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Clavicle fractures - one of the painful injuries in sports

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ABSTRACT

Introduction

Clavicle fractures can be treated either surgically or non-operatively. Traditionally, displaced fractures of the clavicle shaft in adults have been treated non-operatively. However, recent evidence suggests that the rate of non-union following non-operative treatment is higher than previously thought. In addition, there is a growing body of literature suggesting better functional outcomes with operative treatment. This shift in understanding has led to an increased preference for operative management of these fractures in recent years. The aim of this review is to summarise the current evidence on the management of clavicle fractures.

Review methods

English-language scientific literature found in PubMed and Google Scholar was used for the review. Articles were searched based on keywords. Each article was analyzed for knowledge currency and relevance for use in the review.

Description of the State of Knowledge

After searching the articles, 20 articles were selected for final analysis. The collected data provided the latest information on clavicle fractures regarding the epidemiology, treatment and its results.

Summary

Clavicle fractures are one of the injuries happening in sports. As the surgical techniques become better overtime, the dilemma regarding invasive versus non-invasive treatment appears. Overall, both these approaches yield similar results, however may be suitable for different individuals.

Keywords: Clavicle fracture, distal clavicle

REVIEW

Epidemiology and injury mechanism

Fractures of the clavicle, which are most prevalent in young males, account for 2.6–4% of all adult fractures. Approximately 70% of these cases involve males. [1] The most common cause is a direct fall onto the shoulder, which frequently occurs during sports activities or traffic accidents. The majority of fractures (69–82%) occur in the midshaft of the clavicle, with 12–26% occurring in the lateral part and 2–6% occurring in the medial part. [2] This can be anatomically explained by the fact that the medial and lateral parts of the clavicle are firmly secured by strong ligaments and muscles, whereas the middle part lacks these strong attachments and is thus more susceptible to trauma. The attachment of muscles to the clavicle frequently results in the dislocation of major fragments in clavicle fractures, which in turn leads to a shortening of the clavicle, particularly in midshaft fractures. [3]

Classification

Number of systems can be used for clavicle fractures classification. For this review we're gonna be using Neer's classification [4], which communicates both the stability and treatment recommendation of the fracture focusing on the relationship of the fracture to coracoclavicular ligaments and the acromioclavicular joint. [5]

Type I

Considered a stable fracture requiring non-operative treatment

- minimally displaced fracture line sits lateral to the coracoclavicular ligaments
- trapezoid and/or conoid ligament intact

Type IIa

Considered an unstable fracture requiring operative treatment

- fracture is medial to the coracoclavicular ligament with significant displacement of the medial portion
- conoid ligament intact
- trapezoid ligament intact

Type IIb

Considered an unstable fracture requiring operative treatment

- fracture occurs between the coracoclavicular ligaments resulting in a torn conoid ligament and intact trapezoid ligament
- displacement of the medial clavicle

Type III

Considered a stable fracture requiring non-operative treatment

- intra-articular distal clavicular fracture extending into the acromioclavicular joint
- conoid ligament intact
- trapezoid ligament intact

Type IV

Salter-Harris type I physeal fracture considered stable fracture requiring nonoperative treatment

- medial portion clavicle becomes displaced in the superior direction as the periosteal sleeve becomes avulsed from the inferior cortex
- conoid ligament intact
- trapezoid ligament intact

Type V

Considered an unstable stable fracture requiring operative treatment

- comminuted fracture with medial clavicle displacement
- inferior clavicle fragment attached to the coracoclavicular ligament
- conoid ligament intact
- trapezoid ligament intact

Conservative treatment

Conservative treatment involves immobilization with either a simple sling or a figure-of-eight bandage along with analgesics. Anderson et al [6] found no functional or cosmetic difference between these methods, although the simple sling caused less discomfort. Neither method effectively reduced displaced fractures. The bandage is usually removed after the acute pain has subsided, usually within a few weeks. If the fracture has healed, almost full range of motion is usually achieved after six weeks. [7]

It is widely accepted that non displaced midshaft clavicle fractures should be treated conservatively. However, there is ongoing debate in the literature regarding the best management approach for acute displaced fractures, with no clear consensus on the optimal treatment choice. [8]

Riehl et al. [9] have conducted a study in which they concluded that clavicle fractures in patients with high-energy injuries have a high propensity for displacement on follow-up radiographs, even if they are initially minimally displaced therefore giving another perspective on conservative treatment.

Surgical treatment

Typical surgical indications for distal clavicle fractures include: (1) unstable fractures without bony contact and (2) all open fractures with skin compromise and associated neurovascular injury. Due to the high rate of non-union, displaced and unstable distal clavicle fractures are generally recommended for surgical treatment. [10]

Precontoured locking plates provide secure fixation of the fracture site, allowing early range of motion of the affected arm. These plates are anatomically contoured to fit the distal clavicle, facilitating multiplanar fixation and providing increased stability for small fragments. In addition, this type of plate avoids subacromial impingement by allowing fixation without crossing the AC joint. [11]

The Hook Plate is a widely used fixation device for unstable Neer type 2 distal clavicle fractures, especially when the distal fragment is too small for screw insertion. This plate features a hook that sits under the acromion, providing distal leverage to maintain reduction of the superiorly displaced medial fragment. Plates with different hook depths can be selected based on the individual acromial slope. Numerous studies have reported satisfactory results with hook plate fixation. [12]

Coracoclavicular ligament reconstruction has gained popularity due to the mechanical complications associated with direct fracture fixation techniques and the instability resulting from untreated CC ligament ruptures. CC ligament reconstruction removes the forces that displace the fracture, thereby stabilising the fracture and promoting indirect fracture healing. The aim of this study was to evaluate the clinical and radiological outcomes of patients who underwent indirect fracture fixation by augmentation with non-absorbable sutures for Neer type IIB fractures. [13]

As arthroscopic techniques have proven effective in the management of AC joint problems, some authors have proposed arthroscopic or arthroscopically assisted surgery for the treatment of distal clavicle fractures. These procedures, which often involve CC fixation with arthroscopic reduction of displaced fractures, offer several important advantages: minimally invasive, early rehabilitation, reduced postoperative pain, fewer wound complications, and the ability to address concurrent shoulder problems such as impingement, rotator cuff tears, or

SLAP lesions. However, arthroscopic surgery is technically demanding, requires a high level of skill developed over many years, and is associated with additional time and cost. [14]

Treatment outcomes

In 2007, the Canadian Orthopaedic Trauma Society conducted a multi-centre, prospective, randomised trial. The results showed that open reduction and internal fixation (ORIF) of displaced midshaft clavicle fractures resulted in improved patient-reported outcome measures (PROMs) and a reduced incidence of symptomatic nonunion and malunion compared to nonoperative management. Following the publication of this study, surgical treatment of this type of injury has become more common. [15]

Salipas et al [16] reported excellent results during assessments at an average of 3 years post-injury. Approximately 77% of patients assessed for radiographic and/or clinical union were considered healed. The study found that delayed union occurred in two patients under the age of 65 with an initial displacement of more than 1 cm. A subsequent systematic review of seven case series and ten case reports found a non-union rate of 5% with non-operative treatment. [17] It appears that, as with midshaft fractures, most medial clavicle fractures, even when displaced, have good clinical and radiographic outcomes.

In a retrospective analysis of 31 patients with medial clavicle fractures, Lindsey et al. [18] reported favourable functional outcomes at an average of 5 years post-injury in surviving patients. Most patients were treated non-surgically. The study also noted that more than a third of these patients had died, which was attributed to the older age of those sustaining these high-energy fractures. No significant associations were found between patient and fracture demographics and functional outcomes. Although the only two cases of radiographic nonunion occurred in patients who did not undergo surgery, only a small percentage had sufficient imaging to allow a meaningful assessment of this outcome measure.

Chen et al. [19] have checked in their study that clavicles with shortening of 15 mm or less had no difference in the incidence of arthritis compared to those with shortening greater than 15 mm. The location of the fracture had no effect on the development of arthritis.

Looking at the other side of the clavicle, Jessen et al. concluded that clavicle fractures may be associated with an enlargement of the ipsilateral SCJ space width and a superior shift of the proximal clavicle. Both morphologic alterations could indicate concomitant injuries of the SCJ as well as a potential increase in the risk of SCJ instability. [20]

Conclusions

Depending on the severity of the injury and the extent of soft tissue involvement, clavicle fractures can be managed either non-operatively or surgically. Current literature suggests that primary surgical fixation may result in faster functional recovery and reduced early residual disability, particularly in patients with displaced fractures. In addition, surgical treatment significantly reduces the incidence of symptomatic delayed union or non-union. However, implants often cause soft tissue irritation, necessitating further surgical intervention to remove symptomatic implants. Therefore, routine primary surgical fixation of all displaced clavicle fractures is not universally recommended.

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