



COMPARATIVE STUDY OF DISPLACED SHAFT CLAVICLE FRACTURE TREATED BY OPEN REDUCTION AND INTERNAL FIXATION BY ANATOMICAL CLAVICLE PLATE VERSUS CLOSED REDUCTION AND INTRAMEDULLARY FLEXIBLE NAIL FIXATION

Orthopedics

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ABSTRACT

Introduction: Mid shaft clavicle fractures are common and accounts for about 3-5% of all fractures and around 45% of fractures around shoulder. Open clavicular fractures however are quite rare which are seen in 0.1% to 1% of cases. The peak incidence occurs in the third decade of life. Surgery is accepted more and more as primary treatment for displaced midshaft clavicle fractures, mainly because the results of non-operative treatment are interpreted as inferior. **Objective:** To assess and compare the postoperative functional outcome of mid shaft clavicle fracture patient treated with either open reduction and internal fixation by anatomical clavicle plate or intramedullary TENS nail using Constant score after a minimum postoperative period of 6 months, by using Constant Score. **Result:** Postoperative functional outcome was assessed by Constant Score at 6 months postoperatively for patients operated with TENS mean Constant Score is 94.1. For patients operated with Plating the mean constant score is 89.25. **Conclusions:** In 20 patients fractures were fixed with intramedullary TENS nail and in another 20 patients the fractures were fixed with Plating. It was found that for patients operated with TENS mean Constant Score was 94.1 and for patients operated with Plating the mean constant score was 89.25. There was a significantly better Constant score for patients operated with TENS.

KEYWORDS

Midshaft Clavicle Fracture, Anatomical Clavical Plate, Intramedullary Tens Nail

INTRODUCTION

Mid shaft clavicle fractures are common and accounts for about 3-5% of all fractures and around 45% of fractures around shoulder.

When it comes to distribution of fractures according to the location, mid clavicular constitutes about 70- 80%, lateral end of clavicle fractures contribute 15% to 30% and medial end of clavicle fractures at around 5%.

Open clavicular fractures however are quite rare which are seen in 0.1% to 1% of cases. The peak incidence occurs in the third decade of life.

Surgery is accepted more and more as primary treatment for displaced midshaft clavicle fractures, mainly because the results of non-operative treatment are interpreted as inferior to operative treatment clinically, functionally and sometimes cosmetically.

There is 15% non-union rate in widely displaced fractures of middle-third of the clavicle treated without surgery and all fractures with initial shortening of more than 2 cm resulted in nonunion.[1]

Absolute Indications for operative fixation of clavicle [2,3,4]

- Displaced fracture shaft clavicle >2 cm
- Open fractures.
- Fracture shaft clavicle causing tenting of skin.
- Bilateral fracture shaft clavicle.
- Subclavian artery or vein injury.
- Floting shoulder.
- Associated with multiple ipsilateral rib fractures.
- Polytrauma patient.

Contraindications:

- Non-displaced fractures (no comminution, <3mm displacement)
- Infection
- Elderly, low-demand, high surgical risk patients

Surgical methods of fixation

The following methods of fixation are available[5,6]

1. Plate fixation
2. Intramedullary elastic nail fixation

In a large number of complex clavicle fractures a satisfactory outcome is possible with a low complication rate by plate fixation using a locked compression plate.

Plate fixation options include low contact dynamic compression plate, which are strong, but difficult to contour and causes soft tissue irritation. Anatomical precontoured plate have the potential advantages of not requiring further bending, having a lower profile causing fewer soft tissue problems while retaining the mechanical strength of the stronger plates. [7]

Another technique for midclavicular fracture fixation which have gained attention over the years with its better clinicoradiological outcome is titanium elastic nailing (TENS).

When managed surgically both the options have better outcome than managed conservatively.[8]



Fig 1 TENS nail

Fig 2 Anatomical plate

The advantages of TENS fixation are	The main disadvantages of TENS fixation are
• Small Incision only needed • Limited blood loss • Reduced chances of neurovascular injury • Reduced chances of wound infection • Cosmetically acceptable scar • Reduced Hospital Stay • Implant removal can be done under LA	• Needs flourescopic assistance • Chances of medial hardware migration • Iatrogenic damage to neurovascular structure. • Hardware breakage.

The advantages of plate fixation are	Disadvantages of plate fixation are
- Anatomical reduction possible under direct visualisation - Stable fixation - More opted for comminuted fractures - Length and alignment can be maintained - No hardware migration	- Needs open surgery with lengthy incision - Postoperative scar is large compared to TENS fixation - More blood loss - Implant is costlier than TENS - Needs resurgery for implant removal - Skin irritation later

MATERIALS AND METHODS

AIM:

To compare the postoperative functional outcome, after fixation of displaced mid- shaft clavicle fractures, with Intramedullary Flexible Elastic Nail versus Anatomical Clavicle Plate .

OBJECTIVE:

To assess and compare the postoperative functional outcome of mid shaft clavicle fracture patient treated with either open reduction and internal fixation by anatomical clavicle plate or intramedullary TENS nail using Constant score after a minimum postoperative period of 6 months, by using

- Constant Score
- To analyse the results

Source of data:

The study was a Prospective Cohort type of study It included patients with displaced mid-shaft clavicle fractures who are seen at OPD or Casualty or admitted in Ortho ward of Orthopaedics department of GMERS Medical College Hospital, Gotri Vadodara.

Study Period:

12 months- from march 2022 to February 2023 , follow up was from September 2022 to February 2023 .

Inclusion Criteria:

- Closed fracture
- Unilateral fracture
- Age >18 and <65 years
- Displaced fracture mid 1/3rd of Clavicle .
- Patients medically fit for surgery .

Exclusion criteria:

- Open fracture
- Coexistent morbidity of ipsilateral arm, shoulder or hand
- Fracture involving medial and lateral 1/3rd of clavicle
- Pathological fractures
- Patient medically unfit for surgery
- Fractures with neurovascular compromise

METHODOLOGY:

Forty patients who had fulfilled the inclusion criteria were recruited for the study. The patients were evaluated by clinical examination and radiological imaging Half of the patients were treated with TENS nailing and half of the patients with Plating of Clavicle Method of intervention for the patient was selected by randomized double blind method. Patients were regularly followed up

Post operative functional outcome of patients after a minimum period of 6 months in either group was analysed and compared by using Constant Score.

Analysis Of Outcome

All cases were analysed based on the following data

- Age distribution
- Sex distribution
- Mode of Injury
- Side affected
- Robinson classification
- Constant Score

Table1: Age Distribution

AGE IN YEARS	NO OF PATIENTS	PERCENTAGE
< 30	27	68%

31-40	9	22%
> 40	4	10%

Table 2: Sex Distribution

SEX	NO OF PATIENTS	PERCENTAGE
MALE	31	78%
FEMALE	9	22%

Table 3: Mode Of Injury

MODE OF INJURY	NO OF PATIENTS	PERCENTAGE
ACCIDENTAL FALL	11	27%
ROAD TRAFFIC ACCIDENT	29	73%

Table 4: Side Affected

SIDE AFFECTED	NO OF PATIENTS	PERCENTAGE
RIGHT	28	70%
LEFT	12	30%

Table 5: Robinson Classification

ROBINSON CLASSIFICATION	NO OF PATIENTS	PERCENTAGE
2B1	10	25%
2B2	30	75%

In our study most of the patients (75%) were of Robinson Type 2B2

Table 6: Outcome Result Based On Constant Score

RESULT	NO OF PATIENTS	PERCENTAGE
EXCELLENT	26	65%
GOOD	14	35%

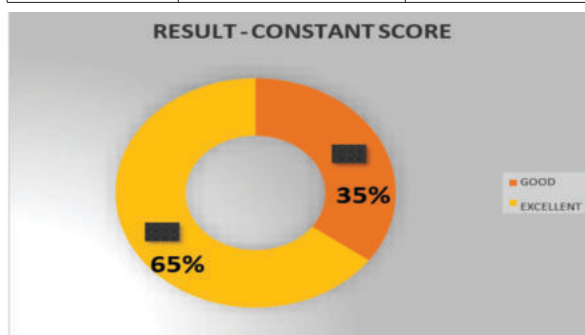


Fig 3: Result - Constant Score

Table 7: Type Of Implant Vs Outcome Based On Constant Score

RESULT	TYPE OF IMPLANT	
	LCP	TENS
GOOD	11	3
EXCELLENT	9	17
CHI SQUARE TEST		
P VALUE - 0.008		
SIGNIFICANT		

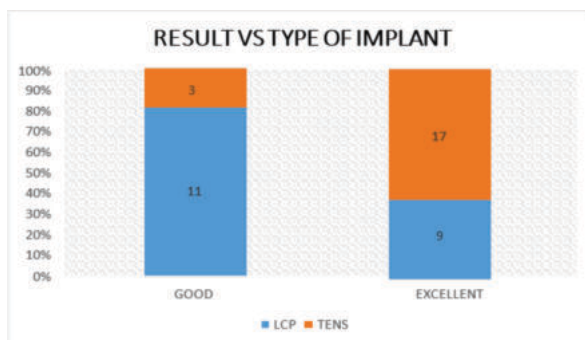


Fig 4: Result Vs Type Of Implant

RESULT

Postoperative functional outcome was assessed by Constant Score at 6 months postoperatively

- For patients operated with TENS mean Constant Score is 94.1

- For patients operated with Plating the mean constant score is 89.25

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.[8]

Two types of fixation are available for middle-third clavicle fractures: Intramedullary devices and plates, Intramedullary fixation can be done by smooth or threaded K- wires, Steinman pins, Knowles pins, Hagie pins, Rush pins or cannulated screws

Plate fixation can be done with a 3.5-mm dynamic compression plate (DCP), low- contact dynamic compression plates, reconstruction plates or locking compression plates with at least three screws (six cortices) in both the medial and lateral fragment each, and an interfragmentary lag screw whenever the fracture pattern allows it.

Biomechanically, plate fixation is superior to intramedullary fixation because it better resists the bending and torsional forces that occur during elevation of the upper extremity above shoulder level.

Patients treated with plate fixation can be allowed full range of motion once their soft tissues have healed.

Disadvantages of plate fixation include the risk for increased exposure and soft-tissue stripping, increased risk of damage to the supraclavicular nerve, slightly higher infection rates, and the risk of refracture after plate removal.[9]

Currently, open reduction and internal fixation with a 3.5-mm dynamic compression plate is the standard method; however, intramedullary fixation is an equally effective alternative.

In this study, both methods of fixation were compared in terms of functional outcome using constant score after 6 months postoperative period.

In our study, in GMERS Medical College Gotri Vadodara , 40 patients with displaced mid shaft clavicle fractures who satisfied the inclusion criteria were included in the study.

Study period was from March 2022 to February 2023. 20 patients were operated with plating and 20 patients were operated with TENS nailing.

Type of intervention for a particular patients was determined by randomized double blind technique.

Postoperative protocol was same for all patients. Patients were discharged and were followed up at regular intervals and functional outcome of all patients after 6 months postoperative period in each group were analysed using Constant Score and compared with the other group.

It was found that functional outcome of patients in TENS group was significantly better for than of plating group. (Constant score P VALUE - <0.001)

Implant removal in the plating group needed another surgery done under general anesthesia, and a large-sized incision was made, while in the TENS group the nail was removed as an outpatient procedure under local anesthesia and a small incision over the tip of the nail was made.

This was another advantage of intramedullary flexible nailing over plating.

CONCLUSION

This was a prospective cohort study done in GMERS Medical College Gotri Vadodara during the period of March 2022 to February 2023, involving 40 patients, diagnosed with Midshaft Clavicle fractures.

In 20 patients fractures were fixed with intramedullary TENS nail and in another 20 patients the fractures were fixed with Plating.

After surgery patients were followed up regularly. Their postoperative functional outcome after 6 months were analysed by Constant Score and the two groups were compared.

It was found that for patients operated with TENS mean Constant Score was 94.1 and for patients operated with Plating the mean constant score was 89.25.

There was a significantly better Constant score for patients operated with TENS, with P value <0.001

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