

Fractures of Mid-Shaft Clavicle: A Systematic Review

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Abstract

Clavicle fractures, particularly those occurring in the mid-shaft, are common injuries, accounting for approximately 2.6% of all fractures. These fractures predominantly affect males in their second and third decades of life, with a bimodal distribution in females. Historically, conservative treatment was preferred due to low nonunion rates. However, recent studies indicate higher nonunion rates with conservative treatment for displaced fractures. Surgical intervention, including plate fixation and intramedullary fixation, has shown better functional outcomes and higher patient satisfaction. This systematic review evaluates various treatment modalities, highlighting the benefits of surgical intervention for specific patient groups.

Keywords: Clavicle fractures, Mid-shaft, Surgical intervention, Conservative treatment, Functional outcomes

Introduction

One of the most frequent injuries to the shoulder girdle is the clavicle fracture [1]. According to statistics, clavicle fractures make up about 2.6% of all fractures [2]. It occurs predominantly in males in their second and third decade of life [3]. It typically has a bimodal distribution in females and peaks in the young and old age group [4]. Based on where the fractures occurred, Allman [5] divided clavicle fractures into three groups. The majority of fractures occur in the middle third, contributing 80–85% all clavicular fractures [6]. Based on the level of comminution and displacement, Robinson updated the Allman classification. The vast majority of mid-shaft clavicle fractures usually require immobilization. Therefore, the preferred modality of treatment for these fractures was conservative. Extremely low nonunion rates reported in numerous research served as proof of this [7, 8]. However, some recent studies have revealed that when displaced fractures are treated conservatively, very substantial nonunion rates occur [9, 10]. The functional impairment of the shoulder and the non-cosmetic hump in the clavicular region caused by the shortening of the clavicle and excessive callus development were further drawbacks of non-operative therapy that were highlighted. These negative effects can be avoided by surgically restoring normal length and alignment. With a variety of surgical techniques for initial fixation of the displaced fractures, good results with high union rates and minimal complication rates have been documented [11–14].

Method

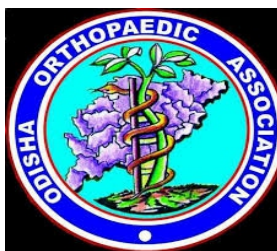
Searches for "shaft clavicle fracture" were done in PubMed. The only articles selected were those written in the English language and released during the last 30 years. A study of shaft clavicle fractures treated with any manner was required to meet the inclusion criteria, and radiological, physical, and functional results were to be examined. Articles that looked at medial and lateral end of clavicle fractures were not utilized in order to preserve uniformity. Microsoft Excel spreadsheets were used to collect and arrange the data. Throughout the data gathering process, each article was carefully read and examined. Each article was read in its entirety and evaluated a number of times during the data collecting process. Number of patients and fractures overall were taken into account. Complications and results were the two criteria utilized to examine the data. Bony union after healing referred to as a union, malunion, or nonunion.

Result

Locking plates, non-locking plates, intramedullary nails/rods, screws, cerclage wires, allografts, external fixation, arthroscopic fixation, non-operative, and other treatment modalities were divided into groups.

Herman Frima et al., suggested that surgery (with an anterior-placed LCP 3.5 plate) is the recommended mode of fixation for selected shaft clavicle fractures. Other fractures can be treated conservatively with a figure-of-eight bandage for 3-6 weeks. Simple fractures of the clavicle shaft are treated with intramedullary fixation, whereas wedge or comminuted fracture patterns are treated by plate fixation (locking). This surgical procedure will be beneficial for young, energetic persons who have high demands and have a low non-union risk and seek an early functional recovery. Plate fixation should be used to treat comminuted fractures [15].

Brent Wiesel et al. discovered that patients in the surgical group had a quicker union, better outcome scores, and higher satisfaction. Despite the positive results, the surgical group also had problems such implant discomfort, wound infection, and wound dehiscence



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Received 20/05/2023; Reviewed 18/06/2023; Accepted 14/11/2023; Published 10/01/2024

© 2024 The Odisha Journal of Orthopaedics and Trauma | Available on www.ojotonline.com | DOI: <https://doi.org/10.13107/ojot.2024.v05i01.047>

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[16].

Kim et al. studied that fractures of the clavicle shaft can be repaired arthroscopically. Patients with tiny medullary canals or severely comminuted fractures may not be the candidates for the arthroscopic approach employing a cannulated screw for displaced clavicular shaft fractures [17].

King et al. stated that currently no categorization system that directs the surgeon or offers alternatives to specific implant options for treating fractures [18]. Annicchiarico et al. studied mid-shaft clavicle fractures treated with plate and screws in 32 individuals were the subject of a retrospective cohort research on plate osteosynthesis. All of the patients recovered fully and quickly functionally, without any abnormalities or non-unions, and were able to resume their pre-injury athletic activities [19].

Smekal V et al. in pediatric fractures and non-displaced or minimally displaced fractures of the shaft of the clavicle can be successfully treated non-operatively. It is advised to use a shoulder arm sling along with figure eight bandage as a cautious measure [20]. Jung et al. studied on "Biologic Fixation through Bridge Plating for Comminuted Shaft Fracture of the Clavicle: All patients had returned to work regularly and were pain-free during rest and activity at the time of the last interview. Except for one patient who had reduced internal rotation, none of the patients had shoulder weakness in the affected joint [21].

Barsaoui et al. stated that the use of a one-third tubular molded plate in the surgical treatment of mid-shaft clavicle fractures helps patients, particularly manual laborers and young athletes, recover a normal shoulder function and return to their regular activities more quickly and at a lower cost [22]. Ko Sh et al. studied Comparison of supraclavicular nerve damage following open reduction and internal fixation versus minimally invasive plate osteosynthesis for clavicle midshaft surgery. In 12 cases, neurological symptoms were evident. Eight patients who received ORIF and four patients who underwent MIPO, respectively, both had numbness in the anterior upper chest around the incision site ($p < 0.001$) [23].

Ni M et al. suggested that load on the implant and bone were distributed equally by the locking plate as well. The suggested solution for a mid shaft clavicle fracture is plate fixation since it considerably lowers implant stress and stabilizes the fracture gap [24]. Zhang et al. concluded that In comparison to PFs, the IF group had shorter incisions, faster union times, improved shoulder function recovery at 6 months, and less problems such hypertrophic scars, symptomatic hardware, and refractures following hardware removal. According to the available data from this meta-analysis, IF was a more advantageous approach for treating midshaft clavicle fractures [25].

Delvaque et al. stated that patients treated with our minimally invasive surgical approach had brief paraesthesia in one patient's area of the C8 nerve root distribution. In comparison to traditional surgery, a surgical approach that uses temporary intra-operative external fixation to assist less invasive internal fixation may have a reduced complication rate and shorter immobilization times [26].

Xie et al. stated that when treating displaced mid-shaft clavicle fractures, intramedullary fixation is preferable to plate fixation [27]. But it is a known fact that clavicle does not have a medullary cavity and intraoperatively, it is often difficult to pass a TEN especially in a young active individual with good bone stock.

Saragaglia et al. for sportsmen and young, active person's surgical therapy has a favorable outcome with less non-union and a quicker return to function [28]. Sidhu N et al. In comparison to Knowles pin intramedullary repair constructs, Echidna pin intramedullary repair structures showed considerably greater pull-out strength and bending stiffness [29]. Van et al. the anatomically precontoured VA-LCP anterior clavicle plate provides angular stability for clavicle shaft fractures [30].

Jie Ai et al. published a meta-analysis on Anterior inferior plating versus superior plating for clavicle fracture showed the anterior inferior plating may reduce the blood loss, the operation and union time, but no differences were observed in constant score, and the rate of infection, nonunion, and complications between the two groups [34].

Naderipour et al. suggested that Middle third clavicle fracture repair with interfragmentary lag screws and precontoured plate- For acute and delayed fixation of clavicle fractures the superior face of the clavicle should be covered with a pre-contoured 3.5 mm plate [31]. Zhu et al. found that intramedullary fixation is a superior alternative to plate fixation for treating mid-shaft clavicle fractures, with shorter surgery times, shorter incision [32]. Smith et al. showed that for middle-third clavicle fractures, IM and plate devices have comparable strength [33].

Naveen et al. suggested that there was no discernible difference in the satisfaction with operational therapy and non-operative treatment (74.3% vs. 66.7%; $P = 0.500$). In the operating group, the non-union rate was 5.7%, while in the non-operative group, it was 13.3% ($P = 0.518$) [34].

Discussion

Common injuries like midshaft clavicle fractures can lead to poor functional outcomes, protracted discomfort, or nonunion if incorrectly managed. Because the complication rates for nondisplaced fractures have remained comparatively low, these fractures should be managed conservatively. Traditional nonoperative management, formerly supported by research demonstrating low rates of nonunion, has been called into doubt as a result of more recent studies that point to a significantly greater nonunion rate. In individuals who match specific criteria, recent studies have shown that Compared to nonoperative therapy, operational treatment of midshaft clavicle fractures can result in better functional results and patient satisfaction. A young, healthy male patient with high functional demands or a strong desire to immediately return to sports and who has a comminuted, displaced, and shorter fracture would be the best surgical candidate, barring conditions that would be obvious operating reasons, such as an open fracture or neuro-vascular injury. Other than this, a simple fracture of the clavicle's shaft can be treated conservatively with a figure-of-eight bandage for three to six weeks. If a wedge or comminuted fracture pattern is present, it is treated by plate fixation (locking). This surgical procedure will be beneficial for young, energetic persons who have high demands and seek a low non-union risk and early functional mobility.

Conclusion

We conclude that for Fracture shaft of clavicle if there is comminution

or displacement >2cm then plating should be done in demanding patient. In cases where there is bilateral clavicle fractures, floating shoulders, and surgery is the modality of treatment. Nailing can be done in closed fracture shaft clavicle with less displacement or open fracture clavicle. ORIF with plating has some disadvantage of prolonged hospital stay, second surgery, risk of infection, socioeconomic burden. Conservative treatment is done in low

demanding patient or undisplaced fracture shaft clavicle. Union is quick in plating with better outcomes and higher patient satisfaction. At last we conclude that superiorly placed locking precontoured plate fixation should be the preferred method of fixation in shaft clavicle fracture if surgery is indicated as the load on implant and bone are equally distributed with stabilizing the fracture gap.

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Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

Conflict of Interest: NIL
Source of Support: NIL

How to Cite this Article

Kar B, Mishra A, Chauhan D | Fractures of Mid-Shaft Clavicle: A Systematic Review | The Odisha Journal of Orthopaedics and Trauma | January 2024; 05;01: 02-05 | <https://doi.org/10.13107/ojot.2024.v05i01.047>