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INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/15049

DOI URL: <http://dx.doi.org/10.21474/IJAR01/15049>



RESEARCH ARTICLE

FUNCTIONAL AND RADIOLOGICAL OUTCOMES OF DISPLACED MID SHAFT CLAVICLE FRACTURES MANAGED OPERATIVELY BY PRECONTOURED LOCKING PLATE

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Manuscript Info

Manuscript History

Received: 15 May 2022

Final Accepted: 18 June 2022

Published: July 2022

Key words:-

Clavicle Fracture, Plating, Constant Score

Abstract

Background: Clavicle fracture is commonly managed conservatively but non cosmetic appearance and non union in few cases has led to increase in number of cases being managed operatively. In this study , we studied the functional and radiological outcome of clavicle fracture managed by plating.

Material and Methods: A prospective study was conducted in GMC jammu on 30 patients from March 2020 to March 2021 . Patients were operated with precontoured 3.5mm compression plate over superior aspect of clavicle and patients were followed up at 2, 4, 6, 12 and 24 weeks post operatively.

Results: In our study , mean time for union was 14.7 weeks with no patient reporting non union .Range of motion at shoulder joint was near normal and patients reported high VAS scores.

Conclusion: Open reduction and internal fixation with precontoured compression plate for mid shaft clavicle fracture gives good functional and radiological outcomes with high patient satisfaction rates and without any major complications.

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Introduction:-

Clavicle fracture is a very commonly encountered injury. It accounts for about 2.6 to 4% of all fractures. It has an incidence of 29 to 64 cases per 100000. About 35% of all fractures of shoulder girdle are clavicle fractures. Most of the clavicle fractures occur at the mid shaft (80 to 85%) which is the thinnest part of bone and doesn't have much soft tissue attachments. Next most common site is lateral 1/3rd of shaft (15 to 20 %) and most uncommon site is medial 1/3rd of shaft (0 to 5 %).¹ Traditionally, clavicle fracture have been treated non operatively with a sling or bandage of eight but in past few decades with improvement in implant design and instrumentation, operative treatment has increased.² Over the decades many randomized controlled trials comparing operative to non operative treatment in midshaft clavicle fractures were done and non operative methods were found to be associated with more cases of non union.^{3,4} Drawbacks of conservative methods include visible/palpable deformity in addition to non union in some cases.⁵ Drawbacks of operative treatment include hardware-related issues in addition to surgical site infection possibility and scar complications.⁶ Various methods of fixation like k-wire fixation, intramedullary nailing and plating have been used for management of midshaft clavicle fracture.⁷ Fixation with pre contoured locking plate is considered superior to all above methods as it provides rigid stability and immediate post operative range of

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motion.^{8,9,10} Present study was conducted to evaluate the functional and radiological outcome of clavicle fractures managed with locking plate and compare our results with other studies.

Material And Methods:-

A prospective observational type of study was conducted in Government Medical College , Jammu including patients with midshaft clavicle fracture managed operatively during the period of March 2020 to March 2021. Patients with midshaft clavicle fractures were enrolled in the study after fulfilment of the inclusion and exclusion criteria and taking proper consent, after approval by Institutional Ethical Committee.

Inclusion criteria:

1. Adults from 20 to 60 years of age.
2. Patients willing to participate in the study.
3. Visible bump at fracture site or tenting of skin.
4. Fracture gap more than 2cm.
5. Closed or Compound fracture GA(gustillo anderson) type 1.

Exclusion criteria:

1. Compound fractures associated with soft tissue injury except GA type 1.
2. Fractures involving medial and lateral ends of clavicle.
3. Head injury patients and unconscious patients.
4. Patients with floating shoulder.

A total of 34 patients were included in the study, 3 were lost to follow up. Remaining 31 patients were followed up and their data was analysed in detail. Detailed history regarding mechanism of injury and clinical assessment was done. Anteroposterior radiographic view(Figure 1A) of the affected shoulder was used to diagnose and assess the fracture pattern which was then classified according to Robinson's classification.¹¹ Patients were operated under general anaesthesia using anterior approach. Fracture was fixed using pre contoured locking clavicle plate with plate on antero inferior surface and in some cases on superior surface. Post operative radiograph(Figure 1B) was done next day and passive range of motion exercises were started from 2nd post operative day. Functional evaluation was done using Constant Murley shoulder score¹². Radiographs were done at monthly intervals till union. Final data was subjected to statistical analysis by calculating the mean and percentages and comparing them with other studies.

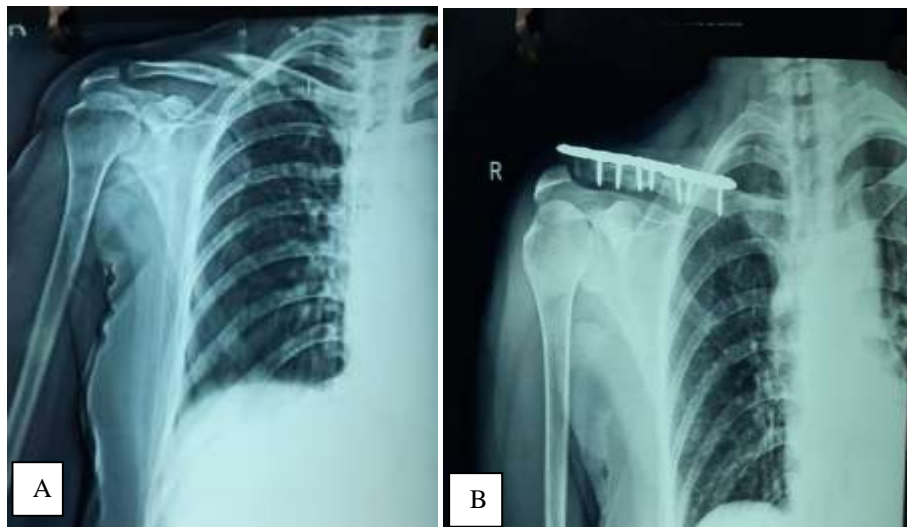
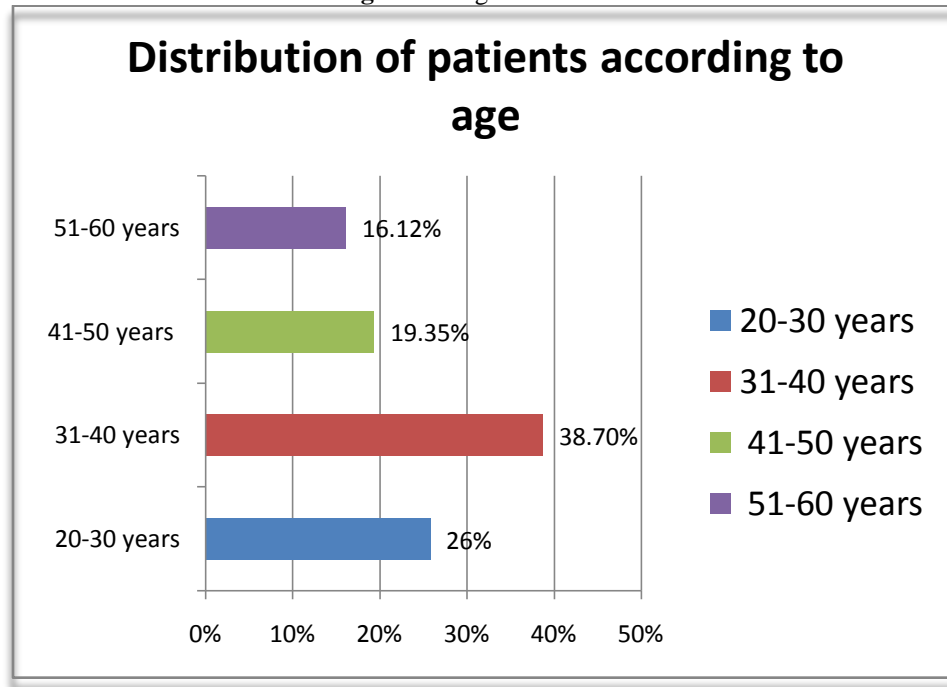


Figure 1:- Pre (A) and post operative xray (B) of clavicle fracture patient managed with plating.

Results:-

In the present study of 31 patients, mean age of patients was 36 years. Figure 2 shows the age distribution of patient included in the study. Rest of the data has been tabulated in table 1.

Figure 2:- Age distribution.**Table 1:-** Results of the study.

Parameter studied	No. of patients	Percentage
Mode of Injury		
RTA	22	70.96%
Fall	08	25.80%
Assault	01	3.22%
Gender		
Male	18	58.06%
Female	13	41.93%
Robinson classification		
2B1	18	58.06%
2B2	13	41.93%
Affected Side		
Right	17	54.83%
Left	14	45.16%
Bilateral	00	0%
Associated injury		
Rib fracture	02	6.45%
Metacarpal fracture	01	3.22%
Distal end radius fracture	02	6.45%
Complications		
Hardware symptoms	04	12.90%
Superficial infection	02	6.45%
Paresthesia	01	3.22%
Hypertrophic scar	01	3.22%

Out of 31 patients operated, 4(12.90%) complaint of hardware symptoms, 2 patients(6.45%) had superficial infection which resolved upon taking culture specific antibiotics. 1 patient(3.22%) had hypertrophic scar and 1 patient(3.22%) complaint of paresthesias which resolved spontaneously in 5-6 weeks.

Mean surgical time was 64 minutes. Mean time of hospital stay was 3-5 days . Mean time for radiological union was 14.7 weeks. Mean constant score was 92.25 and the mean range of motion achieved at shoulder joint was comparable to the unaffected side as shown in the table below .

Table 2:- Range of motion of affected side.

Range of motion	Affected side	Normal side
Mean abduction	173.4 degree	177.6 degree
Mean Internal rotation	67.1 degree	68.9 degree
Mean External rotation	84.2 degree	86.4 degree
Mean flexion / extension	174.6 degree	176.4 degree

Table 3:- Constant Murley shoulder score.

Constant Murley Score(at 6 months)		
Excellent	25	80.64%
Good	06	19.35%
Fair	00	0%
Poor	00	0%

Discussion:-

In this study, males were more commonly affected than females this may be due to the fact that the most common cause was RTA . Right side was affected slightly more than left side . Mean age in our study was 36 years while it was 31 years and 32.90 years in studies of Mohsen khrami *et al*¹³ and Aruljothi Vaithilingam *et al*¹⁴ respectively. Average union time was 14.7 weeks in our study . In Mohsen khrami *et al* study the average union time was 19.3 weeks for operative group whereas in Aruljothi Vaithilingam *et al*¹⁴ study the average union time was 15.73 weeks in operative group . The range of motion achieved is comparable with the unaffected side.

Table 4:- Comparison with different studies.

	Present study	M.khrami <i>et al</i> [2014] ¹³	Aruljothi Vaithilingam <i>et al</i> [2015] ¹⁴	H. Shashidhara <i>et al</i> [2017] ¹⁵	Bhise <i>et al</i> [2018] ¹⁶	AP Kumaret al[2017] ¹⁷
Most common mode of injury	RTA (70%)	RTA (70%)	RTA (65%).	RTA (90%)	-	RTA (85%)
Mean age of the patient	36 years	31 years.	32.90 years.	32.1 years.	-	35 years
Average union time	14.7 weeks	19.3 weeks	15.73 weeks	12 weeks	39.4 days	15.1 weeks
Mean constant score	92.25			87.5	95.35 ± 6.26	
Non-union	0	2 patients (5.7%)		0	1 case (<2%)	1 case (5%)

4 patients complaint of hardware prominence, out which 3 had plates positioned on superior surface. To decrease hardware problems, there are studies which advocate positioning hardware along the anterior surface of clavicle as opposed to superior surface of clavicle.¹⁸ In the present study, 80.64% patients had excellent constant scores while remaining 19.36% had good constant score. In study by Ghosh A *et al*¹⁹, Constant score was excellent in 26 patients good in 2 patients and fair in 2 patients.

Limitation of study include lack of control group and short duration of study

Conclusion:-

Open reduction and internal fixation of mid shaft clavicle fracture gives excellent functional and radiological results and reduces the chances of non union. Pre contoured plates provide stable fixation and hence early range of motion can be started. Although some cases of hardware symptoms were seen, most of patients were pain free and achieved good range of motion at the end of study.

Funding:

No funding sources

Conflict of interest:

None declared

Ethical approval:

The study was approved by the institutional ethics committee

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