Dual plating for bipolar clavicle fractures: A case report

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ABSTRACT

Clavicular fractures are common, accounting for 4% of all adult fractures [1]. However, simultaneous medial and lateral fractures occurring in the same clavicle (the so-called ‘bipolar clavicle fracture’) are rare. Treatment for this type of fracture is not well established. Herein, we report our experience of the operative management of a bipolar clavicle fracture using two anatomical locking plates.

The patient was an 82-year-old woman who presented with left-sided clavicle pain after falling to the ground. Plain radiography revealed midshaft and distal clavicular fractures. Open reduction and internal fixation were performed using two different plates, the VA-LCP anterior clavicle plate (DePuy Synthes, West Chester, PA, USA) for the midshaft fracture and the LCP superior anterior clavicle plate with lateral extension (DePuy Synthes) for the distal clavicle fracture. Bony union was achieved 4 months postoperatively without any complications.

In conclusion, dual plating is an effective surgical procedure for treating bipolar clavicle fractures.

Introduction

Clavicular fractures are fairly common, accounting for 4% of all adult fractures [1]. However, simultaneous medial and lateral fractures occurring in the same clavicle (the so-called ‘bipolar clavicle fracture’) are rare [2]. Reportedly, high-energy trauma can cause this type of fracture [3]. Elderly individuals are more susceptible to this fracture even with low energy trauma [2,4]. Treatment for such clavicular fractures could be conservative or operative, according to the degree of displacement.

Herein, we report our experience of the operative management of a bipolar clavicular fracture using two anatomical locking plates and we present a review of relevant literature.

Case report

The patient was an 82-year-old woman with history of hypertension, hyperlipidemia, and paroxysmal atrial fibrillation. She fell to the ground while carrying bags in both hands, and she was diagnosed with a “bipolar clavicle fracture” (fractures in the medial and distal part of her left clavicle) (Fig. 1).

Two days after she was admitted, open reduction and internal fixation was performed using two different plates since no single plate could fit the whole clavicle. First, the midshaft fracture was reduced and fixed with a 2.0-mm K-wire. Second, the distal end of the fracture was fixed with a 2.0-mm K-wire. Subsequently, a VA-LCP anterior clavicle plate (DePuy Synthes) was placed anteriorly to...
repair the midshaft fracture. An LCP superior anterior clavicle plate with lateral extension (DePuy Synthes) was placed superiorly to repair the distal clavicle fracture (Fig. 2). Plates were positioned so the screws at the distal end of the medial plate and at the proximal end of the lateral plate would not interfere with each other.

The patient was discharged 4 days later and sutures were removed 16 days postoperatively. Passive and active range-of-motion exercises were initiated on postoperative day 2. Low-intensity pulsed ultrasound (LIPUS) application at the fracture site was started 10 days postoperatively, to promote bone healing.

Bony union was achieved 4 months postoperatively, without any complications (Fig. 3). She returned to Ground Golf without any problems.

Discussion

To the best of our knowledge, only 12 cases on surgical treatment of bipolar clavicle fractures (including the present case) have been reported so far (Table 1). Previously, high-energy trauma was known to cause this type of fracture. The mechanism of clavicular
fractures is thought to involve a direct traumatic force to the adducted shoulder [4]. Recently, bipolar clavicle fractures have been found to occur due to low-energy trauma in elderly patients, presumably due to osteoporosis [4–6]. A displaced fracture can easily be seen on a plain radiograph. However, the other minimally displaced fracture tends to be overlooked [7]. Computerized tomography (CT) is useful for detecting minor or nondisplaced second fractures.

The treatment strategy for bipolar clavicle fractures remains controversial. Although, some studies on conservative treatment have reported good clinical outcomes [3,4] (Table 2), rehabilitation should be initiated as soon as possible. We opted for open reduction and internal fixation for this patient to prevent disuse muscular weakness. Application of two anatomical plates to the different aspects of the clavicle was more feasible than bending a single long plate to fit the whole clavicle. Care must be taken when drilling holes in the clavicle, at the point where two plates lie at the same level, so that the position of one hole does not interfere with that of the other.

We could not find the non-union case of bipolar clavicle fracture in the literature. One reason is the non-union rates after clavicle shaft operation are so low (2.6–10%) [8,9] and the bipolar clavicle fracture is so rare that we could not find the non-union case. The selection of treatment must be appropriate in every case. The other reason is the publication bias. Treatment failure doesn’t tend to be reported.

Statement of informed consent

Written informed consent for publication of clinical details and clinical images was obtained from the patient.

Declaration of competing interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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Table 1
Summary of surgical treatment case studies on bipolar clavicle fractures.

| References          | Year | Gender | Age | Trauma        | Implants used               |
|---------------------|------|--------|-----|---------------|-----------------------------|
| Heywood et al. [10] | 2005 | Male   | 54  | Assault       | Medial plate                |
| Miller et al. [11]  | 2009 | Male   | 17  | MVA           | Lateral hook plate          |
| Grossi [12]         | 2011 | Male   | 41  | Fall from roof| Medial plate                |
| Daolagupu et al. [13]| 2013 | Male   | 12  | Fall          | Medial plate                |
| Skedros et al. [14] | 2014 | Male   | 33  | MVA           | Reconstruction plate        |
| Varelas et al. [2]  | 2015 | Female | 68  | Fall on ice   | Medial plate                |
| Sopu et al. [15]    | 2015 | Male   | 52  | Fall from pushbike | Medial plate, Lateral plate |
| Yalizis et al. [7]  | 2016 | Male   | 38  | Fall from pushbike | Medial plate, Lateral no fixation |
| Ogawa et al. [5]    | 2017 | Female | 74  | MVA           | Medial no fixation          |
| de Ruiter et al. [3] | 2019 | Male   | 23  | MVA           | Medial plate, Lateral plate |
| Maalouly et al. [6] | 2019 | Female | 78  | MVA           | Medial plate, K-wire        |
| Present case        | 2020 | Female | 82  | Fall          | Medial plate, Lateral plate |

MVA; Motor Vehicle Accident.

Table 2
Summary of conservative treatment case studies on bipolar clavicle fractures.

| References          | Year | Gender | Age | Trauma                       |
|---------------------|------|--------|-----|------------------------------|
| Pang et al. [16]    | 2003 | Male   | 76  | MVA                          |
| Serra et al. [17]   | 2011 | Male   | 71  | Fall from stairs             |
| Sethi et al. [18]   | 2012 | Female | 70  | Fall from stairs             |
| Talboys et al. [4]  | 2016 | Female | 79  | Stumbled over slipper        |

MVA; Motor Vehicle Accident.
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