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COMPARATIVE STUDY OF CONSERVATIVE VS SURGICAL MANAGEMENT WITH LOCKING COMPRESSION PLATE(LCP) OF DISPLACED MID SHAFT CLAVICLE FRACTURES

Orthopaedics

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ABSTRACT

BACKGROUND: Clavicular fractures are common injuries, accounting for 2.6% of all fractures. The fracture is more common in the males with the male-to-female ratio of 2.6:1. The ratio of left- to right-sided fractures was 1.28:1. Fractures of the middle third account for approximately 80% of all clavicular fractures. **MATERIAL AND METHODS:** The study consists of comparative randomly selected study of 20 patients with acute mid-third clavicular fractures treated with conservative management and 20 patients with acute mid- third clavicular fractures treated with surgical management by open reduction and internal fixation with locking compression plate at Patna medical college and Hospital, Patna Bihar. The Study duration One half years. The fractures were classified according to Edinburgh classification. 20 patients managed conservatively and 20 patients managed surgically were followed. This study was conducted with due emphasis for clinical observation and analysis of results after conservative and surgical management of acute clavicular fractures. **CONCLUSION:** There was a significantly higher incidence of nonunion among the non operative group than reported in the traditional literature. Also there was a high incidence of sequelae among this group. Malunion too did not equate to good outcome as there were residual symptoms. Functional scores were also significantly poorer among this group.

KEYWORDS

Locking Compression Plate (LCP), Clavicular Fractures, Malunion, implants.

INTRODUCTION

Clavicular fractures are common injuries, accounting for 2.6% of all fractures. The fracture is more common in the males with the male-to-female ratio of 2.6:1. The ratio of left- to right-sided fractures was 1.28:1 Fractures of the middle third account for approximately 80% of all clavicular fractures. Fractures were most common in males aged from 13 to 20 years with a subsequent fall in incidence with age until the seventh decade. In females, the incidence remained more constant with age. Sport is the commonest cause of fracture in the young. Fractures due to simple falls occur in older age group. Midclavicular fracture is one of the most common injuries of the skeleton, representing 3% to 5% of all fractures and 45% of shoulder injuries. The annual incidence of midclavicular fracture is 64 per 100 000 population. Breaks of the shaft form 70% to 80% of all clavicular fractures, lateral fractures contribute 15% to 30%, and medial fractures, at 3%, are relatively rare. Open clavicular fracture is an absolute rarity, found in only 0.1% to 1% of cases. The rate of midclavicular fractures is more than twice as high in men as in women. The peak incidence occurs in the third decade of life. Clavicle fractures are traditionally treated nonoperatively, even when substantially displaced. This treatment strategy is based on reports that suggested that clavicular nonunion was extremely rare. More recent studies of displaced midshaft clavicular fractures have shown a higher nonunion rate that previously reported in literature as well as a high rate of unsatisfactory patient-oriented outcome. Recent studies however, have also shown evidence of high rate of fracture union and low rates of complications with surgical fixation. With improved implants, prophylactic antibiotics, and better soft-tissue handling, plate fixation has become a reliable and reproducible technique.

Aims And Objectives

To undertake a clinical study evaluating the effectiveness of conservative management versus open reduction and internal fixation with locking compression plate (LCP) of displaced mid shaft clavicle fracture in adults.

Review Of Literature

In 1994, Nordqvist et al. further classified mid-third clavicular fractures into undisplaced, displaced and comminuted. It was their opinion that the only indications for surgical treatment of isolated clavicle fractures are initial neurovascular injury and skin jeopardy. In 1968, Rowe reported a nonunion rate of 0.8 percent fractures of the clavicle. Analysis of these data is confusing because of the addition of pediatric patients. In 1987, Andersen et al. performed a prospective, randomized study of 79 patients with mid-third fractures treated with either a figure-of-eight bandage for 3 weeks or a simple sling to be discontinued when the patient felt ready. All fractures went on to union. The only difference between the groups was a higher rate of treatment dissatisfaction in the figure-of- eight bandage cohort. In 2007, Huang et al. concluded apex of the superior bow of the clavicle is typically located along the lateral aspect of the bone, whereas the medial aspect of the superior surface of the clavicle remains relatively flat, making it an ideal plating surface. They also opined that displaced midshaft clavicular fractures that are treated with plate fixation have better functional outcomes than those that are treated nonoperatively. Between April 2003 and October 2009, N.Modi et al. operated on 62 clavicle fractures using LCP plates through infraclavicular approach. All patients were followed up until clinical and radiological union was achieved (radiological union was determined by the presence of bridging callus and absence of fracture lines). At the final follow-up 53 patients were available for review. There were 42 male and 11 female patients with an average age of 45 years. The clavicle lies almost horizontally at the root of the neck and is subcutaneous throughout its whole extent. It acts as a prop which braces back the shoulder and enables the limb to swing clear of the trunk and transmits part of the weight of the limb to the axial skeleton. The lateral or acromial end of the bone is flattened and articulates with the medial side of the acromion, whereas the medial or sternal end is enlarged and articulates with the clavicular notch of the manubrium sterni and first costal cartilage. The shaft is gently curved and in shape resembles the italic letter *f*, being convex forwards in its medial two-thirds and concave forwards in its lateral third. The inferior aspect of the intermediate third is grooved in its long axis. The clavicle is trabecular internally, with a shell of much thicker compact bone in its shaft. Superior plating in the subcutaneous border of the clavicle has shown problems with implant prominence and local irritation over the implants. Hardware-related problems often necessitate implant removal. Shen et al. reported that 171 of 232 reconstruction plates that had been applied to the superior surface of the clavicle were removed. Partal et al. in a 2010 study concluded that placing the plate antero-inferiorly on the clavicle provides a more stable construct in terms of bending rigidity with no detriment in axial and torsional stiffness compared with placing the plate superiorly. They preferred antero inferior plating as a result of the

increase in bending rigidity together with other advantages, including avoidance of neurovascular compromise, the use of longer screws, and decreased hardware prominence.

MATERIAL AND METHODS:

The study consists of comparative randomly selected study of 20 patients with acute mid-third clavicular fractures treated with conservative management and 20 patients with acute mid- third clavicular fractures treated with surgical management by open reduction and internal fixation with locking compression plate at Patna medical college and Hospital, Patna Bihar. The Study duration One half years. The fractures were classified according to Edinburgh classification. 20 patients managed conservatively and 20 patients managed surgically were followed. This study was conducted with due emphasis for clinical observation and analysis of results after conservative and surgical management of acute clavicular fractures.

Inclusion Criteria

Male and female patients aged 18-60 years with closed displaced clavicular fracture who have given their consent for the procedure. Patients who are medically fit for surgery.

Exclusion Criteria

Open fractures of the clavicle, Undisplaced fractures, Comminuted fractures of clavicle.

Data Collection:

The necessary clinical details of the patient were recorded in the proforma prepared for the study. After the completion of the hospital treatment the patients were sent home and called for follow up at the outpatient level at regular intervals for serial clinical and radiological evaluation.

The 3.5 mm LCP clavicle plate system is indicated for fixation of fractures, malunions, nonunions, and osteotomies of the clavicle. The existing 3.5 mm LCP superior anterior clavicle was designed to fit on the superior end laterally and twist midshaft to fit anteriorly on the medial aspect. Newer 3.5 mm LCP superior clavicle plate designs do not have the twist in the plate. A lateral bow was put in the plate to enhance plate fit. The flat superior design allows more flexibility in placement. K-wire holes were added to the distal end of the plate as a plate holder. Notches in the plate facilitate easier contouring that may be required in some cases. Diverging and cross-hatching screw pattern in the lateral end increase fixation strength. The 3.5 mm LCP are manufactured in left and right versions and are available in lengths of 6-, 7-, and 8-hole plates with or without lateral extension.

Locking Clavicular Plate With Screws.

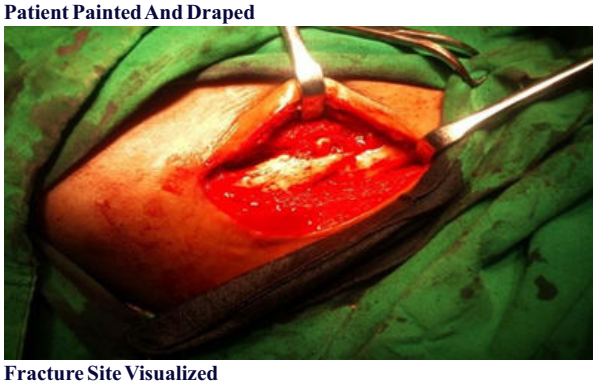
Instruments Essential For Clavicular Plating

Clavicle fractures can be treated in a sling or a figure of eight harness. The figure of eight harness tends to be very awkward to put on and maintain. The brace is adjusted frequently to keep proper tension. It is ensured that the figure of eight harness itself does not lie directly over the fracture as it can actually exacerbate the discomfort rather than alleviate it. The advantage of the figure of eight harness is that it frees up both upper extremities for day-to-day activities.

RESULTS:

Clinical assessment was done based on the Disabilities of the Arm Shoulder and Hand (DASH) score. DASH Score Performa attached as Annexure III.

Patient Painted And Draped



Fracture Site Visualized

Plate Fixed With Screws

RESULTS

The following observations were made from the data collected during the study of 20 cases of mid-third clavicular fractures treated by conservative management and 20 cases of mid-third clavicular fractures treated by open reduction and internal fixation by plating, in the Department of Orthopaedics in Patna medical college and Hospital, Patna Bihar. Study duration on One and Half Years. AGE DISTRIBUTION. Mean age in our study was 38.6 years for the non-operative group, and 33.9 years in operative the group.

Age group (years)	No of cases, conservatively managed	Percentage	No of cases, surgicallym anaged	Percent age
18-30	6	30	7	35
30-40	5	25	5	25
40-50	6	30	7	35
50-60	3	15	1	5
Total	20	100	20	100

In our study, in the conservatively managed group, 5 fractures went into non-union, 4 patients complained of pain during activity, 2 complained of paresthesia which was transient and 5 cases were diagnosed as having CPRS. In the operative group, 2 fractures went on to non-union, 3 complained of pain during activity, 3 had wound infection which subsided with antibiotics, 1 complained of hardware

irritation, 1 patient had early mechanical failure while 2 patients were diagnosed as CPRS. A total of 12 complications were noted in the operative group. No catastrophic complications like pulmonary injury or neuro- vascular injury were encountered.

Functional Results:

Functional results were assessed by the disabilities of the arm shoulder and hand score.

Functional Results.

	Conservatively managed cases	Surgically managed cases
DASH score(mean)	21	11

In our study the two groups (p<0.01). Operative group is found to have a lower DASH score and a better outcom, a mean DASH score of 21 was obtained for non-operative group while a mean score of 11 was obtained for operative group. Independent student „T test was used for statistical analysis. There was a significant difference in the mean DASH scores between e

At Presentation

At 24 Weeks

Fracture Gap Which Eventually Led To Non-union.

DISCUSSION

In our study the mean age in conservatively treated patients was 38.6 years and in the operatively treated patients was 33.9 years. In Allman "s study the mean age was 22 years. Trauma Society study the mean age was 33.5 years.

In our study, there were 15 males and 5 females in the conservatively managed group and 17 males and 3 females in the operative group. 55% of the patients had right sided fracture and 45% had left sided fracture. In our study, 85% of the patients had a direct fall on the shoulder, 10% had a direct blow on the clavicle, and 5% had a fall on the outstretched hand. This pattern confirms to the study on the mechanism of clavicular fractures by Stanley et al. in 1988. Edinburgh classification of clavicular fractures was used in the study. Only type 2B1 and 2B2 fractures were included for the study. In the conservatively managed group, 15 fractures were type 2B1 and 5 fractures were type 2B2. In the operative group, 14 patients were of type 2B1 and 6 patients were type 2B2. Traditionally, clavicular fractures have been considered better treated nonoperatively. Neer in 1960 reported non-union in only three of 2235 patients with middle third fractures treated by closed methods, while Rowe in 1968 reported non-union in four of 566 clavicular fractures. This information formed the basis for the clinical approach to the treatment of clavicular fractures for next several decades. These studies also suggested a higher non-union rate with operative care. Hill et al. in 1997 studied fifty-two displaced midshaft clavicular fractures and reported that eight patients had a non-union and sixteen patients had an unsatisfactory outcome on the basis of patient oriented measures. They concluded that displacement of the fracture fragments by >2 cm was associated with an unsatisfactory result. A meta-analysis by Zlowodzki et al. in 2005 of recent studies revealed that the rate of nonunion for displaced midshaft clavicular fractures was 2.2% after plate fixation compared with 15.1% after nonoperative care, a relative risk reduction for nonunion of 86%. That meta-analysis also showed that primary plate fixation was, contrary to prevailing opinion, a safe and reliable procedure. In our study, there were 5 cases of non-union in the conservative group (25%). In 2 of the cases there was displacement of >2cm. In 2 cases there was fracture comminution. In the surgically managed group, there were 2 cases of non-union (10%). The average rate of union was 25.7 weeks. 5 out of 15 cases treated by conservative methods which went for malunion were symptomatic with 2 patients complaining of shoulder stiffness, 1 patient complaining of pain on activity, 1 case of paresthesia, 2 cases of complex regional pain syndrome. Among the 5 cases of non-union, 3 patients complained of pain on activity and there were 3 cases of CRPS. In the study of sequelae from clavicular fractures by Novak in 2005, he found 86 and 23 out of 219 patients to have pain during activity and paresthesia respectively. He also evaluated various risk factors for development of sequelae in patients with clavicular fractures. comminuted fractures, advanced age and shortening were found to be reliable risk factors for residual symptoms at the end of 6 months. The functional results were graded according to DASH score. The mean DASH score among the non-operative group was 21 and among the operative group was 11. Independent student „T test was used for statistical analysis. There was a significant difference in the mean DASH scores between the two groups (p<0.01). Operative group is found to have a lower DASH score and a better outcome.

CONCLUSION

In our study we compared 20 patients treated by non-operative methods and 20 patients treated operatively for displaced mid shaft fractures of the clavicle, in PMCH, Patna. There was a significantly higher incidence of nonunion among the non operative group than reported in the traditional literature. Also there was a high incidence of sequelae among this group. Malunion too did not equate to good outcome as there were residual symptoms. Functional scores were also significantly poorer among this group.

REFERENCES

1. Khan LA, Bradnock TJ, Scott C, Robinson CM. Fractures of the clavicle. J Bone JointSurg Am. 2009 Feb;91(2):447-60.
2. Robinson CM. Fractures of the clavicle in the adult. Epidemiology and classification. J Bone Joint Surg Br. 1998 May;80(3):476-84.
3. Schiffer G, Faymonville C, Skouras E, Andermahr J, Jubel A : Midclavicular fracture Not just a trivial injury – *current treatment options* .Dtsch Arztebl Int 2010;107(41);711-7.
4. Allman FL Jr. Fractures and ligamentous injuries of the clavicle and its articulation. J BoneJoint Surg Am. 1967 Jun;49(4):774-84.
5. Nordqvist A, Petersson C. The incidence of fractures of the clavicle. ClinOrthopRelat Res. 1994 Mar;(300):127-32.
6. Hill JM, McGuire MH, Crosby LA. Closed treatment of displaced middle-third fractures of the clavicle gives poor results. J Bone Joint Surg Br. 1997 Jul;79(4):537-9.
7. Zlowodzki M, Zelle BA, Cole PA, Jeray K, McKee MD; Evidence-Based Orthopaedic Trauma Working Group. Treatment of acute midshaft clavicle fractures: systematic review of 2144 fractures: on behalf of the Evidence-Based Orthopaedic Trauma Working Group. J Orthop Trauma. 2005 Aug;19(7):504-7.
8. Nowak J, Holgersson M, Larsson S. Can we predict long-term sequelae after fractures of the clavicle based on initial findings? A prospective study with nine to ten years of follow-up. J Shoulder Elbow Surg. 2004;13:479–486.
9. Andersen K, Jensen PO, Lauritzen J. Treatment of clavicularfractures.Figure-of-eight bandage versus a simple sling. Acta Orthop Scand. 1987; 58:71–74.
10. Shen WJ, Liu TJ, Shen YS. Plate fixation of fresh displaced midshaft clavicle fractures. Injury. 1999 Sep;30(7):497-500.
11. McKee MD, Wild LM, Schemitsch EH. Midshaft malunion of the clavicle. J Bone Joint Surg Am. 2003; 85:790-7.
12. McKee MD, Pedersen EM, Jones C, Stephen DJ, Kreder HJ, Schemitsch EH, WildLM, Potter J. Deficits following nonoperative treatment of displaced midshaftclavicular fractures. J Bone Joint Surg Am. 2006; 88:35-40.
13. Canadian Orthopedic Trauma Society. Nonoperative treatment compared with plate fixation of displaced midshaft clavicular fractures. A multicenter randomized clinical trial. *J Bone Joint Surg Am*. Jan 2007; 89(1):1-10.
14. Huang JI, Toogood P, Chen MR, Wilber JH, Cooperman DR. Clavicular anatomy and the applicability of precontoured plates. J Bone Joint Surg Am. 2007; 89:2260-5.
15. N. Modi, A.D. Patel, P. Hallam Norfolk And Norwich University Hospital NHS Foundation Trust,Norwich,UK. Outcome Of 62 Clavicle Fracture Fixations With Locked Compression Plate: Is This The Right Way To Go?*doi:10.1016/j.injury.2011.06.266.*
16. Chul-Hyun Cho, MD, Kwang-Soon Song, MD, Byung-Woo Min, MD, Ki-CheorBae, MD, Kyung-Jae Lee, MD. Reconstruction Plate versus Reconstruction Locking Compression Plate for Clavicle Fractures. Clinics in Orthopedic Surgery 2010: 2: 154- 159.
17. Celestre P, Roberston C, Mahar A, Oka R, Meunier M, Schwartz A. Biomechanical evaluation of clavicle fracture plating techniques: does a locking plate provide improved stability ?J Orthop Trauma. 2008 Apr;22(4):241-7.
18. Kloen P, Werner CM, Stufkens SA, Helfet DL. Anteroinferior plating of midshaft clavicle nonunions and fractures. OperOrthopTraumatol. 2009 Jun;21(2):170-9.
19. Poigenfürst J, Rappold G, Fischer W. Plating of fresh clavicular fractures: results of 122 operations. Injury. 1992;23(4):237-41.