Distal Clavicle Fractures: Open Reduction and Internal Fixation With a Hook Plate

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Summary: Displaced distal clavicle fractures pose unique challenges because of their propensity for instability. In particular, type II fracture patterns are associated with high rates of nonunion with nonoperative management; therefore, surgical fixation is often recommended. Hook plate fixation has demonstrated reliably high rates of osseous union with good functional outcomes. We present our surgical technique and rationale for using a hook plate in the setting of an unstable distal clavicle fracture.

Key Words: distal clavicle fracture, open reduction and internal fixation, hook plate, surgical technique

Video available at: http://links.lww.com/JOT/A389

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Management of distal clavicle fractures is frequently dictated by the stability of the fracture pattern. The ligamentous attachments of the acromioclavicular (AC) and coracoclavicular (CC) ligaments play a pivotal role in determining fracture stability. Type II distal clavicle fractures represent a particularly challenging entity because of the increased risk for instability secondary to CC ligament disruption. Nonunion after nonoperative treatment is seen more frequently with distal clavicle fractures compared with other clavicle fractures and is independently associated with age and increased fracture displacement.[1] Nonunion rates as high as 33% have been reported in distal clavicle fractures in which CC ligament disruption has occurred.[1–7]

Hook plate fixation has demonstrated reliably high union rates,[8–10] excellent functional outcomes,[8–10] and lower rates of overall complications.[10,11] However, using a hook plate necessitates a second surgery for plate removal, which is typically performed between 4 and 6 months postoperatively. Other potential complications of hook plates include peri-implant fracture,[12] subacromial impingement,[13] and erosion into the acromion.[14]

We present the case of a 28-year-old right-hand-dominant man who was involved in a low-speed motorcycle collision (see **Video**, **Supplemental Digital content 1**, http://links.lww.com/JOT/A389). Plain radiographs demonstrated a type IIB distal clavicle fracture with 100% displacement. Given the high rates of nonunion associated with unstable distal clavicle fractures and the higher rates of complications associated with delayed treatment of distal clavicle fracture, surgical intervention was offered.

The patient is positioned supine on a radiolucent table. A transverse incision is made along the superior aspect of the clavicle extending toward the posterior aspect of the AC joint. The skin and subcutaneous tissues are sharply incised. The platysma and deltotrapezial fascia are incised with electrocautery, and dissection is carried deep until the superior aspect of the clavicle is identified. The fracture site is visualized and debrided of interposed soft tissue and hematoma. In more distal fractures, it is important to preserve the AC joint capsuloligamentous attachments given the critical role in providing stability to the distal fragment. Provisional reduction of the fracture is achieved with either Kirschner wires or bone reduction clamps. We often prefer to drill a smooth Kirschner wire percutaneously from the acromion across the AC joint, through the distal fragment and into the proximal fragment to achieve provisional stability.

After provisional fixation, the hook plate is then trialed to determine the appropriate hook plate size and hook depth. The blade of the plate is inserted inferior to the posterior aspect of the acromion, and the shaft of the plate is brought down onto the superior aspect of the clavicle. It is critical to assess fracture reduction with the hook plate in place. Undersizing the hook depth will result in overreduction of the fracture. If the shaft of the plate cannot be brought flush with the clavicle while maintaining an anatomic reduction, a plate with a larger hook depth should be selected. Additionally, one can contour the blade of the hook to match the slope of the acromion to avoid point loading and potential erosion into the acromion. Appropriate position of the hook plate relative to the distal clavicle, AC joint, and acromion is demonstrated in Figure 1.

Once the appropriate plate is determined, it can then be secured to the clavicle with 3.5-mm cortical screws. Some implants also have the options to place locking screws, which can be used if bone quality is poor. The wound is then copiously irrigated and closed in a layered fashion. Ensuring good closure of the deep soft tissue flaps is of paramount importance because this will directly overlie the hardware.

Our postoperative rehabilitating protocol consists of initial non-weight bearing on the operative extremity in a sling used for comfort. During the initial 1–2 weeks, Codman pendulum exercises along with active and active-assisted motion

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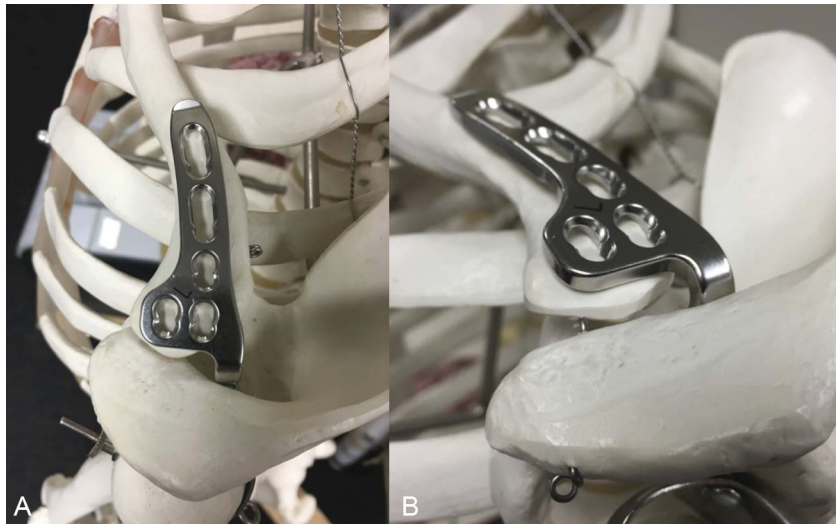

FIGURE 1. Superior (A) and anterolateral (B) views depicting proper positioning of a hook plate on a left distal clavicle.

are permitted. The patient can progress with their activity as their symptoms allow. We will routinely remove the hook plate at 4–6 months postoperatively.

Unstable distal clavicle fractures are associated with high rates of nonunion with nonoperative treatment[1–7] and higher rates of complications when surgical intervention is delayed.[12] Treatment of these fractures with a hook plate is associated with union rates ranging from 95% to 100%.[8–10] The use of a hook plate can be associated with complications in up to 15% of patients[12] and requires a second surgery for elective plate removal. Proper plate selection and appropriate positioning and contouring of the plate are vital to minimize complications.

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