The Journal of Foot & Ankle Surgery xxx (2016) 1–5

Contents lists available at ScienceDirect

The Journal of Foot & Ankle Surgery

journal homepage: www.jfas.org

Case Reports and Series

Percutaneous Plating of Weber B Fibular Fractures

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ARTICLE INFO

Level of Clinical Evidence: 3

Keywords:
ankle fracture
minimally invasive
MIPO
Weber B

ABSTRACT

The purpose of the present study was to describe a minimally invasive percutaneous technique for plating Weber B distal fibular fractures and to evaluate its efficacy by measuring patient outcomes and hardware removal rates. The data from 17 patients undergoing percutaneous plating of a distal fibular (Weber B) fracture were prospectively studied. A 4- to 6-hole semitubular plate with 3 screws was used for percutaneously plating. The Roles and Maudsley score was used to assess the patients' activity level. All fibular fractures had healed clinically and radiographically by 8 weeks after surgery. The postoperative Roles and Maudsley scores had improved significantly. The time required to return to activity was 4.3 ± 2.0 months. Hardware removal was required in 3 patients during the study period, which had an average of almost 4 years postoperatively. The results of the present study have demonstrated that percutaneous plating is an effective surgical option for treating Weber B distal fibular fractures.

Surgical techniques for internal fixation of ankle fractures have traditionally involved an open approach using plate and screw constructs. This allows for a stable, mechanical environment for healing. However, extensive surgical dissection can lead to devitalization of the fracture fragments and their soft tissue attachments, resulting in delayed union, nonunion, infection, or wound necrosis (1). Hence, a balance is necessary between anatomic reduction and soft tissue devitalization (2–4). As an alternative to help reduce the surgical morbidities, techniques using minimally invasive plate osteosynthesis (MIPO) have been developed (5).

MIPO allows for less periosteal stripping and for percutaneously placement of the plate and screws, minimally disrupting the blood supply. The fracture hematoma is also left undisturbed (6,7). This provides for relative stability, allowing micromotion at the fracture site (8). Thus, the callus formation is increased and, potentially, a more optimal healing environment results (9,10). The relative stability also eliminates the need for accurate apposition of the fracture fragments, because the bridging of the fracture gap is achieved by the external callus formation under the appropriate mechanobiologic conditions. The stiffness and strength resulting from callus formation allows stress to be unloaded off the implant, decreasing the chance for failure (8). The present report describes a minimally invasive percutaneous technique using a plate and screw construct for distal fibular fractures. We also evaluated the efficacy of this technique by measuring the patient outcomes and hardware removal rates.

Patients and Methods

The patients were selected from those undergoing surgery at the institution of the senior author (A.S.). Patients who had undergone percutaneous plating of a Weber B distal fibular fracture from August 2006 to October 2014 were prospectively studied. The institutional review board approved the present study, and all the patients provided written informed consent. The inclusion criterion was a diagnosis of a displaced distal fibular (Weber B) fracture (Figs. 1 and 2). Some patients also had additional pathologic features such as fractures of the medial malleolus (n = 3) or syndesmotic ruptures (n = 2). The exclusion criterion was a lack of follow-up data showing clinical or radiographic healing. A total of 17 patients met the inclusion criterion and underwent surgical treatment for their displaced distal fibular (Weber B) fracture. The senior author (A.S.) performed 16 of the 17 procedures (94.1%) and was the assistant surgeon for the remaining procedure. The Roles and Maudsley score was used to assess the patients' activity level, with 1 indicating the greatest (best) score and 4, the lowest (worst) score (11). Statistical analysis was performed using Excel™ (Microsoft Corp., Redmond, WA) and Stat-Sak (Malden, MA). The p value was set at $\leq .05$. Fisher's exact test and Student's t test were used for statistical analysis.

Financial Disclosure: None reported.
Conflict of Interest: None reported.
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http://dx.doi.org/10.1053/j.jfas.2016.11.012

Fig. 1. Preoperative radiograph of a distal fibular (and medial malleolar) fracture.

Fig. 2. Postoperative radiograph of percutaneously plated distal fibular fracture (and medial malleolar fracture reduced and fixated).

Surgical Technique

A 2-cm linear, longitudinal incision was made proximal to the fracture site (Fig. 3 and Supplemental Video S1). Minimal dissection was carried down to the level of the periosteum, preserving the periosteum and taking care to avoid branches of the superficial peroneal nerve. A soft tissue envelope running distally over the fibula

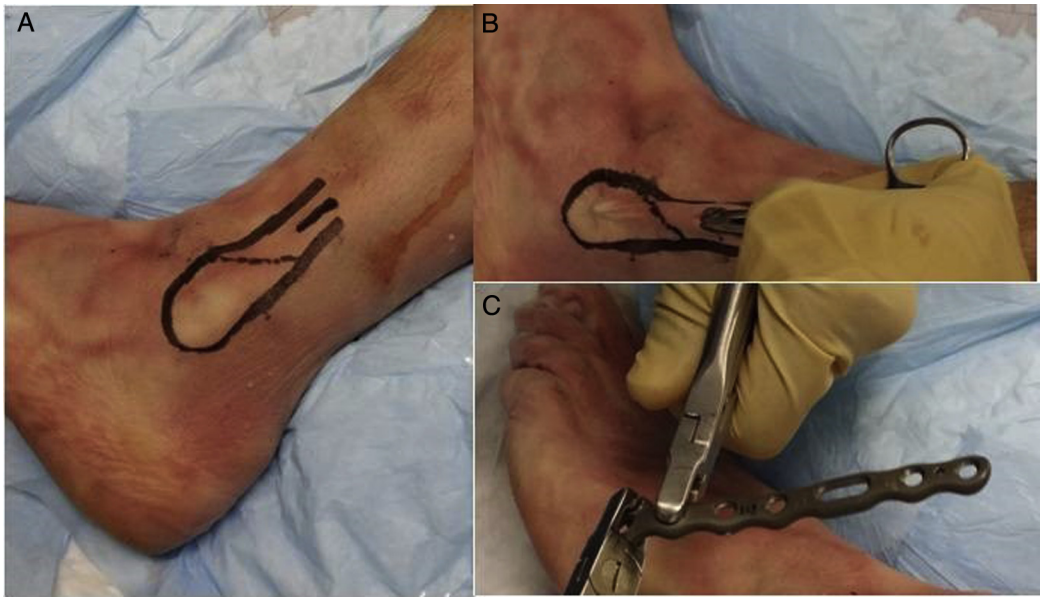

Fig. 3. Surgical technique. (*A*) A 2-cm linear, longitudinal incision was made proximal to the fracture site. (*B*) A soft tissue envelope running distally over the fibula and superficial to the periosteum was then created using a freer elevator. (*C* and *D*) A 4- to 6-hole, semitubular plate was precontoured and then centered percutaneously over the fibula and fracture site using the incision site as the entry point. (*E*) The fracture was further reduced using manipulation and a bone clamp. (*F*) Once the proper position of the plate had been confirmed, a stab incision was made at the approximate location of the most distal hole of the plate. (*G* and *H*) The plate was then fixated with 2 bicortical screws proximal to the fracture and 1 unicortical screw distal to the fracture.