

PEEKPower™ HTO Plate

2nd Generation | Surgical Technique



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System Features

Clinical Use

The PEEKPower HTO plate can only be used for medial proximal tibial osteotomies in an opening wedge technique and for patients whose body weight is not more than 100 kg.

Drill Guide

The PEEKPower system drill guide must always be used for drilling in order to avoid damage to the plate holes. The drill guide must be used even if the aiming adapters are not used. The drill guide is inserted into the plate to have +/- 12° range of motion (ROM).

Screw Placement

With +/- 12° ROM for screw placement, the PEEKPower titanium locking screws offer stable, multidirectional fixation in the carbon-fiber-reinforced polyetheretherketone (CF-PEEK) plate. The aiming adapter for the PEEKPower HTO (medial proximal tibial osteotomy) plate enables provisional fixation of plate to bone and reduces the risk of drilling into the tibial articular cartilage. Proximal screws are drilled using the aiming adapter.

Note: The screws may be replaced once after having been fully inserted. As a result, the angle of the screw in the same hole must be changed.



DrillSaw Max 600
with sagittal SpeedCut blades (a)

Surgical Site Requirements

The surgical center is responsible for providing the following instruments and equipment for a successful procedure:

- Standard open knee surgical instrument set
- Large bone oscillating saw
- Pin driver
- Chuck drill
- Standard C-arm fluoroscope
- Oscillating saw blade

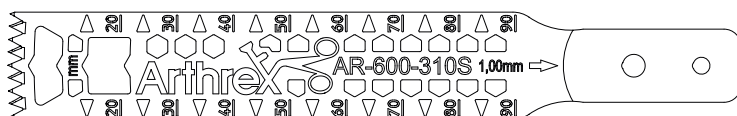
Arthrex recommends the use of the large bone DrillSaw Max 600 in combination with oscillating saw blades.

For horizontal cut:

- Thickness: 1 mm
- Length: 90 mm (a)
- Width: 13, 19, or 25.4 mm

For biplanar cut:

- Thickness: 0.6 mm
- Length: 45 mm
- Width: 9 mm



Thickness 1 mm, length 90 mm,
width 19 mm AR-600-310S (a)

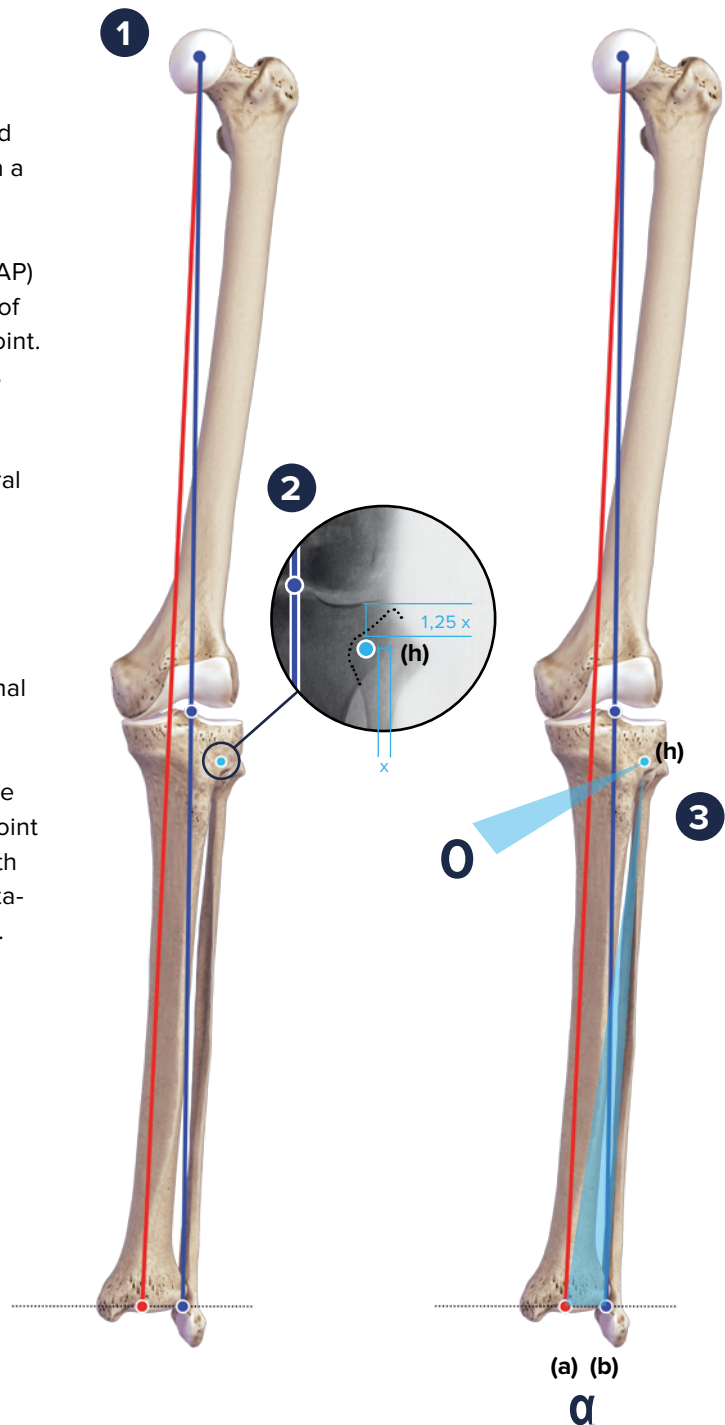
Deformity Analysis and Preoperative Planning

This surgical technique is recommended when the deformity analysis¹ shows a proximal tibial malalignment. It is recommended to precisely plan the location and angle of correction following the method of Miniaci et al.^{2,3} The planning can be done either on a digital workstation or on paper.

- 1 Using the full-length, standing anteroposterior (AP) radiograph, draw a straight line from the center of the femoral head to the center of the tibiotalar joint. This demonstrates the patient's mechanical axis (red line).

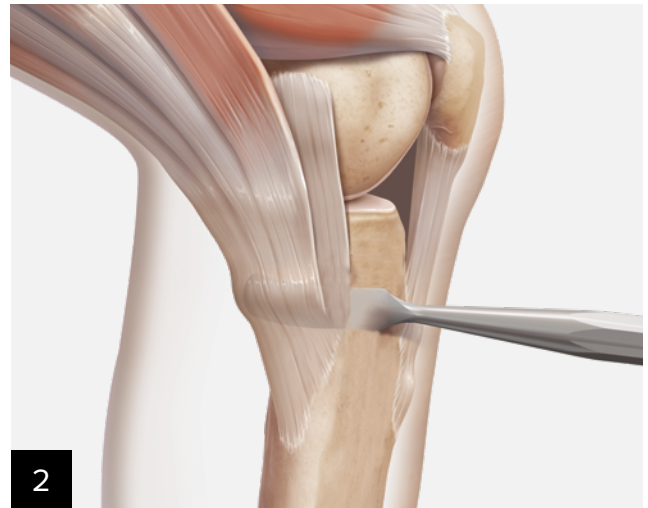
Draw a straight line from the center of the femoral head, passing the joint line through the desired position. This demonstrates the desired mechanical axis (blue line).

- 2 Determine the hinge point (**h**) for the osteotomy on the lateral cortex and at the upper 1/3 proximal fibular head.⁴
- 3 Trace the hinge point with the center of the ankle joint (**a**). Rotate the line h - a around the hinge point until the center of the tibiotalar joint matches with the desired mechanical axis (**b**). The angle of rotation (**α**) corresponds to the degree of correction. (**O**) represents the height of the opening at the medial tibial cortex.





Plan a longitudinal incision midway between the tibial tubercle and the posterior border of the tibia. Start the incision just distal to the joint line and extend distally 7 cm to 9 cm.



Reflect the superficial portion of the medial collateral ligament back using a Cobb elevator.

Biplanar Cut Using Cutting Guide Pins



Place the trial HTO plate on the medial cortex and control position under fluoroscopy. Mark the desired osteotomy start point at the anteroproximal rim of the pes anserinus. Remove the trial implant. Drill the first breakaway guide pin from the starting point angled towards the planned hinge point, upper 1/3 proximal to fibular head. Again control under fluoroscopic guidance.



Slide the cutting guide over the first pin. Determine the appropriate slope plane of the osteotomy. Place the second osteotomy guide pin under x-ray through the cutting guide posterior to the first pin.



Insert the radiolucent soft-tissue retractor into the posterior part of the proximal tibia. Break away the guide pins and position the oscillating saw against the inferior surface of the guide pins to cut the tibial cortex medially, anteriorly, and posteriorly.

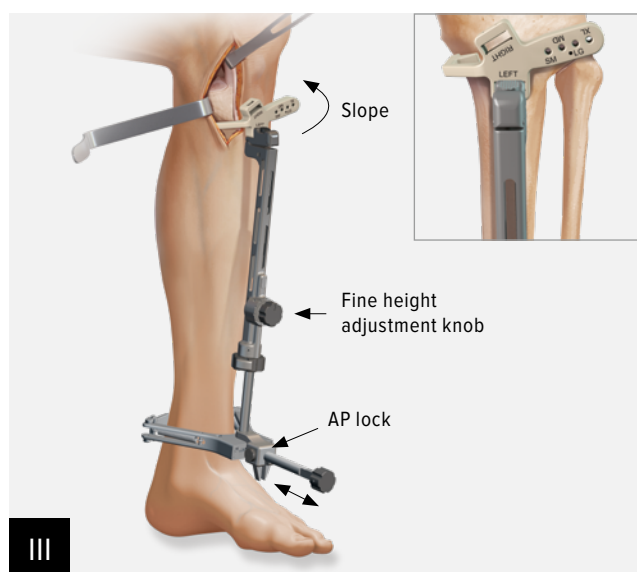
Note: To prevent blockage of the saw blade and damage to the retractor, please avoid hitting the retractor fully.



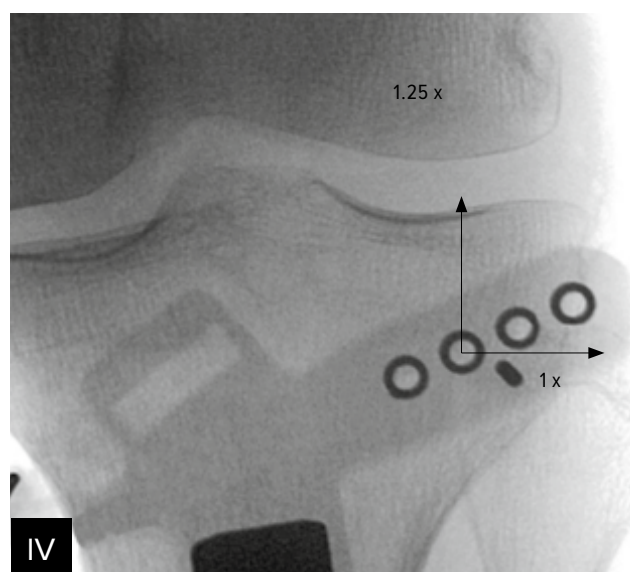
Insert the patella tendon retractor to protect the patella tendon. A smaller (13 mm width) saw blade can be used to create the biplanar cut for higher stability and faster healing. The biplanar cut can be performed ascending or descending.

Continue with "Open Wedge Alignment Correction" (see Page 09)

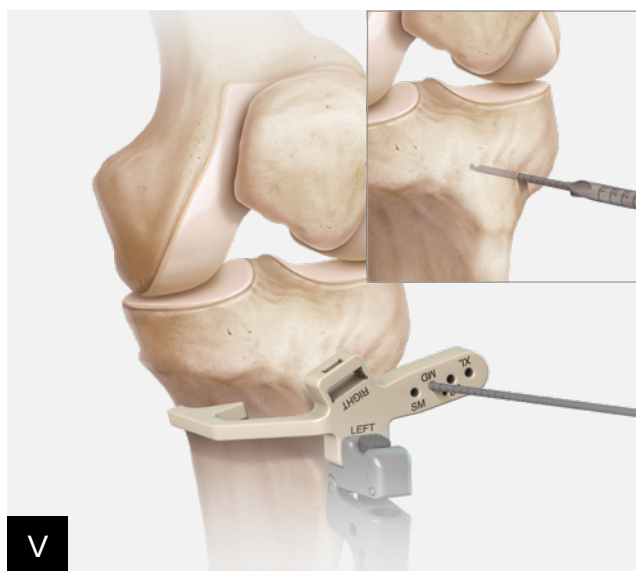
Biplanar Cut Using HTO Hinge Pin System (Alternative)



Assemble the extramedullary (EM) guide and the PEEK hinge pin attachment. Place the EM guide on the operative limb. Adjust the working height and position such that the medial arm is in the approximate location of the desired osteotomy. The guide should be parallel to the tibial crest and the posterior arm should be positioned on the posterior- / medial-most aspect of the tibia.



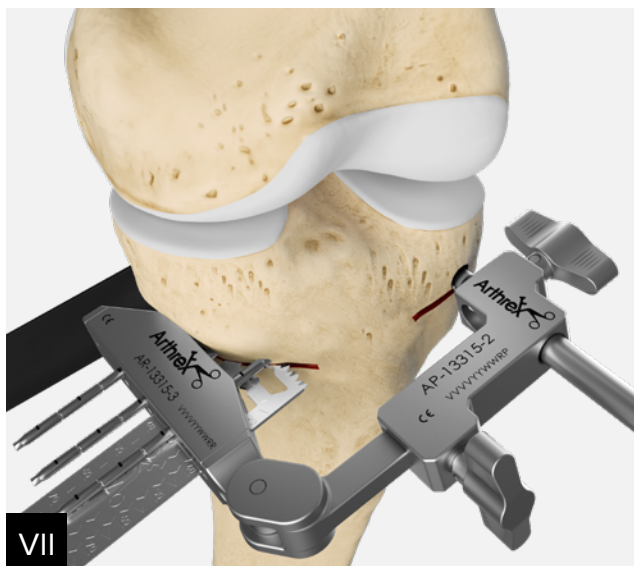
With the assistance of a true AP radiograph, confirm that the hole associated with the determined component size is in the appropriate position (approximately 1.25 times greater than the distance from the hinge pin to the nearest lateral cortex). With the assistance of lateral fluoroscopy, adjust the slope and working height.



After confirming appropriate position, slope, and working height, drive a 2.4 mm guide wire into the appropriate hole corresponding to the desired implant size. Remove the EM guide and ream over the guide wire with a 5 mm reamer.



Note the laser marks on the cannulated reamer at the skin entrance point. The 2.4 mm drill-tip guide pin and the 5 mm cannulated reamer are removed. The HTO hinge pin is inserted, filling the tibial tunnel completely.

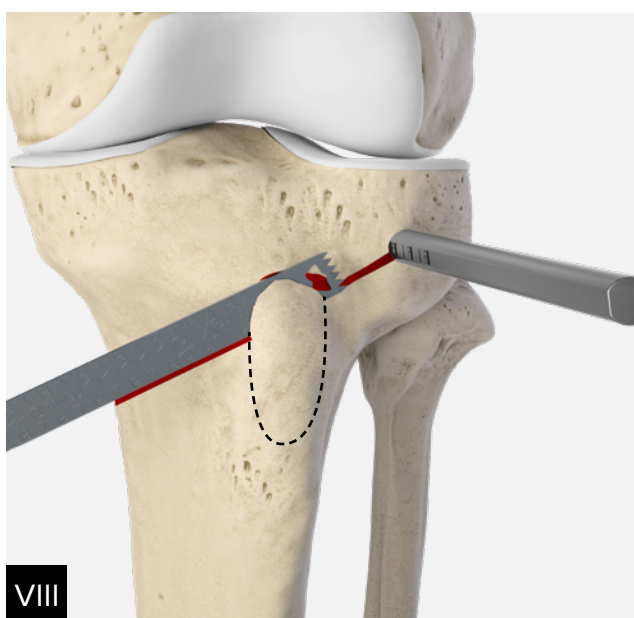


The guide is attached to the HTO hinge pin and positioned as close to the skin as possible. The saw guide is then placed as parallel as possible to the HTO hinge pin axis before all knobs are tightened.

At least two 2.4 mm breakaway guide pins are placed through the drill holes and broken at the level of the saw guide.

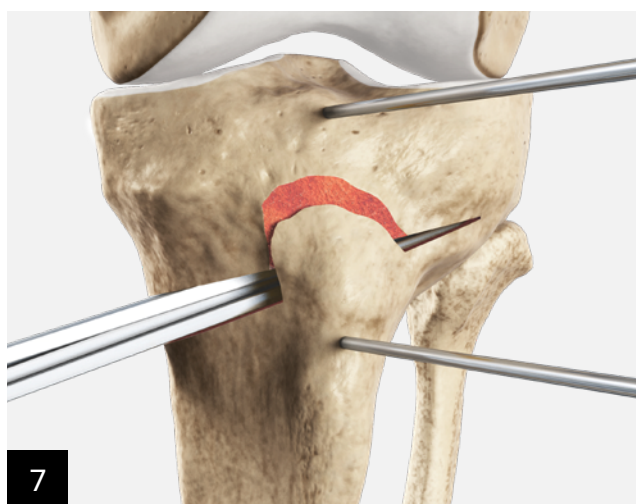
Insert the radiolucent retractor into the posterior part of the proximal tibia to retract and protect soft tissues. The osteotomy is performed by placing the oscillating saw in the saw guide and by cutting the tibial cortex medially, anteriorly, and posteriorly. Stop sawing upon hitting the HTO hinge pin. Once the horizontal cut is finalized, pull out the breakaway pins before loosening the knobs to remove the HTO hinge pin saw guide and guide.

Note: To prevent the saw blade from blocking and to minimize damage to the retractor, please avoid hitting the retractor fully.

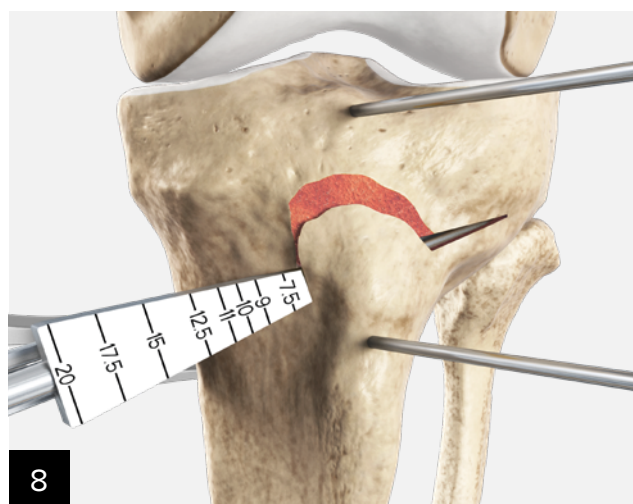


Insert the patella tendon retractor to protect the patella tendon. A smaller (13 mm width) saw blade can be used to create the biplanar cut for higher stability and faster healing. The biplanar cut can be performed ascending or descending.

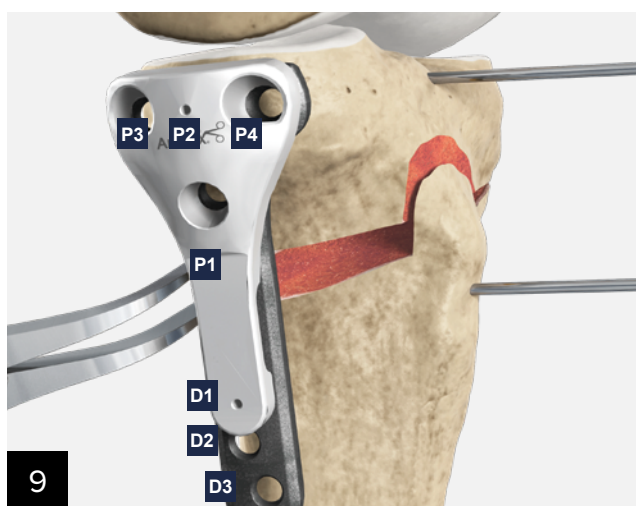
Surgical pearl: Drill 2 K-wires parallel in the sagittal plane of the proximal tibia (1 proximal and 1 distal to the osteotomy cut) to control potential tibial AP slope and rotation when opening the osteotomy.



Use osteotomes to gently open the gap and adjust to the desired correction. Be sure to maintain the lateral tibial cortex. Fluoroscopic confirmation should be used repeatedly. To control tibial AP slope or rotational changes while opening, drill parallel to the sagittal plane 1 K-wire proximal and 1 distal to the osteotomy cut.



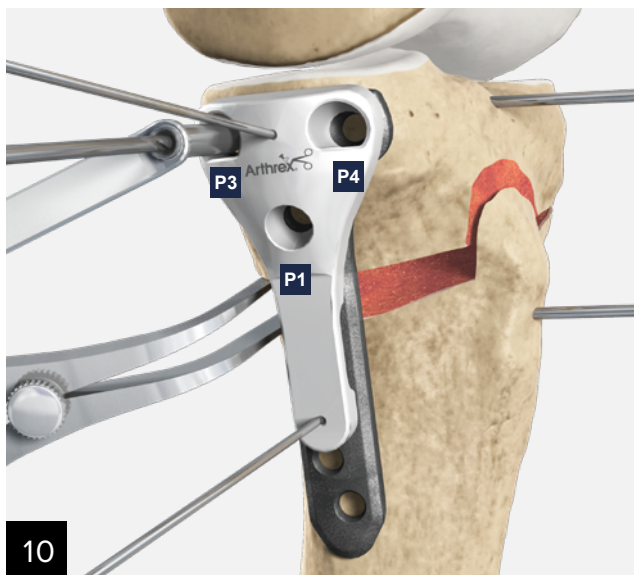
Insert the wedge trial into the osteotomy gap to verify the amount of correction. The amount of opening wedge correction may be read off of the millimeter markings. When the desired correction has been achieved, insert the adjustable bone spreader posteriorly to maintain the correction and remove all wedge trials.



The aiming adapter is attached to the PEEKPower HTO plate and placed over the osteotomy with the 4 proximal holes (**P1 - P4**) positioned proximal to the osteotomy gap. The plate is positioned onto the pes anserinus and temporarily fixed with 1.57 mm guide wires.

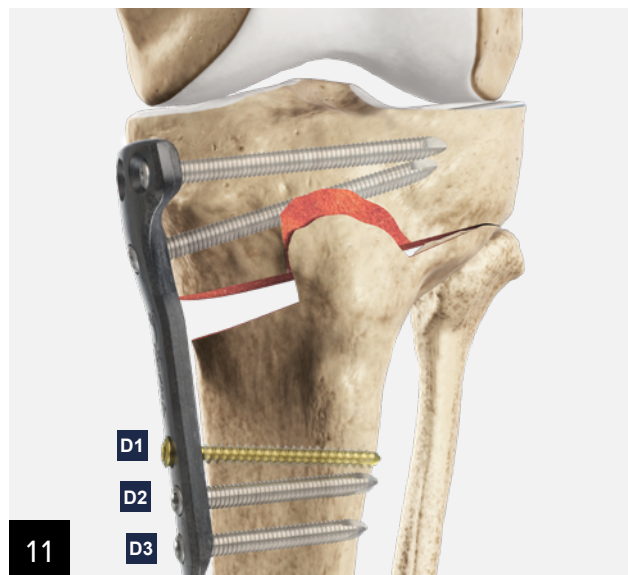
Notes:

- PEEKPower HTO plate cannot be bent
- PEEKPower HTO locking screws:
Screw angle has to be changed if the screw is removed and inserted into the same plate hole



Proximal Fixation of PEEKPower™ HTO Plate

Insert the drill guide for locking screws (AR-1340DG) through the aiming adapter to prevent drilling into the tibial plateau. Drill tunnels for screw holes (**P1**, **P3**, and **P4**) with the 4.3 mm drill (AR-1340D). Read the screw length on the drill where it enters the drill sleeve tunnel or by using the depth gauge for the PEEKPower HTO plate (AR-1340G). Insert 5 mm locking screws through the aiming adapter and stop at 2 - 3 remaining turns. Remove the aiming adapter. **P2** is drilled without the aiming adapter. Complete final fixation of all proximal locking screws with a 3.5 mm hex screwdriver manually until screws are flush with the plate.



Distal Fixation of PEEKPower™ HTO Plate

Intact Hinge:

Screw holes **D1**, **D2**, and **D3** are fixed with 5 mm locking screws. The same 4.3 mm drill and drill sleeve is used as for the proximal screw fixation.

Broken Hinge:

A golden compression screw is used in **D1**: Bicortical fixation is achieved by using a 3.2 mm drill (AR-1343.2D) with drill guide (AR-1343DG) for compression screws. The drill and drill sleeve are angled as distal as possible (12°) to achieve the best intrafragmentary compression of the lateral hinge.

The compression screw is fixed manually with a 3.5 mm hex screwdriver under x-ray control of the lateral hinge.

The plate is fixed in **D2** and **D3** with bicortically placed 5 mm locking screws. The same drill and drill sleeve are used as for proximal screw fixation. Finally, the golden compression screw in **D1** is replaced by a 5 mm locking screw.



ACP-soaked INNOTERE 3D osteotomy wedges or INNOTERE Paste-CPC can be placed into the bone void.

Innotere Wedges and Paste-CPC

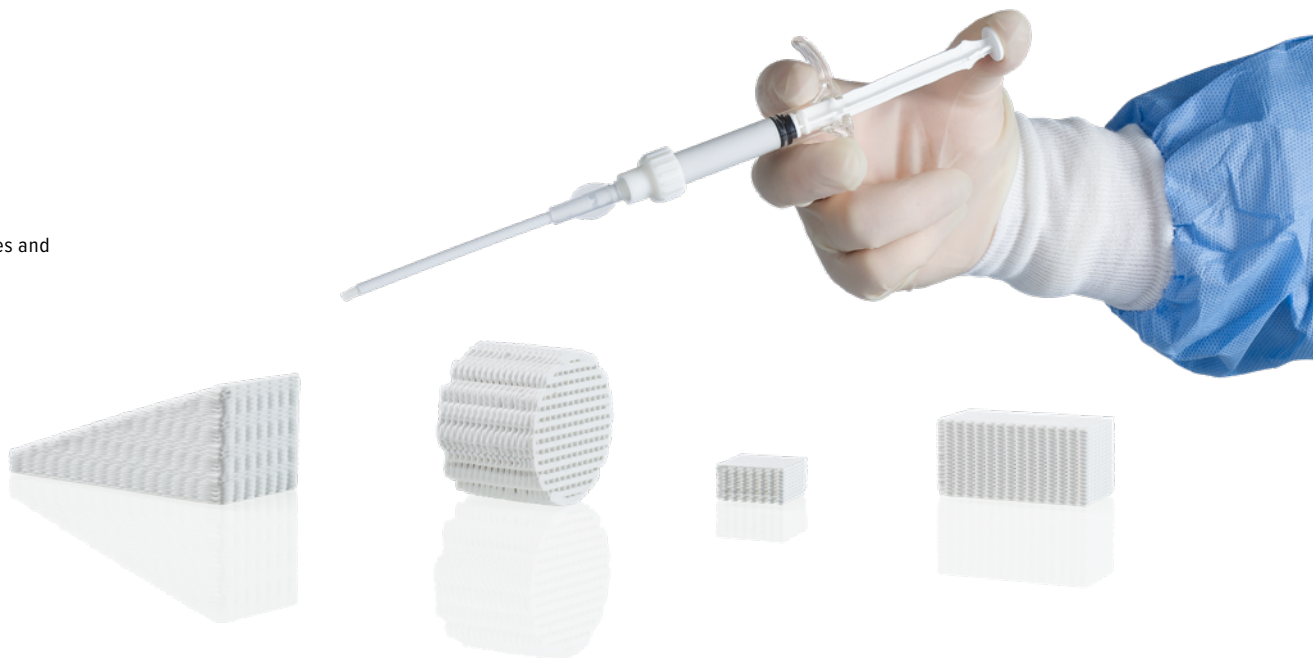


Plate Removal

Screws are removed using the 3.5 mm hex screwdriver for PEEKPower HTO plate. If the hex screw is stripped, an easy-out 3.5 mm hex screw remover, AO connect, has to be used.

Biomechanical Background of Hinge Pin

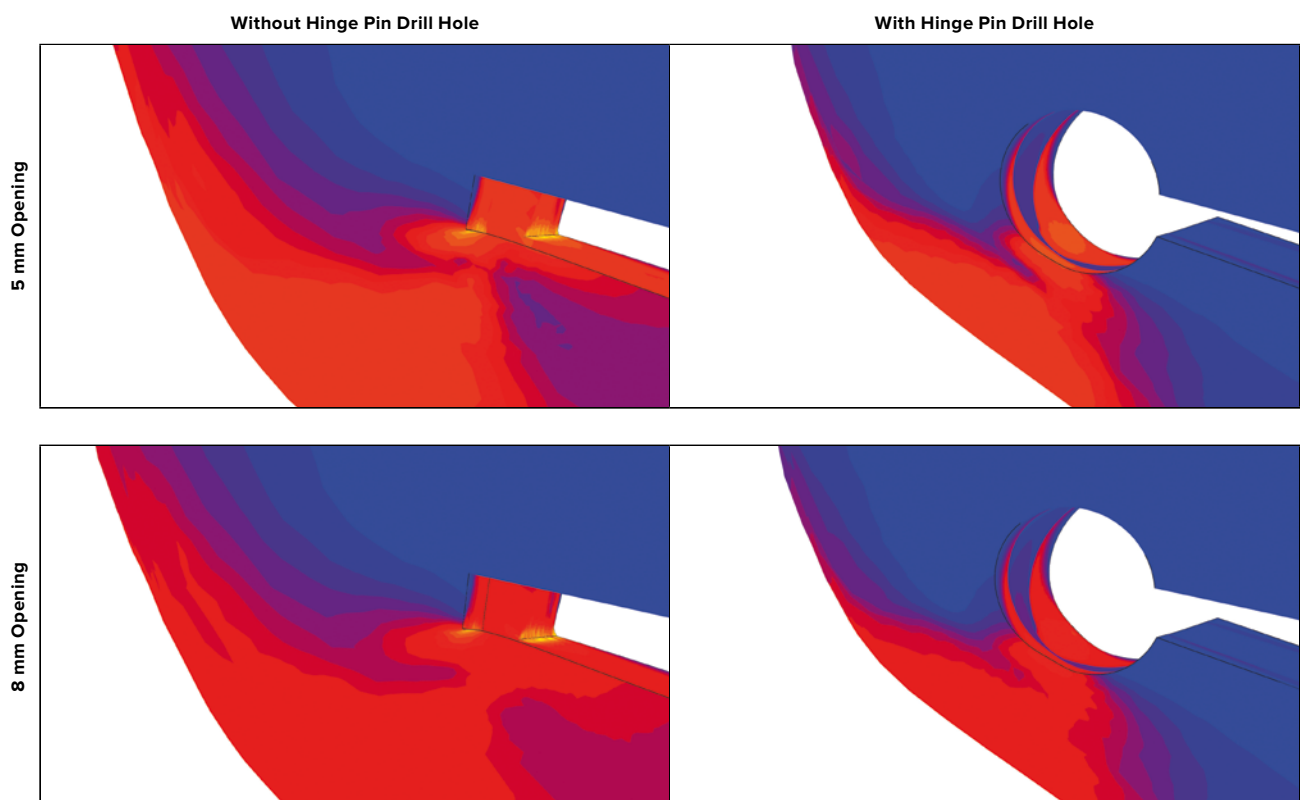
Intraoperative fractures during medial open-wedge HTO is a known complication of this procedure.^{4,6} Kessler et al.⁷ described an osteotomy terminating in a 5 mm drill hole. When compared against a conventional osteotomy, they demonstrated a significant increase in potential wedge angle without lateral fracture when a drill hole is used at the end of an osteotomy.

The aim of the HTO hinge pin system is to:

- Determine the end of an osteotomy with regard to bony references
- Safely saw against a hinge pin while performing the osteotomy
- Reduce the risk of lateral hinge breakage while opening the osteotomy

Finite Element Analysis (FEA) of Hinge Pin

The HTO hinge pin technique reduces the risk of lateral cortex fracture by stress homogenization in the area of the drill hole and therefore avoids local high stress risers in the region of the sharp cutting notch that lead to early crack initiation and fracture.⁸



Ordering Information

Implants

Product Description	Item Number
PEEKPower™ HTO plate	AR- 13401L
PEEKPower™ HTO locking screw, 5 mm × 16 - 90 mm, non-sterile Sizes: 16, 20, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 55, 60, 65, 70, 75, 80, 85, 90 mm	AR-134 16T to -90T
PEEKPower™ cortical non-locking screw, 4.5 mm × 24 - 52 mm, non-sterile Sizes: 24, 28, 32, 36, 40, 44, 48, 52 mm	AR-135 24T to -52T
PEEKPower™ HTO locking screw, 5 mm × 16 - 90 mm, sterile Sizes: 16, 20, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 55, 60, 65, 70, 75, 80, 85, 90 mm	AR-134 16TS to -90TS
PEEKPower™ cortical non-locking screw, 4.5 mm × 24 - 52 mm, sterile Sizes: 24, 28, 32, 36, 40, 44, 48, 52 mm	AR-135 24TS to -52TS

Instrumentation Set for PEEKPower™ HTO Plate

Product Description	Item Number
Saw Blade for DrillSaw Max 600™ Thickness 1 mm, length 90 mm, width 13 mm Thickness 1 mm, length 90 mm, width 19 mm Thickness 1 mm, length 90 mm, width 25.4 mm Thickness 0.6 mm, length 45 mm, width 9 mm	AR- 600-300S AR- 600-310S AR- 600-303S AR- 600-353S
Osteotome, 10 - 25 mm Sizes: 10, 15, 20, 25, 30 mm	AR- 13421W-10 to -30
Trial, for PEEKPower™ HTO, left Positioning handle Bone spreader, for HTO Aiming adapter tibial head Shortened aiming adapter tibial head Drill, for PEEKPower™ HTO locking screws, Ø 4.3 mm Drill guide, for PEEKPower™ HTO plate locking screws Depth gauge, for PEEKPower™ HTO plate Drill, for cortical screws, Ø 3.2 mm Drill guide, for 4.5 mm cortical screws Screwdriver, for PEEKPower™ HTO plate Driver handle, AO connection Cutting guide, for HTO Wedge trial, for HTO AO adapter Osteotomy guide pin, 2.4 mm Guide wire, with trocar tip, 1.57 mm PEEKPower HTO DFO instrument case Osteotomy retractor, radiolucent Easy-out	AR- 13401LT AR- 14024 AR- 1340T AR- 1340DGA AR- 1341DGA AR- 1340D AR- 1340DG AR- 1340G AR- 1343.2D AR- 1343DG AR- 13435D AR- 13421AO AR- 13315 AR- 13324 AR- 4160AOC AR- 13303-2.4 AR- 8941K AR- 13421C AR- 13325 AR- 1994

HTO Hinge Pin System

Product Description	Item Number
HTO hinge pin EM guide HTO hinge pin EM guide, large Tibial guide, EM, proximal body Tibial guide, EM, short distal body Tibial guide, EM, ankle clamp Case, for HTO hinge pin EM guide Template, for HTO hinge pin HTO hinge pin system	AR- 13440-01 AR- 13440-02 AR- 623-30 AR- 623-31 AR- 623-33 AR- 13330C3 AR- 13330 AR- 13315S
Osteotomy guide pin, 2.4 mm Osteotomy guide pin, 2.4 mm × 216 mm, sterile Drill tip guide pin, 2.4 mm × 311 mm Drill tip guide pin, 2.4 mm × 311 mm, sterile	AR- 13303-2.4 AR- 13303-2.4S AR- 1250L-1 AR- 1250LS
Headed reamer, cannulated, 5 mm Army Navy retractor, radiolucent Osteotomy retractor, radiolucent Patella tendon retractor	AR- 1405 AR- 1330 AR- 13325 AR- 13312

Bone Graft Substitute

Product Description	Item Number
INNOTERE osteotomy wedge, 7 mm × 30 mm INNOTERE osteotomy wedge, 10 mm × 30 mm INNOTERE osteotomy wedge, 12 mm × 35 mm INNOTERE osteotomy wedge, 15 mm × 35 mm INNOTERE Paste-CPC, 3 cc INNOTERE Paste-CPC, 0.5 cc INNOTERE Paste-CPC, 1 cc INNOTERE Paste-CPC, 3 × 1 cc INNOTERE Paste-CPC, 3 cc INNOTERE Paste-CPC, 6 cc INNOTERE Paste-CPC, 12 cc	721TS1 721TS2 721TS3 721TS4 111VX2 211IP2 211IP1 231IP1 111VX2 311IP2 311IP1

Products advertised in this brochure / surgical technique guide may not be available in all countries. For information on availability, please contact Arthrex Customer Service or your local Arthrex representative.

References

Please note that the studies referenced below might not fulfill the criteria of a randomized, controlled study.

1. Paley D, Harzender JE Principles of Deformity Correction. Vol 3. Berlin, Heidelberg, New York: Springer; 2002.
2. Miniaci A, Ballmer FT, Ballmer PM, Jakob RP. Proximal tibial osteotomy. A new fixation device. *Clin Orthop Relat Res*; 1989; (246): 250–259.
3. Elson DW, Petheram TG, Dawson MJ. High reliability in digital planning of medial opening wedge high tibial osteotomy, using Miniaci's method. *Knee Surg Sports Traumatol Arthrosc*; 2015; 23(07): 2041–2048.
4. Han SB, Lee DH, Shetty GM, Chae DJ, Song JG, NhaA KW. "Safe zone" in medial open-wedge high tibia osteotomy to prevent lateral cortex fracture". *Knee Surg Sports Traumatol Arthrosc*; 2013; 21: 90–95.
5. Cotic M, Slotta-Huspenina J, Noël PB, Imhoff AB. Two-Year Results of Open-Wedge Tibial Osteotomy with Fixation by the PEEKPower™ HTO-Plate for Varus Malalignment with Unicompartmental Osteoarthritis of the Knee (ISAKOS 2011, paper # 69)
6. Kyononos L, Slenker N, Cohen S (2012) Complications In Brief: Osteotomy for Lower Extremity Malalignment. *Clin Orthop Relat Res* 470:3630–3636
7. Kessler OC, Jacob HA, Romero J (2002) Avoidance of medial cortical fracture in high tibial osteotomy: improved technique. *Clin Orthop Relat Res* 395:180-185
8. LA2-00030-EN Hinge Pin Reduces Fracture Risk in Medial Opening Wedge Procedures



This description of technique is provided as an educational tool and clinical aid to assist properly licensed medical professionals in the usage of specific Arthrex products. As part of this professional usage, the medical professional must use their professional judgment in making any final determinations in product usage and technique. In doing so, the medical professional should rely on their own training and experience, and should conduct a thorough review of pertinent medical literature and the product's directions for use. Postoperative management is patient-specific and dependent on the treating professional's assessment. Individual results will vary and not all patients will experience the same postoperative activity level and/or outcomes.

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