Large Distractor—Tibia. Fracture reduction and provisional stabilization.
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An alternative to the fracture table

In the treatment of multitrauma patients, it is frequently more advantageous to perform surgical procedures on a standard operating table. The use of a fracture table can cause a loss of mobility of the limb, and mandates the surgical approach. The distractor allows free manipulation of the affected limb without the restrictions imposed by the fracture table.

Direct application of force

Unlike the fracture table, where force is applied to the fractured bone through adjacent joints and soft tissue structures, the distractor applies force directly to the bone, thus allowing repositioning of the fractured extremity while adjacent parts of the body remain undisturbed. This eliminates the risk of nerve injuries and complications caused by the fracture table, including peroneal nerve palsy and pudendal crush syndrome.

Patient positioning

Generally, patients with multiple injuries are placed supine on the fluoroscopy table. The entire limb is assessed with the C-arm in AP and lateral views.

When to use

The Large Distractor aids in fracture reduction and holds provisional stabilization prior to definitive fixation.
Relevant anatomy and pin placement

Proximal pin insertion
The proximal pin should be inserted from the posterior medial corner of the proximal tibia, aiming for the fibular head. Take care to avoid the medullary canal if IM nailing of the fracture will be attempted.

Distal pin insertion
For insertion in the distal tibia, the distal pin should be placed parallel to, and 5 to 10 mm above the tibia plafond, but distal to the physeal scar, and proximal to the medial malleolus. If IM nailing of very distal fractures will be attempted, the distal pin can also be positioned in the calcaneus, parallel to the coronal plane of the distal tibia. For pin insertion, care must be taken to avoid both intra-articular penetration and relevant neurovascular structures.

Preparation of the distractor for use

The exact configuration of the large distractor assembly depends on the particular details of each case, such as patient anatomy and which bone is involved, i.e. right or left tibia. The surgeon must consider these factors when assembling the device.

Spring-loaded knurled nut (D)

End piece with double joint (B)

Spindle nut (F)

Cotter pin (C)

Holding sleeve (E)

Spring-loaded knurled nut (D)

Threaded spindle (A)

Spindle nut (F)

Sliding carriage (G)

Spindle nut (F)

Spring-loaded knurled nut (D)

Holding sleeve (H)
1
Select a 14.0 mm threaded spindle (A) of appropriate length (most likely 480 mm). A transverse hole will be in the distal end when applied to the tibia.

2
Turn the end piece with double joint (B) onto the threaded spindle so that the rod and end piece are flush. If the end piece is positioned correctly, the transverse hole will be centered in the slot of the end piece.

3
To lock rotation of the end piece with double joint, push the cotter pin (C) through the hole until it snaps into place. Extend the end piece so that the reference marks align, and hand-tighten the spring-loaded knurled nut (D).

4
Mount the appropriate length holding sleeve (E) onto the end piece so that the serrated ends interface and the reference marks align. To secure the holding sleeve, put the spring-loaded knurled nut on the end piece and hand-tighten.
5 Thread a spindle nut (F) partway down the 14.0 mm threaded spindle. Place the sliding carriage (G) over the threaded spindle, and secure it with a second spindle nut.

6 Mount the other holding sleeve (H or E) onto the sliding carriage. The serrated ends must interface and the reference marks must align. Put the spring-loaded knurled nut on the sliding carriage to secure the holding sleeve and hand-tighten.
1

Insert proximal Schanz screw

**Instrument**

| 393.10 | Universal Chuck |

The proximal Schanz screw should be placed 14 mm inferior and parallel to the tibial plateau. Starting from the posterior medial corner of the proximal tibia, insert the Schanz screw laterally, aiming for the fibular head.

2

Insert distal Schanz screw

The distal Schanz screw should be placed 10 mm above and parallel to the tibial plafond.

**Note:** For extreme distal tibia fractures, there is the option of inserting the distal pin through the tuberosity of the calcaneus. To avoid the neurovascular bundle in this area, the pin should be placed well posterior and inferior on the calcaneus. Typically, the ideal insertion site lies two fingerbreadths from the plantar aspect of the heel, and two fingerbreadths anterior to the dorsal aspect of the heel. The pin should be parallel to the coronal plane of the distal tibia.
3 Attach distractor

**Instruments**

- 321.17 4.5 mm Pin Wrench
- 394.35 Large Distractor

Handling the preassembled distractor as a unit, slide the proximal holding sleeve (on the sliding carriage) over the proximal Schanz screw. The 14.0 mm threaded spindle should be medial and posterior to the axis of the tibia. Slide the distal holding sleeve (with double-jointed end piece) onto the distal Schanz screw. Temporarily loosen the spring-loaded knurled nut or the spindle nuts, as needed. The holding sleeves should be placed firmly against the bone.

4 Tighten wing screws

**Instruments**

- 321.17 4.5 mm Pin Wrench
- 393.10 Universal Chuck with T-Handle

Securely tighten the holding sleeves on the Schanz screws by tightening the wing screws using the 4.5 mm pin wrench. If the distractor is positioned properly, the threaded spindle will parallel the axis of the distal tibia. Tighten all spring-loaded knurled nuts in the neutral position.

**Note:** For segmental fractures, an additional Schanz screw can be inserted into the middle fracture segment, and manipulated into position with the aid of the universal chuck with T-handle.
Adjustment Technique

With all connections loose (except wing screws), obtain approximate alignment and rotation. When the position is acceptable, securely tighten all loose connections with the 4.5 mm pin wrench.

1 Distraction

**Instrument**

| 321.17 | 4.5 mm Pin Wrench |

Loosen the proximal spindle nut (1). Under image intensification, apply distraction by moving the distal spindle nut (2) proximally.

2 Rotation

**Instrument**

| 321.17 | 4.5 mm Pin Wrench |

Loosen both spindle nuts (1 and 2) and the spring-loaded knurled nut (3) on the end piece with double joint. Correct rotation by simultaneously rotating the sliding carriage and the 14.0 mm threaded spindle.

3 Valgus-Varus

**Instrument**

| 321.17 | 4.5 mm Pin Wrench |

Loosen the spring-loaded knurled nut on the distal holding sleeve (4). Correction is achieved by manipulating the distal Schanz screw with the universal chuck with T-handle.
4
Anterior-posterior angulation

Instrument

321.17 4.5 mm Pin Wrench

Loosen the wing screw (5) that secures the proximal Schanz screw in the proximal holding sleeve and correct the anterior-posterior angulation.

5
Compression

Instrument

321.17 4.5 mm Pin Wrench

Loosen the distal spindle nut (2). Under image intensification, apply compression by moving the proximal spindle nut (1) distally.

After reduction, secure distractor joints by tightening all connections.

Notes:
Manipulation of the distractor for reduction of the tibia is similar to that of the femur, although the instrumentation is oriented in the opposing direction. These steps need not be performed in the order given, except for Step 5 (compression), which should be performed last. To avoid loss of correction, retighten all loosened nuts after each step.

References

Illustrations modified and used with permission.
Instruments

310.37  3.5 mm Drill Bit, 195 mm, quick coupling

321.17  4.5 mm Pin Wrench

393.10  Universal Chuck with T-Handle

394.182 3.5 mm Trocar, 118 mm (long)

394.35  Large Distractor, complete

394.40  14.0 mm Threaded Spindle, 480 mm

394.41  14.0 mm Threaded Spindle, 330 mm
394.42 Spindle Nut

394.43 Sliding Carriage

394.44 End Piece with double joint

394.45 Holding Sleeve, 55 mm length

394.46 Holding Sleeve, 105 mm length

395.913 5.0 mm/3.5 mm Drill Sleeve, 107 mm (long)

395.923 6.0 mm/5.0 mm Threaded Drill Sleeve, 98 mm (long)
Large Distractor Set (115.700)

Graphic Case
305.78 Large Distractor Set Graphic Case

Contents
294.55 5.0 mm Schanz Screw, blunted trocar point, 170 mm, 4 ea.
294.56 5.0 mm Schanz Screw, blunted trocar point, 200 mm, 4 ea.
294.67 6.0 mm Schanz Screw, spade point, 160 mm, 4 ea.
294.68 6.0 mm Schanz Screw, spade point, 190 mm, 4 ea.
310.37 3.5 mm Drill Bit, 195 mm, quick coupling, 2 ea.
321.17 4.5 mm Pin Wrench
393.10 Universal Chuck with T-Handle
394.182 3.5 mm Trocar, 118 mm (long)
394.40 14.0 mm Threaded Spindle, 480 mm
394.41 14.0 mm Threaded Spindle, 330 mm
394.42 Spindle Nut, 3 ea.
394.43 Sliding Carriage
394.44 End Piece with double joint
394.45 Holding Sleeve, 55 mm length, 2 ea.
394.46 Holding Sleeve, 105 mm length, 2 ea.
395.913 5.0 mm/3.5 mm Drill Sleeve, 107 mm (long)
395.923 6.0 mm/5.0 mm Threaded Drill Sleeve, 98 mm (long)

Also Available
105.731 Medium Distractor Set
03.100.048 6.0 mm LCP Attachment Pin
305.79 Medium Distractor Set Graphic Case
394.35 Large Distractor, complete
395.49 Medium Distractor, complete

Note: Additional sets are needed for nailing applications.

Contact your Synthes sales representative for a list of replacement parts that are available for the Large and Medium Distractors.

Note: For additional information, please refer to package insert.