



## Is there a role for intramedullary nails in the treatment of simple pilon fractures? Rationale and preliminary results

Matthew S. Marcus<sup>a</sup>, Richard S. Yoon<sup>b</sup>, Joshua Langford<sup>c</sup>, Erik N. Kubiak<sup>d</sup>, Andrew J. Morris<sup>d</sup>, Kenneth J. Koval<sup>c</sup>, George J. Haidukewych<sup>c</sup>, Frank A. Liporace<sup>b,\*</sup>

<sup>a</sup> Division of Orthopaedic Trauma, Department of Orthopaedic Surgery, UMDNJ – New Jersey Medical School, Newark, NJ 07101, USA

<sup>b</sup> Division of Orthopaedic Trauma, Department of Orthopaedic Surgery, NYU Hospital for Joint Diseases, New York, NY 10009, USA

<sup>c</sup> Division of Orthopaedic Trauma, Department of Orthopaedic Surgery, Orlando Regional Medical Center, Orlando, FL 32806, USA

<sup>d</sup> Division of Orthopaedic Trauma, Department of Orthopaedic Surgery, The University of Utah, Salt Lake City, UT 84108, USA

### ARTICLE INFO

#### Article history:

Accepted 9 February 2013

#### Keywords:

Tibia  
Plafond  
Pilon  
Fracture  
Intramedullary nail  
Articular  
AO/OTA type 43C

### ABSTRACT

**Introduction:** Certain patients with pilon fractures present with significant soft-tissue swelling or with a poor soft-tissue envelope typically not amenable to definitive fixation in the early time period. The objective of this study was to review the treatment of simple intra-articular fractures of the tibial plafond (Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association (AO/OTA) type 43C1–C2) via intramedullary nailing (IMN) with the assessment of clinical and radiographic results and any associated complications.

**Materials and methods:** Retrospective clinical and radiological reviews of 31 patients sustaining AO/OTA type 43C distal tibial fractures treated with IMN were evaluated. Our main outcome measurement included achievable alignment in the immediate postoperative period and at the time of union along with complications or need for secondary procedures within the first year of follow-up.

**Results:** Seven patients were lost to follow-up. All the remaining patients achieved bony union at a mean union time of  $14.1 \pm 4.9$  weeks with no evidence of malunion or malrotation. All patients were at full-weight-bearing status at 1-year follow-up. Complications were notable for one delayed union, one non-union, one patient with superficial wound drainage, two with deep infection, one with symptomatic hardware and one with deep vein thrombosis.

**Conclusion:** Simple articular fractures of the tibial plafond (AO/OTA type 43C) treated via IMN can achieve excellent alignment and union rates with proper patient selection and surgical indication. One should not hesitate to use additional bone screws or plating options to help achieve better anatomic reduction. However, larger, prospective randomised trials comparing plating versus nailing, in experienced hands, are needed to completely delineate the utility of this treatment modality.

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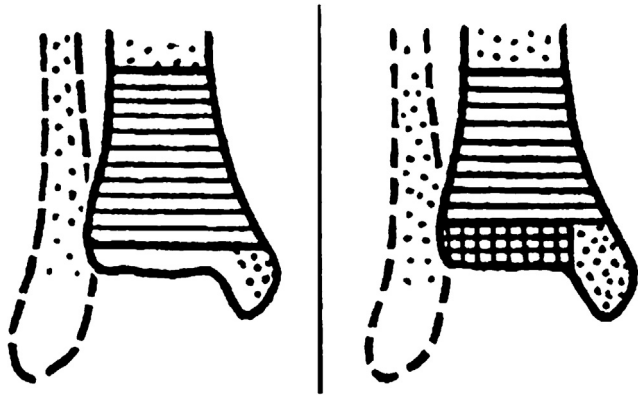
Optimal treatment of pilon fractures remains a controversial topic. Many have adopted a delayed, staged surgical treatment protocol in order to optimise soft-tissue swelling, which minimises wound complications.<sup>1–7</sup> In one recent series, early definitive open reduction and internal fixation (ORIF) has shown comparable results to the staged protocol.<sup>8</sup> Regardless of the treatment protocol, ORIF has typically remained the gold standard of Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association (AO/OTA) type 43C fracture management, with intramedullary nailing (IMN) reserved for fusion and/or salvage scenarios and distal tibial fractures that remain extra-articular.<sup>1–8</sup>

Extra-articular distal tibial fractures (AO/OTA type 43A) are also controversial when it comes to an ideal treatment protocol. Some retrospective reports note slightly fewer complications with plating, while others favour IMN; a recent prospective, randomised trial reported no differences between the two treatment options.<sup>9–20</sup> Despite the controversy, IMN is readily used for the treatment of extra-articular distal tibial fractures; to our knowledge, there are no reports in the literature for the use of IMN in the treatment of fractures of the tibial plafond, specifically with simple articular involvement. The rationale for the use of IMN was to decrease soft-tissue disruption from application of plates on the surface of the tibia as well as to prevent plate prominence in patients with a poor soft-tissue envelope.

With noted similarities between extra-articular distal tibial fracture (AO/OTA type 43A) and simple articular fracture (AO/OTA type 43C1–C2) patterns, IMN has been used in both of our level 1

\* Corresponding author at: Division of Orthopaedic Trauma, Department of Orthopaedic Surgery, NYU Hospital for Joint Diseases, 301 E 17th Street, Suite 1402, New York, NY 10003, USA. Tel.: +1 201 309 2426; fax: +1 212 598 7654.

E-mail address: [liporace33@gmail.com](mailto:liporace33@gmail.com) (F.A. Liporace).



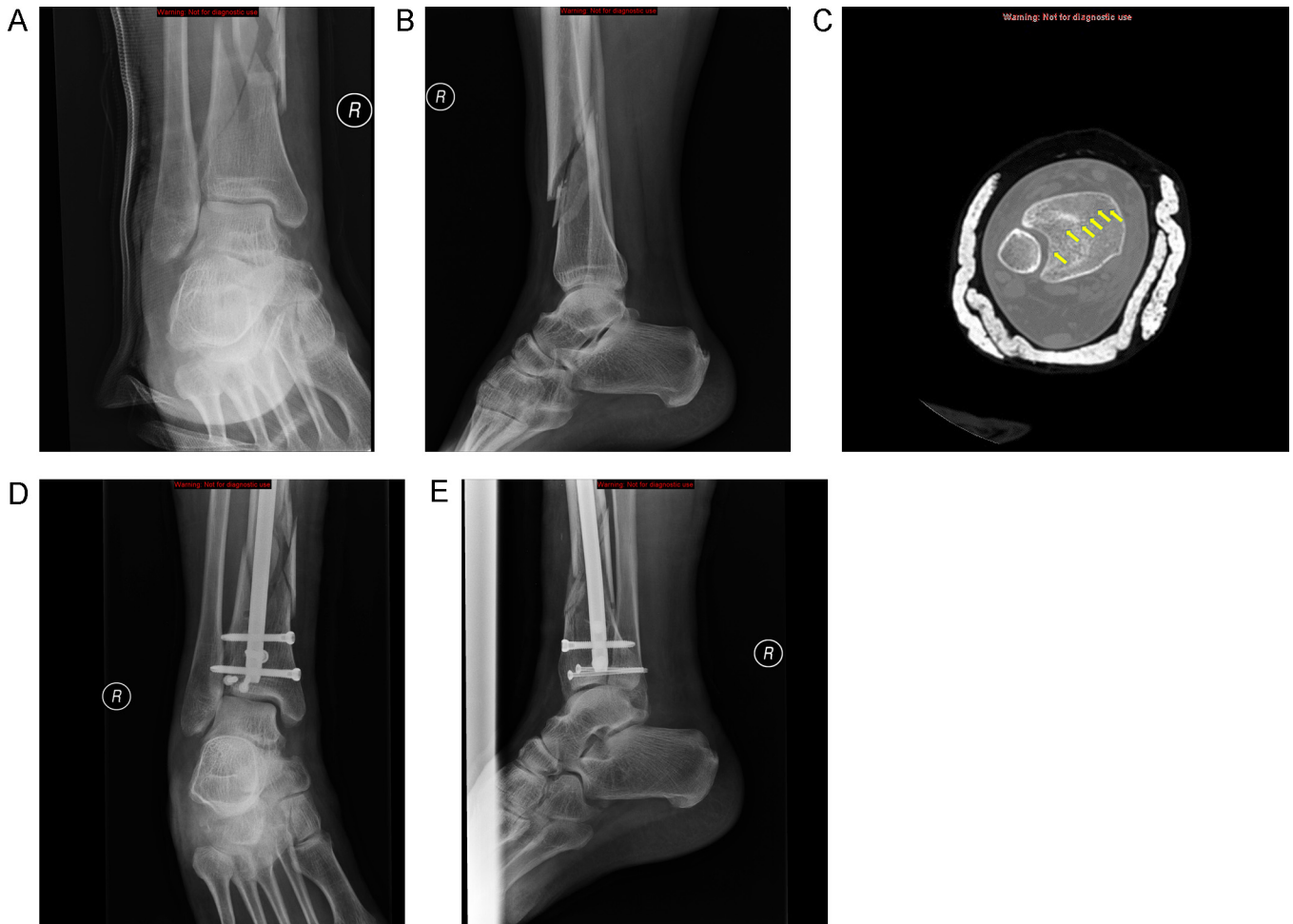
**Fig. 1.** AO/OTA 43A, (left) extraarticular, and AO/OTA 43C (right), complete articular, fracture pattern classifications. Reproduced with permission from the Orthopaedic Trauma Association for academic purposes.

trauma centres as a viable treatment option (Fig. 1). The purpose of this retrospective study is to share our experience, contending that IMN can be readily used for articular fractures of the tibial plafond while maintaining good alignment, high union rates and minimal complications.

**Patients and methods**

Ethical approval was obtained from all institutional review board committees prior to conducting this retrospective review. Initial retrospective screening of each institution’s orthopaedic trauma databases was performed. From December 2004 to March 2010, using initial search criteria (surgically treated tibial fractures, all comers), a total of 265 cases were identified for review. Of these, 165 cases were treated via IMN, of which 31 cases were identified to have at least 1-year clinical follow-up with an AO/OTA type 43C fracture. One AO/OTA type 43C3 fracture was removed. This was confirmed via corroboration between the treating surgeons’ notes, radiographs and computed tomography (CT) analysis. Seven patients were lost to follow-up following initial discharge after definitive fixation. Thus, final alignment and union data were summarised for 23 cases.

Initial management consisted of closed reduction and splinting followed by irrigation and debridement (I&D) for any open fractures within 8 h of presentation. Soft-tissue status was of paramount importance. Only when soft tissues were considered optimal was surgery undertaken. IMN, fibular fixation (if necessary) as well as intra-articular reduction were performed in the same surgical setting after soft tissues were deemed optimised. Fibular fixation was performed via ORIF while all intra-articular reductions and fixations were performed percutaneously.



**Fig. 2.** (A–E) Preoperative AP and lateral radiographs and CT axial views for a simple articular pilon fracture with accompanying postoperative radiographs fixed with supplemental fixation. Very subtle articular fracture lines originating from the primary fracture line seen in CT cuts (arrows) assist in capturing a simple, but true intra-articular fracture.

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