LCP Proximal Tibial Plate 3.5. Part of the Synthes Small Fragment LCP System.

Surgical Technique

This publication is not intended for distribution in the USA.

Instruments and implants approved by the AO Foundation.

DePuy Synthes

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Image intensifier control

This description alone does not provide sufficient background for direct use of DePuy Synthes products. Instruction by a surgeon experienced in handling these products is highly recommended.

Processing, Reprocessing, Care and Maintenance
For general guidelines, function control and dismantling of multi-part instruments, as well as processing guidelines for implants, please contact your local sales representative or refer to:
http://emea.depuysynthes.com/hcp/reprocessing-care-maintenance
For general information about reprocessing, care and maintenance of Synthes reusable devices, instrument trays and cases, as well as processing of Synthes non-sterile implants, please consult the Important Information leaflet (SE_023827) or refer to:
http://emea.depuysynthes.com/hcp/reprocessing-care-maintenance

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LCP Proximal Tibial Plate 3.5. Part of the Synthes Small Fragment LCP System.

The LCP Proximal Tibial Plate 3.5 is part of the Small Fragment LCP System, which merges locking screw technology with conventional plating techniques.

The LCP Proximal Tibial Plate 3.5 has a limited-contact profile. The head and neck portions of the plate accept 3.5 mm Stardrive or hexagonal locking screws. The screw hole pattern allows a raft of subchondral locking screws to buttress and maintain reduction of the articular surface. This provides resistance to local depression loads in addition to the stability of the fixed-angle construct created by locking the screws into the plate.

The Locking Compression Plate (LCP) has combi-holes in the plate shaft which combine a dynamic compression unit (DCU) hole with a locking screw hole. The combi-hole provides flexibility of axial compression and locking capability throughout the length of the plate shaft.

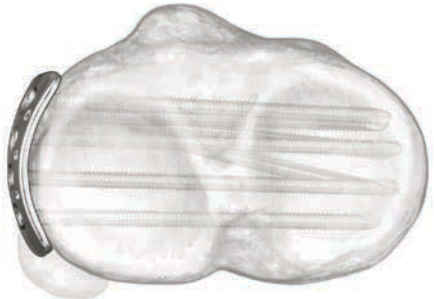
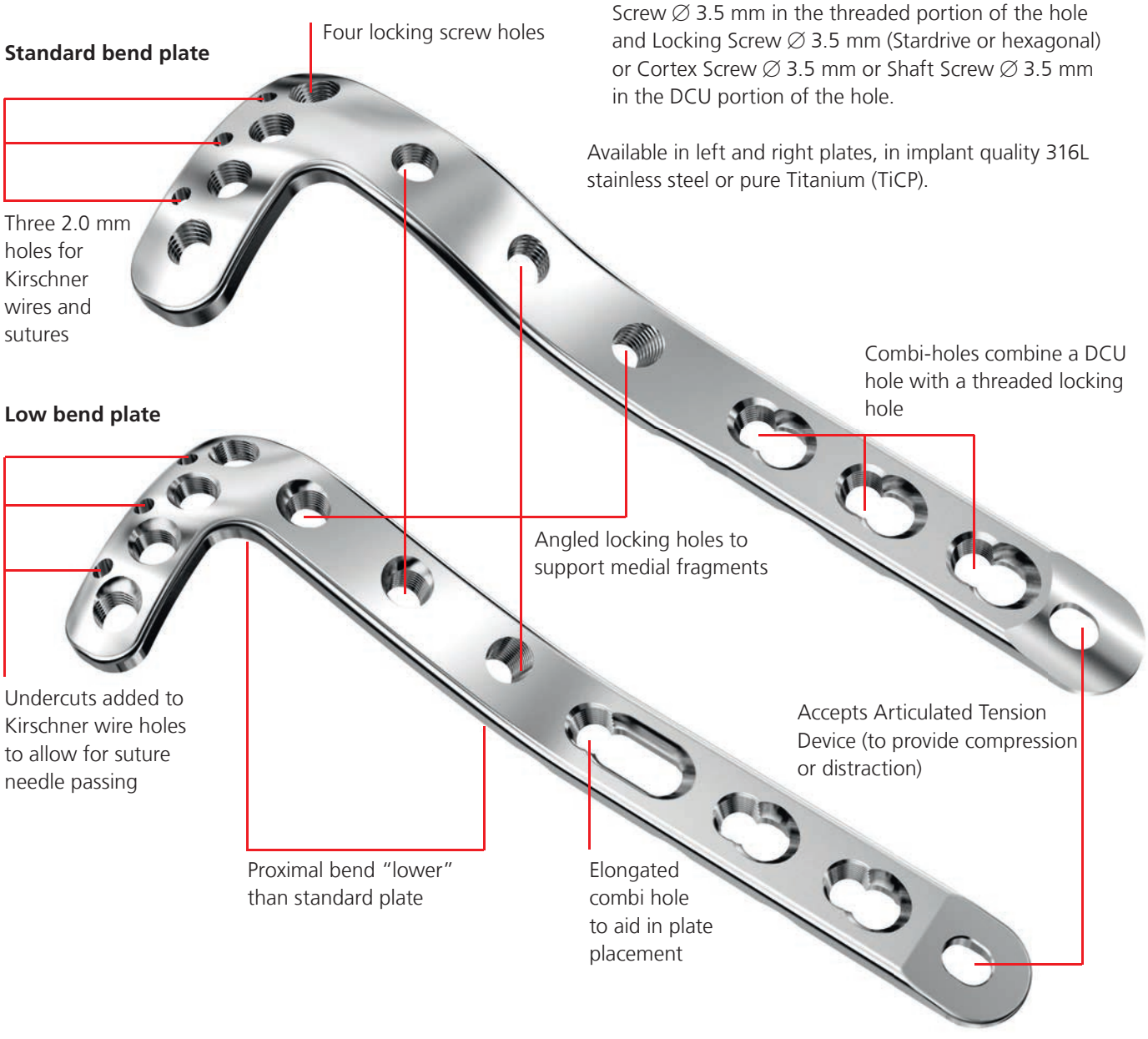


Plate head
- Anatomically contoured to match the lateral proximal tibia.
- Four convergent threaded screw holes accept:
  - Locking Screw ∅ 3.5 mm (Stardrive or hexagonal)
  - Cortex Screw ∅ 3.5 mm
  - Shaft Screw ∅ 3.5 mm
- Three 2.0 mm holes for preliminary fixation with Kirschner wires, or meniscal repair with sutures.

Plate shaft
- Available with 4, 6, 8, 10, 12, 14, or 16 screw holes.
- The three locking holes distal to the plate head accept Locking Screw ∅ 3.5 mm (Stardrive or hexagonal) or Cortex Screw ∅ 3.5 mm or Shaft Screw ∅ 3.5 mm to secure plate position. The hole angles allow the locking screws to converge with three of the four locking screws in the plate head to support medial fragments.
- Combi-holes, distal to the three angled locking holes, combine a DCU hole with a threaded locking hole. The combi-holes accept Locking Screw ∅ 3.5 mm (Stardrive or hexagonal) or Cortex Screw ∅ 3.5 mm or Shaft Screw ∅ 3.5 mm in the threaded portion of the hole and Locking Screw ∅ 3.5 mm (Stardrive or hexagonal) or Cortex Screw ∅ 3.5 mm or Shaft Screw ∅ 3.5 mm in the DCU portion of the hole.

Available in left and right plates, in implant quality 316L stainless steel or pure Titanium (TiCP).

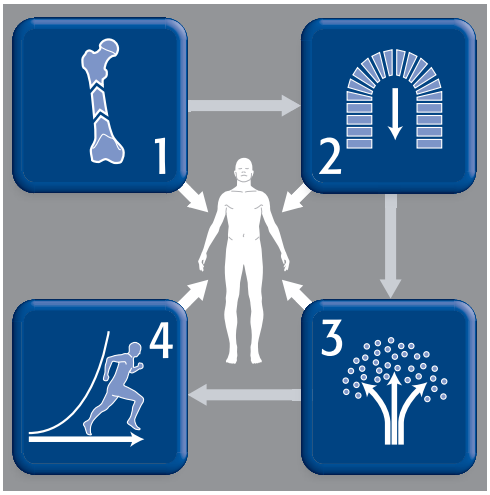


AO Principles

In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation[1,2].

Anatomic reduction
Fracture reduction and fixation to restore anatomical relationships.

Early, active mobilization
Early and safe mobilization and rehabilitation of the injured part and the patient as a whole.



Stable fixation
Fracture fixation providing absolute or relative stability, as required by the patient, the injury, and the personality of the fracture.

Preservation of blood supply
Preservation of the blood supply to soft tissues and bone by gentle reduction techniques and careful handling.

[1] Müller ME, Allgöwer M, Schneider R, Willenegger H. Manual of Internal Fixation. 3rd ed. Berlin, Heidelberg, New York: Springer. 1991.
[2] Rüedi TP, Buckley RE, Moran CG. AO Principles of Fracture Management. 2nd ed. Stuttgart, New York: Thieme. 2007.

Indications and Contraindications

Indications
- Split-type fractures of the lateral tibial plateau
- Lateral split fractures with associated depressions
- Pure central depression fractures
- Split or depression fractures of the medial plateau

Contraindications
Isolated shaft fractures.

Note: For associated shaft fractures is recommended to use a stronger plate such as the 4.5 mm LCP PTP or the 4.5 mm PLT/LISS plates for obese patients. In all cases an adapted reduced post-operative mobilization is mandatory.

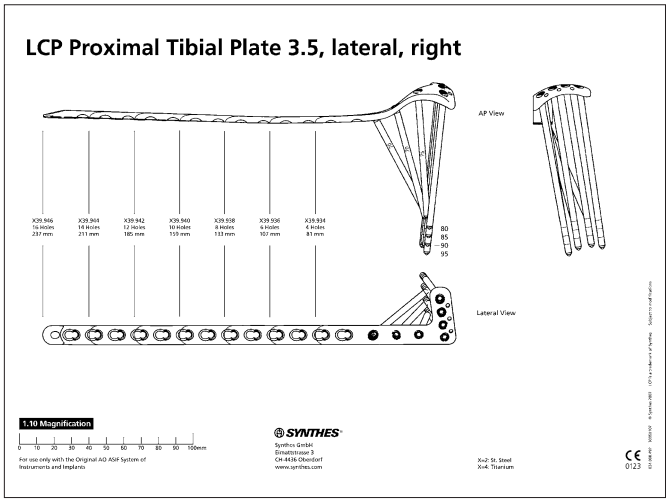
For contraindications of Norian Drillable or chronOS Inject see the corresponding surgical techniques (Norian Drillable DSEM/BIO/0515/0032, chronOS Inject DSEM/BIO/1015/0040).

1

Preparation

Complete the preoperative radiographic assessment and prepare the preoperative plan. Determine plate length and instruments to be used. Determine proximal screw placement and screw lengths to ensure proper screw placement in the metaphysis.

Position the patient supine on a radiolucent operating table. Visualization of the proximal tibia under fluoroscopy in both the lateral and AP views is necessary.



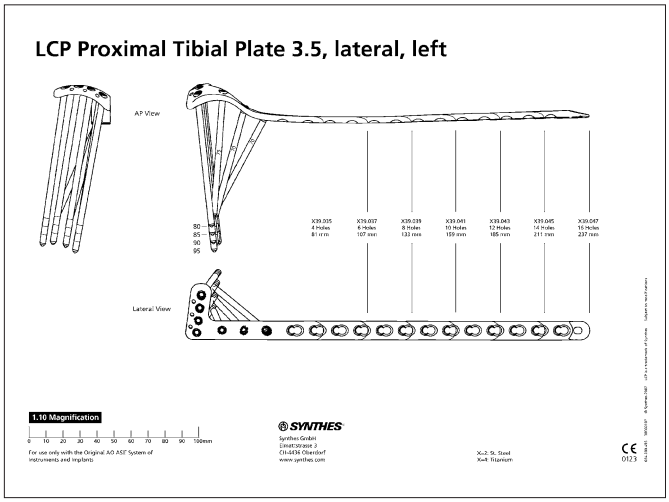
X-ray template for right LCP Proximal Tibial Plates 3.5 (Art. No. 034.000.492)

Required set

A Small Fragment LCP Instrument Set is required when implanting the LCP Proximal Tibial Plate 3.5.

Recommended additional sets

- Basic Instrument Set, for LC-DCP and DCP
- Small Fragment Instrument and Implant Set–LC-DCP, with self-tapping screws
- Bone Forceps Set
- Large Distractor Set
- Large External Fixator Set with self-drilling Schanz screws
- Periarticular Reduction Forceps Set
- Pelvic Implant Set, with self-tapping screws (for longer length 3.5 mm cortex screws up to 110 mm)



X-ray template for left LCP Proximal Tibial Plates 3.5 (Art. No. 034.000.495)

Note: More detailed information on conventional and locked plating principles can be found in the Synthes Locking Compression Plate (LCP) surgical technique (DSEM/TRM/0115/0278(1)).

Precautions:

- Instruments and screws may have sharp edges or moving joints that may pinch or tear user's glove or skin.
- Handle devices with care and dispose worn bone cutting instruments in an approved sharps container.

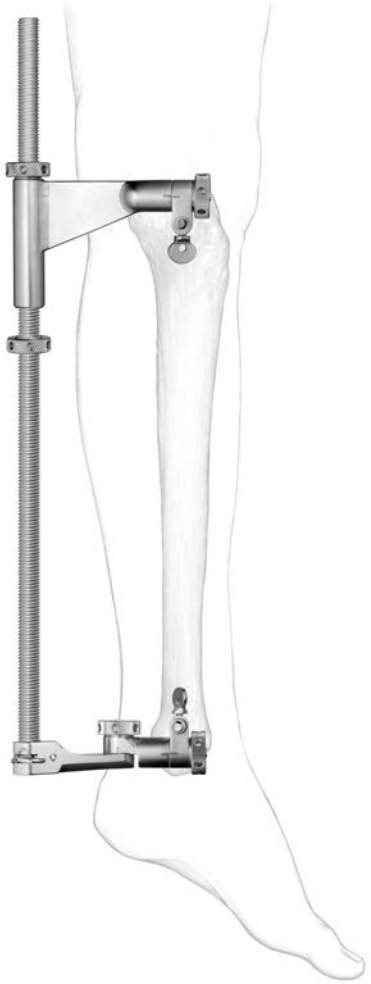
2
Reduce articular surface

Note: Prior to reduction, application of an external fixator or Large Distractor (394.350) may facilitate visualization and reduction of the joint.

Reduce the fracture fragments and confirm reduction using image intensification. Fragments may be reduced using independent Kirschner wires; however, Kirschner wire holes are also provided on the plate to help achieve provisional reduction, plate position, or fixation.

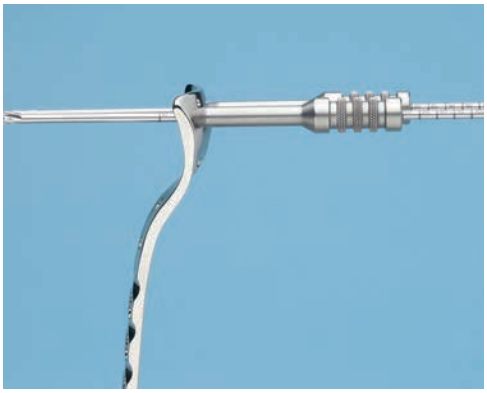
The locking screws do not provide interfragment or plate-to-bone compression; therefore, any desired compression must be achieved with traditional lag screws. The articular fragments must be reduced and compression must be obtained prior to applying the LCP Proximal Tibial Plate 3.5 with locking screws.

Note: To verify that lag screws will not interfere with plate placement, hold the plate laterally to the bone.



3
Determine proximal screw placement

Prior to placing the plate on the bone, thread two 2.8 mm Threaded Drill Guides (312.648) into two nonadjacent threaded holes in the plate head. Insert 2.8 mm Percutaneous Drill Bits (324.214) through the guides and confirm that the drill bits are parallel in the transverse plane. This verifies that the guides are properly threaded into the plate, which ultimately ensures accurate screw placement.



4
Determine plate position

Using anatomic landmarks and fluoroscopy, mount the plate on the intact or reconstructed plateau without attempting to reduce the distal portion of the fracture.

Insert a 2.0 mm Kirschner Wire (292.200) through a Kirschner wire hole. Readjust plate position, if necessary. Place a second Kirschner wire in a Kirschner wire hole to prevent rotation of the plate and to secure provisional fixation of the plate to the tibial plateau. The Kirschner wires should penetrate and extend several millimeters beyond the medial cortex.

Note: An additional 2.0 mm Kirschner wire may be placed in the third Kirschner wire hole to hold the plate in position.

Prior to proceeding, confirm plate head placement. Use clinical examination and fluoroscopy to confirm that:
- Screw trajectories in the proximal locking holes are parallel to the joint in the transverse plane, and the plate is orientated properly on the plateau.
- Screw and plate placement are consistent with the preoperative plan.
- Alignment of the plate to the shaft of the tibia is correct in both the AP and lateral views. Placement of the plate at this point will determine final flexion/extension reduction.

5
Drill for proximal screws

While the plate is placed against the bone, use the 2.8 mm Percutaneous Drill Bit (324.214) to drill for the locking screw through one of the two threaded guides attached to the plate. It is imperative to drill using fluoroscopy to ensure proper screw trajectory and screw placement. Drill through to the medial cortex or the desired screw tip location.

Determine the appropriate screw length indicated on the calibrated drill bit. Remove the drill bit and drill guide.

Alternatively, the Depth Gauge (319.090) can be used to determine the appropriate screw length.

6
Insert proximal screws

Note: This plate can serve as a buttress for a medial wedge. This is accomplished by the convergence of the metaphyseal locking screws and the oblique locking screws from below.

If lag screw reduction of a fragment is required, this must be accomplished prior to inserting locking screws into the fragment. It may be necessary to predrill the lateral cortex using the 2.8 mm percutaneous drill bit.

Insert the appropriate length locking screw into the bone with power, using the 1.5 Nm Torque Limiting Attachment (TLA) (511.770 or 511.773) and Stardrive or Hexagonal Screwdriver Shaft (314.116 or 314.030).

Notes:
- Always use the TLA (Torque Limiting Attachment) when using power.
- Locking screws are not lag screws. When interfragmentary compression is desired, use conical screws ∅ 3.5 mm or cortex screws ∅ 3.5 mm.

At this point, verify screw placement using C-arm imaging.

Alternative
Use the Stardrive or Hexagonal Screwdriver (314.115 or 314.070) to manually insert the appropriate locking screw. Carefully tighten the locking screw, as excessive force is not necessary to produce effective screw-to-plate locking.

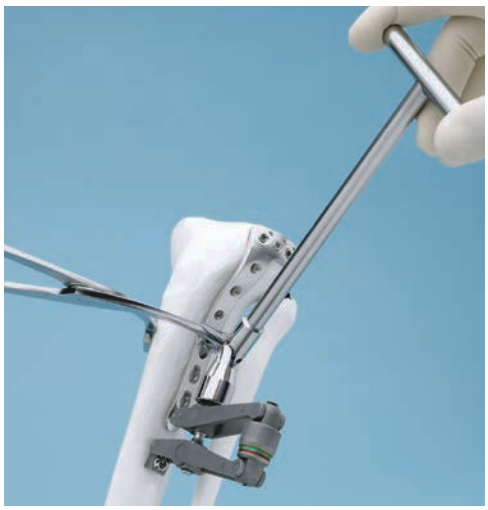
Repeat for remaining proximal locking holes. Securely tighten all locking screws to lock them to the plate.

7
Reduce shaft to tibial plateau

Reduce the tibial plateau to the shaft of the tibia, using indirect reduction techniques whenever possible. Using atraumatic technique, secure the plate to the tibial shaft with bone forceps.

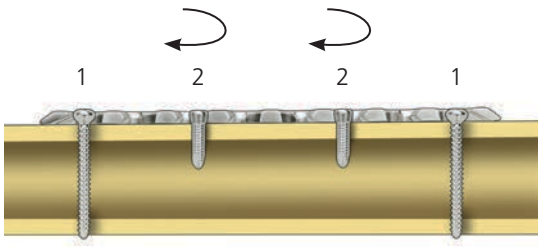
Confirm rotational alignment of the extremity by clinical examination.

Once reduction is satisfactory, and if it is appropriate based on the fracture morphology, the plate should be loaded in tension using the Articulated Tension Device (321.120).*

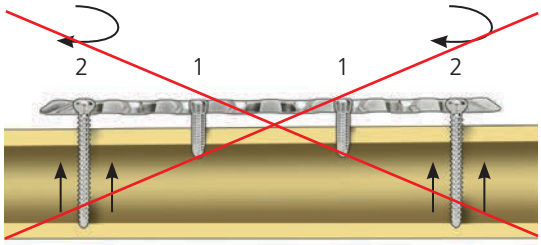


Note: With multifragment fractures, it may not always be possible or desirable to achieve anatomic reduction of the fracture. However, in simple fracture patterns, the Articulated Tension Device may facilitate anatomic reduction. This device may be used to generate either compression or distraction.

In addition to having threaded locking holes, the plate functions similarly to DCP plates which offer the ability to self-compress fracture fragments. Therefore, a combination of lag screws and locking screws may be used.



Correct



Incorrect

Notes:
- If a combination of cortex (1) and locking screws (2) is used, a cortex screw should be inserted first to pull the plate to the bone.
- If locking screws (1) have been used to fix the plate to a fragment, subsequent insertion of a cortex screw (2) in the same fragment without loosening and retightening the locking screw is not recommended.

* Found in the Basic Instrument Set, for LC-DCP and DCP

8

Insert cortex screws in shaft of plate

Insert as many standard 3.5 mm cortex screws as necessary into the distal portion of the plate.

Note: All of the 3.5 mm cortex screws must be inserted prior to insertion of 3.5 mm locking screws.

Use the 3.5 mm Universal Drill Guide (323.360) to predrill for the 3.5 mm cortex screws and drill through both cortices with the 2.5 mm Drill Bit (310.250).

For the neutral position, press the drill guide down in the nonthreaded hole. To obtain compression, place the drill guide at the end of the nonthreaded hole away from the fracture. Do not apply downward pressure on the drill guide's spring-loaded tip.

Neutral Compression

Measure for screw length using a depth gauge. Select and insert the appropriate length 3.5 mm cortex screw.

9

Insert 3.5 mm locking screws in shaft of plate

Attach the 2.8 mm Threaded Drill Guide (312.648) to a locking hole in the plate shaft. Drill a hole using the 2.8 mm Percutaneous Drill Bit (324.214).

Note: Use of the drill guide is mandatory for screws to lock to the plate properly.

Determine the appropriate screw length indicated on the calibrated drill bit.

Remove the drill bit and drill guide.

Insert the appropriate length locking screw into the bone with power, using the 1.5 Nm Torque Limiting Attachment (TLA) (511.770 or 511.773) and Stardrive or Hexagonal Screwdriver Shaft (314.116 or 314.030).

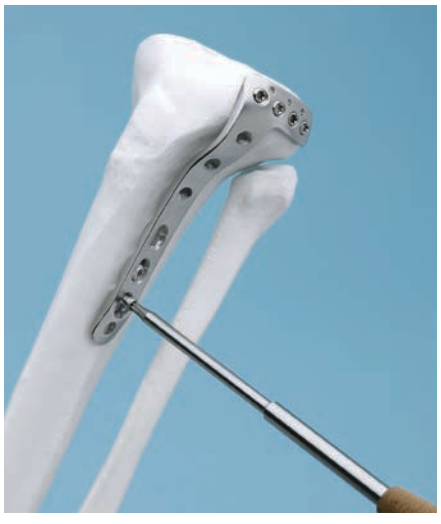
Note: Always use the TLA (Torque Limiting Attachment) when using power.

Repeat as necessary to insert additional locking screws.

Examine the limb clinically and radiographically. It is important that the tibial plateau is in proper orientation to the tibial shaft.

Alternative

Use the Stardrive or Hexagonal Screwdriver (314.115 or 314.070) to manually insert the appropriate locking screw. Carefully tighten the locking screw, as excessive force is not necessary to produce effective screw-to-plate locking.



10
Insert 3.5 mm locking screws in the oblique holes

Note: Use the oblique locking screws to buttress medial fragments.

Thread a 2.8 mm Threaded Drill Guide (312.648) into the distal oblique locking hole.

Drill with the 2.8 mm Percutaneous Drill Bit (324.214).

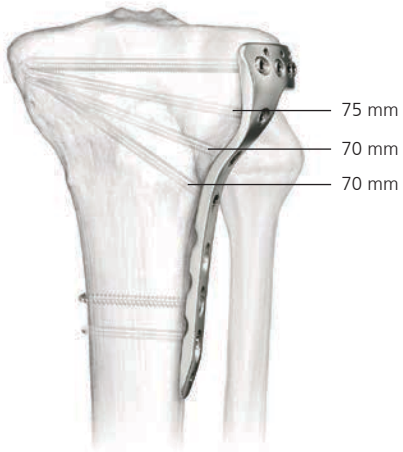
Determine the appropriate screw length indicated on the calibrated drill bit.

Insert the appropriate length locking screw into the bone with power, using the 1.5 Nm Torque Limiting Attachment (TLA) (511.770 or 511.773) and Stardrive or Hexagonal Screwdriver Shaft (314.116 or 314.030).

Repeat steps for the last two oblique locking screws.

Alternative
Use the Stardrive or Hexagonal Screwdriver (314.115 or 314.070) to manually insert the appropriate locking screw. Carefully tighten the locking screw, as excessive force is not necessary to produce effective screw-to-plate locking.

Screw length considerations
When using the appropriate length screws in the oblique locking holes, the screw tips should meet the proximal locking screws.



Suggested screw lengths to achieve desired screw convergence.

Cleaning of Instruments

Cleaning the cannulation in the threaded drill guides is imperative for proper function.

Instruments should be cleared intraoperatively using the 2.5 mm Cleaning Stylet (319.461) to prevent accumulation of debris in the cannulation.

Implant Removal
In case the physician decides to remove the implants, they can be removed by using general surgical instruments.

Unlock all screws from the plate, then remove the screws completely from the bone. This prevents simultaneous rotation of the plate when unlocking the last locking screw. For details regarding implant removal refer to the surgical technique "Screw Extraction Set" (DSEM/TRM/0614/0104).

Implants

LCP Proximal Tibial Plate 3.5, lateral

Stainless steel	Pure Titanium (TiCP)	Shaft holes	Length (mm)	
239.934	439.934	4	81	right
239.936	439.936	6	107	right
239.938	439.938	8	133	right
239.940	439.940	10	159	right
239.942	439.942	12	185	right
239.944	439.944	14	211	right
239.946	439.946	16	237	right
239.935	439.935	4	81	left
239.937	439.937	6	107	left
239.939	439.939	8	133	left
239.941	439.941	10	159	left
239.943	439.943	12	185	left
239.945	439.945	14	211	left
239.947	439.947	16	237	left

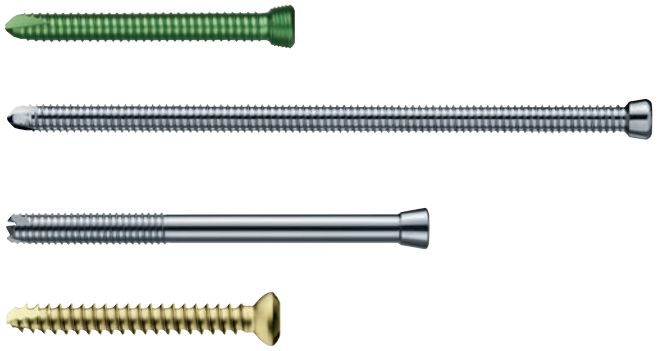
LCP Proximal Tibial Plate 3.5, low bend

Stainless steel	Pure Titanium (TiCP)	Shaft holes	Length (mm)	
02.124.200	04.124.200	4	76	right
02.124.204	04.124.204	6	102	right
02.124.208	04.124.208	8	128	right
02.124.212	04.124.212	10	154	right
02.124.216	04.124.216	12	180	right
02.124.220	04.124.220	14	206	right
02.124.224	04.124.224	16	232	right
02.124.201	04.124.201	4	76	left
02.124.205	04.124.205	6	102	left
02.124.209	04.124.209	8	128	left
02.124.213	04.124.213	10	154	left
02.124.217	04.124.217	12	180	left
02.124.221	04.124.221	14	206	left
02.124.225	04.124.225	16	232	left

All plates are available sterile packed. For sterile implants add suffix S to article number.

Screws

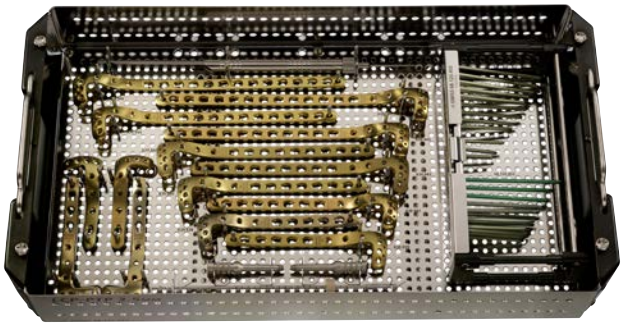
Hex	Stardrive	
X13.010– X13.095	X12.101– X12.131	Locking Screw, ∅ 3.5 mm, self-tapping
X12.367– X12.381	X12.317– X12.331	Screw ∅ 3.5 mm with Conical Head, self-tapping, fully threaded
X12.467– X12.481	X12.417– X12.431	Screw ∅ 3.5 mm with Conical Head, self-tapping, short thread
X04.810– X04.910		Cortex Screw ∅ 3.5 mm, self-tapping



X=2: Stainless steel
X=4: Titanium

Sets

Vario Case for LCP Proximal Tibial Plates 3.5



68.120.403	Vario Case for LCP Proximal Tibial Plates 3.5
689.507	Lid (Stainless Steel), size 1/1
68.120.402	Insert for Screws ∅ 3.5 mm

Set for LCP Proximal Tibial Plates 3.5, with Screws ∅ 3.5 mm

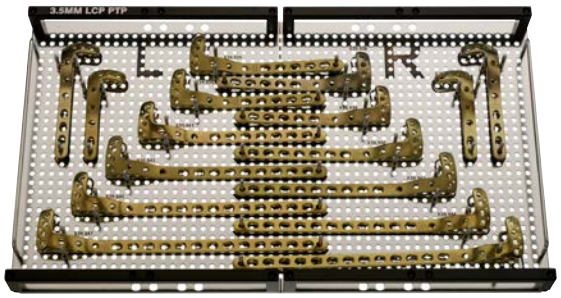
	Hex	Stardrive
Pure Titanium (TiCP)	01.120.407	01.120.417
Stainless steel	01.120.408	01.120.418

Set for LCP Proximal Tibial Low Bend Plates 3.5, with screws ∅ 3.5 mm

	Hex	Stardrive
Pure Titanium (TiCP)	01.120.480	01.120.482
Stainless steel	01.120.481	01.120.483

Vario Case for Plate Set LCP Proximal Tibial Plates 3.5

68.120.401	Vario Case for Plate Set LCP-PTP 3.5
689.508	Vario Case Framing, size 1/1, height 45 mm
689.507	Lid (Stainless Steel), size 1/1
01.120.405	Plate Set LCP Proximal Tibial Plates 3.5 (Pure Titanium) in Vario Case
01.120.406	Plate Set LCP Proximal Tibial Plates 3.5 (Stainless Steel) in Vario Case



Additionally required instruments	
312.648	LCP Drill Sleeve 3.5, for Drill Bits ∅ 2.8 mm
324.214	Drill Bit ∅ 2.8 mm, with Scale, length 200/100 mm, 3-flute, for Quick Coupling
319.090	Depth Gauge for Long Screws ∅ 3.5 mm, measuring range up to 110 mm

Additionally required
LCP Small Fragment Instrument Set

MRI Information

Torque, Displacement and Image Artifacts according to ASTM F 2213-06, ASTM F 2052-06e1 and ASTM F2119-07

Non-clinical testing of worst case scenario in a 3 T MRI system did not reveal any relevant torque or displacement of the construct for an experimentally measured local spatial gradient of the magnetic field of 3.69 T/m. The largest image artifact extended approximately 169 mm from the construct when scanned using the Gradient Echo (GE). Testing was conducted on a 3 T MRI system.

Radio-Frequency-(RF-)induced heating according to ASTM F2182-11a

Non-clinical electromagnetic and thermal testing of worst case scenario lead to peak temperature rise of 9.5 °C with an average temperature rise of 6.6 °C (1.5 T) and a peak temperature rise of 5.9 °C (3 T) under MRI Conditions using RF Coils (whole body averaged specific absorption rate [SAR] of 2 W/kg for 6 minutes [1.5 T] and for 15 minutes [3 T]).

Precautions: The above mentioned test relies on non-clinical testing. The actual temperature rise in the patient will depend on a variety of factors beyond the SAR and time of RF application. Thus, it is recommended to pay particular attention to the following points:

- It is recommended to thoroughly monitor patients undergoing MR scanning for perceived temperature and/or pain sensations.
- Patients with impaired thermoregulation or temperature sensation should be excluded from MR scanning procedures.
- Generally, it is recommended to use a MR system with low field strength in the presence of conductive implants. The employed specific absorption rate (SAR) should be reduced as far as possible.
- Using the ventilation system may further contribute to reduce temperature increase in the body.

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