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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. 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

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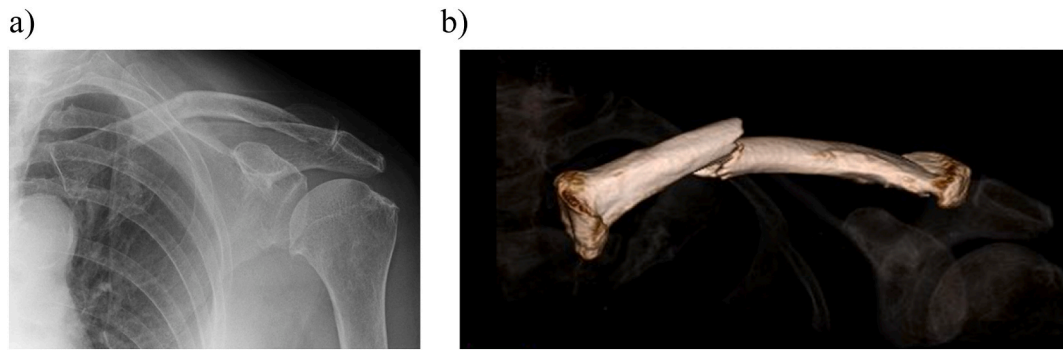


Fig. 1. Preoperative imaging of the bipolar clavicle fracture; (a) X-ray of the bipolar clavicle fracture; (b) 3D reconstruction from computerized tomography scan image of the bipolar clavicle fracture.

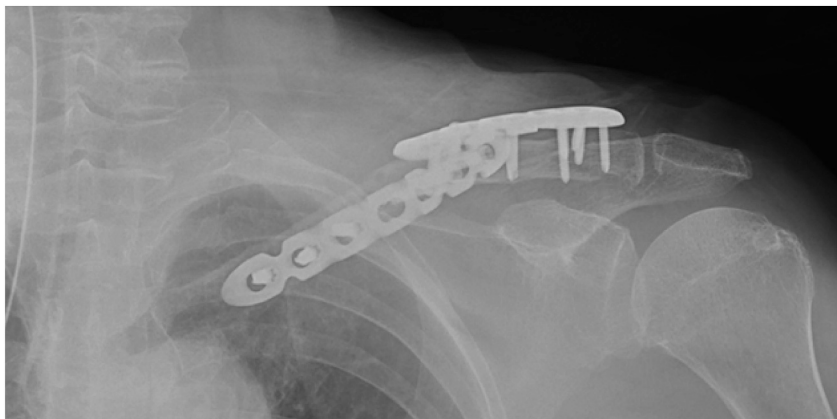


Fig. 2. Postoperative X-ray of the bipolar clavicle fracture; the midshaft fracture was fixed with a VA-LCP anterior clavicle plate (DePuy Synthes) and the distal fracture was fixed with a superior anterior clavicle plate with lateral extension (DePuy Synthes).

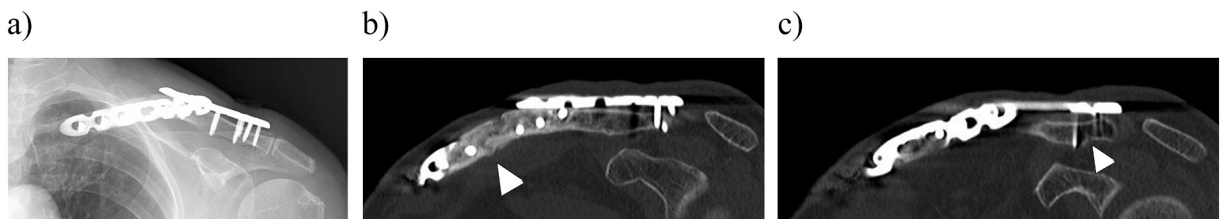


Fig. 3. Images obtained 4 months postoperatively; (a) X-ray at 4 months postoperatively; (b), (c) Coronal CT scan images of the bipolar clavicle fracture. Bony fusion was achieved in both medial (b, white arrowhead) and lateral (c, white arrowhead) fracture site.

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

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 Lateral hook plate
Miller et al. [11]	2009	Male	17	MVA	Medial plate Lateral plate
Grossi [12]	2011	Male	41	Fall from roof	Reconstruction plate K-wire
Daolagupu et al. [13]	2013	Male	12	Fall	Medial plate K-wire
Skedros et al. [14]	2014	Male	33	MVA	Reconstruction plate
Varelas et al. [2]	2015	Female	68	Fall on ice	Medial plate Lateral plate
Sopu et al. [15]	2015	Male	52	Fall from pushbike	Medial plate Lateral no fixation
Yalızis et al. [7]	2016	Male	38	Fall from pushbike	Medial plate Lateral hook plate
Ogawa et al. [5]	2017	Female	74	MVA	Medial no fixation Lateral plate
de Ruitter 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.

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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