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The role of open reduction and internal fixation in displaced mid shaft clavicle fractures using titanium elastic nail fixation

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Abstract

The majority of clavicle fractures 80-85% occur in mid shaft of the bone where the typical compression forces applied to the shoulder and the narrow cross section of the bone combined and result in bony failure. The present study was carried out at Orthopaedics Department in Medical College. During this period 20 patients of clavicular fractures were treated surgically. General information like name, age, sex, occupation and address were noted. Then a detailed history was elicited regarding mode of injury like fall on the shoulder, Road traffic accident, direct injury to shoulder and fall on outstretched hand. In this study with mid shaft clavicle fracture 4 patients (20%) had medial cut end prominence under skin with skin irritation, 2 patients (10%) had delayed union due to fracture comminution and 1 patient (5%) had superficial skin infection which healed with regular dressings and appropriate antibiotics.

Keywords: Open reduction and internal fixation, mid shaft clavicle fractures, titanium elastic nail fixation

Introduction

Clavicle is the bony link from thorax to shoulder girdle and contributes to movements at shoulder girdle. Clavicle fracture is a common traumatic injury around shoulder girdle due to their subcutaneous position. It is caused by either low-energy or high-energy impact. Fracture of the clavicle accounts for approximately 5 to 10% of all fractures and upto 44% of injuries of the shoulder girdle. Clavicle fractures are common injuries seen in young active individuals specially those who participate in activities and sports where high speed fall or violent collisions are frequent and account for 2.6% of all fractures^[1]

The majority of clavicle fractures 80-85% occur in mid shaft of the bone where the typical compression forces applied to the shoulder and the narrow cross section of the bone combined and result in bony failure. Clavicle fractures less often occur in the lateral third (12% to 15%) and medial third (5% to 8%)^[2, 3]

Fractures of the clavicle have been traditionally treated non-operatively. Although many methods of closed reduction have been described, it is recognized that reduction is practically impossible to maintain and a certain amount of deformity and disability is expected in adults^[1]

In the past few years several publications have described about poor outcomes like malunion and nonunion (15%) after conservative treatment of severely displaced mid shaft clavicular fractures^[4]

The proponents of early fixation of fresh clavicular fractures to prevent complications like malunion and nonunion emphasize the value of accurate reduction and fixation in affording quick pain relief and promoting early functional recovery^[5]

The clavicle which is similar to other long bones is treated with intramedullary methods.³ Mid shaft clavicle fractures with titanium elastic nail fixation is a safe, quicker and minimal invasive procedure with less soft tissue injury and with good cosmetic results^[6]

The purpose of this study is to gain experience with the surgical management of fresh displaced mid shaft clavicle fractures with titanium elastic nail fixation.

Methodology

The present study was carried out at Orthopaedics Department in Medical College. During this period 20 patients of clavicular fractures were treated surgically.

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Inclusion criteria

- All patients within the age group of 16 -60 years
- All the displaced middle third clavicle fractures (>2cm displacement)
- Fractures within the last 4 weeks with no cortical bone contact
- Shortening of over 15 mm or >2cm
- If fracture fragments are tenting or compromising skin with an axial malalignment of over 30 degree

Exclusion Criteria

- Age <16yrs
- Fractures with marked comminution
- Fractures older than 4 weeks
- Pathological fractures
- Open fractures
- Congenital anomaly or bone disease
- High anaesthetic risk
- Any medical contraindication for surgery

General information like name, age, sex, occupation and address were noted. Then a detailed history was elicited regarding mode of injury like fall on the shoulder, Road traffic accident, direct injury to shoulder and fall on outstretched hand. Enquiry was made to note site of pain and swelling over the affected clavicle. Past medical illness and family history were also recorded. General condition of the patients was examined for pallor, pulse rate and blood pressure. Respiratory and cardio vascular system were examined for any abnormalities.

Results**Table 1:** Time Interval for Surgery

Time of surgery	No. of Middle third clavicle fracture	%
< 7 days	14	70
7-14 days	06	30

In middle third clavicle fracture 14 patients (70%) were operated in the first week and 06 patients (30%) were operated in the second week due to fixed OT days in Chigateri Government Hospital.

All the patients were operated under general anaesthesia.

In this study all the middle third clavicle fracture were fixed with titanium elastic nail which has a standard length of 44 cm and bent end which has to be placed at the lateral end of the lateral fragment.

Table 2: Type of Implant

Type of Nail	No. of cases	%
Titanium elastic nail	20	100

In this study all the mid shaft displaced clavicle fracture were treated with titanium elastic nail (diameter range 2 -4 mm) and length of 44 cm.

Table 3: Diameter of Nail and Length

Diameter of Nail	Length	Cases	Percentage
2mm	44cm	12	60
2.5mm	44cm	06	30
3.0mm	44cm	02	10
3.5mm	44cm	0	0
4.0mm	44cm	0	0
Total		20	100

In 12 patients (60%) 2 mm of titanium elastic nail were used. In 6 patients (30%) 2.5 mm titanium elastic nail were used and in 2 patients (10%) 3mm of titanium elastic nail were used.

The fracture was considered to be united when clinically there was no tenderness, radiologically the fracture line was not visible and full unprotected function of the limb was possible.

Table 4: Duration of Union

Time of union	No. of Middle third clavicle fracture	%
8-12 week	18	90
>12 weeks	2	10

In middle third clavicle fracture 18 patients (90%) united at the end of 12 weeks. In 2 patients (10%) delayed union occurred due to comminution at fracture site which united at 16 weeks.

Major complication: A complication requiring inpatient treatment and resulting in an additional morbidity of 2 months or more was regarded as a major complication. There were no major complications like – Non union, Nail breakage, Nail migration, Re-fracture after implant removal and Restriction of shoulder movements.

Table 5: Complications

	Types	No. of cases	%
Minor	Medial cut end prominence under skin with skin irritation	4	20
	Delayed union	2	10
	Superficial skin infection	1	5

In this study with mid shaft clavicle fracture 4 patients (20%) had medial cut end prominence under skin with skin irritation, 2 patients (10%) had delayed union due to fracture comminution and 1 patient (5%) had superficial skin infection which healed with regular dressings and appropriate antibiotics.

The functional outcome is assessed by Constant and Murley score.

Table 6: Functional Outcome

Functional outcome	No. of Middle third clavicle fracture	%
Excellent	16	80
Good	04	20
Fair	0	0
Poor	0	0
Total	20	100

In this study on 20 patients (100%) with middle third clavicle fracture treated with titanium elastic nail, 16 patients (80%) had excellent functional outcome and 4 patients (20%) had good functional outcome.

Discussion

All the patients were operated as early as possible once the general condition of the patients were stable. In middle third clavicle fracture 14 patients (70%) were operated in the first week and 06 patients (30%) were operated in the second week due to fixed OT days in Chigateri Government Hospital. All the patients were operated under general anaesthesia.

In Jamal E.H. Assobhi study all the patients were operated within 3 weeks (median – 9 days) [7]

In this study all the middle third clavicle fracture were fixed with titanium elastic nail.

This is in comparison with Jamal E.H. Assobhi study were all the fractures were fixed with titanium elastic nail [7]

In this study all the mid shaft displaced clavicle fracture were treated with titanium elastic nail (diameter range 2 -4 mm) and length of 44 cm.

In our study 12 patients (60%) 2 mm of titanium elastic nail were used. In 6 patients (30%) 2.5 mm titanium elastic nail were used and in 2 patients (10%) 3mm of titanium elastic nail were used.

This is in comparison with Jamal E.H. Assobhi study were 16 patients treated with 2.5 mm titanium elastic nail and 3 patients were treated with 3 mm titanium elastic nail ^[7]

In our study with middle third clavicle fracture 18 patients (90%) united at the end of 12 weeks. In 2 patients (10%) delayed union occurred due to comminution at fracture site which united at 16 weeks.

This is in comparison with Jamal E.H. Assobhi study were middle third clavicle fractures united at an average of 5.2 months (range 3 - 9 months) ^[7]

In our study there were no major complications like non union, nail breakage, nail migration, re-fracture after implant removal and restriction of shoulder movements.

This is in comparison with Jamal E.H. Assobhi study were no major complications associated ^[7]

In this study with mid shaft clavicle fracture 4 patients (20%) had medial cut end prominence under skin with skin irritation. It was not associated with nail perforation through skin.

This is in comparison with Jamal E.H. Assobhi study were 3 patients had medial implant prominence under skin ^[7].

In our study 2 patients had delayed union due to fracture comminution which went on to unite at 16 weeks. There were no delayed union in Jamal E.H. Assobhi study ^[7].

In our study 1 patient was associated with superficial skin infection. Which healed with regular dressings and appropriate antibiotics. There were no superficial infection in Jamal E.H. Assobhi study ^[7]

In our study no patient were associated with hypertrophic callus. In Jamal E.H. Assobhi study 1 patient was associated with hypertrophic callus ^[7]. The total complications in this study were 20% excluding skin related minor complications, 2 of the medial cut end prominence patients under skin went for delayed union. The total complications rate in Jamal E.H. Assobhi study was 21.1%. ^[7]

In this study on 20 patients (100%) with middle third clavicle fracture treated with titanium elastic nail, 16 patients (80%) had excellent functional outcome and 4 patients (20%) had good functional outcome.

This is in comparison with Jamal E.H. Assobhi study were 17 patients had excellent outcome and 2 patients had good outcome ^[7].

The results were comparable with other studies also ^[8-10]

Conclusion

- In this study primary open reduction and internal fixation with titanium elastic nail provides a good fixation and does not require immobilization for longer periods.
- In this study all the mid shaft clavicle fractures were treated with titanium elastic nail of 44 cm length and diameter ranging from 2mm to 4mm.
- All the fractures united and there was no nonunion.
- Nine implant removal was done till the end of this study.
- For fresh displaced simple middle third clavicle fracture titanium elastic nail fixation and early mobilization gave excellent results in 16 patients and good in 4 patients.
- The clavicle which is similar to other long bones can be treated with intramedullary methods.

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