Section: Orthopaedics

Research

A PROSPECTIVE STUDY OF OPERATIVE TREATMENT OF CLAVICULAR FRACTURES

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Abstract

Background: Fracture of clavicle is a common skeletal injury around shoulder region due to its subcutaneous location. It has been reported that fractures of the clavicle account for approximately 2-4 % of all fractures. The middle-third fractures are most common and account for approximately 80–85% all clavicular fractures. Clavicle fractures mostly occur in male individuals younger than 30 years, with an increased incidence, regardless of sex, above age 70 years. **Materials and Methods:** The present study is prospective study and was carried out from January 2021 to January 2022. at Orthopedics Department in Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta, Assam.. During this period 80 patients of clavicle fractures were treated surgically and were included in the study. General information like name, age, sex, occupation and address were noted. Then a detailed history was elicited regarding mode of injury like fall on the shoulder, Road traffic accident, direct injury to shoulder and fall on outstretched hand. Enquiry was made to note site of pain and swelling over the affected clavicle. Past medical illness and family history were also recorded. **Result:** In this study on 72 patients (90%) with middle third clavicle fracture treated with plate and screws and IM nails 56 patients (70%) had excellent functional outcome, good functional outcome in 12 patients (15%) and fair functional outcome in 4 patients. For 8 patients of lateral third clavicle fracture fixed with Kirschner wire and tension band wire 4 patients (5%) had excellent functional outcome results and 4 patients (5%) had fair functional outcome. **Conclusion:** Operative treatment of fracture clavicle offers a definitive method of treatment in some specific instances. It reduces the time of union, stiffness of the adjoining joints and morbidity.

INTRODUCTION

Fracture of clavicle is a common skeletal injury around shoulder region due to its subcutaneous location. It has been reported that fractures of the clavicle account for approximately 2-4 % of all fractures. The middle-third fractures are most common and account for approximately 80–85% all clavicular fractures.[1] Clavicle fractures mostly occur in male individuals younger than 30 years, with an increased incidence, regardless of sex, above age 70 years.[2]

Conservative treatment was recommended for nondisplaced clavicular fractures in adults in the form of immobilization in an arm sling or figure-of-8 bandage with early rehabilitation.[3] Several researches have compared operative and non-operative therapy of clavicular fractures in adult athletes, which show substantial postoperative strength benefits, functional outcomes, quicker time for returning to normal activity, and decreased nonunion rates with operative treatment.[4]

Several studies have examined the safety and efficacy of primary open reduction and internal fixation for completely displaced fractures clavicle and noted high union rate with a low complication rate.[5] There are various methods for treating clavicle mid shaft fractures such as pre contoured clavicular locking plates, reconstruction plates, dynamic compression plates, intramedullary nails etc.

For lateral third clavicular fracture operative treatments include transacromial Kirschner wire, cancellous compression screw and coracocalvicular screw. AO/ASIF group has recommended the use of tension band wire construct for fixation of displaced lateral third clavicle fracture.[6] The purpose of this study is to gain experience with the surgical management of fresh displaced, comminuted middle third clavicle fractures with plate and screws and Kirschner wires with tension band construct for displaced lateral third clavicle fractures.

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MATERIALS AND METHODS

The present study is prospective study and was carried out from January 2021 to January 2022. at Orthopedics Department in Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta, Assam. During this period 80 patients of clavicle fractures were treated surgically and were included in the study.

Inclusion Criteria

- Age between 18 and 60 years.
- All compound fractures of clavicle.
- All clavicle fractures with neurovascular deficit.
- All displaced or comminuted fractures.
- All fractures with tenting of skin.
- No medical contraindication to general anaesthesia.
- All clavicular fractures with >20mm bone loss.

Exclusion Criteria

- Age < 18 years and >60 years.
- Pathological fractures.
- Undisplaced fractures.
- Associated head injury.
- Any medical contraindication to surgery or general anaesthesia (heart diseases, renal failure or active chemotherapy).
- Lack of consent.

General information like name, age, sex, occupation and address were noted. Then a detailed history was elicited regarding mode of injury like fall on the shoulder, Road traffic accident, direct injury to shoulder and fall on outstretched hand. Enquiry was made to note site of pain and swelling over the affected clavicle. Past medical illness and family history were also recorded.

Procedure

Minimal soft tissue and periosteum dissection was done. Fracture fragments were reduced, provisionally hold with k-wires and plate was applied over the superior aspect of the clavicle.

At the junction of the medial and middle third of the clavicle, the inferior surface is exposed so that a protective instrument can be inserted during drilling to prevent injury to neurovascular structure underneath it. ii. The pre contoured locking plate or recon plate or DCP was fixed to the medial and lateral fragment with locking screws/ cortical screws and at least three screws in medial and lateral fragment were applied. iii. IM nail fixed by taking an entry point into medial or lateral end of clavicle and progressed under c-arm control.

Post-Operative Care

Patients were kept nil orally for 4 to 6 hours post-operatively. Intravenous fluids were given as needed. Antibiotics were continued for 10 days. Analgesics and tranquilizers were given according to the needs of the patient. The operated upper limb was immobilized in an arm pouch. Check X- rays were taken to study the alignment of fracture fragments. The wound was inspected at 3rd or 4th postoperative day. Suture/ staple removal was done on 10th postoperative day. Patients were discharged with the arm pouch. Rehabilitation of the affected arm was started at the end of 2 weeks. Gentle pendulum exercises to the shoulder in the arm pouch were allowed. At 4 to 6 weeks gentle active range of motion of the shoulder was allowed but abduction in limited to 80 degrees. At 6 to 8 weeks active range of motion in all planes were allowed.

RESULTS

The present study is a prospective study consisting of 80 patients of fresh fractures of the clavicle which satisfying the inclusion and exclusion criteria were treated surgically between January 2021 to January 2022. at Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta, Assam

All the patients were available for follow-up and they were followed every 4 weeks. Results were analyzed both clinically and radiologically.

Age Incidence

Majority of the patients were with middle third clavicle fracture i.e. 32 patients (40%) were in the age group of 19-29 years. The youngest patient was 19 years and oldest patient was 59 years. The average patient age was 32 years. Most patients 8 cases (10%) with lateral third clavicle fracture were between 40-49 years. The youngest patient was 21 years and oldest patient was 52 years with average age of 37.5 years.

Sex Incidence

In middle third clavicle fracture the majority was males, 64 patients (80%) and females were 8 patients (10%) In lateral third clavicle fracture all the 8 patients (10%) were males and no females.

Table 1: Age distribution

S.No	Age Group	N (%)
1	19-29 years	32 (40%)
2	30-39 years	22 (25%)
3	40-49 years	15 (18.75%)
4	50-59 years	11 (13.75%)

Table 2: Gender distribution

S.No	Age Group	N (%)
1	Male	72 (90%)
2	Female	8 (10%)

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Table 3: Types of fractures

Type	Bostman et al.	Kao et al	Lokesh H.et al	Present study
Open	Nil	Nil	Nil	Nil
Closed	All	All	All	All

Table 4: Outcome

Results	Lokesh. H et al	Present study
Excellent	70%	75%
Good	20%	15%
Fair	10%	10%
Poor	-	-

Mode of Injury: In Middle third clavicle fractures direct injury occurred in 64 patients(80%) among them 48 patients (60%)were due to road traffic accident, 16 patients (20%) were due to fall on the shoulder after slipping. Indirect injury occurred in 8 patients (10%) due to fall on outstretched hand. In lateral third clavicle fracture the direct injury occurred in 8 patients (10%) due to Road traffic accident.

Site of Fracture: In this present study there were 36 patients (90%) of middle third clavicle fracture and 4 patients (10%) were lateral third clavicle fracture and there were no medial third clavicle fracture. All the patients in both middle and lateral third clavicle fracture were closed type. There was no associated medical illness in any patient.

Side Affected: In this study for middle third clavicle fractures there were 40 patients (50%) of Left sided fracture and 32 patients (40%) of Right sided fracture. For Lateral third clavicle fracture there were 4 patients (5%) on the left side and 4 patients (5%) on the Right side. Plain radiograph of clavicle with shoulder is taken in anteroposterior view to assess the site of fracture and the type of fracture (Like Displacement, Angulation, and Comminution). In this study Robinson classification was followed.

There was no type-1 (medial third) fracture. In type-2 middle third fracture type-2 B1 (displaced with simple or single butterfly fragment) occurred in 64 patients (80%) and type-2 B2 (displaced with comminuted or segmental) fracture occurred in 8 patients (10%). In lateral third clavicle fracture there was type- 3 B1 (displaced with extra articular) occurred in 8 patients (10%). There were no type- 3 B2 fracture (Displaced with intra articular).

Time Interval for Surgery: All the patients were operated as early as possible once the general condition of the patients was stable. In middle third clavicle fracture 64 patients (80%) were operated in the first week and 8 patients (10%) were operated in the second week due to fixed OT days in ********** In lateral third clavicle fracture all the 8 patients (10%) under gone surgery within 1 week. All the patients were operated under general anaesthesia.

Functional Outcome: In this study on 72 patients (90%) with middle third clavicle fracture treated with plate and screws and IM nails 56 patients (70%) had excellent functional outcome, good functional outcome in 12 patients (15%) and fair functional outcome in 4 patients. For 8 patients of lateral third clavicle fracture fixed with Kirschner wire and tension band wire 4 patients (5%) had excellent functional outcome results and 4 patients (5%) had fair functional outcome.

DISCUSSION

Recent studies show increasing evidence that non-operative treatment of displaced, comminuted mid shaft fractures of clavicle was not as optimal as once thought Non-union rates, strength and endurance deficits are common in cases treated conservatively.[7]

Zlowodzkiet al., in a meta-analysis of literature found that the nonunion rate of clavicles treated non-operatively was 15.1%, much higher than that was described earlier by Neer (0.1%). Stanley and Norris stated that 33% of patients treated conservatively had symptoms 3 months after fracture. Sankarankutty and Turner reported 15% of patients with deformity at the fracture site in 100 cases treated non-operatively.[8]

Displaced fractures of the clavicle can never be treated the same way as un-displaced or minimally displaced fractures for the deforming pull of the Sternocleidomastoid is too great and that the deformity recurs shortly after figure of eight bandage. It has been shown that mid third clavicle fractures with >2cm displacement or 15mm shortening are at increased risk of nonunion.[9]

Thompson reviewed 100 cases of mid clavicular non-unions and found that 90% of the original fractures had displacement >100%, overriding>1cm or had severe comminution, thus necessitating surgical stabilization. Plate fixation provides immediate pain relief and stabilization, facilitates early mobilization and early return to pre injury activities.[10]

Functional Outcome: The functional outcome according to Constant and Murley in this study of total 72 patients of fresh middle third clavicle fracture fixed with plate and screws showed excellent results in 56 patients (70%) and good functional outcome in patients 12 patients (15%). Fair functional outcome in 4 patients (5%) where plate loosening occurred and the patients had some pain over the shoulder in over-head activities and decrease in strength in shoulder abduction. Out of 8 patients fixed with Kirschner wire with tension band

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wire 4 patients had excellent functional outcome and 4 patients had fair functional outcome due to restriction of shoulders movements in that patients.

In lokesh H et al study 32 patients (80%) middle third clavicular fractures treated with plate and screws 24 patients (60%) had excellent functional outcome, good functional out come in 6 patients (15%) and fair functional out come in 2 patients (5%). For 8 patients of lateral third clavicle fracture fixed with Kirschner wire and tension band wire 4 patients (10%) had excellent functional outcome results and 2 patients (5%) had good functional outcome 1 patient had fair functional outcome and with 1 patient fixed with 4 hole hook plate had fair functional outcome due to associated scapula body fracture.

The advantage of rigid internal fixation and early mobilization of fresh displaced clavicle fracture is that it (Displaced comminuted middle third and displaced lateral third clavicle fracture) gives immediate pain relief and prevents the development of shoulder stiffness and non-union.

CONCLUSION

Specific indications for which operative treatment is needed like comminuted, displaced middle third clavicle fractures and displaced lateral third clavicle fracture. Primary open reduction and internal fixation with plate and screws of fresh middle third clavicle fractures provides a more rigid fixation and does not require immobilization for longer periods. Among the internal fixation methods intramedullary fixation do not control rotation so they require longer period of immobilization till union. Dynamic compression plate is strong and gives better stability in comminuted and three part fractures. Pre-contoured anatomical locking plates are associated with less hardware related problems than with reconstruction plate or DCP plate.

REFERENCES

1. Jeray KJ. Acute midshaft clavicular fracture. J Am Acad Orthop Surg. 2007;15(4):239-48. doi: 10.5435/00124635-200704000-00007.
2. Morgan RJ, Bankston LS Jr, Hoenig MP, Connor PM. Evolving management of middle-third clavicle fractures in the National Football League. Am J Sports Med. 2010;38(10):2092-6. doi: 10.1177/0363546510372795.
3. Rabe SB, Oliver GD. Clavicular fracture in a collegiate football player: a case report of rapid return to play. J Athl Train. 2011;46(1):107-11. doi: 10.4085/1062-6050-46.1.107.
4. Stegeman SA, de Jong M, Sier CF, Krijnen P, Duijff JW, van Thiel TP, et al. Displaced midshaft fractures of the clavicle: non-operative treatment versus plate fixation (Sleutel-TRIAL). A multicentre randomised controlled trial. BMC Musculoskelet Disord. 2011;12:196. doi: 10.1186/1471-2474-12-196.
5. Singh V, Marotia AK, Gundavarapu A, Sharma A. A prospective observational study on outcomes of displaced mid-shaft clavicle fractures treated with locking compression plate, at a tertiary center in Jaipur. J Evid Based Med Healthc. 2021;8(30):2679-2684.
6. Verborgt O, Pittoors K, Van Glabbeek F, Declercq G, Nuyts R, Somville J. Plate fixation of middle-third fractures of the clavicle in the semi-professional athlete. Acta Orthop Belg. 2005;71(1):17-21.
7. Vannabouathong C, Chiu J, Patel R, Sreeraman S, Mohamed E, Bhandari M, et al. An evaluation of treatment options for medial, midshaft, and distal clavicle fractures: a systematic review and meta-analysis. JSES Int. 2020;4(2):256-271. doi: 10.1016/j.jseint.2020.01.010.
8. Wijdicks FJ, Van der Meijden OA, Millett PJ, Verleisdonk EJ, Houwert RM. Systematic review of the complications of plate fixation of clavicle fractures. Arch Orthop Trauma Surg. 2012;132(5):617-25. doi: 10.1007/s00402-011-1456-5.
9. Wijdicks FJ, Houwert RM, Millett PJ, Verleisdonk EJ, Van der Meijden OA. Systematic review of complications after intramedullary fixation for displaced midshaft clavicle fractures. Can J Surg. 2013;56(1):58-64. doi: 10.1503/cjs.029511.
10. Kumar A, Amar. Prospective study of clavicle fractures treated with precontoured locking compression plate. Indian J Orthop Surg. 2020;6(3):172-174.

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