Bridge Plating of Proximal Tibial Metaphyseal Fracture by Limited Open Technique

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Summary: In this video, we demonstrate application of a bridge plate by limited open technique for fixation of a proximal tibial metaphyseal fracture. Although intramedullary nailing remains our preferred surgical technique for treatment of most extra-articular fractures of the proximal tibia, we find bridge plating by limited open technique to be an important alternative option for select fracture patterns not amenable to intramedullary nailing.

Key Words: bridge plating, tibial fracture

Video available at: http://links.lww.com/JOT/A801

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NARRATION

The patient is a 57-year-old gentleman who sustained a closed fracture of his right proximal tibia after a motorcycle collision. The fracture pattern is a comminuted proximal tibial metaphyseal fracture that includes a nondisplaced simple articular split through the proximal tibia. Axial CT confirms a simple fracture line coursing through the proximal tibia from an anteromedial to posterolateral direction. Sagittal CT is notable for a large posterior butterfly fragment that is extra-articular, as well as the large anterior fragment that includes the tibial tubercle and the lateral tibial plateau.

We elected to treat this proximal tibia fracture with bridge plating by limited open technique.[1–4] We find this technique to be useful for comminuted fractures of the proximal metaphysis, metadiaphysis, and proximal one-third of the diaphysis that are not amenable to intramedullary nailing. We prefer bridge plating rather than intramedullary nailing for fractures that are too proximal to allow for multiple bicortical interlocking screws, as well as fracture patterns that have posterior cortical comminution that prevents placement of the typical posterior blocking screw to direct the nail. We also select this technique in proximal tibial fractures with intra-articular extension where the planned articular fixation will block the passage of an intramedullary nail.

The patient was taken to the operating room 4 days after his injury; we did not temporize him in an external fixator. The positioning is supine on a radiolucent operating table with a bump behind the ipsilateral hip and the operative lower extremity partially elevated on a bone foam ramp. Sterile prep and drape was performed in a standard fashion. We position a large C-arm on the contralateral side of the table to the injured extremity to facilitate intraoperative fluoroscopy.

The skin incision is a limited version of the standard anterolateral exposure of the proximal tibia used for tibial plateau fracture fixation. After the skin incision, the fascia of the iliotibial band and the proximal extent of the anterior compartment of the leg are exposed. The iliotibial band is incised sharply in line with its fibers a few millimeters proximal to the level of the knee joint line. The fascial incision is carried onto the anterior edge of Gerdy's tubercle. The tibial crest is then palpated, and the fascia of the anterior compartment of the leg is incised a few millimeters lateral to the crest to leave a cuff of tissue for later repair. The iliotibial band is then sharply elevated off of Gerdy's tubercle from anterior to posterior to make room for the plate. In addition, the anterior compartment is elevated off of the proximal tibia in a submuscular fashion.

The simple articular split in the proximal tibia is addressed first. Compression of the fracture is achieved with a large periarticular reduction clamp. The lateral arm of the clamp is placed through the surgical exposure, and the medial arm of the clamp is placed through a separate percutaneous incision. Clamp trajectory is based off of orientation of the fracture line on axial CT. Two 3.5-mm cortical screws are placed by lag technique for fixation of the simple articular split.

With the articular injury fixed, we proceed with bridge plating of the comminuted metaphyseal fracture. When possible, we use medium Weber clamps placed either through the anterolateral exposure or percutaneously to help correct angular deformity. If the clamps get in the way of instrumentation for the bridge plating, 0.062-inch Kirschner wires can be placed to provisionally hold the reduction, and the clamps can be removed.

The precontoured proximal tibial locking plate is then affixed to the radiolucent aiming jig and advanced along the anterolateral cortex of the tibia in a submuscular fashion. The edge of the plate is palpated just lateral to the tibial crest to confirm appropriate placement. The plate is seated just distal to the articular surface of the lateral plateau and confirmed on

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the AP fluoroscopic view. Appropriate plate position distally is confirmed on the lateral fluoroscopic view. A smooth wire is placed through a guide in the aiming jig to provisionally hold the plate in place proximally.

We use the aiming jig to percutaneously place a whirly bird device through the most distal hole to hold the plate in place distally and to bring the plate down to bone. Care is taken when percutaneously placing whirly birds or screws through the most distal aspect of this plating system to avoid damage to the superficial peroneal nerve. We then place a large periarticular reduction clamp proximally to compress the plate to bone. We place several 5.0-mm locking screws proximally through the plate and then remove the large periarticular reduction clamp. We find the whirly bird device be a useful tool to correct coronal alignment of the tibia as needed with this plating technique.

We place multiple 5.0-mm locking screws distally through the plate with percutaneous incisions using the aiming jig. We check final fluoroscopic images of the tibia to ensure acceptable reduction and safe placement of plate and screws. And finally, full-length AP and lateral x-rays of the tibia are obtained intraoperatively to confirm overall alignment.

Fascia and skin are closed in a layered fashion by preferred technique, and then, a soft dressing is applied. The patient is kept non–weight-bearing postoperatively. We like to see clinical and radiographic evidence of fracture healing before initiation of weight-bearing for a bridge plate construct such as this. At 6-week follow-up, the patient is made weight-bearing as tolerated and permitted a gradual return to light activities with instructions to advance his activity level as tolerated. At 12-week follow-up, the overall alignment has been maintained, the fracture is completely united on x-ray, and the patient has returned to full, unrestricted activities.

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