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Anterior Plating of Displaced Middle Third Fractures of Clavicle --------An Effective Alternate Method---------

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Abstract
Background: *Various techniques namely Krishner wire fixation, Knowles pin fixation, Elastic intra-medullary nailing and intra-medullary fixation has been described for the treatment of grossly displaced fractures of mid one third Clavicle. Various types of open reduction and internal fixations with reconstruction plates and anatomical ' S ' shaped plates and were popularly done for the same indication. While there is agreement that grossly displaced fractures and comminuted fractures should be internally fixed, selecting the best form of fixation is debatable. Commonly done plating is at the superior surface. It is associated with neuro-vascular injury and striping of muscles which may lead on to non-union. In this study we did plating on anterior-inferior surface and studied our results.*
Materials and Methods: *We retrospectively reviewed 52 patients of mid one third fractures of clavicle, who underwent anterior plating at our hospital Sri Venkataewaraa medical College and research centre, Ariyur, PONDICHERRY, between June 2009 to June 2012. We analysed the results and evaluated using the UCLA shoulder rating scale and QUICK DASH (Disabilities of Arm, Shoulder and Hand) score.*
Results: *At the time of latest follow-up all the fractures united well radiologically and all the patients returned to pre-injury activity level. The average UCLA SCORE was 29 (Range 25 to 32) suggesting good to excellent outcome. The QUICK DASH score was 6.8 (Range 4.5 to 13.6). All the patients were satisfied with outcome of surgery.*
Conclusion: *Our study shows that Anterior plating of mid 1/3rd Clavicle provides stable fixation, early return of function without neuro-vascular complications.*
Key Words: *Fracture clavicle, Anterior plating 3.5 mm Dynamic Compression plate, pendulum exercises.*

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I. Introduction

Treatment of fracture mid 1/3rd clavicle differs widely from conservative means to ORIF with plating and intra-meduallay nailing. Now it is widely accepted that any mid 1/3rd fractures which are displaced more than 2.0 cm or comminuted has to be internally fix Superior aspect of clavicle is the load bearing side, but superior plate prominence can cause discomfort. Many studies showed relatively high complications rates with loss of fixation, persistent non-union, implant related problems etc.., requiring subsequent surgeries. Whereas few studies revealed anterior-inferior plating of mid 1/3rd fractures had fewer complications. The purpose of the study is to evaluate the clinical results of patients with mid 1/3rd fracture clavicle treated with anterior-inferior plating using 3 – 5 mm plate.

They were evaluated using UCLA score and QUICK DASH score.

II. Materials And Methods

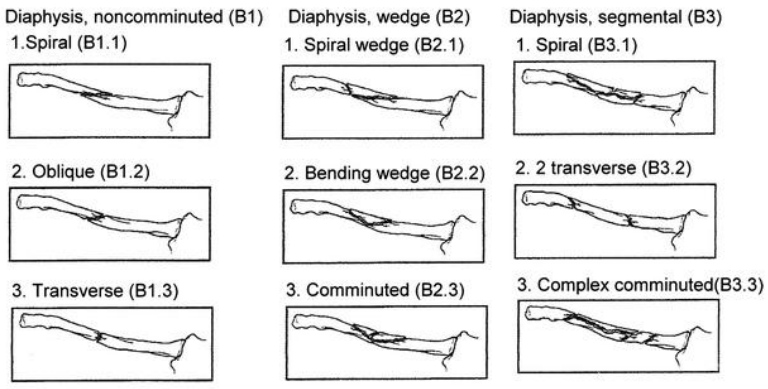
We retrospectively reviewed 52 patients of middle one third fracture clavicle who were treated with anterior plating in our hospital between June 2009 to June 2012. They were followed for a minimum of two years post operatively and the results were analysed.

Only mid 1/3rd fracture clavicle were taken for surgery. Complete displacement, or comminution or shortening of more than 2 cms are the criteria for inclusion in the study.

Open fractures, ipsilateral fractures of Humerus or Scapula and Paediatric fractures were excluded from the study. Of the 52 patients, there was no bilateral fractures. 40 were males and 12 were females.

The cause of injury was predominantly road traffic accidents. 40 patients were from RTA and 12 patients had fracture due to fall. Right clavicle was involved in 30 patients and Left in 22 patients The mean age group was 35 years (Range 25 – 63 yrs). Pre-operative X-rays were used to classify the fracture. The A.O, O.T.A. Classification was used. There were 10 patients of B1, 18 of B2 and 4 patients of B3 Classification.

A.O. (O.T.A.) CLASSIFICATION



The AO classification for diaphyseal fracture of the clavicle

Each patient was taken up for surgery at the earliest, mostly in the same day.

Operative procedure

Under G.A with patient supine, with affected shoulder elevated with folded towel, an incision parallel to the inferior border of clavicle made. Fracture reduced and held with clamps. For spiral fracture circlage wiring with 0.8 mm S.S. wire was done very carefully, taking care of vital structures posteriorly and then the plating done. Whenever possible lag screwing was done. Minimum of six cortices purchase obtained in both proximal and distal fragments. An Asian DCP plate contoured to the shape of anterior clavicle surface was used in all the patients. No patients received any bone grafts. Wound was closed in layers without any drain.

Post-operative Rehabilitation

Post operatively arm sling used. Elbow and Wrist mobilisation started from day one. Pendulum shoulder exercises started once the pain had subsided. Active overhead abduction of shoulder allowed after 4 weeks. Resisted exercises started after 6 weeks.

III. Results

All the 52 fractures were followed for a minimum of two years.

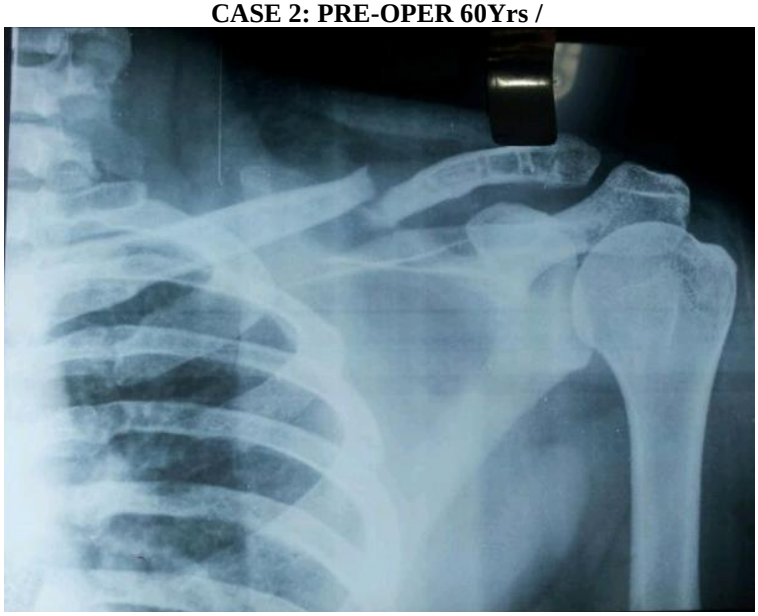
No patient was lost to follow-up. All the fractures united well as demonstrated clinically and radiologically (Range 8 to 16 weeks). At the time of last follow-up, all the patients returned to pre injury activity level.

There were one case of skin break down, 2 cases of superficial wound infection and 2 cases of hematoma. The superficial wound infection resolved with antibiotics. No patients required implant removal for any cause, pain, prominence, deformity or cosmetic causes.

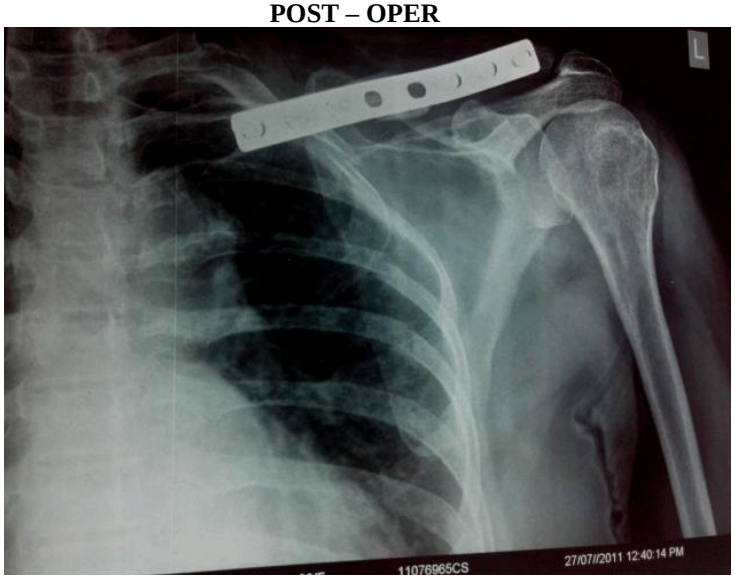
CASE 1. PRE-OPER

CASE 1: 6 MONTHS POST OPERCASE 2: PRE-OPER 60Yrs /

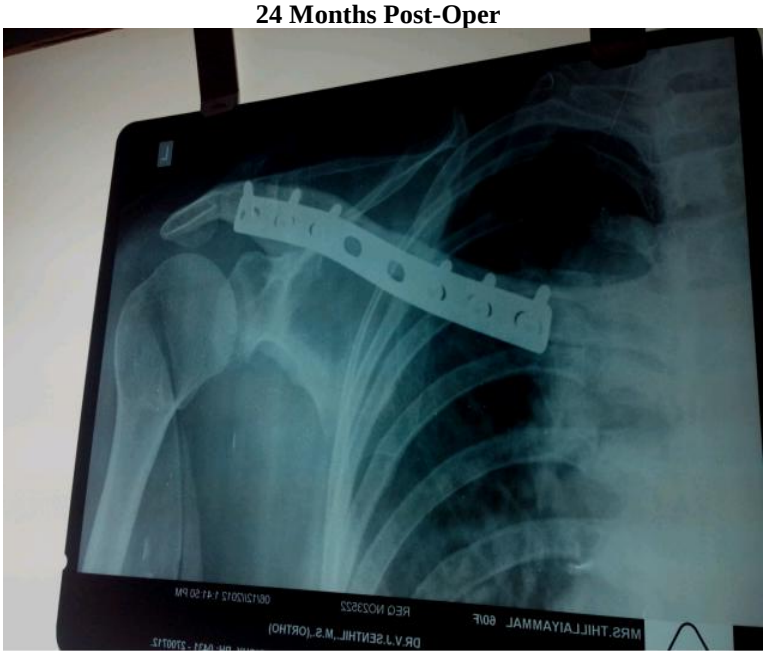
CASE 2: PRE-OPER 60Yrs /



POST – OPER



24 Months Post-Oper



IV. Discussion

The optimum treatment for Acute displaced and comminuted fractures of mid one third clavicle remains controversial. The Canadian Orthopaedic Trauma Society[1] compared the results of conservatively treated and operatively – with plate and screws – fractures of mid one third clavicle. The results showed that the operative group fared better in union time and rate with better functional outcome.

Despite many such studies favouring treatment of displaced fracture mid 1/3rd clavicle, the optimal position plating is still debated.

Jupiter and Leffert[9] suggested that superior plating was bio-mechanically better than inferior plating, because the superior surface of clavicle is the load bearing side. But the downward pulling force of the weight of the arm challenges the holding power of the screws especially in the lateral fragment in osteopenic bones. Celestre et al[3], after bio-mechanical evaluation reported that superior plating was better than anterior-inferior plating in mid 1/3rd fracture, when one considers load to failure ratio and bending failures stiffness.

But if one considers axial compression stiffness anterior-inferior plating fared better. But it was not statistically significant.

Iannote et al[8] used models to test and found that plates placed superiorly showed greater bio-mechanical stability than those anterior-inferiorly placed plates.

Hamroongroj and Vanadurongwan[6] also used osteotomies models of clavicle to produce unstable fractures mid 1/3rd. They found anterior plating was significantly stronger than superior plating, but also that anterior plating failed before superior plating in a simple transverse fracture. Thus the optimal position for plate fixation of mid 1/3 rd clavicle depends on fracture pattern.

Majority of patients in our study had unstable fractures.

Shen et al[15] reported that 171 of the 232 reconstruction plates applied superiorly had to be removed. Apart from second surgery and its associated risks, there is a possibility of refracture. Anterior-inferior plating avoids these disadvantages. None of our patients needed implant removal.Collige et al[5] used anterior-inferior plating including non unions in 42 patients. They reported 93% success rate in acute fractures.Chin Fn Cheu et[4] al did anterior-inferior plating in 25 patients of Acute mid 1.3rd fracture clavicle with 100% union rate.We did not compare anterior inferior plating with superior plating in mid 1/3rd fracture. Our aim was to test the efficacy of anterior plating in all types of fractures of mid 1/3rd clavicle. We had excellent results – 100 % Union rate – in all types of fractures including transverse fractures.

Our sample size is moderate in size neither small nor large. But we had long follow-up. The technique is also not difficult.

V. Conclusion

The results of this study shows in unstable displaced or comminuted fractures of mid one third of clavicle, anterior-inferior plating provides stable fixation avoids injury to vital structures, has very good patient satisfaction. Therefore, we recommend anterior-inferior plating for displaced and comminuted fractures of mid one third clavicle.

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