**Posttraumatic Tibial Defects Treated by the Ilizarov Method: Comparison of Classic Versus Integrated Technique**

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**Background/Purpose:** Limb salvage in the presence of posttraumatic tibial bone loss can be accomplished using the Ilizarov method. Internal fixation at the beginning of the consolidation phase stabilizes the regenerate and allows for early removal of the external fixator. We compared patients with posttraumatic tibial bone loss treated with either a circular external fixator exclusively, termed the "classic technique" (Fig. 1) or a combination of a circular external fixator and plating or insertion of an intramedullary nail during the consolidation phase, termed "integrated technique" (Fig. 2). We asked: (1) Does integrated fixation decrease the time in the external fixator? (2) Is there a difference in the rate of complications between the two groups? and (3) Are the results obtained at final follow-up comparable?

**Methods:** 58 consecutive patients (58 tibiae) with posttraumatic tibial bone loss were retrospectively identified. Patients were divided into two groups, "classic technique" (30 patients) and "integrated technique" (28 patients). The mean follow-up was 33 months (range, 6-90). IRB approval was obtained prior to initiation of the study. Baseline demographics, surgical variables, and outcomes were compared. Adverse events were reported as problems, obstacles, or complications as described by Paley. Functional and radiographic outcomes were reported using the Association for the Study and Application of Methods of Ilizarov (ASAMI) scoring system.

**Results:** Baseline demographics were similar in both groups. Mean tibial bone loss was 5.3 cm (range, 1.6-13) and 50% of patients were actively infected. Patients treated with integrated fixation had significantly less time ($P < 0.001$) in the external fixator, 7 months (range, 1.3-15) compared with 11 months (range, 4.5-15). There were 49 adverse events in 31 patients (17 problems, 31 obstacles, 1 minor complication). There was no difference in the severity ($P = 0.8703$) or number ($P = 0.359$) of complications between both groups. Overall, patients required a mean of 4.05 surgical procedures (range, 2-5) for limb salvage. There was no difference ($P = 0.2194$) in the incidence of unplanned surgical procedures (obstacles) between groups. All patients had no recurrence of infection and all had bony union at final follow-up. Good-to-excellent ASAMI function, and bone scores were obtained in 100%, and 98% of patients, respectively.

**Conclusion:** Limb salvage with distraction osteogenesis in the presence of posttraumatic tibial bone loss is a challenging surgical entity. The integrated fixation method allows for earlier removal of the external fixator while the frequency of adverse events and ability to restore limb lengths are similar in both groups. A mean of 4.05 surgical procedures were required for tibial reconstruction. Adverse events did occur in 53% of patients; however, good/excellent results can be expected in all patients with proper management.

**Figure 1. A**, Antero-posterior, and **B**, lateral x-rays of a 34 year-old male with a 6 cm distal tibial metaphyseal defect. The patient was treated with the "classic method" of distraction osteogenesis, **C**,**D**. Final result, **E**, **F**, with restoration of limb-lengths and normal coronal and sagittal alignment. Time in frame: 302 days.

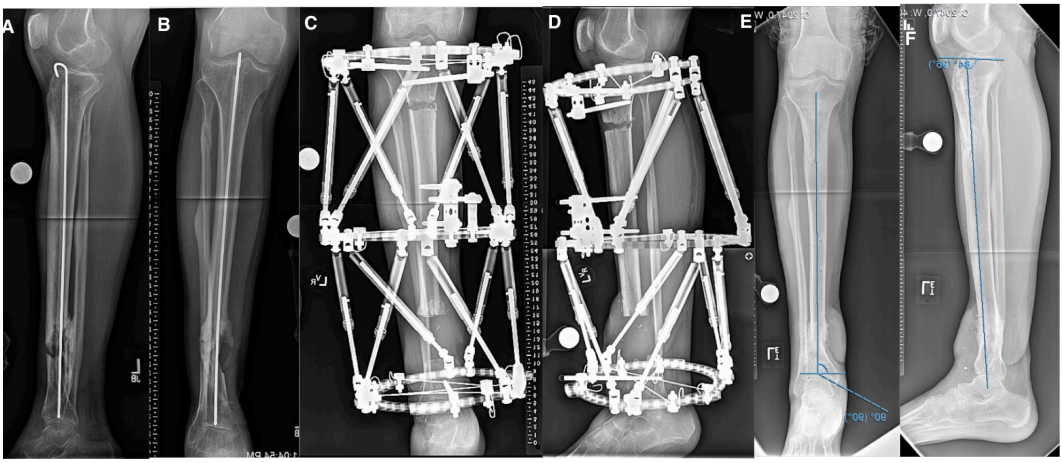
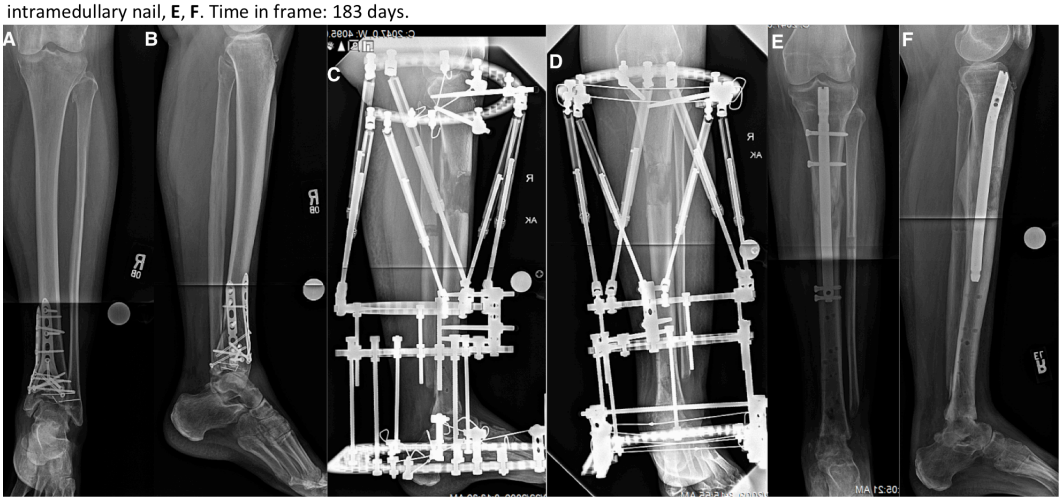



**Figure 2. A**, Antero-posterior, and **B**, lateral x-rays of a 50 year-old female with an infected Pilon fracture and 4 cm of nonviable bone at the ankle joint. Patient was treated with "integrated fixation", lengthening, **C**, **D**, and then insertion of an intramedullary nail, **E**, **F**. Time in frame: 183 days.

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