

Special Case Report Series

JOT

CASE REPORTS

www.jorthotrauma.com

JOURNAL OF ORTHOPAEDIC TRAUMA

OFFICIAL JOURNAL OF

Orthopaedic Trauma Association

AOTrauma North America

Belgian Orthopaedic Trauma Association

Canadian Orthopaedic Trauma Society

Foundation for Orthopedic Trauma

International Society for Fracture Repair

The Japanese Society for Fracture Repair

JOT

CASE REPORT

High-Energy Pilon Fractures in the Elderly: A Case Report Highlighting Treatment Options and Strategies

Michael T. Archdeacon, MD, MSE

Summary: The appropriate treatment for a high-energy pilon fracture in an elderly patient has not been clearly established. In this case report, a 68-year-old female patient who is independent and ambulatory sustained an open, complex intra-articular pilon fracture. The fracture and soft-tissue injury were managed in a staged manner initially with open fracture debridement, wound closure, and provisional spanning ankle external fixation. The patient ultimately underwent uncomplicated ORIF and subsequent uneventful healing. However, the appropriate treatment modality, including the necessity of anatomic reduction in an elderly patient, remains a subject of controversy.

Key Words: high energy, pilon fracture, elderly

INTRODUCTION

High-energy pilon fractures are complex injuries for which treatment recommendations have changed substantially over the past 4 decades. Traditional Arbeitsgemeinschaft für Osteosynthesefragen principles were used with early efforts toward anatomic fixation of these injuries, yet it became clear that the soft-tissue envelope was as critical or more so than the fracture components.¹⁻⁴ Thus, staged treatment algorithms evolved to reduce soft-tissue complications.^{5,6} Definitive treatment strategies for these injuries include proponents of formal

traditional ORIF, limited ORIF of the articular surface with external fixation neutralization, and definitive external fixation using fine-wire fixators.⁷⁻⁹ Results of these various treatment modalities vary tremendously throughout the literature, further highlighting the complexity of treating these injuries.^{10,11}

In the more senior patient population, this particular fracture variant becomes an even more complex problem. Regardless of the definitive stabilization, almost all would agree that striving for an anatomic reduction of the articular surface to reduce the risk of posttraumatic arthropathy is a major goal. However, in an elderly patient, the effort toward achieving an anatomic reduction and the associated risks of doing so may not be warranted. Elderly patients often have more comorbid conditions including peripheral vascular disease and diabetes, both of which increase the risk of wound complications. In addition, the physical demands of a more senior patient and the associated limitations of arthritis are not the same as for a younger patient. Ambulatory capacity may be limited because of cardiopulmonary issues regardless of the status of the ankle joint, and life/work requirements are likely much different in the more senior patient. Finally, salvage options for failed fixation, infection or wound complications, and posttraumatic arthropathy are often far fewer for the elderly patient. Thus, the ultimate goals for treatment and the strategy for achieving those goals in the elderly pilon fracture are not clear.

PRESENTING CONCERNS

A 68-year-old white female patient was in a high-speed motor vehicle accident and sustained an open left pilon fracture. The patient was the driver of the vehicle, and airbag deployment occurred. Incursion into the passenger compartment including firewall and floor pan invasion was noted.

CLINICAL FINDINGS

At presentation, the patient complains of pain in the left foot and ankle but with no pain in the ipsilateral knee or hip.

From the Department of Orthopaedic Surgery, University of Cincinnati Academic Health Center, Cincinnati, OH.

The authors report no conflict of interest.

Reprints: Michael T. Archdeacon, MD, MSE, Department of Orthopaedic Surgery, University of Cincinnati Academic Health Center, PO Box 670212, Cincinnati, OH 45267-0212 (e-mail: michael.archdeacon@uc.edu).

The views and opinions expressed in this case report are those of the authors and do not necessarily reflect the views of the editors of Journal of Orthopaedic Trauma or Stryker Trauma & Extremities.

Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.



FIGURE 1. Anteroposterior (AP) and lateral radiographs of the initial injury for this left open pilon fracture.

The patient has no other complaints. She is moderately healthy with minor comorbidities, but no diabetes or peripheral vascular disease. The patient does not smoke and is currently retired. She lives independently and is socially active. There are no other musculoskeletal or other trauma-associated injuries.

Physical examination demonstrates an alert and oriented 68-year-old woman in no acute distress. The patient is hemodynamically stable with no evidence of respiratory distress. She has no ecchymosis, no edema, no swelling, no open wounds, no pain with palpation, and no instability of the upper extremities nor the right lower extremity. She has a full active and passive range of motion of those extremities as well with no evidence of neurovascular compromise. The spine is nontender, and the pelvis is stable to compression. In the injured left lower extremity, there is no evidence of injury to the left hip, femur, knee, or proximal tibia.

The patient does have gross deformity and instability of the left ankle with a 5-centimeter open fracture wound along the medial and distal tibia. Comminuted fracture segments are visible in the



FIGURE 2. AP and lateral radiographs of the provisional reduction and spanning ankle external fixation for the left pilon fracture.

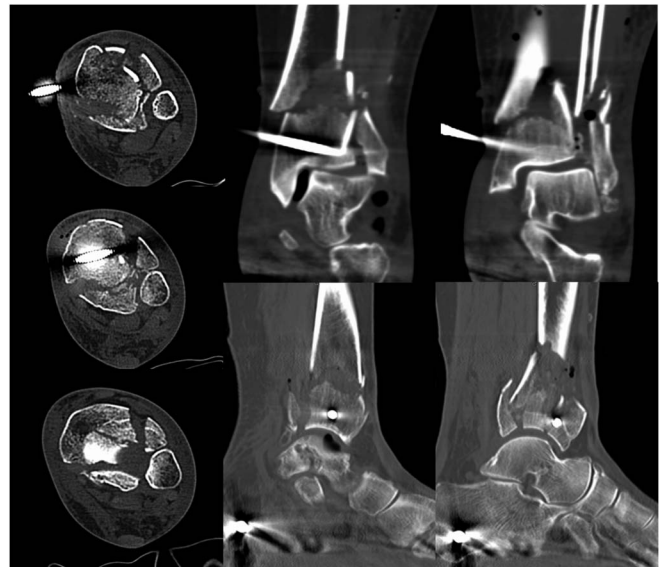


FIGURE 3. Axial, sagittal, and coronal computed tomography images of the left pilon fracture after provisional stabilization.

wound. The lateral soft tissues are intact and moderately edematous. The posterior tibial and dorsalis pedis pulses are palpable, and brisk capillary refill is noted. In a sensory examination, light touch is intact dorsal, plantar, and in the first web space, but the patient is completely insensate distal to the medial open fracture wound in the distribution of the saphenous nerve. From a motor standpoint, the extensor hallucis longus, toe extensors, and toe flexors are intact; however, given the fracture, motor assessment of ankle dorsiflexion and plantar flexion is not possible.

TIMELINE

The day of injury is January 14, 2015. The patient has initial surgical debridement and wound closure, with provisional external fixation on the day of injury. The patient is returned to surgery on postinjury day 16 (January 30, 2015) for definitive ORIF and removal of the external fixator. The patient returns to the office

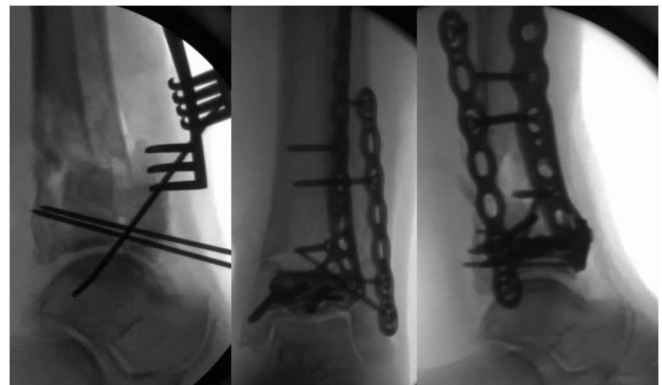


FIGURE 4. Intraoperative fluoroscopic images demonstrating provisional open reduction and definitive fixation in both the AP and lateral planes.

approximately 2.5 months status after ORIF of the pilon fracture with near complete consolidation of the fracture and wounds that are fully healed with no drainage or erythema. The patient is advanced to weight-bearing as tolerated gait. The patient is seen at the final follow-up 9-month postoperative in October 2015 with full weight-bearing ambulatory gait using a cane for balance. Her wounds are healed; she has minimal pain and has returned to most social activities including living independently.

DIAGNOSTIC FOCUS AND ASSESSMENT

Plain radiographs were obtained at the time of injury (Fig. 1). Radiographic images were obtained at the time of surgical debridement and external fixator application (Fig. 2). This was followed by axial, sagittal, and coronal computed tomography images (Fig. 3). Intraoperative fluoroscopy was used during the definitive fixation, and at subsequent follow-up visits; plain radiographs were obtained of the ankle until fracture healing was noted.

THERAPEUTIC FOCUS AND ASSESSMENT

Surgical management of the patient included an initial excisional debridement and irrigation of the open fracture wound on the day of injury. At the same surgical setting, a provisional reduction was obtained, and a spanning ankle external fixator was applied. The traumatic wound was closed after the initial debridement. On postinjury day 16, the patient is taken to surgery for staged removal of the external fixator and definitive ORIF. Intraoperative reduction was assessed with fluoroscopy, and stabilization was obtained with a locking plate construct using an anterior-lateral approach (Fig. 4).

FOLLOW-UP AND OUTCOMES

The patient was seen in follow-up approximately 2 weeks after the definitive fixation, and sutures were removed. The patient was placed in a postoperative boot, and outpatient physical therapy was initiated for active range of motion and gait training while maintaining a non-weight-bearing gait. At 10 weeks



FIGURE 5. Ten-week follow-up AP and lateral radiographs of left tibia demonstrating an early fracture consolidation. At this time point, weight-bearing was initiated.



FIGURE 6. Nine-month follow-up AP and lateral radiographs of the tibia showing complete fracture consolidation with a reasonably well-preserved joint space.

postoperatively, the fractures appeared nearly consolidated on plain radiographs and weight-bearing, as tolerated gait was allowed (Fig. 5).

At 9 months postoperatively, the patient was seen for the final follow-up. At that point, her wounds were completely healed, and radiographs demonstrated a consolidated fracture with acceptable joint and limb alignment (Fig. 6). She was using the leg with full weight-bearing, with minimal to no pain, and intermittently uses a cane or walker for balance assistance. The patient has returned to full independent living.

DISCUSSION

As was described in the Introduction, the management of open pilon fractures is complex under any circumstances. In the more senior patient, the factors to consider about treatment, comorbid conditions, and outcomes are even more difficult, as salvage options may be very limited. Factors that contributed to a good outcome include early and aggressive open fracture debridement and provisional stabilization with spanning ankle external fixation. In addition, reasonable expectations for outcomes were explained early in the treatment course.

Although a very acceptable outcome was achieved in this particular case, open pilon fractures in the elderly remain a difficult clinical problem. Definitive algorithms are not easy to determine, as so many factors come into play for the clinical decisions. Each case must be individually evaluated while weighing the goals of the patient, the condition of the soft tissues and fractures, the comorbid conditions, the skill of the surgeon, and the resources available to assist the patient postoperatively. Ultimately, this clinical problem will likely continue to increase, as more and more senior patients are remaining active and are at the higher risk for high-energy injuries. Thus, surgeons who manage these problems should be familiar with a variety of treatment options. These include early provisional spanning external fixation, definitive ORIF through formal or limited incisions, and definitive external fixation including fine-wire fixators and nonoperative treatment, which may decrease possible surgical complications despite less than perfect clinical outcomes.

INFORMED CONSENT

The patient was informed that her deidentified health information would be used in this publication, and she provided informed consent for the publication of this case report.

AXSOS-AR-13_14129

REFERENCES

1. Ruedi TP, Allgower M. The operative treatment of intra-articular fractures of the lower end of the tibia. *Clin Orthop Relat Res.* 1979;138:130–100.
2. McFerran MA, Smith SW, Boulas HJ, et al. Complications encountered in the treatment of pilon fractures. *J Orthop Trauma.* 1992;6:195–200.
3. Teeny SM, Wiss DA. Open reduction and internal fixation of tibial plafond fractures. *Clin Orthop Relat Res.* 1993;292:108–117.
4. Helfet DL, Koval K, Pappas J, et al. Intraarticular “pilon” fracture of the tibia. *Clin Orthop Relat Res.* 1994;298:221–228.
5. Sirkin M, Sanders R, DiPasquale T, et al. A staged protocol for soft tissue management in the treatment of complex pilon fractures. *J Orthop Trauma.* 1999;13:78–84.
6. Patterson MJ, Cole JD. Two-staged delayed open reduction and internal fixation of severe pilon fractures. *J Orthop Trauma.* 1999;13:85–91.
7. Anglen JO. Early outcome of hybrid external fixation for fracture of the distal tibia. *J Orthop Trauma.* 1999;13:56–57.
8. Blauth M, Bastian L, Krettek C, et al. Surgical options for the treatment of severe tibial pilon fractures: a study of three techniques. *J Orthop Trauma.* 2001;15:153–160.
9. Collinge CA, Sanders RW. Percutaneous plating in the lower extremity. *J Am Acad Orthop Surg.* 2000;8:211–216.
10. Marsh JL, Weigel DP, Dirschl DR. Tibial plafond fractures. How do these ankles function over time? *J Bone Joint Surg Am.* 2003;85-A:287–295.
11. Cutillas-Ybarra MB, Lizaur-Utrilla A, Lopez-Prats FA. Prognostic factors of health-related quality of life in patients after tibial plafond fracture. A pilot study. *Injury.* 2015;46:2253–2257.

Read the rest of the **JOT Case Reports** online on www.jorthotrauma.com. It's the Grand Rounds series from the *Journal of Orthopaedic Trauma*, the official journal of the Orthopaedic Trauma Association.