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Original Research

# Isolated Medial Malleolus Fractures: Conventional Techniques Versus Headless Compression Screw Fixation

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ABSTRACT

The aim of the present study was to evaluate the clinical and radiologic results of surgically treated isolated medial malleolar fractures and compare the clinical and radiologic results of the fixation methods of headless cannulated fully threaded compression screws and cancellous lag screws and tension band wiring. We included 32 patients who attended the final follow-up examination. Group 1 consisted of 11 patients (34.4%) treated with headless cannulated fully threaded compression screws. Group 2 consisted of 10 patients (31.2%) treated with cancellous lag screws. Group 3 consisted of 11 patients (34.4%) treated with Kirschner wires and intraosseous tension wiring. Standard ankle radiographs, American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot scale, and visual analog scale for pain were assessed. No statistically significant differences were found among the groups in regard to age, gender, preoperative fracture type, follow-up time, radiologic bone union time, and baseline AOFAS scale scores. The interval to fracture healing was 2.2 ± 0.42 months in group 1, 2.5 ± 0.71 months in group 2, and 2.45 ± 0.52 months in group 3. The AOFAS ankle-hindfoot scale score was 96.73 ± 5.55 in group 1, 93.1 ± 5.43 in group 2, and 93.73 ± 5.52 in group 3. Hardware removal was not required in any patient in group 1 but was required in 2 patients (20%) in group 2 and 3 patients (27.3%) in group 3. The visual analog scale score for pain on palpation at the medial malleolus was significantly lower statistically in the headless compression screw group (group 1; $p = .003$).



Isolated medial malleolar fractures are less common than other ankle fractures, such as lateral malleolar, bimalleolar, and trimalleolar fractures (1). The stability attributed to the deltoid ligament complex has been suggested as a reason for the resistance of the medial malleolus to isolated fracture (2–4). When displaced, restoration of the medial malleolar fracture is often necessary for continuation of normal and pain-free ankle biomechanics. A full consensus has not yet been reached regarding the optimal treatment protocol for isolated medial malleolar fractures, which are seen relatively infrequently. Nondisplaced or minimally displaced isolated medial malleolar fractures can be treated conservatively (5,6). Surgery is usually applied to medial malleolar fractures for anatomic reduction and/or early joint range of motion (1,2). Fixation of these fractures is generally with either cancellous lag screws or tension band wiring. However, these conventional fixation methods can cause postoperative patient dissatisfaction, and complications have been reported such as cellulitis or pain associated with implant irritation (7–9). This has led clinicians to research innovative fixation materials (7,10–12). Recently, headless cannulated fully threaded compression screws, which are widely used for intraarticular fractures, primarily scaphoid fractures, have begun to be used in medial malleolar fracture surgery. However, very few studies have been reported on this subject (11). To the best of our knowledge, no study has compared headless cannulated fully threaded compression screws with conventional fixation methods for isolated medial malleolar fractures.

The aim of the present retrospective study was to evaluate the clinical and radiologic results of surgically treated isolated medial malleolar fractures and compare the clinical and radiologic results of the fixation methods, either headless cannulated fully threaded compression screws or cancellous lag screws and tension band wiring.

## Patients and Methods

Our university institutional review board approved the present study. We reviewed the data from 214 patients who had undergone surgery in our clinic for a medial malleolar fracture from June 2013 to March 2017. Patients were excluded if they were aged <18 years, had a follow-up period of <1 year, or had a bimalleolar, trimalleolar,

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**Fig. 1.** *(A)* Preoperative radiograph of an isolated medial malleolar fracture. *(B)* Postoperative radiograph of the patient treated with 2 headless cannulated fully threaded compression screws.

or open fracture. After application of the exclusion criteria, 32 patients (14.95%) who had attended the final follow-up examination were included in the present study. Group 1 included 11 patients (34.4%) treated with headless, cannulated, fully threaded compression screws (Fig. 1). Group 2 consisted of 10 patients (31.2%) treated with cancellous lag screws (Fig. 2). Finally, group 3 consisted of 11 patients (34.4%) who received tension band wiring using Kirchner wire and intraosseous tension wire (Fig. 3). The fixation method was selected according to the surgeon's personal preference.

In the preoperative fracture evaluation, the fractures were classified according to the classification system of Herscovici et al (5), which is based on the fracture level. In this system, type A fractures involve avulsions of the tip of the malleolus distal to the ankle joint line, type B involves fractures between the tip of the malleolus and the level of the tibial plafond, type C involves fracture at the level of the plafond, and type D involves fracture that extends vertically above the level of the tibial plafond. Of the 32 patients in the present study, 14 (44%) had Herscovici type D, 11 (34%) had type C, and 7 (22%) had type B fractures.

The radiologic evaluation included standard anteroposterior, mortise, and lateral non-weightbearing radiographs of the ankle. Nonvisualization of the fracture line on the radiographs and/or bony callus tissue bridging the fracture line was considered to indicate radiologic union. A 3-month period with no signs of progressive fracture healing was considered to represent delayed union. If present for a period of ≥6 months was considered nonunion. The radiologic measurements (radiologic bone union and fracture classification) were performed by a radiology specialist, and all clinical evaluations

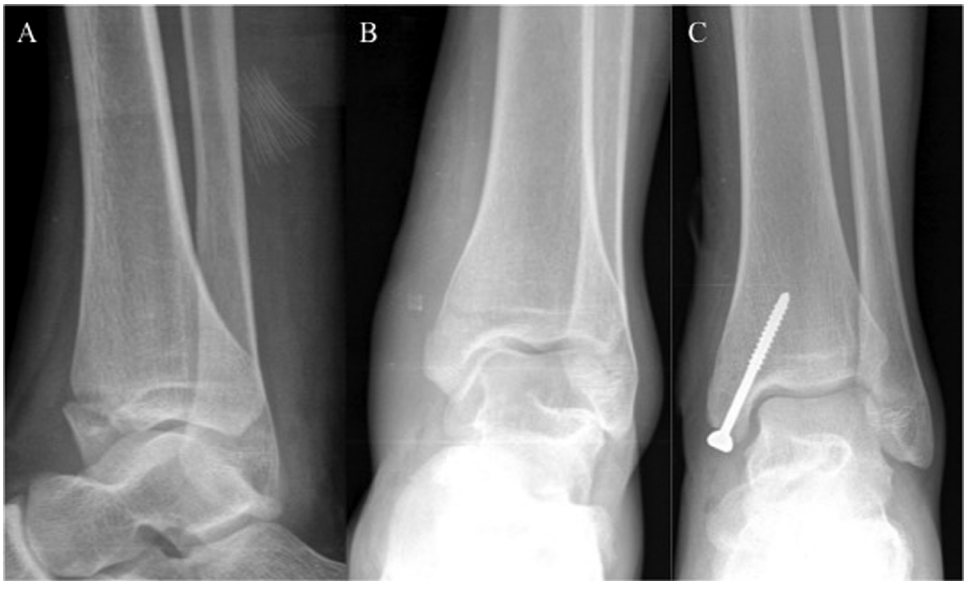


**Fig. 2.** Preoperative *(A)* lateral and *(B)* anteroposterior radiograph of an isolated medial malleolar fracture. *(C)* Postoperative radiograph of the patient treated with 1 cancellous lag screw.