. Patient on admission to emergency unit or OPD was initially resuscitated and stabilized. All the cases were initially investigated with radiograph to assess fracture type and post traumatic clavicular shortening and routine blood investigation, urine and stool examination, ECG and cardiological check-up. Fractures were classified as

per AO/OTA Classification. In Both cases patients were operated under general anaesthesia.

Surgical technique for plating:

Patient placed in the supine position with a large bump placed between the scapula, allowing injured shoulder girdle to fall posteriorly, helping to restore length and exposed to the clavicle reduction was done and a 3.5 mm Recon plate, LCP, one third tubular plate was contoured with bending for application to the superior surface of the clavicle or antero-inferior surface. In case of long oblique fractures or wedge comminuted fractures, lag screw were used wherever possible with care taken to preserve soft tissue attachment for comminuted fractures sufficiently long plate with nine or twelve hole was used to bridge the fracture and obtain at least six cortex fixation on each side of fractures.

Surgical technique for TENS:

Patients were placed in supine position. A small incision was made Approximately 1 cm lateral to the sternoclavicular joint. A TEN (Titanium Elastic stable intramedullary nail) was inserted (the diameter varied from 2 to 3 mm depending on the width of the bone). Before introduction, the original curvature of the small and flattened nail tip was straightened slightly to allow better gliding in the small medullary canal. Closed reduction was performed under fluoroscopic guidance using two percutaneously introduced pointed reduction

Postoperative protocol and follow up.

For both the groups:

- Intravenous Antibiotics was given for 5 days and changed to oral antibiotics for 5 days.
- Operated limb was immobilized in a broad arm sling.
- On post-operative day-1 x-ray was taken to study the alignment of fracture fragments
- The wound was inspected at 3rd post-operative day and
- Suture removal was done on 8th postoperative day.

Patients were discharged with the broad arm sling. Rehabilitation of the affected arm was started at the end of 2 weeks. A gentle pendulum exercise of the shoulder in the broad arm sling was allowed. At 3 to 5 weeks gentle range of motion of the shoulder was allowed but abduction in Limited to 80 to 90 degree. At 6 to 8 wks active range of motion in all planes were allowed. All patients were assessed on day 3, then every week, till radiological signs of union then once a month on 3rd and 4th X-ray was taken for all patients at each follow up for evaluation of fracture healing and implants position.

Outcome assessment:

Radiographic healing was defined as evidence of bridging callus across the fracture site or obliteration of fracture line Time to achieve union was recorded. After union, shortening of clavicular length was measured clinically as the linear difference of clavicle lengths from sternal end to acromial end between operated and normal side. We measured

subjective pain with a visual analogue scale (VAS) 1 day before and 3 days after conservative and surgical management. The VAS ranged from 0-10, 0=no pain, to 10=worst pain imaginable. The functional outcomes were assessed by Constant and Murley score and DASH Score. The objective variables are range of motion and strength which give a total of 65 points. Patients were graded as below with a maximum of 100 points. DASH outcome measure is a 30-item; self-report questionnaire designed to measure physical function and symptoms in patients with any or several musculoskeletal disorders of the upper limb. More severely disabled individuals have a higher score on a scale of 0 to 100. Secondary outcome measures include perioperative data like operative time, amount of blood loss and size of the surgical wound; complications such as neurovascular injury, wound infection, non-union, malunion, implant migration, implant failure, soft tissue irritation, refracture after implant removal and visible deformity, hypertrophic scars and hardware prominence under the skin.

RESULTS

Total 12 patients were studied among whom 6 belonged to TENS group and rest belonged to plating group. The age range of the patient was from 20 to 45 years. The mean age for TENS group was 24.43±10.73 and plate group 31.76±11.87 (p=0.646). The injury being a result of trauma was commonly found in male population compared to female in both the groups. Male to female ratio 2.5:1. The mode of injury was uniformly distributed in both the groups. 66% of cases are due to road traffic accident, 14% cases were due to fall from height and sports activity and due to fall on outstretched hand on 10% cases. In both the group the dominant side of the patient was more affected (64%). In respect to type of fracture as per OTA classification, 50% cases were simple (B1) type and 50% cases were wedge (B2) type. In our study 2 patients were used locking compression plate, 2 patients' recon plate and 2 patients semi tubular plate. As per OTA classification for type B1 simple fracture locking compression plates were used in 3 patients recon plates in 2 patients and semi tubular plates in 1 patient. For type B2 both LCP and STP were used in 20% cases each. Recon plates were used in 3 patients (12%). In our study the fractures in the TENS group were united with an average time of 10.4±2.1 weeks and in plate group one case non united but rest cases united with an average time of group 12.4±3.16 weeks; difference was significant. No clavicular shortening was seen in 3 patients and less than 4 mm shortening in 1 patients of plate cases. 2 patients in plate group shows 5 to 8 mm shortening. Majority of the patients in TENS group shows no shortening. 1 patient in TENS group shows less than 5 mm shortening Mean shortening in TENS group was 1.84±1.88 mm and plate group was 4.5±6.12 mm and the difference was significant.

Functional outcome was measured according to Constant Shoulder score and DASH score. In TENS group 4 patients showed excellent result, 2 patients showed good result. But in plate group about 2 patients showed excellent result while 4 cases showed good result. In our prospective study mean DASH and Constant shoulder score in TENS group were 1.57+3.4, 9.16+7.04 and plate group 4.91 +9.0 and 15.08+9.4 respectively. In TENS group we found the complications are delayed union in 3%, infection in 4%. In TENS group, majority of the cases had complete radiological union within 8-10 weeks & 2 patients had union at 12-14 weeks. But plate group majority had it in about 10-12 weeks with mean union time 13.4 weeks with 2% having non-union, 2% having delayed union and 2% having mal-union. In addition to it in plate group, hypertrophic scar was found in 11% cases, plates loosening due to infection in 9% cases, 9% patient showed superficial infection and 5% showed re-fracture. TENS group is better in terms of infection, plate loosening, hypertrophic scar and plate prominence, refracture, neurovascular injury as no such complication was found in TENS group.

DISCUSSION

The majority of clavicle fractures (80-85%) occur in midshaft of bone where the typical compressive forces applied to the shoulder and narrow cross section of the bone combine and result in the bony failure. Most of the cases in this group are mild to moderate displaced and can be treated conservatively. However, 4% of middle third clavicle fractures are completely displaced and shortened. This small group of fractures accounts for 90% of non-union of the middle third fractures and therefore may warrant early open reduction and internal fixation. Our study was done to compare the rate of union and functional outcome in displaced middle third clavicle fractures by surgical management using TENS vs Plating. This study was conducted in the post graduate department of Orthopaedics, Sri Lakshmi Narayana Institute of Medical Science, Pondicherry from July 2019 to November 2019. In our study mean age of the patients with displaced mid shaft clavicle fracture in TENS group was 33.45 years and in plate group was 31.76 years. Our study also found 65% of participants were males. In this study we use 3.5 mm LCP in 52% patients and RP in 24% and STP in 24% cases. According to our study the mean radiological union time in TENS group was 10.4+2.1 weeks and plate group 12.4+3.16 weeks TENS was found to be better in terms of radiological union for the fracture of middle third of the clavicle than plate fixation. In our study we use Titanium elastic nail in TENS group and 3.5 mm LCP, RP or STP in plate group. In TENS group we found the complications are delayed union (4%), infection (4%). In TENS group, majority of the cases had radiological union within 8-10 weeks and 2 patients

(28%) had union at 12-14 weeks. But plate group majority of the cases had it in about 10- 12 weeks with 1 having non- union, 1 having delayed union and 1 having mal-union. In addition to it in plate group, hypertrophic scar was found in 12% cases, plates loosening due to infection in 8% cases, 8% patient showed superficial infection and 4% showed re-fracture. TENS group is better in terms of infection, plate loosening, hypertrophic scar and plate prominence, refracture or neurovascular injury as no such complication was found in TENS group. Although plating of the clavicle spares the original fracture site it rarely involves fixation along its entire length. Our study shows refracture rate 8% (one patient) in plate group. Patients treated by plating showed excellent outcome in 60% cases while 84% in TENS group. The mean DASH score was found to be 1.67+3.8 in TENS group and 4.2+4.9 in plate group. Patients treated with TENS were found to be better in terms of CONSTANT and DASH score than treated with plate. TENS group had significantly higher cosmetic satisfaction.

CONCLUSION

Our analysis found that patients treated by plating showed well appreciated outcome in 60% cases while 80% in TENS group. Patients treated with TENS were found to be better in terms of Constant and DASH score than treated with plate. So, in the management of acute displaced midshaft clavicular fractures, TENS is better to plating for management of clavicular fracture. Surgery with TENS results superior functional outcome compared to surgical plating treatment.

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