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A PROSPECTIVE STUDY OF SURGICAL MANAGEMENT OF DISPLACED MIDDLE THIRD CLAVICAL FRACTURE BY PLATE OSTEOSYNTHESIS

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ABSTRACT: BACKGROUND: Clavicle fractures are usually known for its conservative treatment, but for displaced middle third comminuted fractures (Robinson type 2B) plate osteosynthesis is a promising option. **AIM:** To evaluate the functional outcome of middle third clavicular fracture (2B1, and B2 Robinson classification) in 30 patients managed with Open reduction and internal fixation with plate and screw. **METHODS AND MATERIAL:** We performed a prospective study between Jan 2009 to May 2012 of 30 acute displaced comminuted middle third clavicle fractures in adults which were treated with plate osteosynthesis. There were 22 males, 8 females, the mean age of the patient was 35.6 years and 10 patients had associated injuries and average follow up was 18 month, minimum of 6 months. **RESULTS:** Union was achieved in 12-16 weeks. Post operatively 2 patients had superficial infection, 3 patients had scar hypertrophy, 3 Patients had hard ware prominence, no patients had hardware failure and none of the patients had deep infection. The average constant score was 96 and patients were relatively satisfied with the treatment. **CONCLUSION:** Plate Osteosynthesis for displaced middle third shaft fracture in adults gives excellent results.

KEYWORDS: Non-union, Plate Osteosynthesis, Collar bone.

INTRODUCTION: Clavicle is unique horizontally placed^[1,2] bone that acts as a structure between the sternum and the glenohumeral joint. Clavicle fractures account for about 40% of injuries around the shoulder girdle, of which 80% in the middle third region^[3,4,5] In fractures of the middle one third the proximal fragment is displaced upwards due to pull of sternocleidomastoid muscle, distal fragment is displaced inferiorly by the pull of pectoralis muscle and weight of the arm.

In earlier studies the incident of non-union in case of clavicle fracture was (0.1- 0.8%)^[6] and functional recovery was good but recent evidences and studies have shown displaced fracture with complete loss of bony contact or shortening more than 2cms were associated with increased risk of nonunion and decreased in shoulder joint function and increased risk in persistent pain.

Recent literature suggesting that primary operative treatment of displaced clavicle fracture conferred functional benefit when compared with result of initial non operative treatment.^[7,8]

Various methods have been described for operative fixation of clavicular shaft fracture, implants using plate and screw, intra medullary pins, external fixation Knowles's pins, Haige pins,

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Rockwood pins and titanium nails, but the plate fixation has advantage of rigid fixation, cortical compression and rotational control.

MATERIAL AND METHODS: A prospective study was carried out from March 2013 to July 2015, CAIMS. In this study of 30 cases of acute middle third displaced fracture shaft of clavicle treated with open reduction with internal fixation with precontoured LCP clavicle plate and screws.

Inclusion Criteria:

1. Age >18.
2. Mid – shaft fracture of clavicle with displacement without bony contact and shortening of >2cms.
3. Radiological Robinson^[9] classification 2B1, 2B2.

Exclusion Criteria: Patient not willing for surgery, open fracture, medically unfit patients and other clavicle fracture like, Pathological Fracture, Fracture >3 weeks of duration.

The average follow up was 18 months, minimum of 6 months. Results were analyzed in terms of union, and functional outcome using shoulder constant score return to previous activities and complications.

AIM: The aim of this study was to evaluate the functional and radiological outcome of middle third clavicular fracture (2B1, and B2 Robinson classification) in 30 patients managed with the open reduction and internal fixation with plate and screws.

Surgical Techniques: All operations were performed under general anaesthesia. All patients were put in supine position with a bolster in interscapular space and incision was take on the superior border of the clavicle, minimal periosteal stripping was done, supraclavicular nerve was protected, fracture ends reduced and fixed with 3.5mm precontoured LCP with minimum 6cortical purchases on either side, the plate placed on superior surface. Interfragmentary screw is placed whenever necessary for compression.

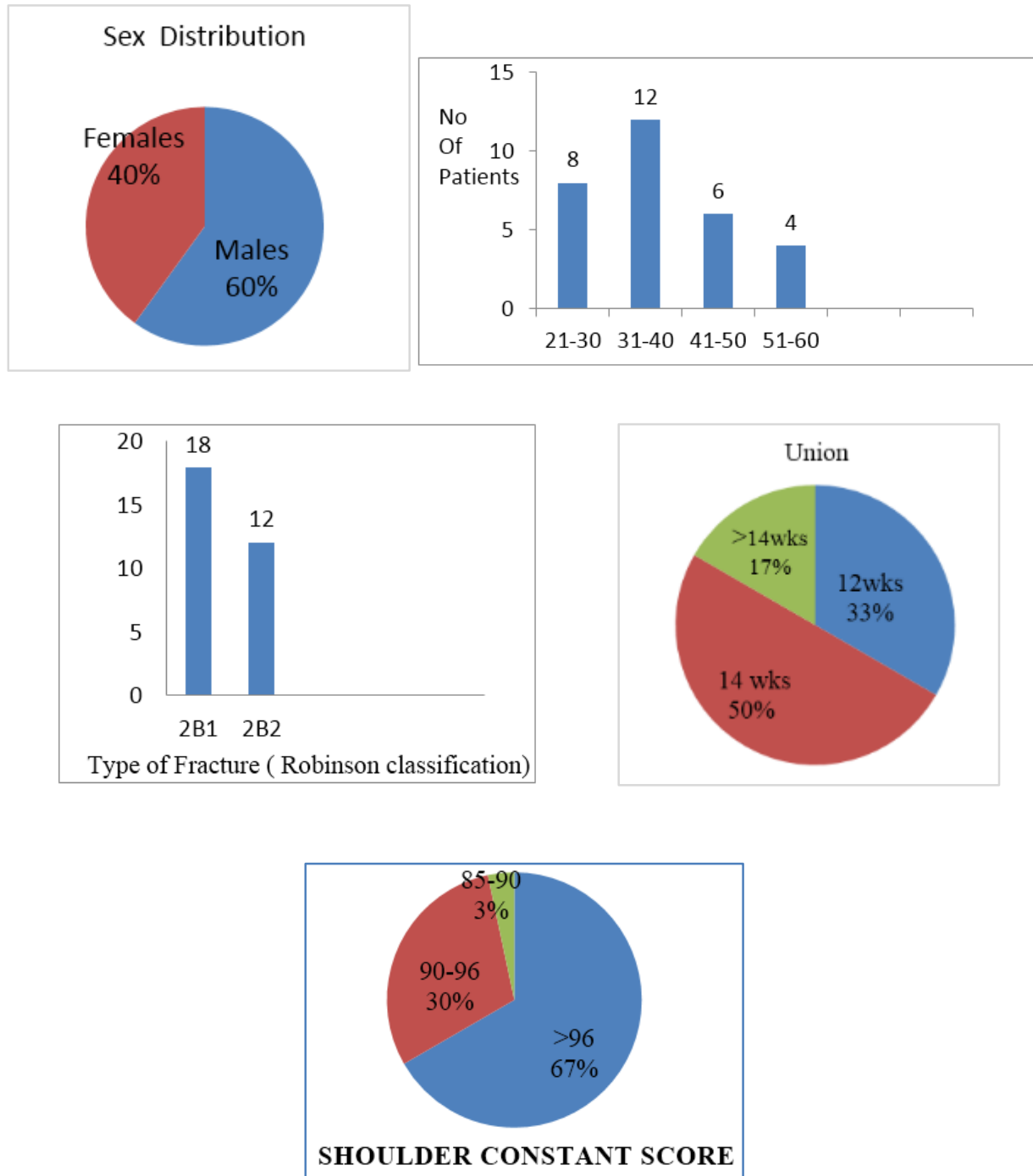
Post-Op Protocol: Wound was inspected at 2nd and 5th day sutures removed at 10th day. Physiotherapy has started 2nd post-operative day. Follow- up was done 3, 6, 12, 24 weeks and required until there was clinical and radiological union. Functional outcome was assessed after fracture union.

RESULTS: There were 30 patients, 22 males & 8 females. The mean age of the patient was 35.6 years, 20fractures occurred on the right side and 10 on the left side. Mechanism of injury was RTA in 25, and 5 due to fall. According to Robinson classification^[9] 2B1 type was 18 cases 2B2 type were 12 cases. None of the patient had associated neurovascular deficits. 10 patients had associated injuries among them, 5 had tibia fracture, 1 had proximal humerus fracture, 2 had fracture both bone forearm fracture, 2 had rib fracture.

In follow up 15 patient had union at 10 weeks and 11 patient had 12 weeks and 4 patients had >14 weeks, 2 patients had superficial infection, 4 patients had hardware

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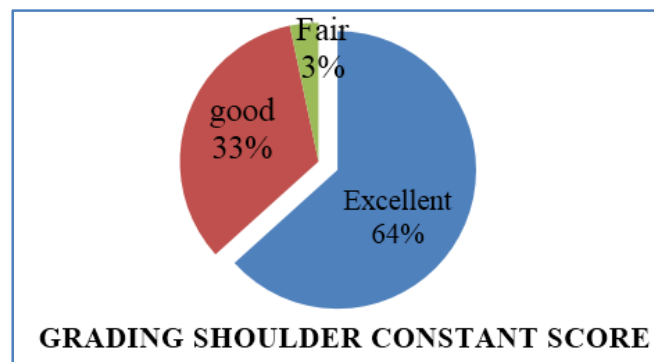
prominence, no patient had nonunion, implant failure. Constant shoulder score ranged 90–98 with mean average 96% and it was excellently 19 patients and 10 had good result, 1 patient had fair result. 2 patient had scar hypertrophy. All the patient were resumed to prior professional and athletic activity and satisfied with the result. 1 patient had frozen shoulder needed little more time.



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Complications	No. Patients	Percentage
Surgical site superficial infection	2	6.0%
Surgical site deep infection	0	0%
Hypertrophic scar	2	6%
Hardware prominence	4	12%
Implant failure	0	0%
Malunion	0	0%
Non union	0	0%

Complications in the Study Group



DISCUSSION: Fractures of clavicle are common accounting for 2.6% of all fractures, more than 75% of fractures are located in the mid shaft.^[3,4,5] These fractures traditionally treated conservatively even though substantially displaced, but in recent studies suggest surgical intervention is increasingly considered to be an acceptable line of treatment^[10,11] but there is no definitive indications for operative fixation is established.

Hill et al noted unsatisfactory patient oriented outcomes which was around 31% when treated conservatively for displaced mid shaft clavicle fractures. In a multicentered randomized controlled study by COTS^[12] has shown good functional outcome and low rate of complications when treated operatively for displaced mid shaft clavicle fractures compared with conservative management.

In our study the mean age of operatively treated patients is 36.5, in Canadian orthopaedic trauma society^[12] (COTS) the mean age was 33.5 years, 22 patients are males and 8 patients are females and mechanism of injury in 25 patients are due to road traffic accidents and in 5 patients fracture was due to fall. According to Robinsons classification 18 cases fall in to 2B type 1 and 12 cases fall in to 2B type 2.

In our study all the patients had union, union rate was 100% with mean time for union was 10 to 14 weeks. In study by Jeffery et al and Chowdary^[13] et al (3) showed mean union rate was 100% when fixed with plate osteosynthesis. In our study 2 patients had superficial surgical site infection which was treated by regular dressings and antibiotics, Hypertrophic scar was present in 2 patients and hardware prominence was present in 4 patients (12%) and the Average Constant Score was 96, constant score was excellent in 19 patients and 10 patients had good results and 1 patient had fair results.

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In a study by Mohammed^[14] et al and Ranalletta^[15] average constant score was 95.33 when plate fixation was done and the mean constant score ranged from 90 to 96 and majority of patients returned to prior occupational and athletic activity.

The most important prognostic factors for reoperation following mid shaft clavicle fractures are non-union, infection and hardware prominence/implant removal, among above implant removal is the most important prognostic factor. It ranges from 18 to 27% among various studies^[16,17] In our study implant removal was done in 3 patients due to hardware prominence, this hardware prominence can be reduced by precontoured plates.^[18]

In summary we believe that open reduction and internal fixation of fracture of mid shaft clavicle gives excellent results in terms of functional outcome and low complication rates and patient satisfaction. However we have limitation of our study, the sample size of this series was relatively small and preoperative base line measurements such as range of motion and strength assessment were not available to post procedure comparison.

CONCLUSION: It is traditional to manage middle third clavicular fracture conservatively, but plate osteosynthesis gives excellent functional outcome in terms of early mobilization, satisfactory union, complete range motion and early return to daily activity

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