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Outcomes of Midshaft Clavicle Fractures Treated with Intramedullary Elastic Nail Versus non Operative Management

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Abstract: In this prospective study, 40 patients diagnosed as midshaft clavicle fracture, approaching the casualty and the outpatient department of KIMS, Karad within the period of May, 2014 to May, 2016 have participated. The study purpose is to compare outcomes of midshaft clavicle fractures treated with intramedullary elastic nail with figure of 8 clavicle brace. Out of total 40 patients treated in this study, 1 case in Operative group had nail back out and 4 cases had medial cut end nail prominence while in conservative group 11 patients had Malunited clavicle fracture and 2 went in to Delayed union. Out of 40 patients we studied 22 (55%) patients had excellent result, 16 (40%) patients had good result and 2 (5%) patients had fair result. On comparing the results in both groups, better results were seen in Operative group as compared to conservative group. The duration of union in operative group was early as compared to those treated conservatively. Delayed union was seen in 2 patients treated conservatively with brace.

INTRODUCTION

Clavicle is the bony contact between the thoracic and shoulder girdle which leads to shoulder girdle motion. The clavicle which is similar to other long bones is treated with intramedullary methods. Mid shaft clavicle fractures with elastic nail fixation is a safe, quicker and minimal invasive procedure with less soft tissue injury and with good cosmetic results (Assobhi, 2011). Most clavicle fractures occur in the mid shaft of the bone 80-85% where the usual compression forces applied to the shoulder and the bone's narrow cross section are combined and result in bony failure. Clavicle fractures occur less frequently in the lateral third (12-15%), than in the medial third (5-8%) (Mckee, 2010).

Aims: To compare outcomes of midshaft clavicle fractures treated with intramedullary elastic nail with figure of 8 clavicle brace.

Objectives: Analyzing the practical result of conservative and fastening of the mid-shaft fracture clavicle.

Literature review: It is impossible to support and immobilize a fracture of middle third of clavicle in an adult by external means with figure-of-eight bandages. (Mckee, 2010; Perez, 2013).

The technique of elastic stable intramedullary nailing of midshaft clavicle fractures is based on the operative principle described by Ligier for femoral shaft fractures in children (Mueller *et al*., 2007). Adults may not have a remodeling capacity, so displaced clavicular fractures

may be followed by shortening or angulation. The trapezoid line where trapezoid ligament is attached (Craig *et al*., 2004).

Zlowodzki found that the non-union rate for fractures of the non-operatively treated displaced middle shaft clavicle was 15.1% higher than previously described (Mckee, 2010; Jubel *et al*., 2003; Kettler *et al*., 2007).

In study by Kulshrestha *et al*. (2011) 4 patients in operative group experienced implant irritation and required implant removal between 3-6 months post-operative periods after fracture healing was achieved. In conservative group of 28 cases 7 patients had nonunion which were then treated operatively with plating plus bone grafting. The 11 patients had malunion of displaced midshaft clavicle fractures which were asymptomatic but visible deformity.

MATERIALS AND METHODS

The present study was carried out from May, 2014 to May, 2016 at Orthopaedics Department in Krishna Hospital and Medical Research Centre attached to Krishna Institute of Medical Sciences Deemed University, Karad. The 40 cases were taken in this study. The 20 cases operated with intramedullary elastic nailing. The 20 cases treated conservatively with figure of 8 clavicle brace. The cases were allotted to each group alternatively in an order to which they arrived to Krishna Hospital on OPD or IPD basis after signing Written informed consent. All the displaced middle third clavicle fractures. Compliant patients of 18-60 years age who have active recreational lifestyle. Patients treated conservatively with figure of 8 clavicle brace coming for regular follow-up included in conservative group.

The overall health of the patients was tested for pallor, pulse rate and blood pressure. Respiratory and cardiac vascular structures have been tested for some anomalies. Movements of the injured side of the shoulder is restricted due to pain. Distal neurovascular condition of the injured upper limb was examined and related fractures clavicle as well as the associated injuries were noted.

RESULTS AND DISCUSSION

The current study includes 40 patients with freshly displaced mid shaft fractures of the clavicle with a figure of 8 clavicle brace between May, 2014 and 2016 who underwent titanium elastic nail and conservative surgery. In this present Table 1, there were 40 patients (100%) of middle third clavicle fracture and no lateral third clavicle fracture or medial third clavicle fracture included.

As seen in Table 2, 38 patients (95%) of which 32 (80%) were attributed to road traffic injuries had a clear injury to the middle third of the clavicle fractures,

Table 1: Site of fracture

Site of clavicle fracture	No. of cases	Percentage
Middle third	40	100%
Lateral third	-	-
Medial third	-	-

Table 2: Mode of injury

	Operative		Conservative	
Mode	No.	Percentage	No.	Percentage
Fall	3	15	3	15
OH	1	5	1	5
RTA	16	80	16	80
Total	20	20		

Table 3: Age and sex incidence

	Treatments			
	Operative		Conservative	
Age (years)	Male	Female	Male	Female
20-30	8	2	6	1
30-40	6	0	5	2
40-50	2	2	2	2
50-60	0	0	0	2
Total	16	4	13	7
Mean±SD	31.80±11.23		35.10±12.58	

whereas 06 (15%) were attributed to dropping on the shoulder after falling. Indirect damage resulted in 2 patients (5%) owing to a decline in the outstretched hand.

As seen in Table 3, 16 patients (40%) has the fracture of the clavicle in the middle third. These patients were belonging to the age group of 19-29 years. The majority of middle third clavicle fractures were male, 29 patients (70%) and women 11 patients (30%).

As seen in Table 4, it was only two of the patients where type 2 A1 (Undisplaced) was found whereas4 patients were found with type 2 A2 (Angulated). The 32 patients were found to have type 2 B1 and 2 patients have type 2 B2.

In middle third clavicle fracture treated operatively 2 patients (10%) united at 8-10 weeks. In 16 patients (80%) union occurred at 10-12 weeks and in 2 patients (10%) fracture united at 12-16 weeks. In middle third clavicle fracture treated conservatively 4 patients (20%) united at 10-12 weeks. In 14 patients (70%) union occurred at 12-16 weeks and in 2 patients fracture united at more than 16 weeks. By applying Student's Unpaired t test there is a significant difference between values of time of union (weeks) in Operative treatment V/s Conservative treatment ($p<0.001$) (Table 5).

In Jamal E.H Assobhi study the mechanism of injury was due to vehicle accidents in 9 patients, in 5 patients injury was due to sporting activities and in 5 patients injury was due to fall from height. This shows direct injury to the shoulder is the common cause of this fracture (Assobhi, 2011). In study by Kulshrestha *et al*. (2011)

Table 4: Robinson fracture classification

Robinson Classification	Operative		Conservative	
	No.	Percentage	No.	Percentage
2A1	0	0	2	10
2A2	2	10	2	10
2B1	18	90	14	70
2B2	0	0	2	10
Total	20	20		

Table 5: Duration of union

Time of union (weeks)	Operative		Conservative	
	No.	Percentage	No.	Percentage
9	2	10	-	-
11	8	40	1	5
12	8	40	4	20
13	-	-	1	5
14	-	-	5	25
15	1	5	4	20
16	1	5	3	15
20	-	-	1	5
21	-	-	1	5
Total	20	100	20	100
Mean±SD	12.70± 1.66 weeks		14.55± 2.52 weeks	

1 injuries of clavicle were a result of road traffic accidents in 36, fall in 21, sports related in 13 and due to assault in 3. In our study with mid shaft clavicle fracture there were few associated injuries. These injuries were Contralateral Humerus shaft fractures (1), skull fractures (2), superior and inferior pubic rami fracture (1), Mandible fracture (1).

In our study, complications was seen in both conservative and operative group. Conservative group was associated with malunion in 11 patients out of which 7 had visible deformity. Delayed union was seen in 2 patients due to comminution at fracture site. In operative group medial cut end nail prominence under skin was seen in 4 patients. Nail Backout was seen in 1 patient on post op day 14 due to inadequate immobilisation of the injured limb due to contralateral humerus shaft fracture. The nail was removed under local anaesthesia and patient was then treated conservatively. Patient lost follow up and thus functional and union outcomes of this patient cannot be recorded.

CONCLUSION

In this study all the mid shaft clavicle fractures in operative group all were treated with titanium elastic nail with diameter ranging from 2-4 mm. In conservative group all the patients were treated with figure of 8 clavicle brace. The duration of union in operative group was early as compared to those treated conservatively. Delayed union was seen in 2 patients treated conservatively with brace. In conservatively treated group fractures unite but they are associated with complication and less patient satisfaction. Patient is immobilized for longer period. Figure of 8 clavicle brace and sling is good modality of treatment in minimally displaced fractures and patient with fewer demands. Deformity is often cosmetic. 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. While in conservative group mobilization after 6 weeks of brace gave excellent outcomes in 6 patients, good in 12 and fair in 2 patients. Mobilization was started early after two weeks in operative group while in conservative group it was started after six weeks without affecting time of union and range of motion of shoulder joint. Thus, titanium elastic nail fixation for fresh displaced midshaft clavicle fractures is a safe, quicker and minimal invasive procedure with less soft tissue injury and with good cosmetic results.

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