



A SYSTEMIC REVIEW OF MEDIAL CLAVICLE FRACTURE

Orthopedics

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ABSTRACT

BACKGROUND: Medial third clavicle fractures are rare injuries, with limited information available on their characteristics or treatment results. **MATERIALS AND METHODS:** We performed a systematic review according to PRISMA guidelines to evaluate the demographics, clinical profile, management and treatment outcome. Electronic searches of the MEDLINE, EMBASE and Cochrane databases were performed. **RESULTS:** Seventeen studies were included, consisting of 7 case series and 10 case reports. Two hundred twenty fractures were identified. Seventy-eight percent of fractures occurred in men with mean age of 48 years (16–94 years). Road traffic accident was the most common mechanism of injury (64%). Associated injuries occurred in 81% of patients, with thoracic trauma being the most common (47%). The most common fracture type was extra-articular, with no or minimal displacement (60%). In 9% of patients the fracture was segmental. One hundred ninety-one patients received nonoperative treatment. Twenty-nine patients were treated operatively. The overall non-union rate was 5% (7/137). The non-union rate following nonoperative management was 4.6% (5/108). The functional result following nonoperative treatment indicated overall “good” functional outcome. There was no report of catastrophic intraoperative complication amongst patients undergoing surgical fixation. **CONCLUSION:** Medial third clavicle fractures represent a distinct subgroup of clavicle fractures. Nonoperative treatment of these fracture seems to result in high union rate and overall favourable functional outcome. Further high-quality research in this area is warranted to investigate the outcomes and indication for nonoperative versus operative management of these fractures.

KEYWORDS

INTRODUCTION

Medial clavicle fractures are uncommon injuries, accounting for 2–3% of all clavicle fractures [1, 2]. Most medial clavicle fractures have traditionally been treated conservatively [1, 3, 4]. Operative treatment of these fracture is usually considered for open injuries, and fractures with neurovascular compromise or overlying skin compromise [5, 6]. With reports indicating unsatisfactory outcome and high non-union rate following nonoperative treatment of displaced midshaft clavicle fracture [4, 7], an increasing trend is seen towards operative fixation of displaced midshaft clavicle fracture [8]. However, due to the rarity of medial clavicle fractures, the true rate of non-union and the outcome following nonoperative or operative treatment of these fracture are not well defined [5, 6, 9–11]. The objective of this study is to search the literature, summarise and analyse the demographics, clinical features and treatment outcome of acute medial clavicle fracture in adults.

MATERIALS AND METHODS

The systematic review was performed following Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) guidelines [12].

Search strategy; In July 2019, an electronic search of MEDLINE (1950 to present) (via PubMed), Embase (via OVID) and Cochrane Database of Systematic reviews (CDSR) was performed. The search terms used were as follows: “clavicle fracture”, “medial clavicle fracture”, “internal fixation”, “bipolar” and “segmental clavicle fracture”. Bibliographies of all accessed papers were searched for any undetected studies. English language restriction was applied. The studies were shortlisted if they pertained to medial clavicle fracture epidemiology or management. The abstracts of the shortlisted studies were then reviewed, and selected abstracts were considered for full-text review. Study inclusion and exclusion criteria Studies were included if they reported outcome of treatment of acute medial clavicle fracture in adult (all levels of evidence). We excluded studies with medial clavicle physal injuries, paediatric and adolescent fractures, non-union, stress fracture and associated sternoclavicular or acromioclavicular joint dislocation.

DATA COLLECTION AND ANALYSIS

Data from included studies were extracted to create the evidence table. Descriptive analysis including measures of frequency, central tendency and dispersion was performed to describe the features of the data using SPSS software (version 25; SPSS, Chicago, IL, USA). Meta-analysis was not performed due to the nature of included studies, being case reports and case series with no control groups.

RESULTS

The search yielded 17 articles, comprising 7 clinical studies and 10

case reports. A total of 220 adults with medial clavicle fractures were identified. There were 168 men and 48 women (n=216). The mean age at time of trauma was 48 years (range 16–94 years). The most common mechanism of injury was road traffic accident (RTA) (64%), followed by low fall (17%), high fall (5%), direct trauma (5%), sports (4%) and other (5%). The left side was fractured in 54% of patients. Six fractures were open, and associated vascular injury was reported in one patient. In 9% of patients the fracture was segmental. Eighty-one per cent of patients had associated injuries, with thoracic trauma being the most common (47%). Sixty percent of medial clavicle fractures were undisplaced or minimally displaced extra-articular fractures. Of the seven included observational studies, five were retrospective and two were prospective case series with no controls. Twenty-nine (13%) patients were treated surgically, and 191 (87%) were treated non-surgically. The indication for operative treatment was displacement (n=21), open fracture (n=5) [5, 15] and segmental fracture (n=3) [10, 16, 17]. Most commonly the displacement was anteriorly, but in two patients the medial clavicle fracture was posteriorly displaced [18, 19]. Various internal fixation implants were used for open reduction and internal fixation including plates screws. The implant was removed in 52% of patients (n=13). Overall, there were seven non-unions (n=137, 5%), and seven complications other than non-union (six delayed union and one prominent bone). The non-union rate following nonoperative management was 4.6%. (n=108). Only five studies evaluated the outcome using an outcome measure tool (n=50) [9, 10, 15, 17, 20]. Other reports were mainly restricted to general comments on pain and overall range of motion (ROM).

DISCUSSION

The findings of this systematic review show that medial clavicle fractures represent a distinctive subgroup of clavicle fractures. They commonly occur in middle-aged men as a result of road traffic accident. The high incidence of segmental fractures (9%) and chest trauma (49%) implies an association with high-energy trauma. This is in contrast to the overall demographics of clavicle fractures, which commonly occur in men in their early 30s, with simple fall being the most common mechanism of injury [1]. Nonoperative treatment is known to be the mainstay of management of acute medial clavicle fracture [5, 9]. The review shows an overall high union rate (95%) and a “good” functional outcome following nonoperative treatment. The main indications in the literature for operative management of medial clavicle fracture are displacement, open injury and segmental fracture. Nonetheless, absence of controlled studies makes comparison between operative versus nonoperative treatment options difficult. Furthermore, limited radiographic and clinical follow-ups and lack of use of validated outcome assessment tool precludes any further detailed analysis of treatment outcome based on fracture pattern and

displacement. The process of decision-making on surgical management of medial clavicle fracture can be complicated due to lack of consensus on the indications, and also a potentially challenging nature of surgery. Proximity to vital structures increases the potential risk of catastrophic intraoperative complication [21]. Furthermore, the small size of the medial fragment makes it difficult to achieve adequate fixation. This review shows that, in the 29 patients in whom the fracture was treated operatively, no intraoperative complication occurred. Staying anterior and superior to clavicle during surgery, and use of unicortical locking screws in the medial fragment, can reduce risk of intraoperative adverse events [21]. Various implants have been used for open reduction internal fixation of medial clavicle fracture. None of the implants revealed by this review have been specifically designed for a medial clavicle fracture. A low profile 2.4-mm plate may not be strong enough to resist torsional and bending forces on clavicle whilst healing occurs. We believe an ideal fixation implant for medial clavicle fracture is yet to be designed [22]

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