



**Zimmer®
Periarticular
Distal Tibial
Locking Plate**

Surgical Technique



The Science of the Landscape



Surgical Techniques for the Periarticular Distal Tibial Locking Plates

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Introduction

The *Zimmer* Periarticular Locking Plate System combines locking screw technology with periarticular plates to create fixed-angle constructs for use in comminuted fractures or where deficient bone stock or poor bone quality is encountered. The fixed-angle plate/screw device can be used in osteopenic bone and other areas where traditional screw fixation may be compromised.

The Periarticular Locking Plates will accommodate standard screws, as well as locking screws with threaded heads. When necessary, interfragmentary compression can be achieved using standard screws in the dual compression slots.

Cannulated screws and instruments allow provisional fixation with guide pins in the metaphysis. This helps ensure that the threaded locking screw heads align properly with the threaded plate holes.

All plate configurations contain locking screw holes in the plate head, and alternating locking and compression slots in the shaft.

Locking Screw Technology

The heads of the locking screws contain male threads while the holes in the plates contain female threads. This allows the screw head to be threaded into the plate hole, locking the screw into the plate. This technical innovation provides the ability to create a fixed-angle construct while using familiar plating techniques.

Locking Plate Technology

By using locking screws in a bone plate, a fixed-angle construct is created.

In osteopenic bone or fractures with multiple fragments, secure bone purchase with conventional screws may be compromised. The locking screws do not rely on bone/plate compression to resist patient load, but function similarly to multiple small angled blade plates. In osteopenic bone or comminuted fractures, the ability to lock screws into a fixed-angle construct is imperative.

By combining locking screw holes with compression screw slots in the shaft, the plate can be used as both a locking device and a fracture compression device. If compression is desired, it must be achieved first by inserting the standard screws in the compression screw slots before inserting any locking screws.

The locking plate design does not require compression between the plate and bone to accommodate loading. Therefore, purchase of the screws in the bone can be achieved with a thread profile that is shallower than that of traditional screws. The shallow thread profile, in turn, allows for screws with a large core diameter to accommodate loading with improved bending and shear strength.

Plate Features

The plates are precontoured to create a fit that requires little or no additional bending and helps with metaphyseal/diaphyseal reduction

- The plates are precontoured to help with metaphyseal/diaphyseal reduction
- The anatomical shape of the plates matches the shape of the distal tibia
- Locking holes in the plate head allow placement of the screws to capture fragments

- The low profile plate facilitates fixation without impinging on soft tissue
- The tapered plate shaft design allows for a minimally invasive technique with submuscular passage of the plate
- Distal Lateral Tibial Locking Plates are available in six lengths, from 6 hole (94mm) to 18 hole (237mm)
- Distal Medial Tibial Locking Plates are available in six lengths, from 6 hole (120mm) to 18 hole (264mm)

Indications

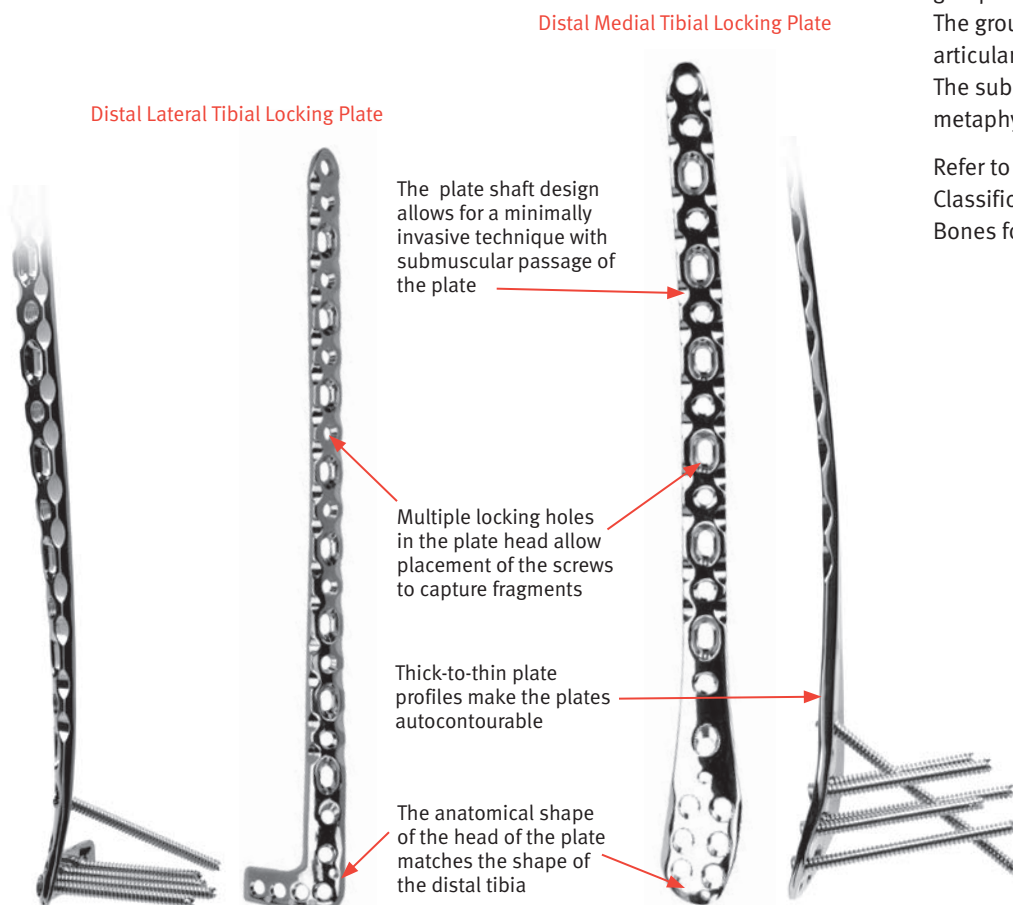
The Periarticular Locking Plate System is indicated for temporary internal fixation and stabilization of osteotomies and fractures, including:

- Comminuted fractures
- Supracondylar fractures
- Intra-articular and extra-articular condylar fractures
- Fractures in osteopenic bone
- Nonunions
- Malunions

Fracture Classification

The OTA/AO classification for long bone fractures is divided into three general groups each with three subgroups. The groups are extra-articular, partial articular, and complex articular. The subgroups reflect the degree of metaphyseal comminution.

Refer to the OTA/AO Comprehensive Classification of Fractures of Long Bones for more specific information.



Surgical Technique for the Periarticular Distal Tibial Locking Plates

Required Instrumentation

The following sets may be required for application of the Periarticular Distal Tibial Locking Plates:

- Small Fragment Screw and Instrument Set
- Basic Forceps Set
- 3.5mm/2.7mm Locking Screw and Instrument Set
- Distal Tibial Locking Plate and Standard Jig Set
- Linear Bone Clamps

Preoperative Preparation

Preoperative planning is an essential part of the treatment of distal tibial fractures.

Radiographic assessment of pilon fractures must include A/P, Lateral, Mortise and Oblique views of the distal tibia. For comminuted fractures, traction radiographs will allow for more precise identification of the fracture morphology and may facilitate preoperative planning. CT scans are very helpful in determining the precise amount of articular and rotary displacement and impaction of the fracture fragments.

Preoperative planning should include patient positioning, placement of incision(s), careful soft tissue assessment, methods and instruments required for fracture reduction, and the implants necessary for fixation.

Instruments frequently required include: distractor, tension device, bone spreaders and reduction forceps or linear bone clamps.

Place the patient in the supine position on a radiolucent table. Be sure that the fluoroscope can be positioned to visualize the distal tibia in both the lateral and anterior/posterior (A/P) projections.

Surgical Approach: Fibula

Rüedi and Allgower¹ described four sequential steps for the internal fixation of a distal tibial fracture, which are still applicable in contemporary management of pilon fractures.

1. Open reduction and internal fixation of the fibula
2. Anatomic reduction and fixation of the distal tibial articular surface
3. Bone graft subchondral defects
4. Buttressing with plate(s)

If fibular fixation is necessary, two incisions are used – one classically posterolateral and the other anteromedial. Exposure of the fracture fragments is critical to the success of the procedure.

Stabilize the fibula first. Fibular fixation helps restore length and is particularly important when there are fractures of the anterolateral or posterolateral tibia. Reduction of the fibula indirectly facilitates a reduction of Volkmann and Chaput fragments through ligamentotaxis via the anteroinferior or posteroinferior tibiofibular ligaments.

Fixation of the fibula

Outline the distal fibula of the affected limb. Mark the calcaneofibular ligament, posterior tibiofibular ligament and the anterior talofibular ligament.

Mark the path of the sural nerve and superficial peroneal nerve.

¹Rüedi, T., Allgower, M. The operative treatment of intra-articular fractures of the lower end of the tibia. *Clin Orthop.*, 138:105-110, 1979.

Begin the incision at the posterolateral border of the fibula, and extend it proximally about 6 inches. Then deepen the incision. The incisions should be made directly to, but not through the periosteum without substantial dissection of the subcutaneous tissues.

Incise the fascia of the peroneal muscles along the posterior border of the fibula. Expose the peroneus longus and brevis tendons, and the posterior border of the fibula. Incise the tissue along the posterior border of the fibula. This allows the peroneals to be reflected off the shaft.

Expose the fracture fragments by elevating the periosteum along the fracture lines. Dissect the soft tissue to between 2 and 3 mm away from the fracture lines, and hinge open the fragments to expose the fracture sites. A plane of dissection between the periosteum and the subcutaneous layer may be developed if necessary for placement of the plate.

The single most important factor in avoiding devitalization of the fracture fragments is distraction. Initial distraction may be achieved using a femoral distractor or an external fixator with pins placed in the proximal tibia and calcaneus.

Surgical Approach: Distal Medial Tibia

Medial Plate: Medial comminution or medial translation of the distal fragment.

Locate the appropriate landmarks on the anterior tibia. Mark the medial malleolus and the posterior border of the medial tibia. Mark the ankle joint, the lateral posterior border of the tibia, the crest of the tibia and the tibialis anterior tendon.

Begin the incision at the tip of the malleolar articular surface. Extend it laterally across the tibialis anterior tendon and then superiorly along a line about 1 cm lateral to the crest of the tibia.

It is vital that a well vascularized 6 – 8 cm skin bridge or flap is maintained between the incisions. Avoid opening the anterior compartment.

Continue the dissection being careful not to interrupt the peritenon of the tibialis anterior tendon. Elevate the flap medially avoiding the superficial peroneal nerve and the tibialis anterior tendon. Retract the flap and deepen the incision directly medial to the tendon. Distally displace the tendon laterally and deepen the incision leaving the lateral interval intact. Dissect down to the ankle joint, exposing the medial malleolus.

Fracture Reduction

It is imperative that accurate reduction of the fracture be obtained prior to and maintained during application of the distal medial tibial plate.

Reduce the intra-articular fragments using a combination of impactors, hooks, and linear bone clamps or Kirschner wires to temporarily achieve and hold the articular reduction. Use lag screws to secure the intra-articular fragments. To help avoid inserting the lag screws where they will interfere with plate placement, hold the plate on the bone in its approximate position. Then insert the lag screws outside the plate as needed. In most instances, the screws can be placed through the plate itself.

When the distal tibial articular surface is comminuted, carefully reduce it with tissue-sparing forceps, a dental pick or awl and provisional k-wire fixation.

Anterior and medial fragments may be retracted by a dental pick or a small bone spreader in order to obtain a view into the joint. This will bring the central and posterior fragments into view. The posterior fragment, often a key to reduction, may need to be derotated using a k-wire as a joystick. Another key fragment, the anterolateral edge of the tibia, which is usually joined by the intact anterior syndesmotic ligament, must be perfectly aligned. This may be accomplished through a separate stab incision avoiding the anterior tibial artery. Preliminary reduction must be checked by x-ray or c-arm prior to definitive fixation.

In all cases with articular impaction and/or a metaphyseal bone defect, bone graft or bone graft substitute must be used. The graft is usually applied prior to placement of the plate.

Axial alignment may be obtained using the anatomic contours of the plate.

To apply a medial buttress plate, perform a subperiosteal dissection. The proximal tip of the plate is tapered so it can be easily maneuvered under the soft tissue. Push the plate up under the soft tissue proximally. The distal end of the plate should fit on the medial malleolus. The plate can be held in place temporarily with a clamp.

Plate Positioning

Hold the appropriate Metaphyseal Jig on the selected plate and finger tighten the set screw (Fig. 1). Insert the 3.5mm Standard Jig Sleeve into one of the holes in the metaphyseal region of the Jig and thread the 1.6mm Standard Cannula into the plate hole (Figs. 2&3).



Fig. 1



Fig. 2



Fig. 3

Before placing the plate on the bone, place additional Jig Sleeves and 1.6mm Standard Cannulas into as many of the holes in the head of the plate as appropriate (Fig. 4). It is easier to thread the cannulas into the plate holes before the plate is applied to the bone. The cannulas can be used as handles to position the plate.



Fig. 4

Use this construct to place the initial 1.6mm Drill Tip Guide Wire in the metaphysis. Check plate placement, visually and fluoroscopically, to ensure that the plate is positioned appropriately on the metaphysis of the bone.

Use A/P and lateral fluoroscopic images to help position the plate. Because the tibial shaft may not be aligned with the distal fragment, the plate head should be used to determine the appropriate placement of the plate. The plate head should conform to the shape of the intact or reconstructed distal tibia. This will determine the alignment of the shaft.

Warning: Do not contour or bend the plate at or near a threaded hole, as doing so may deform the threaded hole and cause incompatibility with the locking screw.

Hold the plate in the desired position and insert a 1.6mm Drill Tip Guide Wire through one of the Guide Wire Cannulas until the tip engages the opposite cortical wall (Fig. 5). Use the fluoroscope to confirm the position of the wire in both the A/P and lateral planes. Adjust the wire location if necessary. If preferred, use a linear bone clamp or bone reduction instrument to secure the plate.



Fig. 5

When the first wire is satisfactory, adjust the plate rotation, if necessary. The next step is to align the plate shaft with the tibial shaft. Insert a 2.7mm standard cannula into the most proximal shaft hole (Fig. 6). Use the 2.7mm drill bit through the cannula (Fig. 7). Make certain under A/P and lateral fluoroscopy that the plate shaft and tibial shaft are aligned properly. Measure for the 3.5mm cannulated conical screw using the 3.5mm cannulated screw depth gauge (Fig. 8). Insert the 3.5mm conical screw. Then insert 1.6mm Drill Tip Guide Wires through the other distal Guide Wire Cannulas to help prevent rotation of the plate.

If desired, after removal of the metaphyseal jig, additional 1.6mm Drill Tip Guide Wires can be inserted through the distal K-wire holes to further stabilize the plate.

Use the fluoroscope for both A/P and lateral views to confirm the position of the plate head, shaft, and guide wires.

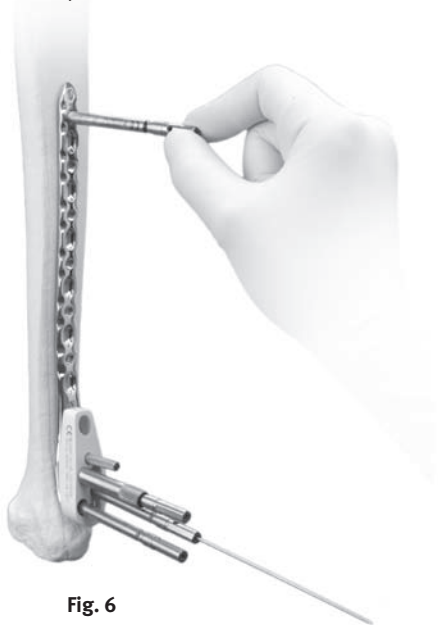


Fig. 6



Fig. 7



Fig. 8

Screw Trajectory

Distal Medial Tibial Locking Plate



Fracture Fixation

Metaphyseal Screw Fixation

If required, lag screw reduction of a fragment, compression of the articular surface and lagging of the plate shaft proximally must be accomplished before inserting any locking screws. The 3.5mm Cannulated Conical Screws can be used for lag screw fixation.

Once the plate is properly positioned, slide the 3.5mm Cannulated Screw Depth Gauge over the guide wires to measure for the screw lengths (Fig. 9). The tip of the gauge must contact the end of the guide wire cannula for an accurate measurement. This will position the tip of the screw at the tip of the guide wire. Read the proper screw length from the guide.

Predrilling and tapping are typically not necessary as the flutes of the screws are self-drilling and self-tapping. If the bone is dense, the lateral cortex can be predrilled using the 2.7mm Cannulated Drill and tapped using the 3.5mm Cannulated Screw Tap.

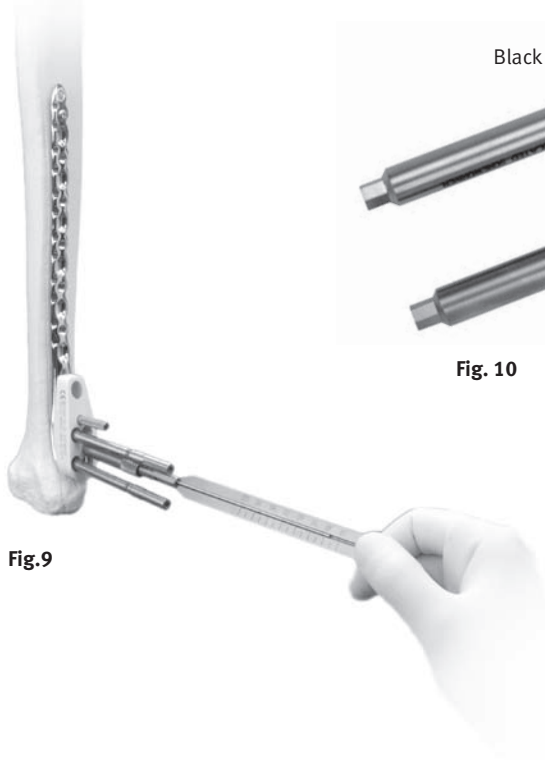


Fig.9

Slide the Screwdriver Stop Ring onto the screwdriver shaft and place it at the level of the black ring etched on the driver shaft (Fig. 10). Before the Blue Stop Ring approaches the top of the Jig Sleeve, power insertion should stop. Screws must be seated by hand (Fig. 11). The Screwdriver Stop Ring is intended to be a visual cue to stop power insertion of the locking screws.

Remove the Guide Wire Cannulas and use the 2.5mm Hex-head Cannulated Driver to insert a Cannulated Conical or Cannulated Locking Screw over each of the guide wires and into the distal holes.

Note: A screwdriver shaft can be used to loosely insert the screw under power, but the final seating must be accomplished by hand to avoid cross-threading of the screws in the plate holes or failure of the screw or driver.

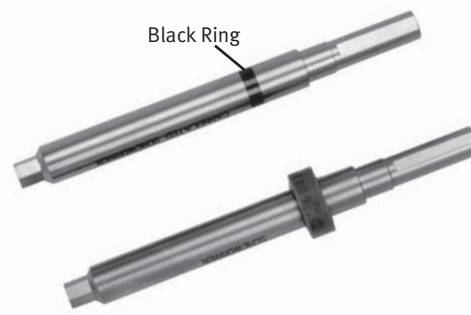


Fig. 10

Follow the same procedure for each distal screw. Be sure that all screws are securely tightened.

Note: If the plate shifts during screw insertion, all the pins and screws must be removed and reinserted for the screws to lock properly to the plate.

Note: If a plate screw impinges on one of the intra-articular lag screws, the lag screw must be removed and repositioned.

Use direct or indirect reduction techniques to reduce the distal tibia to the shaft. Confirm that the leg is in proper rotation. Temporarily secure the plate shaft to the bone with plate holding forceps, a nonlocking screw or the appropriate plate reduction instrument.

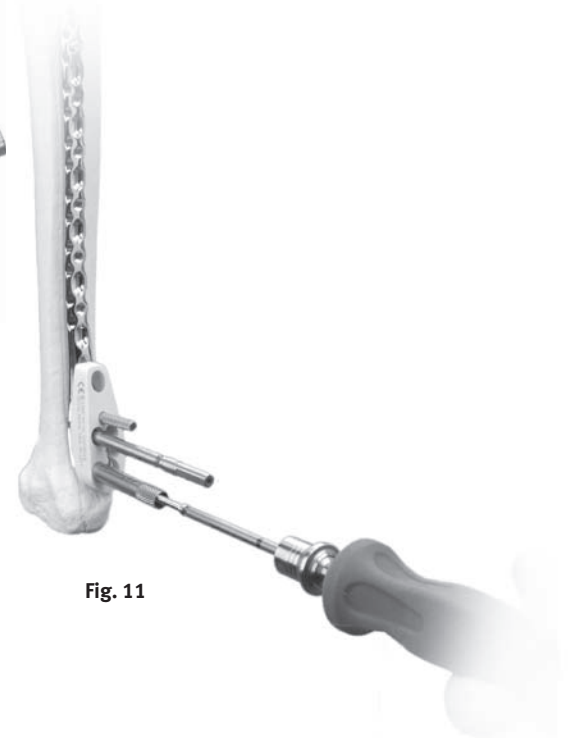


Fig. 11

Surgical Approach: Distal Lateral Tibia

Lateral Plate: Anterolateral buttressing needed to push the lateral fragment down.

The lateral plate should sit just above the articular surface so that the contour of the plate fits the contour of the bone.

Locate the appropriate landmarks on the anterior tibia. Mark the medial malleolus and the medial posterior border of the tibia. Then mark the ankle joint and the lateral posterior border of the tibia. Mark the crest of the tibia and the tibialis anterior tendon.

This incision is centered at the ankle joint, is parallel to the fourth metatarsal distally, and is parallel to and between the tibia and fibula proximally.

Because of the origin of the anterior compartment muscles from the anterior fibula, proximal extension more than seven centimeters from the ankle joint is usually not performed. Distally, the incision terminates slightly distal to the predicted location of the talonavicular joint.

Dissection through the skin and subcutaneous tissues should proceed sharply with maintenance of full thickness skin flaps. The superficial peroneal nerve invariably crosses the surgical incision proximal to the ankle joint and should be identified, mobilized, and protected throughout the surgical procedure. The fascia over the anterior compartment of the distal tibia is then incised sharply, beneath the superficial peroneal nerve. Distally, the extensor retinaculum is incised and the anterior compartment tendons are all retracted medially. The entire anterior compartment musculature, including the peroneus tertius, can then be mobilized and retracted

medially. These muscles and tendons are usually easy to mobilize from the underlying anterior tibiofibular ligament, the periosteum of the distal tibia, and the joint capsule. Exposure to the level of the medial shoulder of the distal tibia is possible. Proximally, the dissection is limited to the origin of the anterior compartment muscles from the fibula and the interosseus membrane. Distally, the tendons are retracted medially. The fascia of the extensor digitorum brevis can be incised, with the muscle carefully dissected and retracted medially. This allows exposure of the talar neck for pin placement and femoral distractor application. An arthrotomy can then be performed. The identification (consistent with the preoperative plan) of the proper location for the arthrotomy is critical to avoid unnecessary and damaging extensive devascularization of the distal tibia. The location of the arthrotomy should be at or close to the fracture line separating the anterolateral fracture fragment. Under no circumstances should the anterior tibiofibular ligament be surgically incised. The arthrotomy can be extended distally onto the talar neck.

Elevation of the capsule from the anterior distal tibia will allow inspection of the articular segments(s).

Application of a femoral distractor intraoperatively greatly assists with the articular visualization. The previously placed pins for an ankle-spanning external fixator are typically located medially and are of no use for intraoperative distraction. A 4mm Schanz pin can be placed transversely at the talar neck. A second 4mm Schanz pin can then be placed laterally at the tibia, proximal to the anticipated plate application. The location of the

anterior compartment neurovascular bundle and the superficial peroneal nerve should be kept in mind during this pin placement. A small distractor can then be applied with the threaded rod located posterolaterally. This will produce distraction across the ankle joint (and not the subtalar joint) combined with plantarflexion since the talar neck is anterior to the axis of rotation of the talus.

Fracture Reduction

It is imperative that accurate reduction of the fracture be obtained prior to and maintained during application of the distal lateral tibial plate.

Reduction typically proceeds from posterolateral to posteromedial to central to anterior to anterolateral. Since the rotation of the entire articular segment in the sagittal plane will not be known until the final reduction maneuver (that is, reduction of the anterolateral segment to the remaining reduced articular segments), it is not uncommon that a second reduction attempt to be required. Typically, an increase in the plantarflexion of the posterior segments is required to correct the commonly observed dorsiflexion deformity of the posterolateral segment. In order to proceed with the articular reduction, removal of all hematoma, debris, and early callus is required. The anterolateral segment can be externally rotated on its ligamentous attachment facilitating exposure into the joint and cancellous surfaces of the metaphysis. Any intercalary anterior cortical fragments and central osteochondral fragments should be retained. The cancellous surface of the medial and postero-lateral fragments should be cleaned. This includes cleaning proximally into the interface between

the postero-lateral segment and the intact tibia to allow mobilization of this fragment. If a large posterior spike is present, the posterolateral articular segment can be reduced to the intact tibia and held with k-wires placed percutaneously and obliquely from the anterior tibia. Control of the posterolateral segment can be difficult yet facilitated with a joystick placed directly into the anteriorly facing cancellous surface. Additionally, a large pointed reduction clamp (Weber clamp) can be placed behind the fibula but anterior to the peroneal tendons and onto the posterolateral tibia. This can be placed either through a small posterolateral incision or through a small opening in the posterolateral approach used for plating the fibula. Reduction then proceeds to the medial segment which can be reduced using the sagittally oriented articular fracture line located posteromedially. After k-wire stabilization of this reduction, the centrally impacted segments and osteochondral fragments can then be reduced. Dental picks and k-wires (as joysticks) are helpful during this portion of the reduction. These fragments can be temporarily stabilized with k-wires strategically placed (from lateral or medial) to allow for reduction of the anterior articular segments. If an anatomic reduction between these fragments and the posterior pilon is confidently obtained, intraosseous lag screws can be placed from anterior to posterior. Finally, the anterolateral segment is reduced to the remaining distal tibia. There is frequently a proximal cortical read to the anterolateral segment that ensures that the rotation and length of this segment is correct. The anterolateral segment should accurately match the extraarticular cortical read of the medial segment,

as well as all articular reads. Any inaccuracies should be corrected at this time. Any anterior distal tibial cortical fragments (whether vascularized or not) should be replaced to ensure an accurate overall reconstruction of the anterior tibial length. The anterolateral segment can frequently be clamped to the medial segment for added stability. The overall reduction can then be confirmed both visually and fluoroscopically if desired.

An alternative reduction strategy includes leaving all impacted central chondral and osteochondral fragments in their native (albeit malreduced) position while the remaining reductions are accomplished (posterolateral to medial to anterolateral). A small cortical window proximally can then be used to reduce the centrally impacted segments while the joint is viewed from below.

A fixation strategy should follow a carefully constructed preoperative plan. The goals of fixation should include interfragmentary compression of any articular components combined with stabilization of the articular segment to the tibial diaphysis.

Plate Positioning

Hold the appropriate Metaphyseal Jig on the selected plate and finger tighten the set screw (Fig. 12). Insert the 3.5mm Standard Jig Sleeve into one of the holes in the metaphyseal region of the Jig and thread the 1.6mm Standard Cannula into the plate hole.

Before placing the plate on the bone, place additional Jig Sleeves and 1.6mm Standard Cannulas into as many of the holes in the head of the plate as appropriate. It is easier to thread the cannulas into the plate holes before the plate is applied to the bone. The cannulas can be used as handles to position the plate.

Use this construct to place the initial 1.6mm Drill Tip Guide Wire in the metaphysis (Fig. 13). Check plate placement, visually and fluoroscopically, to ensure that the plate is positioned appropriately on the metaphysis of the bone.



Fig. 12

Use A/P and lateral fluoroscopic images to position the plate. Because the tibial shaft may not be aligned with the distal fragment, the plate head should be used to determine the appropriate placement of the plate. The plate head should conform to the shape of the intact or reconstructed distal tibia. This will determine the alignment of the shaft.

Warning: Do not contour or bend the plate at or near a threaded hole, as doing so may deform the threaded hole and cause incompatibility with the locking screw.

Hold the plate in the desired position and insert a 1.6mm Drill Tip Guide Wire through one of the Guide Wire Cannulas until the tip engages the opposite cortical wall. Use the fluoroscope to confirm the position of the wire in both the A/P and lateral planes. Adjust the wire location if necessary. If preferred, use a linear bone clamp or bone reduction instrument to secure the plate.



Fig. 13



Fig. 14

When the first wire is satisfactory, adjust the plate rotation, if necessary. The next step is to align the plate shaft with the tibial shaft. Insert a 2.7mm standard cannula into the most proximal shaft hole. Use the 2.7mm drill bit through the cannula (Fig. 14). Make certain under A/P and lateral fluoroscopy that the plate shaft and tibial shaft are aligned properly. Measure for the 3.5mm locking screw length using the 3.5mm/2.7mm standard locking screw depth gauge. Insert the 3.5mm locking screw (Fig. 15). Then insert 1.6mm Drill Tip Guide Wires through the other distal Guide Wire Cannulas to help prevent rotation of the plate.

If desired, after removal of the metaphyseal jig, additional 1.6mm Drill Tip Guide Wires can be inserted through the distal K-wire holes to further stabilize the plate.

Use the fluoroscope for both A/P and lateral views to confirm the position of the plate head, shaft, and guide wires. The guide wires should be parallel to the joint line.



Fig. 15

Screw Trajectory

Distal Lateral Tibial Locking Plate



Fracture Fixation

Metaphyseal Screw Fixation

If required, lag screw reduction of a fragment or compression of the articular surface must be accomplished before inserting any locking screws. The 3.5mm Cannulated Conical Screws can be used for lag screw fixation.

Once the plate is properly positioned, slide the 3.5mm Cannulated Screw Depth Gauge over the guide wires to measure for the screw lengths (Fig. 16). The tip of the gauge must contact the end of the guide wire cannula for an accurate measurement. This will position the tip of the screw at the tip of the guide wire. Read the proper screw length from the guide.

Predrilling and tapping are typically not necessary as the flutes of the screws are self-drilling and self-tapping. If the bone is dense, the lateral cortex can be predrilled using the 2.7mm Cannulated Drill and tapped using the 3.5mm Cannulated Screw Tap.

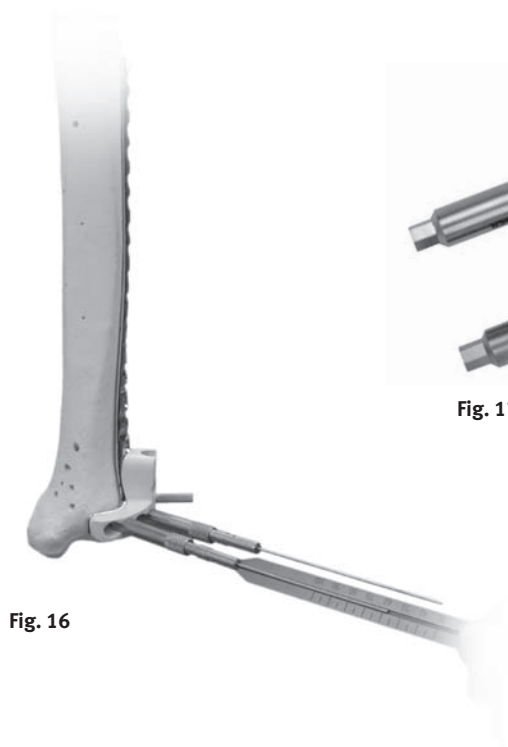


Fig. 16

Slide the Screwdriver Stop Ring onto the screwdriver shaft and place it at the level of the black ring etched on the driver shaft (Fig. 17). Before the Blue Stop Ring approaches the top of the Jig Sleeve, power insertion should stop. Screws must be seated by hand. The Screwdriver Stop Ring is intended to be a visual cue to stop power insertion of the locking screws.

Remove the Guide Wire Cannulas and use the 2.5mm Hex-head Cannulated Driver to insert a Cannulated Conical or Cannulated Locking Screw over each of the guide wires and into the distal holes (Fig. 18).

Note: A screwdriver shaft can be used to loosely insert the screw under power, but the final seating must be accomplished by hand to avoid cross-threading of the screws in the plate holes or failure of the screw or driver.



Fig. 17

Follow the same procedure for each distal screw. Be sure that all screws are securely tightened.

Note: If the plate shifts during screw insertion, all the pins and screws must be removed and reinserted for the screws to lock properly to the plate.

Note: If a plate screw impinges on one of the intra-articular lag screws, the lag screw must be removed and repositioned.

Use direct or indirect reduction techniques to reduce the distal tibia to the shaft. Confirm that the leg is in proper rotation. Temporarily secure the plate shaft to the bone with plate holding forceps, a nonlocking screw or the appropriate plate reduction instrument.



Fig. 18

Shaft Fixation

If both locking and nonlocking screws will be used in the shaft, the nonlocking screws must be inserted first. Insert additional nonlocking screws through the compression slots in the plate as desired.

Apply the appropriate drill guide to one of the nonlocking shaft slots, and use the appropriate Standard Drill to drill through both cortices. Use the Depth Gauge to measure the appropriate screw length. Then insert a self-tapping lag screw. Check the position of the screw with the fluoroscope. Repeat this procedure for each of the nonlocking screws to be inserted.



Fig. 19

To insert locking screws, thread the 2.7mm Standard Cannula into a locking hole in the shaft of the plate. Use the 2.7mm Standard Drill through the cannula to drill a pilot hole (Fig. 19). Check the depth and position of the drill with fluoroscopic images. Remove the cannula and use the Depth Gauge to measure the appropriate screw length. Then insert the locking screw (Fig. 20).

Tapping is typically not necessary as the flutes of the screws are self-drilling and self-tapping. If the bone is dense, the lateral cortex can be tapped using the 3.5mm Locking Screw Tap.

Insert locking screws as desired through the remaining locking holes of the shaft in the same manner.



Fig. 20

Strut Screw Fixation

A locking strut screw can be inserted into the plate to buttress a lateral fragment. Insert a Jig Sleeve and a 1.6mm Standard Cannula into the oblique locking hole. Then insert a Drill Tip Guide Wire through the Cannula until the tip engages the lateral cortical wall (Fig. 21). Use the fluoroscope to confirm the position of the wire in both the A/P and lateral planes.

Slide the Cannulated Locking Screw Depth Gauge over the guide wire to measure for the screw length, making sure that the tip of the gauge contacts the end of the guide wire cannula. This will position the tip of the screw at the tip of the guide wire. Read the proper screw length from the guide.



Fig. 21

Remove the Guide Wire Cannula and use the 2.5mm Hex-head Cannulated Driver to insert a Cannulated Locking Screw over the guide wire (Fig. 22).

Make a final check of the limb alignment and fracture reduction. Then make sure that all locking screws in the head and shaft are securely tightened before closing (Fig. 23).

Note: To avoid interference with the Strut Screws, the distal row of screws should not be more than 40mm in length.



Fig. 22



Fig. 23

Wound Closure

Use the appropriate method for surgical closure of the incision.

Postoperative Treatment

Postoperative treatment with locking plates does not differ from conventional open reduction internal fixation (ORIF) procedures.

Implant Removal

To remove locking screws use the small hexagonal screwdriver, 2.5mm hex to first unlock all screws from the plate and then remove screws completely. Do not use the Forward Captive Drivers for screw removal.

Please refer to the package insert for product information, including contraindications, warnings, and precautionary information.

Instruments and Implants



Distal Medial Tibial Plate Jig,
Right, 00-2360-094-01, Left 00-2360-094-02



3.5mm Standard Jig Sleeve 00-2360-093-04



Distal Lateral Tibial Plate Jig,
Right, 00-2360-095-01, Left 00-2360-095-02



Cannula Inserter 00-2360-088-00



1.6mm Standard Cannula 00-2360-021-16



Guide Wire Inserter 00-2360-085-00



1.6mm Standard Drill Tip Guide Wire 00-2360-033-16



2.7 Standard Drill 00-2360-205-27



2.7mm Standard Cannula 00-2360-020-27



2.5mm Hex Standard Cannulated Screwdriver
00-2360-066-25



Modular Handle 00-2360-086-00



2.0mm Standard Cannula 00-2360-020-20



2.0mm Standard Drill 00-2360-175-20



2.5mm Hex Standard Screwdriver 00-2360-065-25



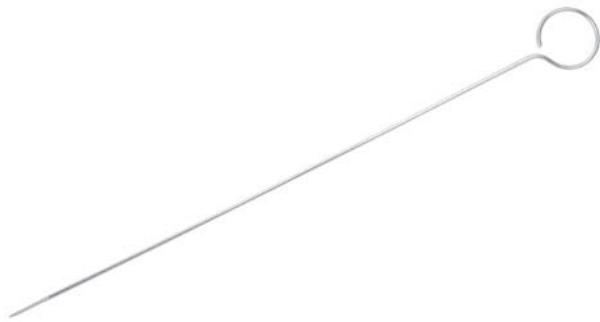
1 3.5mm / 2.7mm Locking Plate Reduction Instrument
00-2360-011-01

2 3.5mm / 2.7mm Plate Reduction Sleeve 00-2360-011-02

3 Spin Knob 00-2360-012-03



3.5mm Cannulated Locking Screw Depth Gauge
00-2360-041-35



Cleaning Brush 00-1147-076-00



3.5mm/2.7mm Locking Screw Depth Gauge
00-2360-040-35



Cleaning Stylet 00-1147-071-00



2.5mm Hex Std Forward Captive Screwdriver 00-2360-050-25



2.5mm Hex Std Cannulated Forward Captive Screwdriver
00-2360-051-25



2.7mm Std Locking Screw Tap 00-2360-053-27



3.5mm Std Locking Screw Tap 00-2360-053-35



3.5mm Std Cannulated Locking Screw Tap 00-2360-054-35

Order Information

Description	Part Number	Set Quantity
3.5mm/2.7mm Periarticular Locking Screw and Instrument Set - Set # 00-2360-000-02		
Cleaning Stylet	00-1147-071-00	1
Cleaning Brush	00-1147-076-00	1
3.5mm/2.7mm Plate Reduction Instrument	00-2360-011-01	2
3.5mm/2.7mm Plate Reduction Sleeve	00-2360-011-02	2
Plate Reduction Spin Knob	00-2360-012-03	2
2.0mm Standard Cannula	00-2360-020-20	4
2.7mm Standard Cannula	00-2360-020-27	4
1.6mm Standard Cannula	00-2360-021-16	4
1.6mm Standard Drill Tip Guide Wire (5 per box)	00-2360-033-16	2 Boxes
3.5mm/2.7mm Locking Screw Standard Depth Gauge	00-2360-040-35	1
3.5mm Cannulated Locking Screw Depth Gauge	00-2360-041-35	1
2.7mm Locking Screw Tap	00-2360-053-27	2
3.5mm Locking Screw Tap	00-2360-053-35	2
3.5mm Cannulated Locking Screw Tap	00-2360-054-35	2
2.5mm Hex Standard Screwdriver	00-2360-065-25	2
2.5mm Hex Standard Cannulated Screwdriver	00-2360-066-25	2
2.7mm Standard Cannulated Drill	00-2360-071-27	2
2.0mm Standard Drill	00-2360-175-20	2
2.7mm Standard Drill	00-2360-205-27	2
Modular Handle	00-2360-086-00	1
3.5mm/2.7mm Cannula Inserter	00-2360-088-00	1
Large Hex Screwdriver	00-4812-045-00	1
3.5/2.7mm Locking Screw and Instrument Case	00-2358-040-00	1
2.5mm Screwdriver Stop Ring	00-2360-065-00	1
Torque Limiting Attachment	00-2360-080-00	1
Additionally available		
2.5mm Hex Forward Captive Screwdriver	00-2360-050-25	1
2.5mm Hex Cannulated Forward Captive Screwdriver	00-2360-051-25	1
Distal Tibial Locking Plate Set - Set #00-2357-000-10		
Distal Medial Tibial Locking Plate, 6 Hole, 120mm Lng, Left	00-2357-008-06	1
Distal Medial Tibial Locking Plate, 8 Hole, 144mm Lng, Left	00-2357-008-08	1
Distal Medial Tibial Locking Plate, 10 Hole, 168mm Lng, Left	00-2357-008-10	1
Distal Medial Tibial Locking Plate, 14 Hole, 216mm Lng, Left	00-2357-008-14	1
Distal Medial Tibial Locking Plate, 18 Hole, 264mm Lng, Left	00-2357-008-18	Loaner Bank
Distal Medial Tibial Locking Plate, 6 Hole, 120mm Lng, Right	00-2357-007-06	1
Distal Medial Tibial Locking Plate, 8 Hole, 144mm Lng, Right	00-2357-007-08	1
Distal Medial Tibial Locking Plate, 10 Hole, 168mm Lng, Right	00-2357-007-10	1

Description	Part Number	Set Quantity
Distal Medial Tibial Locking Plate, 14 Hole, 216mm Lng, Right	00-2357-007-14	1
Distal Medial Tibial Locking Plate, 18 Hole, 264mm Lng, Right	00-2357-007-18	Loaner Bank
Distal Lateral Tibial Locking Plate, 6 Hole, 94mm Lng, Left	00-2357-010-06	1
Distal Lateral Tibial Locking Plate, 8 Hole, 118mm Lng, Left	00-2357-010-08	1
Distal Lateral Tibial Locking Plate, 10 Hole, 142mm Lng, Left	00-2357-010-10	1
Distal Lateral Tibial Locking Plate, 14 Hole, 189mm Lng, Left	00-2357-010-14	1
Distal Lateral Tibial Locking Plate, 18 Hole, 237mm Lng, Left	00-2357-010-18	Loaner Bank
Distal Lateral Tibial Locking Plate, 6 Hole, 94mm Lng, Right	00-2357-009-06	1
Distal Lateral Tibial Locking Plate, 8 Hole, 118mm Lng, Right	00-2357-009-08	1
Distal Lateral Tibial Locking Plate, 10 Hole, 142mm Lng, Right	00-2357-009-10	1
Distal Lateral Tibial Locking Plate, 14 Hole, 189mm Lng, Right	00-2357-009-14	1
Distal Lateral Tibial Locking Plate, 18 Hole, 237mm Lng, Right	00-2357-009-18	Loaner Bank
Distal Tibial Standard Jig Set - Set # 00-2360-000-13		
Distal Medial Tibial Plate Jig, Right	00-2360-094-01	1
Distal Medial Tibial Plate Jig, Left	00-2360-094-02	1
Distal Lateral Tibial Plate Jig, Right	00-2360-095-01	1
Distal Lateral Tibial Plate Jig, Left	00-2360-095-02	1
Distal Tibial Plate and Jig Case	00-2358-020-00	1
3.5mm / 2.7mm Locking Screw Set - Set # 00-2359-000-02		
3.5mm Cannulated Locking Screw 30mm Lng	00-2359-030-36	3
3.5mm Cannulated Locking Screw 35mm Lng	00-2359-035-36	3
3.5mm Cannulated Locking Screw 40mm Lng	00-2359-040-36	3
3.5mm Cannulated Locking Screw 45mm Lng	00-2359-045-36	3
3.5mm Cannulated Locking Screw 50mm Lng	00-2359-050-36	4
3.5mm Cannulated Locking Screw 55mm Lng	00-2359-055-36	4
3.5mm Cannulated Locking Screw 60mm Lng	00-2359-060-36	4
3.5mm Cannulated Locking Screw 65mm Lng	00-2359-065-36	4
3.5mm Cannulated Locking Screw 70mm Lng	00-2359-070-36	4
3.5mm Cannulated Locking Screw 75mm Lng	00-2359-075-36	3
3.5mm Cannulated Locking Screw 80mm Lng	00-2359-080-36	3
3.5mm Cannulated Locking Screw 85mm Lng	00-2359-085-36	3
3.5mm Cannulated Locking Screw 90mm Lng	00-2359-090-36	3
3.5mm Cannulated Conical Screw 30mm Lng	00-2359-030-37	2
3.5mm Cannulated Conical Screw 35mm Lng	00-2359-035-37	2
3.5mm Cannulated Conical Screw 40mm Lng	00-2359-040-37	2
3.5mm Cannulated Conical Screw 45mm Lng	00-2359-045-37	2
3.5mm Cannulated Conical Screw 50mm Lng	00-2359-050-37	2
3.5mm Cannulated Conical Screw 55mm Lng	00-2359-055-37	2
3.5mm Cannulated Conical Screw 60mm Lng	00-2359-060-37	2

Description	Part Number	Set Quantity
3.5mm Cannulated Conical Screw 65mm Lng	00-2359-065-37	2
3.5mm Cannulated Conical Screw 70mm Lng	00-2359-070-37	2
3.5mm Locking Screw 12mm Lng	00-2359-012-35	2
3.5mm Locking Screw 14mm Lng	00-2359-014-35	2
3.5mm Locking Screw 16mm Lng	00-2359-016-35	2
3.5mm Locking Screw 18mm Lng	00-2359-018-35	2
3.5mm Locking Screw 20mm Lng	00-2359-020-35	2
3.5mm Locking Screw 22mm Lng	00-2359-022-35	2
3.5mm Locking Screw 24mm Lng	00-2359-024-35	2
3.5mm Locking Screw 26mm Lng	00-2359-026-35	2
3.5mm Locking Screw 28mm Lng	00-2359-028-35	2
3.5mm Locking Screw 30mm Lng	00-2359-030-35	2
3.5mm Locking Screw 32mm Lng	00-2359-032-35	3
3.5mm Locking Screw 34mm Lng	00-2359-034-35	3
3.5mm Locking Screw 36mm Lng	00-2359-036-35	3
3.5mm Locking Screw 38mm Lng	00-2359-038-35	3
3.5mm Locking Screw 40mm Lng	00-2359-040-35	3
3.5mm Locking Screw 42mm Lng	00-2359-042-35	3
3.5mm Locking Screw 44mm Lng	00-2359-044-35	3
3.5mm Locking Screw 46mm Lng	00-2359-046-35	3
3.5mm Locking Screw 48mm Lng	00-2359-048-35	3
3.5mm Locking Screw 50mm Lng	00-2359-050-35	3
3.5mm Locking Screw 52mm Lng	00-2359-052-35	2
3.5mm Locking Screw 54mm Lng	00-2359-054-35	2
3.5mm Locking Screw 56mm Lng	00-2359-056-35	2
3.5mm Locking Screw 58mm Lng	00-2359-058-35	2
3.5mm Locking Screw 60mm Lng	00-2359-060-35	2
3.5mm Locking Screw 65mm Lng	00-2359-065-35	2
3.5mm Locking Screw 70mm Lng	00-2359-070-35	2
3.5mm Locking Screw 75mm Lng	00-2359-075-37	2
3.5mm Locking Screw 80mm Lng	00-2359-080-37	2
3.5mm Locking Screw 85mm Lng	00-2359-085-37	2
3.5mm Locking Screw 90mm Lng	00-2359-090-37	2
2.7mm Locking Screw 10mm Lng	00-2359-010-27	3
2.7mm Locking Screw 12mm Lng	00-2359-012-27	3
2.7mm Locking Screw 14mm Lng	00-2359-014-27	3
2.7mm Locking Screw 16mm Lng	00-2359-016-27	3
2.7mm Locking Screw 18mm Lng	00-2359-018-27	3
2.7mm Locking Screw 20mm Lng	00-2359-020-27	3

Description	Part Number	Set Quantity
2.7mm Locking Screw 22mm Lng	00-2359-022-27	4
2.7mm Locking Screw 24mm Lng	00-2359-024-27	4
2.7mm Locking Screw 26mm Lng	00-2359-026-27	4
2.7mm Locking Screw 28mm Lng	00-2359-028-27	4
2.7mm Locking Screw 30mm Lng	00-2359-030-27	4
2.7mm Locking Screw 32mm Lng	00-2359-032-27	4
2.7mm Locking Screw 34mm Lng	00-2359-034-27	4
2.7mm Locking Screw 36mm Lng	00-2359-036-27	4
2.7mm Locking Screw 38mm Lng	00-2359-038-27	4
2.7mm Locking Screw 40mm Lng	00-2359-040-27	4
2.7mm Locking Screw 42mm Lng	00-2359-042-27	4
2.7mm Locking Screw 44mm Lng	00-2359-044-27	4
2.7mm Locking Screw 46mm Lng	00-2359-046-27	4
2.7mm Locking Screw 48mm Lng	00-2359-048-27	4
2.7mm Locking Screw 50mm Lng	00-2359-050-27	4
2.7mm Locking Screw 52mm Lng	00-2359-052-27	3
2.7mm Locking Screw 54mm Lng	00-2359-054-27	3
2.7mm Locking Screw 56mm Lng	00-2359-056-27	3
2.7mm Locking Screw 58mm Lng	00-2359-058-27	3
2.7mm Locking Screw 60mm Lng	00-2359-060-27	3

Please refer to package insert for complete product information, including contraindications, warnings, precautions, and adverse effects.

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