Anterolateral Approach for Tibial Pilon Fractures

David J. Hak, MD, MBA

Abstract: The anterolateral approach to the tibia has been popularized for management of tibial pilon fractures. This approach offers the benefit of improved soft tissue coverage and the potential for a lower rate of wound-healing complications by avoiding incision placement over the subcutaneous border of the tibia. Although the fracture pattern dictates specific plate use, anatomically designed anterolateral plates are useful for fixation of common fracture patterns. Additional exposures may be required to address other areas of the fracture, such as the medial malleolus, which cannot be accessed through this approach.

High-energy tibial pilon fractures present significant challenges. The high rate of wound-healing complications has lead to the adoption of a staged management protocol in which the fracture is initially stabilized with an external fixator followed by delayed open reduction and internal fixation when the soft tissues appear to have adequately recovered. Occasionally, definitive fixation of an associated fibula fracture may be performed initially, but care must be taken to ensure anatomic reduction. In addition, the fibula fixation incision should be planned so that it does not limit subsequent surgical treatment.

Historically, an anteromedial approach has been used for the management of tibial pilon fractures. This approach places an incision along the medial border of the anterior tibialis tendon and retracts the anterior structures laterally to allow for exposure of the anterior distal tibia. One of the major disadvantages of this approach is the risk of wound breakdown over the subcutaneous tibial border, with the potential need for flap coverage. In addition, this approach limits visualization of the lateral Chaput fragment.

ANTEROLATERAL APPROACH

Recently, the anterolateral approach to the tibia has been popularized. Although the fracture pattern dictates specific plate use, anatomically designed anterolateral plates are useful for fixation of common fracture patterns. Additional exposures may be required to address other areas of the fracture, such as the medial malleolus, which cannot be accessed through this approach.

Dr Hak is from the Department of Orthopedic Surgery, Denver Health/University of Colorado, Denver, Colorado.

Dr Hak has no relevant financial relationships to disclose.

Correspondence should be addressed to: David J. Hak, MD, MBA, Department of Orthopedic Surgery, Denver Health/University of Colorado, 777 Bannock St, MC 0188, Denver, CO 80204 (David.Hak@dhha.org).

doi: 10.3928/01477447-20120123-31

Figure 1: The incision for the anterolateral approach parallels the fourth metatarsal distally and runs between the tibia and fibula proximally. The border of the tibia and fibula have been marked.

The skin incision, which is centered at the ankle joint, parallels the fourth metatarsal distally and runs between the tibia and fibula proximally (Figure 1). The incision is usually not extended >7 cm above the ankle joint, the origin of the anterior compartment muscle bellies is encountered. Full-thickness skin flaps should be maintained. The superficial peroneal nerve is at risk for injury during the ap-
trauma update

Approach because it lies directly beneath the skin and crosses the surgical approach at the ankle. It must be identified, protected, and retracted during the surgical procedure.

With the superficial peroneal nerve mobilized and retracted, the fascia over the anterior compartment of the distal tibia and the extensor retinaculum are sharply incised. The anterior compartment tendons are then retracted medially (Figure 2). Proximally, the anterior compartment musculature, including the peroneus tertius, can also be mobilized and retracted medially. In addition, should you wish to place a distractor pin in the talus, the extensor digitorum brevis fascia can be incised and the muscle retracted medially, exposing the talar neck. The location of the ankle joint arthrotomy should be carefully planned to avoid unnecessary devascularization of the fracture fragments.

Although fracture pattern dictates specific plate use, anatomically designed anterolateral plates are useful for fixation of common fracture patterns. Fixation of the proximal portion of the plate can be performed percutaneously through separate stab incisions (Figure 3).

BIOMECHANICS

Yenna et al^4 compared the biomechanical stiffness of anterolateral and medial plates in a distal tibial fracture model using composite sawbones. They concluded that no significant difference in stiffness was found between anterolateral and medial locking plate constructs in compression and torsion testing. Thus, even for fracture patterns prone to varus collapse, locked anterolateral plating was mechanically equivalent to locked medial plating.

COMPLICATIONS

Based on a cadaveric vascularity study, Fisher et al^5 expressed concern about potential iatrogenic skin breakdown along the posterior border of the anterolateral incision. Howard et al^6 reported 2 (5.1%) wound healing complications in a study that included 39 anterolateral approaches for fixation of tibial pilon fractures. Both patients developed eschars that healed by secondary intention. In 1 patient, an anterolateral incision and a posterolateral incision with a 5.1-cm skin bridge were used, and at 3 months the patient developed a 4-cm eschar of the anterolateral incision. In the other patient, an anterolateral incision and a posterolateral incision with a 5.5-cm skin bridge were used, and at 3 months the patient developed a 1-cm eschar of the anterolateral incision.

Mehta et al^7 reviewed 112 patients treated with an anterolateral approach from the same institution with a minimum 3-month follow-up. In this series, 3 (2.7%) wound infections required operative debridement and irrigation, and 7 (6.3%) patients developed an iatrogenic superficial peroneal nerve palsy, 5 of whom recovered during the follow-up period.

Grose et al^8 reported 2 deep infections and 2 wound-healing complications in a series.
of 44 fractures treated using a more direct lateral approach just anterior to the fibula. In addition, they reported 4 non-unions (9%) in fractures treated with both nonlocked and locked precontoured anterolateral plates. In comparison, Sirkin et al reported a 12.5% partial-thickness wound necrosis rate in a series of 56 tibial pilon fractures that were treated in a staged manner primarily through an anteromedial approach.

Although reports have not highlighted tendon irritation, the placement of the plate directly beneath the extensor tendons may cause additional scarring and tendon irritation, which may necessitate subsequent hardware removal.

**Outcome**

At an average 13.7-months follow-up, Grose et al reported that the total ankle range of motion arc measured 43° (range, 15°-70°). The maximum ankle dorsiflexion averaged 10°, and the maximum plantar flexion averaged 35°. To date, no published series have examined patients’ functional outcome measures following tibial pilon fixation using an anterolateral approach.

**Conclusion**

The anterolateral approach has become increasingly popular for the fixation of tibial pilon fractures. It offers the benefits of improved soft tissue coverage and the potential for a lower rate of wound healing complications. Additional exposures may be required to address other areas of the fracture, such as the medial malleolus. Furthermore, long-term studies are needed to compare the overall complication rates and to assess patient’s functional outcomes using this approach.

**References**