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## To study outcomes and disabilities after operative and Non-operative treatment of Midshaft clavicular fracture

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### Abstract

**Introduction:** Present study was conducted to compare functional outcome and disability following operative and non-operative treatment of completely displaced midshaft clavicular fractures.

**Methodology:** This hospital based analytical study between sling and plate osteosynthesis for treatment of displaced midshaft clavicle fractures. Inclusion criteria are: patients with middle third clavicular fractures that is completely displaced. Exclusion criteria are: patients with fracture without displacement, patients associated neurovascular injury.

**Result:** A total of 72 patients of displaced middle third clavicle fractures presenting to our institute were treated by 2 methods. 36 by conservative method (sling) and 36 by operative method (LCP). Mean age of the patient in LCP group was 32.06 +/- 8.86 whereas in conservative group was 29.56 +/- 7.69. Mean time of union for LCP group comes out to be 7.33±0.76 weeks whereas Mean time of union for Sling (conservative) group comes out to be 8.57±1.29 weeks. P value for this association is <0.0001. The mean Constant score for LCP group comes out to be 92.44±1.44 whereas mean Constant score for SLING group comes out to be 88.34±1.92. The P value for this association is less than 0.0001. **CONCLUSION:** The conservative method of managing un-displaced or severely-comminuted clavicular fracture with brace and sling gave good functional and radiological results.

**Keywords:** Clavicular fracture, conservative methods, locking compression plate

### Introduction

Clavicle fractures are common injuries in young, active individuals, especially those who participate in activities or sports where high-speed falls (e.g., bicycling, motorcycles) or violent collisions (e.g., football, hockey) are frequent and they account for approximately 2.6% of all fractures<sup>[1]</sup>.

Robinson reported in an epidemiologic study that the annual incidence was highest in the under-20 age group, decreasing with each subsequent age cohort. The incidence in females was constant, with peaks seen in teenagers (e.g., sports, motor vehicle accidents) and the elderly (e.g., osteoporotic fractures from simple falls). The annual incidence of fractures in their population was 29 per 100,000 population per year<sup>[2]</sup>.

The majority of clavicular fractures (80-85%) occur in the midshaft of the bone where the typical compressive forces are applied to the shoulder and the narrow cross section of the bone combine and result in bony failure. Distal third fractures are the next common fractures (20%) and they tend to occur in more elderly individuals as a result of simple fall. Medial third fractures are rarest (5%), perhaps because of difficulty in accurately imaging and identifying them. Motor vehicle accident is the usual mechanism of injury with a relatively high (20%) associated mortality rate from concomitant head and chest injuries<sup>[1]</sup>.

Most clavicle fractures heal uneventfully without serious consequences with non-operative treatment. Treatment guidelines were based on Neer and Rowe's two large series that show non-union rates of less than 1% in conservatively managed fractures with Sling or Figure-of-Eight bandage compared to nearly 4% in operatively treated patients<sup>[3,4]</sup>.

But more recent studies have questioned union rates, functional recovery and the morbidity of

malunions after conservative management. These concerns led the Canadian Orthopaedic Trauma Society to initiate a multicentre prospective randomized controlled trial to compare non operative treatment with a Figure of 8 clavicle bandage and operative plate fixation for displaced clavicular fractures. They concluded that operative treatment resulted in improved functional outcomes and lower rates of malunion and non-union. Complications occurred in 23 (37%) of 62 patients treated operatively compared to 31 (63%) of 49 treated non operatively [5].

Operative treatment consists of open reduction and internal fixation with plates and screws or intramedullary nail. Plating techniques continue to evolve. Newer precontoured locking plates allow more accurate fitting while maintaining strength; compared to previously used locking compression plates and reconstruction plates.

Results of more commonly used conservative modality have been preferred method but recent reports in literature suggesting superiority of surgical treatment led us to contemplate this study to compare the two modalities assess outcome.

**Material and Methods**

This hospital based analytical study between sling and plate osteosynthesis for treatment of displaced midshaft clavicle fractures was carried out from January 2013 to June 2014 in 72 cases (36 each group) patients admitted in Department of Orthopaedics, SMS Hospital, Jaipur in accordance with the following criteria.

**Inclusion Criteria are:** patients with middle third clavicular fractures that is completely displaced, patients within 7 days

of injury, patients age between 18 and 70 years and patient willingness to provide written informed consent are included.

**Exclusion criteria are:** patients with fracture without displacement, patients associated neurovascular injury, treatment beginning later than 7 days of injury, patients with open fracture and lack of informed consent are excluded.

**Results**

A total of 72 patients of displaced middle third clavicle fractures presenting to our institute were treated by 2 methods. 36 by conservative method (sling) and 36 by operative method (LCP). Patients were distributed equally in both the groups. The following are the observations made from our study.

**Table 1:** Demographic Data

Demographic data	Lcp group	Sling group
Mean age	32.06±8.86	29.56±7.69
Gender (m/f)	28/6	26/8
Occupation		
Labourer	18	16
House wife	6	8
Student	1	2
Others	11	10

In our study mean age of the patient in LCP group was 32.06 + /- 8.86 whereas in conservative group was 29.56 +/- 7.69. Our result is non-significant as the p value is 0.20. The difference in male and female ratio in our study is due to higher propensity of males to undergo road traffic accidents and fall from height. Occupation of our patients are listed in table1.

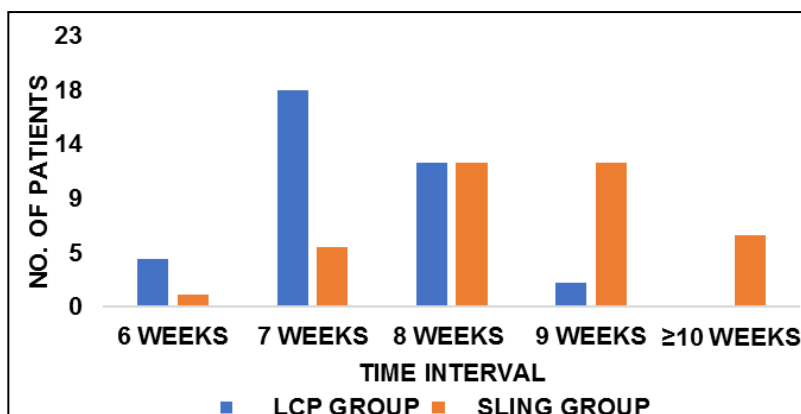
**Table 2:** Table Showing Mode, Side of Injury

Modes	Position	LCP group	Sling group
Mode of injury	Fall from height	14	16
	RTA	20	18
	Assault	2	2
Side affected	Left	16	18
	Right	20	18
Ass. Injury	Head injury	4	3
	Chest injury	8	6
	Pelvic injury	2	2
	Spine injury	1	0

In our study we are observing 3 modes of injury named RTA, assault and patients fall from height. We also observe the side affected of the injury i.e left or right. We assess the injury as head injury, chest injury, pelvic injury and spine injury. There respective data are collected and arranged in table 2.

In graph 1, we present mean time of union for LCP group

comes out to be 7.33±0.76 weeks whereas Mean time of union for SLING(conservative) group comes out to be 8.57±1.29 weeks. P value for this association is <0.0001. which shows difference in time of union between LCP group and SLING group is considered to be extremely statistically significant.



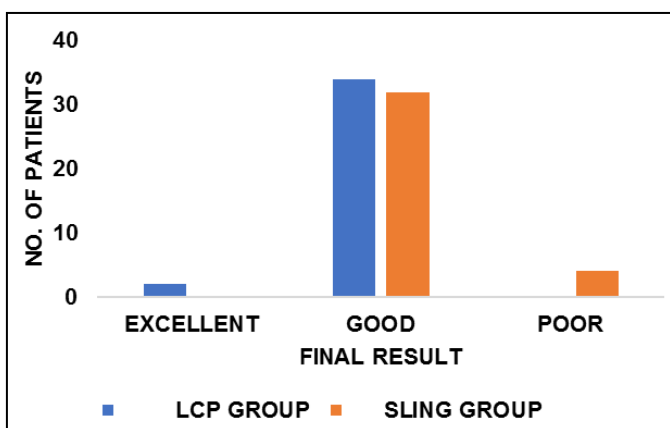
**Graph 1:** Distribution of patients according to time to fracture union

**Table 3:** Dash Score and Constant Score

Scores	Range	LCP group	Sling Group
Final dash score	< 30	2	----
	30 - 34	5	2
	35 – 39	16	14
	40 – 44	12	16
	≥45	1	4
Constant score	≤85	1	0
	86-90	30	2
	91-95	5	34

In our study mean Quick DASH score for LCP group comes out to be 37.72±4.43 whereas mean Quick DASH score for SLING group comes out to be 40.14±4.16. P value for this association is 0.0198. P-value is <0.05 which shows the difference in Quick DASH score between LCP and SLING group is considered to be statistically significant. The mean Constant score for LCP group comes out to be 92.44±1.44 whereas mean Constant score for SLING group comes out to be 88.34±1.92. The P value for this association is less than 0.0001.

In graph 2 we showed that no complications were associated with patients of shoulder pain except mild shoulder pain in only 2 patients. Whereas 4 cases of malunion and 2 cases of delayed union were noted with patients managed conservatively. No cases of non-union were reported with any of the patients in either group. No cases of wound dehiscence and infected implant were reported.



**Graph 2:** Final Outcome

**Discussion**

Historically, clavicle fractures have been considered best treated non operatively, with good outcomes. Vast majority of fractures healed with variable amount of cosmetic deformity. But recently there has been a trend towards operative approach to facilitate early mobilization and better functional outcome. Controversy remains concerning operative versus non operative treatment, so, we have studied functional outcome between operative and non-operative group. Between January 2013 to June 2014, a total of 72(36 each group) patients with displaced midshaft clavicle fractures with age between 18 to 53 years were treated with either open reduction and internal fixation using anatomical locking clavicle plate(36) or managed conservatively using a sling(36). Mean age of the patient in LCP group was 32.06 +/- 8.86 whereas in conservative group was 29.56 +/- 7.69. There were 28 males and 6 females in lcp group whereas 26 males and 8 females in conservative group. In lcp group the mode of injury was RTA in 20 cases fall from height in 14 cases and

assault in 2 cases whereas in conservative group the mode of injury was RTA in 18 cases fall from height in 16 cases and assault in 2 cases. In lcp group right side was affected in 20 patients & left side was affected in 16 patients whereas in conservative group right side was affected in 18 patients & left side was affected in 18 patients. All patients were operated within 7 days of injury. With respect to lcp group intra-Operatively, no complications like bleeding or neurovascular injury were encountered in any patients. In postoperative period, we had no complication like delayed union, non-union, implant failure, osteomyelitis, fracture at plate end, deformity except two cases of mild pain. Whereas with conservative group 4 cases of mal-union and 2 cases of delayed union were noted.

Majority of fractures united at around 7 - 8 weeks with mean time of union as 7.33+/-0.76 weeks in LCP group and 8.57 +/- 1.29 weeks in CONSERVATIVE group. Majority of patients had final DASH score between 35 to 45 with mean score of 37.72 +/- 4.43 in LCP group and 40.14 +/- 4.16 in CONSERVATIVE group. Final Constant score of LCP group was between 90 - 95 and majority constant score in conservative group was between 85 – 90. All patients had a good range of motion.

**Conclusion**

The conservative method of managing un-displaced or severely-comminuted clavicular fracture with brace and sling gave good functional and radiological results. But conservatively treated displaced non-comminuted clavicle fractures had increased rates of non-union, malunion and poor functional outcomes compared to operatively treated patients. Though better cosmesis, intramedullary fixation is not favoured due to higher complications like difficulty technique, implant impingement or migration, need for implant extraction, etc.

In our study we found that open reduction and internal fixation using precontoured anatomical locking compression plate facilitated:

1. Anatomical reduction
2. Stable and rigid fixation
3. Better implant for all types of clavicle fractures as implant is anatomically contoured
4. Less operative time
5. Less implant failure rate
6. Less implant removal rate
7. Accurate screw placement that prevents neurovascular injury
8. Faster union
9. Better functional outcome
10. Faster return to day to day activity with minimal complications

Although our study has its own pitfalls like small sample size and small follow up but on the basis of short-term results of our study we can safely conclude that pre-contoured anatomical plate is preferred for the treatment of displaced midshaft clavicle fractures with better functional outcome and faster recovery compared to conservative mode of treatment. We hereby suggest that large multicentric randomized control trials are necessary to substantiate our results.

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