



Mid Clavicle fracture treated by plate osteosynthesis: our experience

KEYWORDS

clavicle fracture, osteosynthesis

Subal Debnath

Assistant professor, Tripura Medical college, Hapania, Tripura

Sachlang Debbarma

Assistant professor, Tripura Medical college, Hapania, Tripura

Santosh Reang

Assistant professor, AGMC Agartala, Tripura

ABSTRACT Objective: To study the outcome of mid clavicle fracture treated with plate osteosynthesis.

Material and methods: A prospective study was carried out in the department of orthopedics Tripura Medical college Agartala Tripura for a period of two years from January 2014 to march 2016 with thirty (30) consecutive cases of fractures of the mid clavicle, aged 15-65 yrs, irrespective of sex were subjected to plate osteosynthesis after obtaining written and informed consent.

Result: Road traffic accidents (RTA) accounted for 60 % (18) fractures and fall accounted for 40 % (12) fractures. 40% of patients had consented for plate osteosynthesis for want of early mobility or for early return to work and 26 % for early relieve of pain. The mean time to sound clinical union was 8.13 ± 1.65 weeks (range, 6 -12 weeks) in all cases. Radiologically cortical bridging was seen at 10th post-operative weeks. The Mean time to complete cortical bridging or radiological union was 17.90 ± 2.57 weeks (range, 14-24 weeks).

Based on the assessment criteria (Constant Shoulder Score) for the present study, the final outcome for all cases was Excellent in 17 (56.67%) patients. Good in 9 (30.00%) patients and Fair in 4 (13.33%) patient

Conclusion: Historically, the preferred method of treatment of mid clavicle fractures has been conservative. Current recommendation for treatment of displaced mid shaft clavicle fractures is operative fixation. Current treatment is Controversial but conventional plating is often proposed as the gold standard. Hence the choice for operative intervention for a displaced mid clavicle fracture will be a decision made between the surgeon and the patient.

Introduction

Clavicle is the S shaped collar bone, which is subcutaneous and thus easily accessible to inspection and palpation. Clavicle fractures are very common representing about 4% to 5% of all fractures in adults and most prevalent in the young and physically active. Clavicle fracture is seen in the middle third of the bone and is estimated to be about 70% to 75%^{1,2} and distal third to be 12-15%, and medial third to be about 5-6%. In adults this fracture is increasing due to high velocity injuries, direct blow to the shoulder and fall on outstretched hand.

Historically, the preferred method of treatment of mid shaft clavicle fractures has been conservative. The traditional literature regarding conservative treatment of clavicle fractures has shown good results^{3,4,5} the incidence of non-union of the clavicle following mid shaft fracture has traditionally been described as 1% or less based on two landmark studies in the 1960. Hence been the reason to avoid primary operative intervention. Recent studies on completely displaced, mid-shaft fractures of the clavicle reveal non-union rates between 15% and 20%.

Issues pertaining to clavicle fractures have been more dependent on functional outcome and patient self-assessment. Studies reported 15% incidence of nonunion and a 31% patient dissatisfaction rate with selected displaced middle-third clavicle fractures treated conservatively⁶. Hence, current recommendation for treatment of displaced mid shaft clavicle fractures is operative fixation^{7, 8, 9}.

Current treatment is Controversial but conventional plating is often proposed as the gold standard other alternative approach are like titanium lock plate, intramedullary nails, threaded pins and external fixators.

Material and methods

A prospective study was carried out in the department of orthopedics Tripura Medical College Agartala Tripura from January 2014 to march 2016. Thirty (30) consecutive cases of mid clavicle fractures, aged 15-65 yrs., irrespective of sex, fitting the inclusion criteria were subjected to plate osteosynthesis after obtaining informed and written consent

Inclusion criteria mid clavicle fracture, age between 15 and 65, open fractures, impending skin disruption and irreducible fracture and neuro-vascular compromise. Exclusion criteria were pathological fracture, poly trauma, mental and physical inability to co-operate, presence of other complicating medical conditions and un-displaced fracture.

Patients were initially assessed in the emergency and OPD of the hospital and were given first aid in the form of analgesia, shoulder arm pouch immobilization, and other resuscitation measures. All the routine investigations like complete blood count & biochemistry were done. Radiographic evaluation by X-ray of the chest, shoulder PA view and axial view was done in every patient. Informed and written consent was taken from the patients

S-shaped clavicle LCP (3.5mm) and Reconstruction plate (3.5mm) were used for fixation of the mid clavicle fractures.

Operative procedure

After general anesthesia the patient were placed in supine position. A bolster was placed in the midline to help facilitate fracture reduction. The shoulder girdle and clavicle region of the upper chest prepared and draped in standard fashion^{10, 11}.

Incision was made centering over the fracture site, an oblique incision was made along the superior surface of the clavicle, skin and subcutaneous tissue were raised as a flap and Supra clavicular nerves were identified and spared wherever possible.

After reduction of fractures, 3.5 reconstruction plates was fixed on the antero-superior surface of the bone after contouring the plate, starting medially using bicortical screws. Inter fragmentary lag screws were used to achieve compression in oblique or complex fractures were ever needed. The fascia and skin were closed in layers.

Sling was given to all patients for comfort. Wound was inspected on the 3rd post-operative day, and the stitches removed on the 14th day after inspection and patient was discharged with sling and advised elbow, wrist and finger range of movement exercises¹¹. Patient followed up at 3 weeks, 6 weeks, 3 months, 6 months and finally at 12 completed months. At each visit, patients were assessed clinically and radiologically for the outcome measures.

Assessment included standardized clinical evaluation and completion of the Constant Shoulder Score^{12,13,14}.

Results

Table 1: MODE OF INJURY

Mode of injury	No. of patients	percentage
RTA	18	60%
Fall from height	12	40%
TOTAL	30	100%

Table 3: OPERATIVE INDICATION

	No of patient	Percentage
Patient dis satisfactions :-		
Want of early pain relieve	8	26.7 %
Want of early mobility /return to work	12	40%
Open fractures	2	6.7%
neurovascular injury	1	3.3%
Fail conservative	7	23.3%
(a)Non union		
(b)delayed union	0	0
TOTAL	30	100

Table 4: TIME TO UNION

Type of Union	Duration to union (weeks)	Mean duration to union (weeks)
Clinical	6-12	8.13 ± 1.65
Radiological	14-24	17.90 ± 2.57

Table 5 .FINAL OUTCOME [Constant Shoulder Score]

Outcome	Number of patients	Percentage (%) (n=30)
Excellent	17	56.67
Good	9	30.00
Fair	4	13.33
Total	30	100.00

Figure 1 : Mid clavicle fracture



Figure 2 :-Plate fixation [reconstruction plate]



Figure 2: showing union



Twenty six (26) male (86.77%) and four (4) female (13.33%), patients with male to female ratio of 6:1 had undergone plate osteosynthesis for the mid clavicular fracture. Road traffic accidents (RTA) accounted for 60 % (18) fractures and fall accounted for 40 % (12) fractures. 40% of patients had consented for plate osteosynthesis for want of early mobility or early return to work and 26 % for early relieve of pain. 23% patients were treated for non-union. The mean time to sound clinical union was 8.13 ± 1.65 weeks (range, 6 -12 weeks) in all cases. Radiologically cortical bridging was seen at 10th post-operative weeks. Mean time to complete cortical bridging or radiological union was 17.90 ± 2.57 weeks (range, 14-24 weeks).

Based on the assessment criteria (Constant Shoulder Score)^{13, 14} for the present study, the final outcome for all cases was Excellent in 17 (56.67%) patients. Good in 9 (30.00%) patients and Fair in 4 (13.33%) patient

Discussion

Thirty patients with displaced mid shaft fracture of clavicle underwent open reduction and plate osteosynthesis in the department of orthopedics, Tripura Medical College Hapania between January 2014 to march 2016.

The present study was to analyze the results of fixation of mid clavicular fractures with plate and screws and assess their union radiologically and clinically, restoration of range of motion and function of the shoulder.

There were 26 male and 4 female patients (m: f = 6.5:1) Similar findings were reported by Chen YF¹⁵. Road traffic

accidents (RTA) accounted for majority of fractures (60%) and falls accounted for the remaining (40%) Chen YF et al¹⁵ reported RTA as a majority of cause of injuries in their study 58.53 % (24 in 41 patients) while falls accounted for 41.46% (17 of 41 patients). Ole B et al¹⁶ reported RTA in 57 of 104 patients (55.33%) and falls in 46 of 103 patients (44.66%).

Clinical union was seen at a mean time of 8.13 ± 1.65 weeks (range, 6 -12 weeks) in all our cases, Kulshrestha WCV¹⁷ reported clinical union by 8 weeks and Sadiq S¹⁸ in his study reported that in all cases clinical union was evident at 4 weeks post operatively (range, 3-15 weeks). Zilberfarb JL et al¹⁹ reported clinical union at 6 weeks.

Radiological cortical bridging was seen at 10th post-operative weeks and mean time to complete radiological union was 17.90 ± 2.57 weeks (range, 14-24 weeks). McKee et al²⁰ reported mean time to union at 16.4 weeks. Shabir M et al²¹ reported union at 10 weeks (range, 8-17 weeks). Kelly VH et al²² reported mean time to union at 7.4 weeks. Wentz S et al²³ reported union at 14 (range, 11-16 weeks). Boyer MI et al²⁴ reported mean union at 9 weeks (range, 6-12 weeks). Mukhopadhaya J et al²⁵ in their study reported radiological union at 12 weeks. Coupe BD et al²⁶ reported mean union at 13.5 weeks. Maqbool IM et al²⁷ reported union at 10 weeks. Cho CH et al²⁸ reported radiological union at 14.6 weeks.

The final results in our study, based on Constant shoulder score were Excellent 17 (56.67%), Good 9 (30%) and Fair 4(13.33) patients. This finding were similar to Kulshrestha WC¹⁷ who reported 12 excellent, 6 good and 2 fair in his 20 patients who were subjected for midshaft clavicle fracture with reconstruction plating. Nagy MH et al²⁹ reported 3 (33.33 %) as excellent, 5 (55.56%) as good and 1 (11.11 %) as fair in the total of 9 patients.

Conclusion

Historically, the preferred method of treatment of mid shaft clavicle fractures has been conservative. Recent studies have concentrated on completely displaced, mid-shaft fractures of the clavicle reveal non-union rates between 15% to 20% and 31% patient dissatisfaction rate with selected displaced middle-third clavicle fractures treated conservatively.^{9F} Hence, current recommendation for treatment of displaced mid shaft clavicle fractures is operative fixation.^{7,8-13B}

Current treatment is Controversial but conventional plating is often proposed as the gold standard. The choice for operative intervention for a displaced midshaft clavicular fracture will be a decision made between the surgeon and the patient.

Reference

- Nordqvist A, Petersson CJ. The incidence of fractures of the clavicle. *Clin Orthop*. 1994;300:127Y132.
- Robinson CM. Fractures of the clavicle in the adult. *Epidemiology and classification*. *J Bone Joint Surg Br*. 1998;80:476Y484.
- Rowe CR. An atlas of anatomy and treatment of midclavicular fractures. *Clin Orthop*. 1968;58:29Y42.
- Nordqvist A, Petersson CJ, Redlund-Johnell I. Midclavicle fractures in adults: end result study after conservative treatment. *J Orthop Trauma*. 1998;12:572Y576.
- Anderson K, Jensen PO, Lauritzen J. Treatment of clavicular fractures. Figure-of-eight bandage versus a simple sling. *Acta Orthop Scand*. 1987;58:71Y74.
- 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;79:537Y539.
- Lazarides S, Zafiroopoulos G. Conservative treatment of fractures at the middle third of the clavicle: The relevance of shortening and clinical outcome. *J Shoulder Elbow Surg* 2006;15:191-4.
- Canadian Orthopaedic Trauma Society. Nonoperative treatment compared with plate fixation of displaced midshaft clavicular fractures. A multicenter, randomized clinical trial. *J Bone Joint Surg Am* 2007;89:1-10.
- Smekal V, Oberladstatter J, Struve P, Krappinger D. Shaft fractures of the clavicle: Current concepts. *Arch Orthop Trauma Surg* 2009;129:807-15.
- Kim W, McKee MD. Management of Acute Clavicle Fractures. *J of Orthopedic Clinics* 2008 May 6; 39: p 491-501.
- Ring D, Jupiter JB. Injuries to shoulder girdle. In: Browner BD, Browner TB, Levine AM, Tafton PG, editors. *Skeletal trauma*. Third edition. Philadelphia: Saunders's; 1998: p 1635
- Magetsari R. Sensitiveness of Constant Murley's Shoulder and quick DASH as an Outcome Measure for Midshaft Clavicle Fracture. *Malaysian Ortho J* 2010; 4(1): p 4-7.
- Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *Clin Ortho Relate Res* 1987 Jan; 214: p 160-4.
- Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. Available from URL: http://www.Orthopaedicscore.com/score_pages/constant_shoulder_score.html.
- Chen YF, Zeng BF, Wang HM, Chai YM, Xue JF, Xie XT, Zhang C. Clinical outcomes of Midshaft Clavicular Fracture. *Can J Surg* 2010 Dec 10; 53(6): p 379
- Eskola A, Vainionpaa S, Mullynen P. Outcome of clavicular fractures in 89 patients. *Arch orthopedic trauma surgery* Jan1989;105: p 337-38.
- Kulshrestha WV. Primary Plating of Displaced Midshaft Clavicular Fracture. *MJAFI* May 2008; Vol. 64, No. 3: p 208-11
- Sadiq S, Waseem M, Peravalli B, Doyle J, Dunningham T, Muddu BNM. Single or Double Plating for Nonunion of the Clavicle. *Acta Othopodica* 2001; 67(4): p 354-60
- Zilberfarb JL, Vernick G, Richardson L. Open Reduction and Internal Fixation of Displaced Midshaft Clavicle Fracture. Available from URL:<http://www.orthojournalhms.org/volume11/> accessed 18 July 2009.
- McKee MD, Kreder HJ, Mandel S, McCormack R, Reindl R, Pugh DM et al. Nonoperative Treatment Compared with Plate Fixation of Displaced Midshaft Clavicular Fractures. A Multicentre Randomized Clinica Trial. *JBJS* 2007; 89/; p 1-10.
- Shabir M, Durrani Z. Nonunion of Fracture Clavicle Treatment by Compression Plating and Bone Graft. *JPMI* 2004 Dec; 18(3): p 453-56.
- Kelly VH, Aaron PA, Michelle C, Frances F. Operative Versus Non operative Treatment of Midshaft Clavicle Fractures in Adolescents. *J of Ped Ortho* 20010 June; 30(4): p 307-12.
- Wentz S, Eberhardt C, Leonhard T. Reconstruction Plate Fixation with Bone Graft for Midshaft Clavicular Nonunion in Semi Professional Athletes. *J of Ortho Science* 2000 Dec; 4(4): p 269-72.
- Boyer MI, Axelrod TS. Atrophic Nonunion of The Clavicle Midshaft Treatment by Plate Lagscrew and bone graft. *JBJS* 1997; 79(B): p 301-03.
- Mukhopadhaya J. Functional outcome after open reduction and internal fixation for symptomatic delayed union and nonunion after fracture clavicle: a series of 31 cases. *Ind J of Orthopedics* July- Sept 2007; 41(3): p 209-13
- Coupe BD, Wimhurst JA, Indar R, Calder DA, Patel AD. A New Approach for Plate Fixation of Midshaft Clavicular Fractures. *Injury* 2005 Oct; 36(10): p 1166-71.
- Maqbool IM, Reidy DP. Results of acute open reduction and internal fixation of mid-shaft clavicle fractures: a review of 60 cases. 10 years follow-up. *JBJS* May 2004; 86-B: p 130-34.
- Cho CH, Song KW, Min BW, Bae KC, Lee KJ. Operative Treatment of Clavicle Midshaft Fractures, Comparison between Reconstruction Plate and Reconstruction Locking Compression Plate. *Clin Orthop Surg* 2010 Sept; 2(3): p 154-59.
- Nagy MH, Issa K, Khalil AS. Fracture Clavicle when to Fix. *Pan Arab J Ortho Trauma* 2007 Jan; 11(1): p 72-77.