CASE REPORT

Proximal end clavicle fracture from a parachute jumping injury

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KEYWORDS
Medial end; Clavicle fracture; Parachutist

Summary Fractures of the medial end of the clavicle are the least common type of clavicle fracture. We report a 29-year-old military parachutist who presented with medial end clavicle fracture after a bad landing. He was first treated non-operatively in a tertiary center and was then referred to our center by his general practitioner. Surgery was indicated since the fracture was displaced and the patient needed anatomical reconstruction to promote rapid bone healing and a prompt return to work. The medial fragment being comminuted, K-wires were used for internal fixation instead of a plate. The two K-wires were bent 180° to avoid risk of migration and were removed 3 months after surgery when the patient had begun to perform all activities without pain. Aggressive treatment is recommended for medial end clavicle fracture in case of displacement and facilitates rapid functional recovery, notably in patients with considerable clavicular demand.

Introduction

Medial end clavicle fracture is rare, at no more than 10% of clavicle fractures as a whole, according to published series [1–5]. It is usually caused by high-energy trauma such as a motorcycle crash, but can also be secondary to a fall, aggression or firearm wound [3–5].

We report a case of medial end clavicle fracture sustained by a parachutist on landing.

Case report

A 29-year-old military parachutist, right-handed, with no particular medical history, experienced sudden right shoulder pain after a normal training jump. At first, he took this to be a simple pain following a bad landing; however, it progressively worsened and became severe under right upper limb motion. He was admitted to the nearest hospital, where clinical examination found intense pain on palpation of the clavicle. X-ray found a displaced right medial end fracture with a distal fragment lowered with respect to the proximal fragment, without contact between the two extremities (Figs. 1 and 2). Conservative management was decided on and the patient was discharged with a sling and swathe. The patient experienced great difficulty...
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Figure 1  Anteroposterior (AP) radiograph showing the medial end right clavicle fracture.

during the week following the trauma and was referred by his departmental physician for a second opinion. CT fracture analysis (Figs. 3a and 3b) confirmed considerable displacement and found a comminuted medial fragment. Given the presenting complaint and type of fracture, open surgery was indicated for reduction and osteosynthesis, and was performed at day 10 post-trauma. The patient was positioned in dorsal decubitus with a support between the two scapulae, and the upper limb included in the operative field. The horizontal incision along the clavicle was in this case extended toward to the medial end. The platysma muscle was sectioned perpendicular to its fibers. The periosteal incision was performed just above the pectoralis major insertions, with a subperiosteal approach avoiding unnecessary periosteal stripping. The comminuted aspect of the medial fragment was confirmed peroperatively; osteosynthesis therefore used not a plate but two 20 mm K-wires running from the distal fragment and then crossed and curved back 180° to avoid secondary migration (Fig. 4). Postoperative sling immobilization was prescribed for 4 months, with regular follow-up. Consolidation was achieved by the 3rd month, with complete clinical recovery of right shoulder function. The osteosynthesis material was subsequently removed (Fig. 5). The patient was able to return to work as a professional parachutist by the 8th month and was completely asymptomatic.

Figure 2  AP radiograph enlargement showing the great displacement at the fracture site with no contact between fracture ends.

Discussion

Medial end clavicle fracture is rare and little referred to in the literature. The etiology found in the present case has seldom been mentioned. The most frequent lesions following parachute jumps are to the ankle [6]; few studies

Figure 3  a and b: computed tomography (CT) scan showing the comminuted aspect of the medial fragment with an articular fracture line at the sternoclavicular joint.

Figure 4  AP radiograph showing the two crossed K-wires bent 180° to avoid risk of migration.

Figure 5  Radiograph of the clavicle fracture after hardware removal.
have reported the incidence of clavicle fracture in these cases. In 1948, Ciccone and Richman [7] reported a series of 3000 fractures and major soft-tissue lesions following parachute jumps, including 35 clavicle fractures—about 1% of all lesions, confirming the rarity of this fracture in this context. More recently, Bricknell and Craig [8] published a review of the literature on military parachuting lesions, with clavicular fracture rates ranging from 0.1 to 1.2% according to the series. None of the reports detailed the types of clavicular fracture. Medial end fracture is even rarer than the rates mentioned in the various reports concerning parachute jump lesions.

Management of medial end clavicle fracture is usually conservative, but there were several reports of pain and subjective impairment persisting long after trauma [2,5] and of high rates of non-union [9]. Table 1 summarizes the literature data. Clavicular surgery is rare, reputedly entailing a risk of neurovascular lesions. Our patient complained of considerable discomfort due to his displaced fracture, and the lesion mechanism was inherent to his job as a parachutist. Involvement was of the dominant side. Taking all this together, along with the risk of non-union, surgery seemed logically indicated. Due to the severe comminution of the medial fragment, osteosynthesis had to rely on two K-wires, running from the distal toward to proximal fragment, crossed and, given the considerable risk of secondary migration well established in the literature [10,11], cut and bent back 180°. In a series of five patients, Lowe et al. [12] reported results with surgical treatment of displaced medial end clavicle fracture, stressing the importance of early intervention for rapid recovery of anterior function with minimal complications. One case in that series was similar to the present, and was managed with a single screw between the two fragments associated to bone suture, which was not possible in the present case as the fracture line was not sufficiently oblique and the comminution would have impaired screwing. Material was removed in the 3rd month, to eliminate any further risk of wire migration. The patient was a parachutist who intended to carry on with his job, with the attendant risks of falls or bad landings and of displacement of material by strong trauma to the body and to the clavicles in particular.

Medial end clavicular fracture is rare and generally due to a motorcycle accident; it can also be caused by parachute landing, without associated multiple trauma. It is often overlooked due to insufficient plain X-ray, and CT examination is essential for classifying fractures, determining joint involvement, assessing fragment displacement and measuring the proximity of any vascular axes. In case of displacement, treatment should be surgical, comprising reduction and osteosynthesis, particularly in professional parachutists. K-wire stabilization may be useful in case of comminution, but the procedure must be strictly rigorous, bending the wires back 180° to avoid secondary migration. The wires should be removed once clinical and radiological consolidation has been achieved.

**Disclosure of interest**

The authors declare that they have no conflicts of interest concerning this article.

**References**


**Table 1** Epidemiological data in the literature for medial end clavicle fractures.

<table>
<thead>
<tr>
<th></th>
<th>Clavicle fracture (n)</th>
<th>Medial end fracture (%)</th>
<th>Mean age (years)</th>
<th>Most frequent mechanism</th>
<th>Treatment</th>
<th>Non-union (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nordqvist (1994) [1]</td>
<td>2035</td>
<td>3</td>
<td>59 [34–70]</td>
<td>RA</td>
<td>Conservative 100%</td>
<td>Not specified</td>
</tr>
<tr>
<td>Lowe (2008) [12]</td>
<td>5</td>
<td>100</td>
<td>43 [25–52]</td>
<td>RA (80%)</td>
<td>Surgical</td>
<td>100% 0</td>
</tr>
</tbody>
</table>

RA: road accident.

