Purpose:
The open pilon fracture creates significant challenges in treatment. Parallel priorities of articular reconstruction and soft tissue restoration must be addressed. Patients are at increased risk for soft tissue related complications such as failure of primary wound healing and infection. In an effort to decrease complications, we have adopted a soft tissue driven treatment algorithm which involves the initial use of spanning external fixation in all patients. Following formal internal fixation of the articular surface, patients are then stratified into either plate fixation or use of an Ilizarov fixator based on their soft tissue injury severity and pattern. This study reports the results of 28 consecutive open pilon fractures over a five year period using this algorithm at a level one trauma center.

Methods:
Following IRB approval, a surgical database was queried for all open pilon fractures (OTA 43B and 43C) from December 2002 through December 2007. OTA 43A fractures were excluded. 28 fractures (28 patients) were identified as meeting inclusion/exclusion criteria. In each case, definitive fixation was performed by one of three fellowship-trained traumatologists using an injury-specific protocol based on metaphyseal fracture pattern and soft tissue zone of injury [Fig. 1]. Direct ORIF of the joint surface was performed in all cases. The metaphysis was fixed with either a plate or Ilizarov construct based on the complexity of the wound and the soft tissue coverage requirements. The Ilizarov frames were placed by a single surgeon after primary wound closure or flap placement. The number of procedures, soft tissue coverage problems, nonunions/malunions, wound infections and other major complications were assessed. Functional outcome was assessed in 20 patients by the Short Musculoskeletal Functional Assessment survey (SMFA) and the AAOS Foot and Ankle Questionnaire obtained with minimum follow-up of 12 months (ave. 38 months). Data was analyzed using a two-tailed unpaired t-test.

Results:
18 fractures were treated with plate fixation and 10 were treated with Ilizarov fixation, with Ilizarov predominating in IIIB open fractures (60%) [Table 1]. Soft tissue coverage consisted of free or rotational flap in 10 patients (IIIB) and primary closure +/- skin graft in 18 patients. Two delayed unions required bone grafting, and union was ultimately achieved in 100% of fractures. There were no malunions. Four patients developed deep tissue infections, three in the plated group (17%) and one Ilizarov case (10%) [Table 1]. All were treated successfully with staged debridement. None of these resulted in arthrodesis or amputation. The average SMFA Dysfunction Index was 19.4 versus 12.7 for a normative “uninjured” population (p<0.056). The Ilizarov fixation patients had a slightly worse SMFA Dysfunction index (22.1 vs 17.6), but better AAOS foot and ankle scores (75 vs 71) than the patients treated with plate fixation. Infection was associated with worse outcome scores on both measurements compared to those without infection [Table 2]. These trends did not reach statistical significance.

Conclusions:
Open pilon fractures are complex injuries with historically high complication rates and poor functional outcomes. Watson et al., reported on a series of pilon fractures using plate and Ilizarov constructs. The Ilizarov techniques were used exclusively in open fractures, which the authors attributed to their low wound complication rate (5% internal fixation vs. 0% Ilizarov fixation). Boraiah et al. reported a 3% deep infection rate in 59 open pilon fractures treated with plate fixation. We feel the selective use of the Ilizarov frame in higher grade open fractures achieves the goals of stable fixation after anatomic joint reconstruction and avoids the additional injury that plate application may incur. Although infection can be successfully treated following an open pilon fracture, the additional scarring and extended treatment time probably contributes to the worse functional outcome scores in the infected cases.

References: