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Functional outcome of lateral clavicular fractures treated with locking plate: A prospective study

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Abstract

Background: Lateral clavicular fracture accounts for has 25% of all clavicle fractures. Non-operative modalities are associated with high incidence of non-union (22%-50%). Union rate of up to 95% can be achieved with surgical management. Treatment with hook plates or K-wires are associated with high complication rates of up to 22%. Recently use of newly available precontoured clavicular locking plate with lateral extension has become popular.

Objectives: To evaluate functional outcome of the patients with lateral clavicle fracture treated lateral locking plate using Constant – Murley Score, DASH Score, UCLA Shoulder Rating Score

Methods: The study was conducted in the Department of Orthopaedics, BPKIHS, a tertiary care hospital in eastern Nepal, over a period of 12 months from August 2020 to July 2021. Patients with closed lateral clavicle fracture between ages 18-45 years were included. Fifty eight cases were included and analyzed for functional outcome using Constant-Murley score, DASH score and UCLA shoulder rating score.

Results: The mean Constant-Murley score at 6 months follow-up was 91.68 ± 2.81 . The mean DASH score at 6 months was 6.42 ± 2.74 . Similarly, the mean UCLA shoulder rating score at 6 months was 31.27 ± 1.81 . The mean time for union was 14.89 weeks. There were 2 cases of superficial surgical site infection.

Conclusion: Use of locking plates with broad lateral extension has shown to result in good functional outcome, high union rate and minimal complication.

Keywords: lateral clavicle, locking plate, outcome

Introduction

Clavicle fracture is one of the most commonly encountered fractures in adults ^[1]. Lateral accounts for around 25% of all clavicle fractures. ² Twenty-five percent of these fractures are unstable due to deforming forces acting on fracture fragments. ³ Non-operative modalities are associated with high incidence of non-union (22%-50%) and a significant number of them are symptomatic ^[4, 5, 6]. Union rate of up to 95% can be achieved with surgical management ^[7]. Many treatment modalities have been used for management of lateral end clavicle fracture including Kirschner wires ^[8], hook plates ^[9-11], coracoclavicular screws ^[12], tension bands ^[8, 13, 14], Bosworth type screw ^[15], lateral locking plates ^[2, 10, 13, 16-20].

Treatment with hook plates or K-wires are associated with high complication rates of up to 22% ^[21]. Recently some authors have reported good functional and radiological outcome with the use of newly available precontoured clavicular locking plate with lateral extension ^[2, 19, 20] However concerns regarding correction of integrity of AC joint still prevail and so does the controversy of better treatment.

Objectives

To evaluate functional outcome of the patients with lateral clavicle fracture treated lateral locking plate using Constant – Murley Score, DASH Score, UCLA Shoulder Rating Score.

Materials and Methods:

The study was conducted in the Department of Orthopaedics, BPKIHS, over a period of 12 months from August 2020 to July 2021.

Patients with closed lateral clavicle fracture between ages 18-45 years were included. Fifty-eight cases were included and analyzed for functional outcome using Constant-Murley score, DASH score and UCLA shoulder rating score.

Intervention

Patient was placed in a beach-chair position. A curved incision was made centering at the fracture site. Subcutaneous tissue and platysma were dissected along the line of incision. Provisional reduction and fixation was done with a trans-acromial K-wire. Final fixation was done with a precontoured locking plate for the clavicle with broad lateral end. Medial side was fixed with 3.5 mm locking and non-locking screws while the lateral side was fixed with multiple 2.7 mm locking screws. K-wire was removed after final fixation. Wound was closed in layers and dressing was done.

Patient was followed up in 2 weeks for suture removal and shoulder ROM was started (0° - 90°). Subsequent follow-up was done at 6-week post-operative period for x-ray to look for union and physiotherapy for over shoulder ROM was initiated. Follow up was done at 6 weekly intervals till radiological sign of union

was seen.

Constant-Murley score, DASH score and UCLA score was evaluated at 3 months and 6 months follow up.



Fig 1: Intraoperative image of fixation of lateral clavicle fracture



Fig 2: Pre-operative x-ray



Fig 3: 6 months follow up x-ray



Fig 4: Pre-operative x-ray



Fig 5: 6 months (AC joint subluxation)



Fig 6: At 6 months follow-up patient has almost full range of motion and is asymptomatic despite AC joint subluxation.

Results

Sixty-four patients who fulfilled the inclusion criteria and gave consent for the study were included in the study. Six were lost to follow-up. So, 58 cases were included in the final analysis. Patients with age ranging from 18 years to 45 years were included in this study with mean age of 32.55. In our study,

55.17% of the total study population were male and 44.83% were female. Left side (53.45%) was found to be more commonly fractured than the right side (46.55%). The mean duration between day of admission and day of surgery was 2.48. All the fractures were operated from between (1 – 6) days following admission with 86.2% being operated within 3 days.

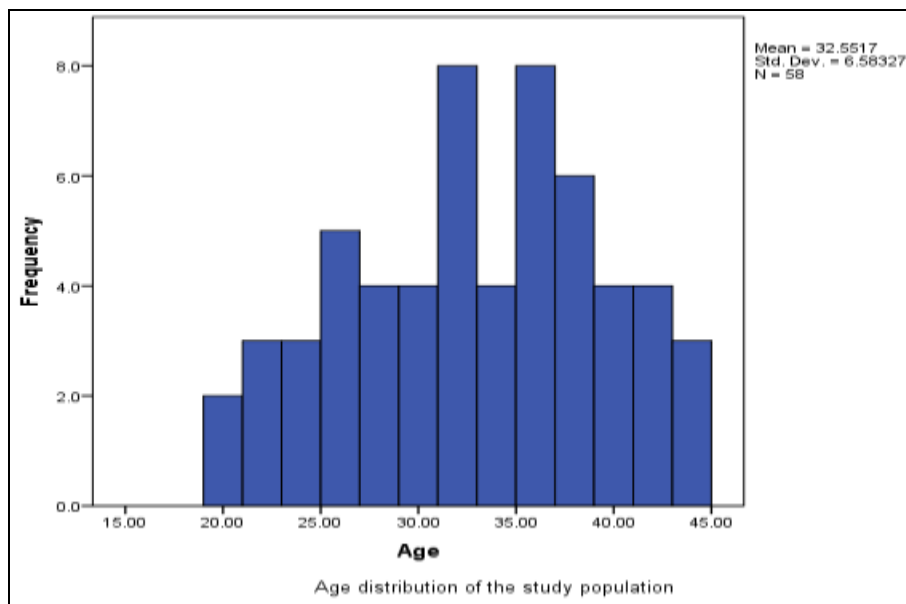


Fig 7: Histogram showing age distribution

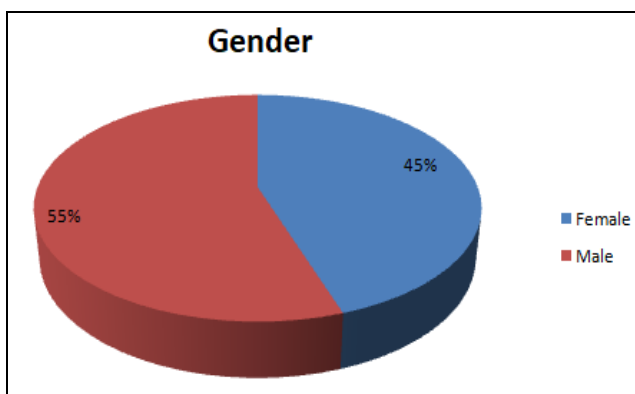


Fig 8: Age distribution

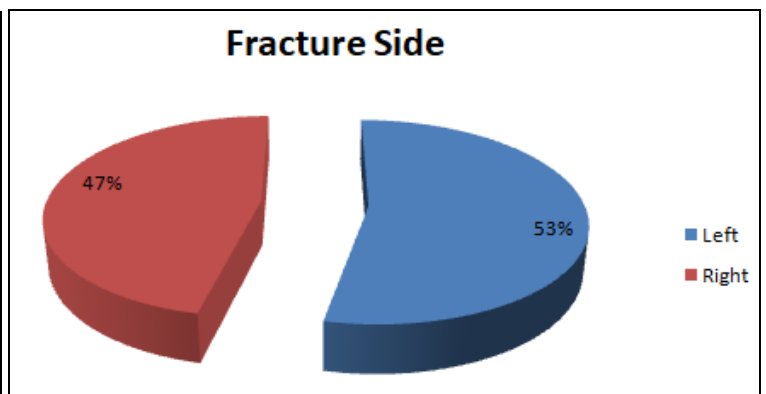


Fig 9: Fracture side distribution

Intra-operative parameters, Union time and Complications

Table 1: Intra-operative parameters, union time and complications

Mean blood loss in ml	76.03±14.97 ml (60-110 ml)
Mean surgical time in minutes	61.55±11.39 minutes (45-78 minutes)
Mean time to union in weeks	14.89±3.02 (12-18 weeks)
Early complication	2 (3.45%) (superficial SSI)
Late complication	3 (5.17%) (2 malunion;1 AC joint subluxation)

Functional Outcomes

Table 2: Functional outcomes at 3 months and 6 months follow-up

Parameters (Mean and Range)	3 months	6 months
Constant-Murley score	88.75±2.83 (82-94)	91.68±2.81 (85-96)
DASH score	10.62±2.78 (6.70-18.30)	6.42±2.74 (2.50-12.50)
UCLA shoulder rating score	29.94±1.78 (26-33)	31.27±1.81 (27-34)

Discussion

The average age of patients in our study was 32.55. In a similar study done by Vaishya R *et al.* [2] the average age of patient was 25.6 years. As per our study, 55.17% of the total study population were male and 44.83% were female. In a similar study done by KC KM *et al.* [20], 63.04% of the total population were male and 36.96% were female. Left side (53.45%) was found to be more commonly fractured, which was similar to the study done by KC KM *et al.* [20] (54.35%).

The mean blood loss during surgery as documented in our study was 76.03±14.97 ml while the mean surgical time was 61.55±11.39 minutes (45-78 minutes). In the study done by Xiong J *et al.* [22] mean blood loss during surgical fixation by anatomical locking plate was 42.00±20.50 ml. Study done by Vaishya R *et al.* [2] reported a mean surgical time of 53 minute (42-67 minutes).

The average union time in our study was 14.89 weeks. In the study done by Tiren D *et al.* [19] union occurred in all fractures by 12 weeks. There were 2 cases of malunion while non-union was not seen in our study. Vaishya R *et al.* [2] reported mean union time of 15.3 weeks with 1 case each of malunion and nonunion.

Two cases of early superficial site infection were seen in our study. Both cases were treated with IV antibiotics and revision surgery was not required. Our study also showed 1 case of postsurgical AC joint subluxation but the patient was asymptomatic.

A similar study done by Anderson JR *et al.* [17] reported complication in 2 out of 20 patients treated with lateral locking plate. One of them had a fracture medial to the plate while the other had a deep infection that required debridement and hardware removal. As per our study the mean Constant-Murley score at 3 months follow-up was 88.75 and at 6 months follow-up was 91.68.

The study done by Vaishya *et al.* [2] reported Constant-Murley score at 2 months and 6 months as 85 and 92 respectively. Similarly a study done by Lee SK *et al.* [23] showed no significant difference in Constant-Murley score between injured side and normal side at final follow up (P=0.13)

In our study the DASH score at 3 months and 6 months follow up was 10.62±2.78 and 6.42±2.74 respectively. This is similar to a study done by Vaishya *et al.* [2] in which DASH score at 2 months and 6 months follow up was found to be 11.63 and 4.6 respectively. UCLA shoulder rating score in our study at 3 months and 6 months follow up was 29.94±1.78 and 31.27±1.81 respectively. A similar study done by KC KM *et al.* [20] reported UCLA shoulder rating score at 6 months as 30.29±2.08.

Conclusion

Use of locking plates with broad lateral extension has shown to result in good functional outcome, high union rate and minimal complication. These implants provide more stable fixation than k-wires and also avoid subacromial impingement as seen with hook plate construct.

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