stryker®

Orthopaedics

MIS Knee Joint Replacement

Surgical Technique

Alignment, resection, balancing and implantation

The Minimally Invasive Surgery (MIS)
Surgical Technique

Table of Contents

Alignment, Resection, Balancing and Implantation

Appendix 1

Indications

- Painful, disabling joint disease of the knee resulting from: degenerative arthritis, rheumatoid arthritis or post-traumatic arthritis.
- Post-traumatic loss of knee joint configuration and function.
- Moderate varus, valgus, or flexion deformity in which the ligamentous structures can be returned to adequate function and stability.
- Revision of previous unsuccessful knee replacement or other procedure.

Additional Indications for Posterior Stabilized Components:
- Ligamentous instability requiring implant bearing surface geometries with increased constraint.
- Absent or non-functioning posterior cruciate ligament.

Contraindications

- Any active or suspected latent infection in or about the knee joint.
- Any mental or neuromuscular disorder which would create an unacceptable risk of prosthesis instability, prosthesis fixation failure, or complications in postoperative care.
- Bone stock compromised by disease, infection or prior implantation, which cannot provide adequate support and/or fixation to the prosthesis.
- Skeletal immaturity.
- Severe instability of the knee joint secondary to the absence of collateral ligament integrity and function.
- Obesity. An overweight or obese patient can produce loads on the prosthesis which can lead to failure of the fixation of the device or to failure of the device itself.

Warnings and Precautions:

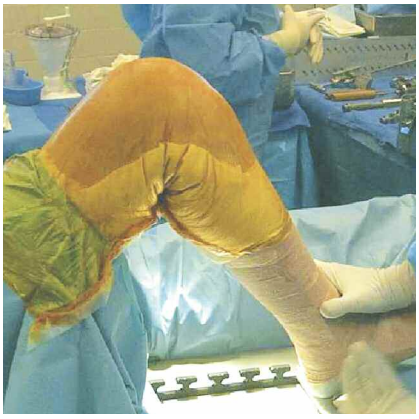
- See package insert for warnings, precautions, adverse effects and other essential product information.

Introduction

The transition from traditional TKA to MIS–TKA should be considered a process of "evolution rather than revolution."

The following strategic actions are involved in this "evolutionary" approach:
- Progressively reduce the incision
- Minimize quadriceps trauma
- Retract rather than evert patella
- Decrease trauma to peril-articula soft-tissues
- Incremental exposure of the relevant joint anatomy into a smaller wound rather than full exposure of the joint through a larger wound and total visualization.

- Experience with the MIS–TKA is best gained using a traditional leg holder method (*see illustration below*). This allows for variable flexion and extension while providing an effective and familiar resource for the orthopaedic surgeon.



Adjustable Leg Holder

- The surgeon may choose to utilize a suspended leg technique (*see illustration below*) in which the leg, resting on a bolster, is hanging over the table. This advanced approach allows gravity to distract the joint and may enhance posterior soft-tissue exposure.

Suspended Leg

- With either the adjustable leg holder or the suspended leg technique, the MIS–TKA utilizes the natural elasticity of the skin to enhance exposure while reducing the necessary incision length.

- Progressive utilization of flexion and extension effectively presents the relevant joint anatomy without the need for a traditional incision.

- The surgeon's goal should be to reduce the incision length to a minimum without causing excessive traction to soft-tissue structures. This does not need to be an immediate adjustment. As one's experience grows, it will be possible to gradually reduce incision length to 2.5 times the length of the patella. During the learning curve, the incision can always be extended to match the surgical circumstance and the surgeon's preference.

- Recognize that the primary patient concerns are pain and length of rehabilitation. Cosmetics are a secondary consideration. Adopting a "Quad Sparing" strategy helps to address these issues.

- A VMO snip, 2cm to 2.5cm in length with superior and inferior capsulotomies, rather than cutting the muscle, begins the "Quad Sparing" strategy.

- "Quad Sparing" is enhanced by elevating the quadriceps with a two-pronged retractor rather than cutting the muscle to allow exposure[1].

- Gentle retraction of the patella rather than eversion "Spares the Quad" by avoiding over-extending the quadriceps mechanism.

- Minimizing capsular damage may also significantly improve postoperative recovery. The damage can be avoided by cutting the tibia and femur in situ, thus avoiding dislocation of the tibio-femoral joint.

- Downsized instrumentation minimizes the need for extensive exposure and allows for the substitution of gentle patellar retraction rather than the traumatic practice of patellar eversion.

- By using sequential bone removal, the extensor mechanism is decompressed without violating its integrity. This allows a progressively larger working space for greater visibility.

External Tibial Alignment

- With the knee flexed, place the External Tibial Alignment Guide along the tibial shaft. The spring-loaded clamp is used around the distal tibia just above the malleoli.

- Axial alignment is achieved when the vertical shaft of the instrument parallels the long axis of the tibia in both the A/P and M/L views. Use the A/P and M/L adjustment thumb-screws are used to facilitate alignment.

- Landmarks often used to obtain correct axial alignment and rotation include:

1) Tibial Tubercle – The alignment rod lies over the medial third of the tibial tubercle, and

2) Second Metatarsal – The second metatarsal is in line with the center of the ankle *(Figure 2a*). The posterior slope of the tibial resection may be adjusted slightly by moving the distal end of the alignment jig anteriorly.

- Once axial alignment is achieved, tighten the A/P and M/L adjustment thumbscrews. *(Figure 2b)*

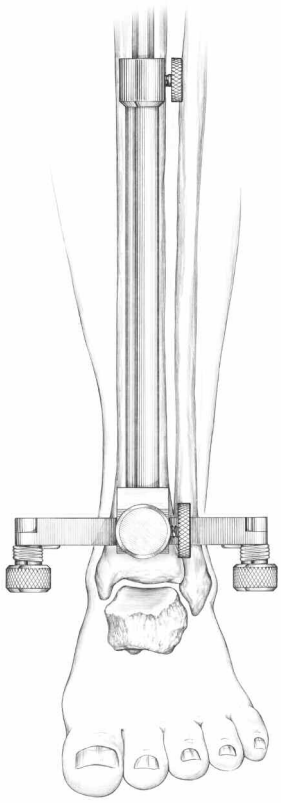


Figure 2a
Distal tibial alignment.

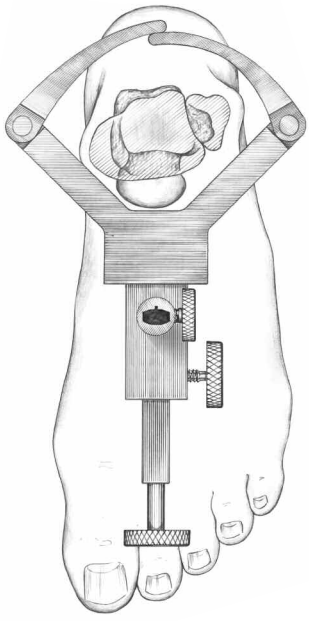


Figure 2b
Tibial alignment adjustments.

Tibial E/M Alignment Ankle Clamp
8000-1040

Lateral Tibial Retractors
8050-5001L Left
8050-5001R Right

8050-5001L

- Assemble the Tibial Resection Guide to the External Tibial Alignment Guide by loosening the locking knob and sliding the Tibial Resection Guide over the top of the Proximal Tibial Rod. Tighten the locking knob on the Tibial Resection Guide when the desired location is reached. Place the head of the instrument over the tibial eminence *(Figure 2c)*. There should be a finger's breadth clearance between the Proximal Rod of the External Tibial Alignment Guide and the anterior cortex when the head is positioned correctly. Center the fixation pinhole over the tibial eminence and place a 2.5" headless pin *(Figure 2d)*. Tighten the vertical adjustment screw to secure the Proximal Rod to the External Tibial Alignment Guide.

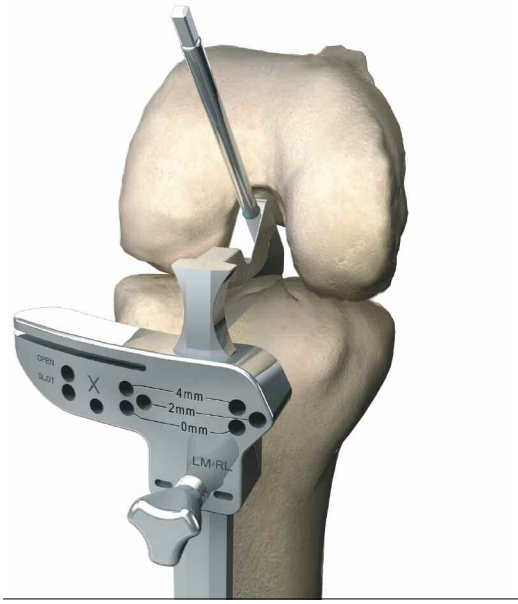
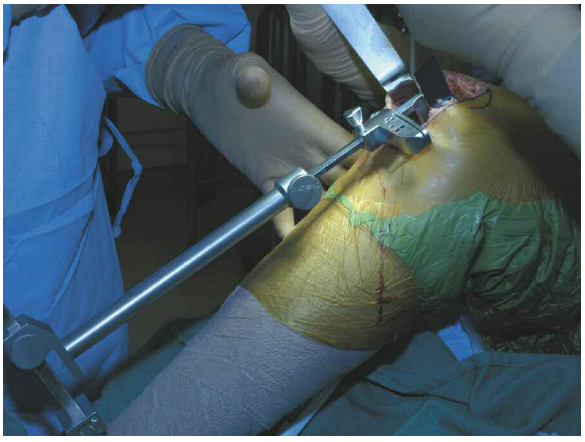


Figure 2c
Proximal rod placement.

Note:
Care should be taken with respect to the depth and position of the headless pin fixation.



External Tibial Alignment

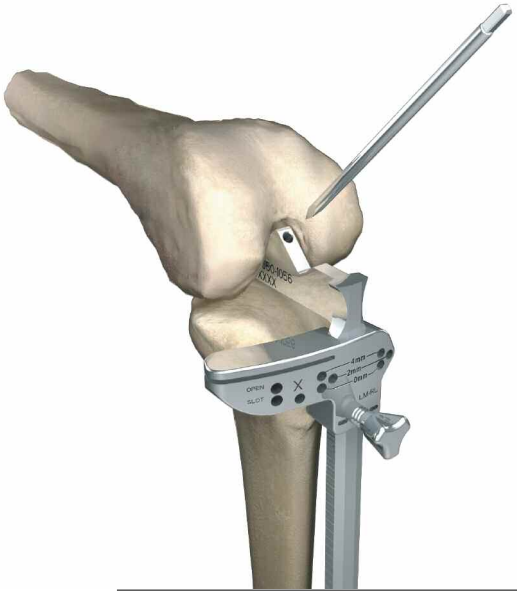


Figure 2d
Proximal rod fixation.

Proximal Rod
8050-1056

Headless Pin Driver
7650-1035

8050-1060R

Tibial Resection Guide
8050-1060L/R 0˚ Left/Right
8050-1063L/R 3˚ Left/Right
8050-1065L/R 5˚ Left/Right
8050-1060-2 (replacement knob)

7650-1038

1/8" Headless Pins

7650-1039 2.5"	Long (4 pack)
7650-1038 3.5"	Long (4 pack)
7650-2038 3.5"	Long (sterile 4 pack)

Setting Tibial Resection Level

The Minimally Invasive Instrumentation System provides Right and Left, 0 and 5 degree Tibial Resection Guides.

Note:
0 degrees of posterior slope is recommended for use with the Scorpio PS femoral components.
5 degrees of posterior slope is recommended for use with the Scorpio CR femoral components.

Note:
The components shall be positioned to avoid excessive hyperextension. Excessive femoral flexion and tibial slope should be avoided when implanting the components. Implant positioning resulting in excessive hyperextension may result in premature wear and damage to the implant.

- Captured and uncaptured resection options are available. The Tibial Stylus is assembled to the appropriate Tibial Resection Guide *(Figure 3a)* by aligning the pin and plate of the Tibial Stylus with the appropriate hole and cutting surface on the Tibial Resection Guide respectively.

- A pin is placed in the hole marked "SLOT" to use the captured resection jig *(Figure 3b)* and another pin is placed in the hole marked "OPEN" for the uncaptured resection jig *(Figure 3c)*.

- Loosen the locking knob on the Tibial Resection Guide and adjust the Tibial Stylus to reference the desired point on the tibial plateau. Tighten the knob clockwise to lock in place.

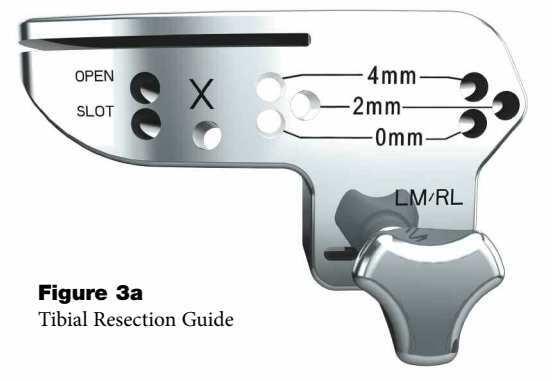


Figure 3a
Tibial Resection Guide

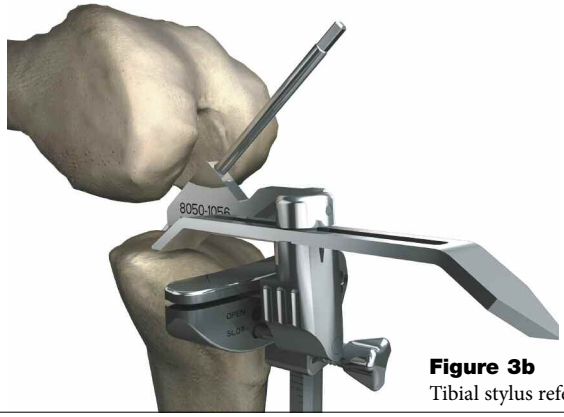


Figure 3b
Tibial stylus referencing: captured slot.

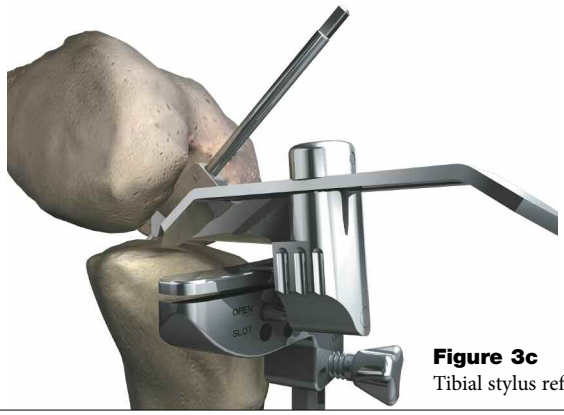


Figure 3c
Tibial stylus referencing: open face.

2/4mm Tibial Stylus
8050-0204

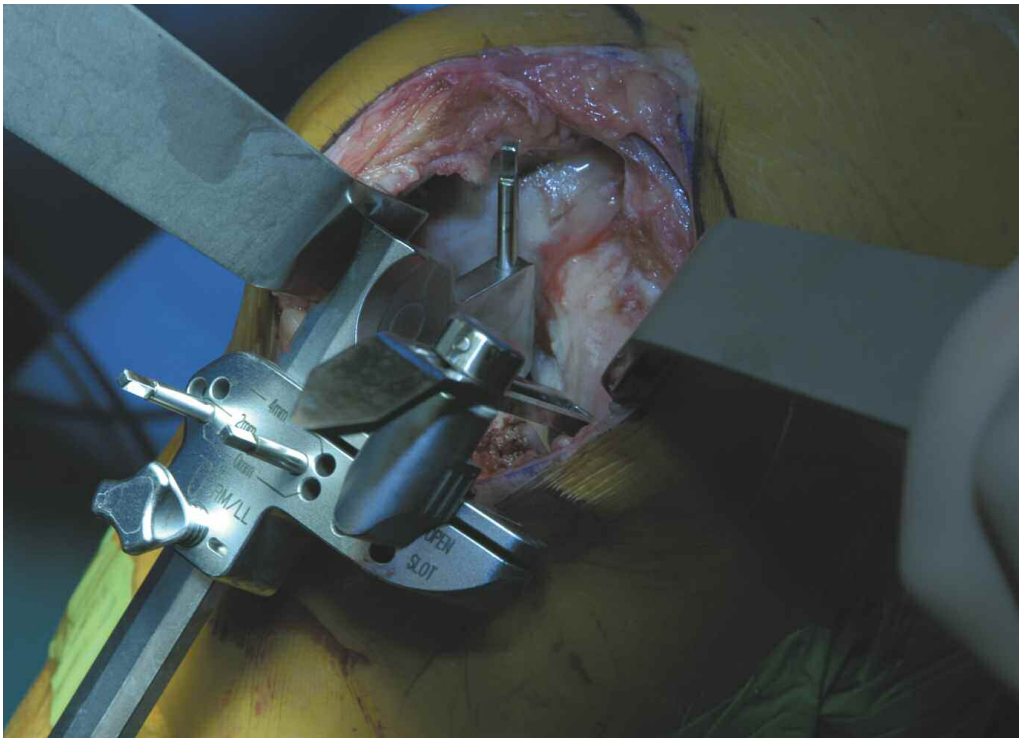


Figure 3d
Tibial referencing.

Note:
The posterior femur may prevent the stylus tip from reaching the low point of the tibia. Typically, there is approximately a 2mm difference between the low point of the tibia and the maximum that the stylus can be inserted into the joint.

The surgical assistant can draw the tibia anteriorly to help expose the tibial sulcus for stylus positioning, then relax forward tension for resection.

- **The Tibial Stylus offers both 2mm and 4mm resection levels. These settings reference the resection level below the tip of the stylus.**

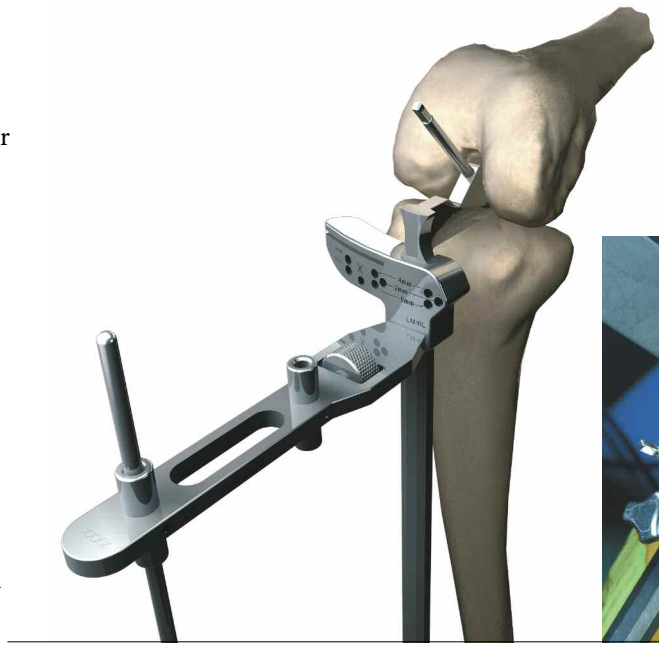
A blade-runner resting against the cutting surface of the Tibial Resection Guide may be used as a secondary technique to measure the desired resection level.

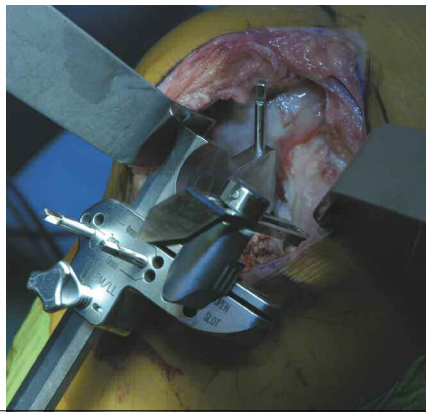
Only the medical tibial sulcus can be referenced with the stylus (*Figure 3d*). Pre-op templating is mandatory for determining how much bone to remove medially. This will also help eliminate the need for tibial recuts or extremely thick poly.

Proximal Tibial Resection

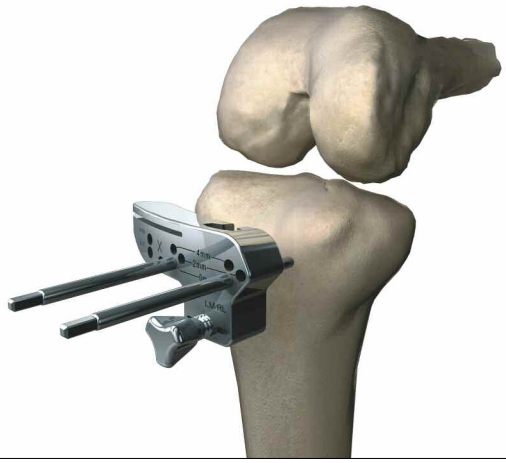
Often the tibia is removed in sections, removing first the medial tibia, then the central tibia, and finally the lateral tibia. Sequential medial and lateral retraction facilitates the removal of the proximal tibial bone. Clean up cuts and excision of osteophytes and remaining meniscus are performed later in the procedure.

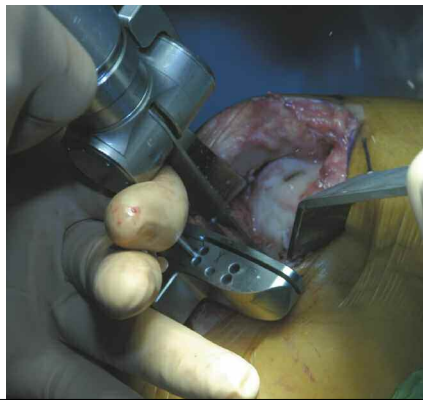
- A Lateral Collateral Ligament Retractor can assist with retraction of the patella for enhanced visualization.
  - As exposure is decreased, special care must be given to protect the patellar tendon and other ligaments; protect them with retractors.
- The Alignment Handle may be used with an Alignment Rod, referencing the same landmarks as previously outlined to verify proper alignment.
- Secure the Tibial Resection Guide to the proximal tibia using two 1/8" fixation pins through the holes marked “0mm”.
- Remove the Tibial Stylus by sliding it out of the Tibial Resection Guide. To ease removal of the Stylus, hold the Stylus pointer while pulling back on the base.
- Remove the Proximal Rod fixation pin and loosen the locking knobs attached to the Tibial Resection Guide and Tibial Alignment Guide to release the Proximal Rod. The Tibial Alignment Guide is then removed by opening the springloaded jaws.
- Slide the Tibial Resection Guide against the tibia and drive a 1/8" fixation pin into the X-pin hole (*direction points downward*).





Tibial Referencing





Tibial Resection

Alignment Rod
3180-2000

- Resect the medial plateau and as much of the central and lateral portion of the tibia as possible using a. 050" (1.27mm) thick x 14mm wide non-offset saw blade. (*Figure 4a*)

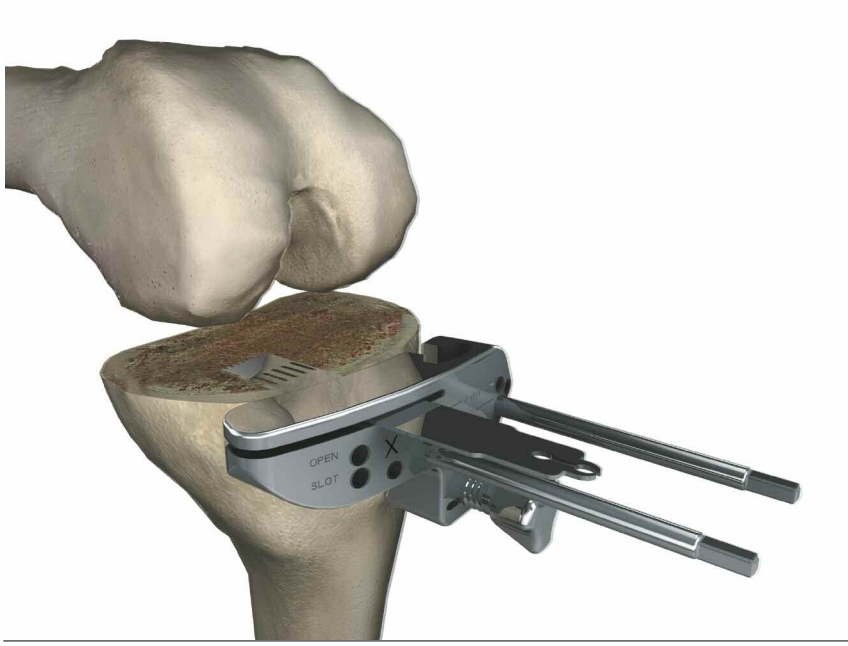


Figure 4a
Tibial resection: captured slot

- The Tibial Resection Guide can be repositioned through the 4mm holes to use the top surface of the Tibial Resection Guide as a flat surface to complete the resection *(Figure 4b)*. Be sure to remove the fixation pin in the X-pin hole prior to repositioning.

Figure 4b
Tibial resection: open face

- Using the Pin Puller, extract the fixation pins from the Tibial Resection Guide.

Intramedullary Canal Preparation

Femoral preparation is achieved with an Intramedullary Guide, downsized cutting blocks and an Anterior Referencing System. A double-pronged Anterior Femoral Retractor *(Figure 5a)* is used to retract the anterior quadriceps mechanism off the anterior femur.

Figure 5a
Anterior Femoral Retractor

- Drill a hole in the center of the intercondylar notch using a 3/8" diameter starter drill to access the intramedullary canal. *(Figure 5b)*

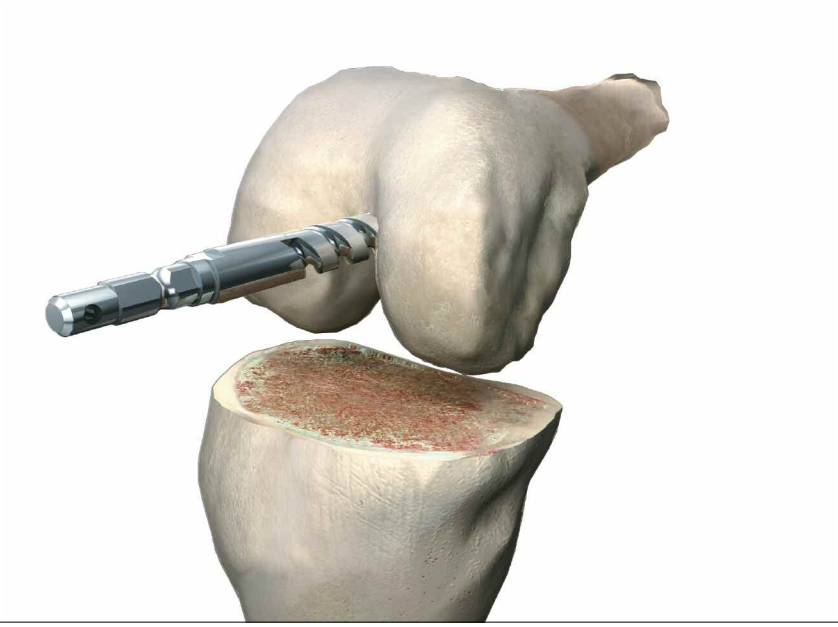


Figure 5b
IM canal access

Pin Puller
6633-7-605

3/8" IM Drill
7650-1033

Anterior Femoral Retractor
8050-5002

Femoral Alignment Guide
8050-5901

Femoral Alignment and Rotation

The Femoral Alignment Guide is designed for use on either the left or right knee and can be set between zero and nine degrees of valgus, in one-degree increments. Place the 5/16" T-Handle Rod through the back of the Femoral Alignment Guide and set the instrument to the preoperatively determined angle by pulling the knob on the Femoral Alignment Guide and locking it in the appropriate notch.

Insert the Femoral Alignment Guide into the intramedullary canal. With the appropriate retraction (*Anterior Retractor under quadriceps mechanism and Lateral Tibial Retractor holding back patella*), femoral rotation should be determined and verified by using at least one of the following three methods:

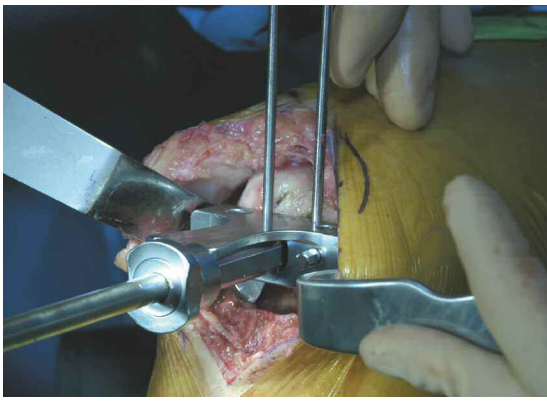


Figure 6a
External femoral alignment.

1. Mark the top and bottom portion of the femoral AP axis (Whiteside's line) and draw a line connecting the two points. Insert two 1/8" diameter pins into the top surface of the Femoral Alignment Guide. Align the two 1/8" diameter pins parallel to the femoral AP axis in the trochlear groove as shown in Figure 6a.

2. Place the three-degree External Rotation Guide pins over the medial and lateral slots on the front face of the Femoral Alignment Guide, taking care to assemble the three-degree External Rotation Guide in the appropriate left or right orientation. Use this guide to assess equal amounts of medial and lateral posterior condyle. (*Figure 6b*)

3. Correct femoral rotation can also be verified by ensuring that the Femoral Alignment Guide is parallel to the epicondylar axis. Location of the epicondyles may be aided by palpation techniques.

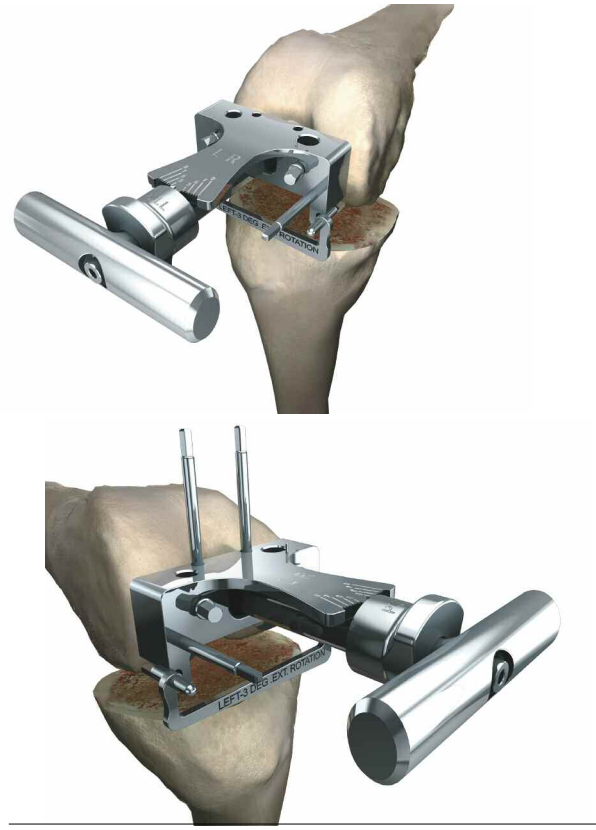


Figure 6b
Setting femoral rotation.

Once proper rotation has been set, drive a long 1/8" diameter pin through the lateral side of the Femoral ligament Guide using the angled fixation hole (*direction points inward*). This pin will also help in retracting the patella and soft-tissue.

Anterior Skim Resection

Insert the Anterior Resection Guide into the two anterior holes on the Femoral Alignment Guide *(Figure 7a)*. The Femoral Stylus is assembled to the Anterior Skim Resection Guide by depressing the plunger on the Femoral Stylus and placing it into the hole on the top surface of the Anterior Skim Resection Guide *(Figure 7b)*. Once the Stylus is positioned on the anterior femur, use the hex pin driver to lock the Anterior Skim Resection Guide to the Femoral Alignment Guide. *(Figure 7c)*

Note:

Make sure the tip of the Stylus is slid maximally distal on its axis to avoid the skin fold on the anterior femur. Once the Stylus is positioned on the Anterior Skim Resection Guide, the Stylus can then be advanced under the skin fold.

Figure 7a
Anterior Skim Guide assembly.

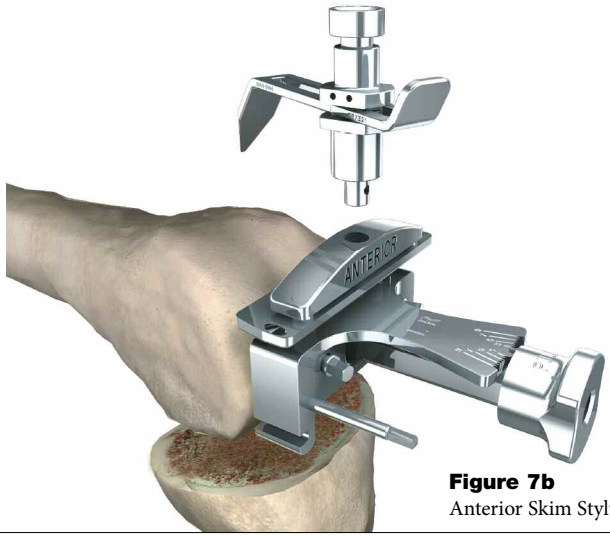


Figure 7b
Anterior Skim Stylus assembly.

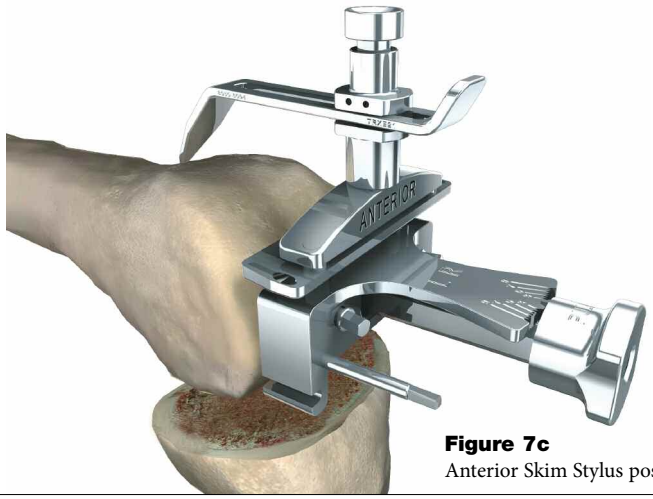


Figure 7c
Anterior Skim Stylus positioning.

3˚ External Rotation Guide
8050-5000

Femoral Alignment Guide
8050-5901

Anterior Skim Resection Guide
8050-5903

Anterior Skim Resection Guide
8050-5004

Hex Pin Driver
8050-0018

Anterior Femoral Alignment

The length of the Femoral Stylus on the Anterior Skim Resection Guide may be easily adjusted by sliding it to the appropriate position on the anterior cortex. The tip of the Stylus indicates the exit point of the saw blade when the final femoral anterior resection is made with the Femoral Resection Guide.

Prior to resection, check the saw exit level around the supero-medial side of the anterior cortex with a saw blade or a blade-runner. Tighten the thumbscrew on the Femoral Alignment Guide to secure the Anterior Skim Resection Guide.

Depress the plunger on the Femoral Stylus and remove it from the Anterior Skim Resection Guide *(Figure 7d)*. Use a. 050" (1.27mm) thick x 18mm wide non-offset saw blade to resect the anterior cortex. *(Figure 7e)*

Note:
Built into the medial and lateral walls of the Skim Resection Guide are rounded posts, which allow the surgeon to access more bone medially and laterally.

Proper resection level and femoral rotation typically results in an anterior resection resembling that of a "baby grand piano".

After the anterior skim resection is complete, leave both the Anterior Skim Resection Guide and Femoral Alignment Guide in place.

Figure 7f shows the Intramedullary Femoral Guide in position. There is a two pronged retractor superiorly retracting the quadriceps mechanism. This allows visualization of the anterior femur and to adjust for rotation.

Figure 7d
Anterior Skim Resection Guide

Figure 7e
Anterior skim resection.

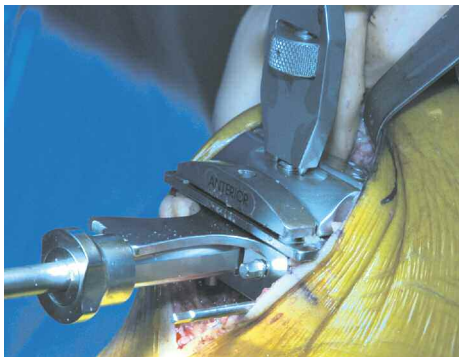


Figure 7f
Quadriceps mechanism retraction.

Distal Resection

Assemble the 8mm, 10mm or 12mm Distal Femoral Resection Guide to the Anterior Skim Resection Guide by aligning the slot on the Distal Femoral Resection Guide with the tab on the Anterior Skim Resection Guide. These guides are magnetized to facilitate correct assembly.

Note:
Rest the Distal Femoral Resection Guide on the cut surface of the anterior femur and then slide it into place, connecting it to the Anterior Skim Resection Guide.

Note:
The components shall be positioned to avoid excessive hyperextension. Excessive femoral flexion and tibial slope should be avoided when implanting the components. Implant positioning resulting in excessive hyperextension may result in premature wear and damage to the implant.

The distal resection guide *(Figure 8a)* has been specifically designed for MIS–TKA. It is designed to slide under the soft-tissue sleeve covering the anterior femur. Ergonomic design allows for easy instrument handling with medial and lateral depressions that serve as finger-tip grips.

Prior to pinning the Distal Femoral Resection Guide to the femur, an optional external alignment check may be done. Attach the Alignment Guide Handle to the Distal Femoral Resection Guide and insert an External Alignment Rod through the hole provided in the Alignment Guide Handle. Alignment is correct when the rod intersects the center of the femoral head and roughly parallels the axis of the femur in the lateral view.

Drive two 1/8" short headless pins into the holes marked "0" *(Figure 8b)*. The Distal Femoral Resection Guide is available in 8mm (*as shown*), 10mm, or 12mm resection configurations and allows 8mm, 10mm, or 12mm of bone to be removed from the distal femur.

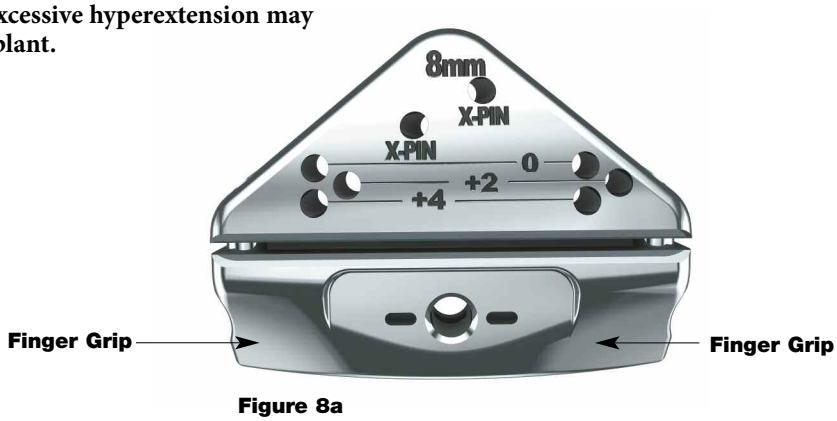


Figure 8a
Distal Femoral Resection Guide.

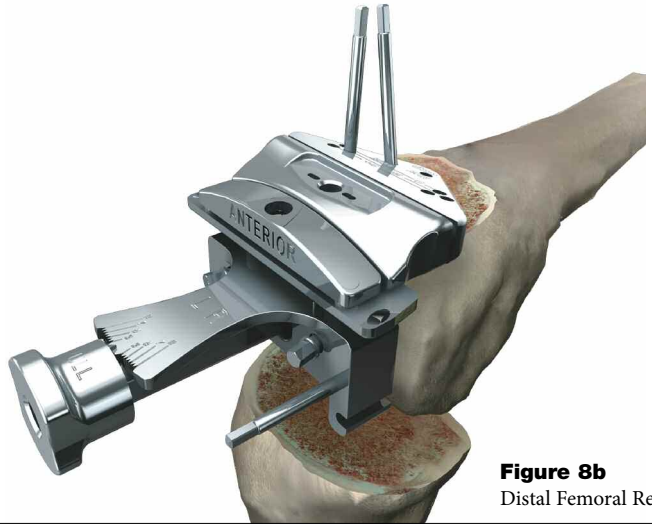


Figure 8b
Distal Femoral Resection Guide fixation.

8050-5008

Distal Femoral Resection Guide
8050-5008 8mm
8050-5010 10mm
8050-5012 12mm

Once the Distal Femoral Resection Guide is secured, remove the 1/8" pins that are holding the Femoral Alignment Guide and Anterior Skim Resection Guide in place. Remove the IM Rod, Femoral Alignment Guide and Anterior Skim Resection Guide from the femur, leaving only the Distal Femoral Resection Guide in place. If desired, a 1/8" cross pin can be used for extra fixation (*direction points inward and downward or outward and lateral*). Perform the distal resection using a. 050" (1.27mm) thick x 18mm wide saw blade and remove the Distal Femoral Resection Guide. *(Figure 8c)*

Figure 8c
Distal femoral resection.

Note:

1. **Insertion of a broad osteotome on top of the tibial cut will prevent the saw blade from inadvertently cutting the tibia.**
2. **Similar to the anterior skim resection, the Distal Resection Guide has been specifically designed for MIS–TKA with integrated circular radii to increase the cutting area of the blade.**

An additional 2mm or 4mm of distal femur may be resected by sliding the Distal Femoral Resection Guide up and off the headless pins and placing it back over the pins through either the "+2" or "+4" holes. Be sure to remove the fixation pin in the x-pin hole prior to repositioning.

An alternative option is to proceed directly to the next size Distal Femoral Resection Guide.

Figure 9a shows the Distal Femoral Cutting Block in position. The IM guide and two pins help to stabilize the distal femoral cutting block in position.

Note:
If the IM Rod is left in, care should be taken during the distal resection to avoid knocking the IM Rod with the saw blade

After the Distal Femoral Cutting Block is pinned into position, the pin guide can be removed and the distal femoral cut made. The IM hole is then visible which will allow the surgeon to make the depth of resection at the intracondylar notch and resect the medial and lateral femur. *(Figure 9b)*

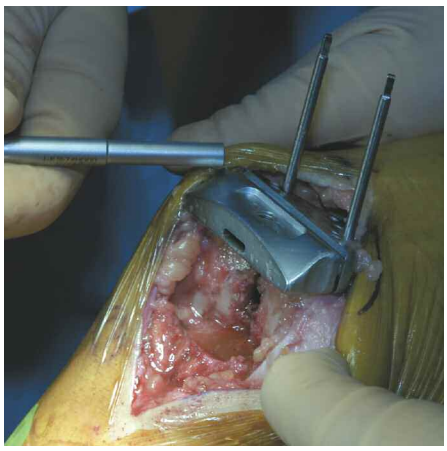


Figure 9a
Distal femoral resection guide position.

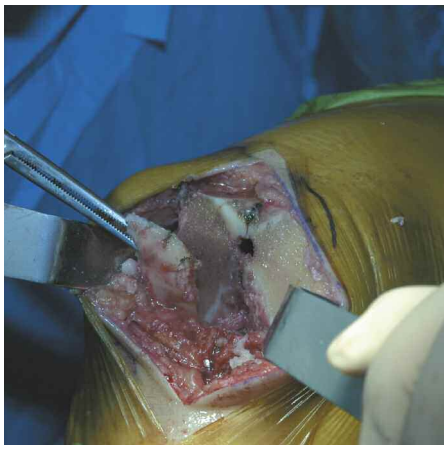


Figure 9b
Depth of distal resection made at level of intracondylar notch.

8050-5008

Distal Femoral Resection Guide
8050-5008 8mm
8050-5010 10mm
8050-5012 12mm

Femoral Sizing

The femoral implant size is determined by seating the Femoral Sizer on the medial side of the resected anterior and distal femur *(Figure 10a)*. A traditional Scorpio sizer may also be applied. Compress the Femoral Sizer so that it rests on the posterior condyle and read the size that corresponds with the two hashed lines. As this is an anterior referencing system, a smaller femoral size should be selected in the event of a "half-size" reading.

The A/R Femoral 4:1 Resection Guide should sit flat on the anterior cut. The wings represent the M/L width of the corresponding sides of the implant. The scribe line on the anterior plate can be used to mark the proper M/L patellar recess position on the bone (*refer to the Patellar Recess Preparation section of the surgical technique*).

Place the appropriately sized A/R Femoral 4:1 Resection Guide flush against the resected anterior and distal femur. Drive a 1/8" pin in the lateral hole. A 1/8" pinhole is located on the anterior plate if additional fixation is required. *(Figure 10b)*

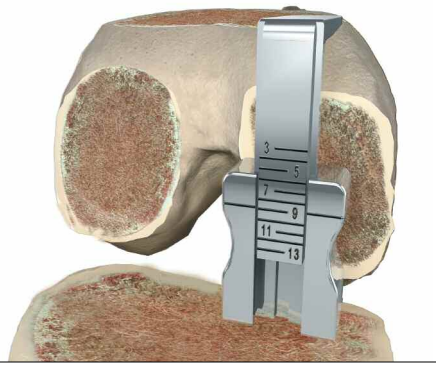


Figure 10a
Femoral A/P sizing.

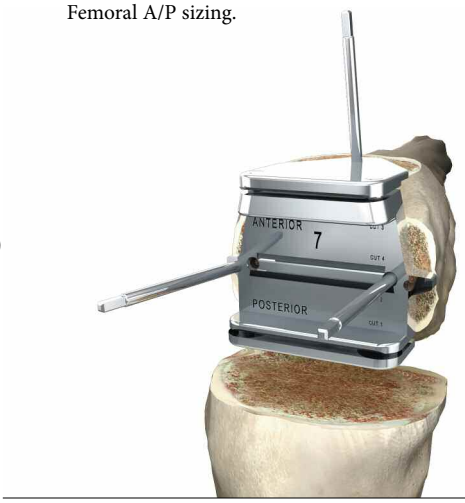


Figure 10b
Fixation of 4:1 Cutting Guide.

Note:

The medial angled pin increases fixation strength *(two converging pins can also be used)*

With a smaller incision, the patella may present an obstacle for a converging pin. If a pin is desired for stability on the lateral side, the straight hole may present an alternative option.

Complete the remaining four femoral bone resections in the following sequence, as indicated on the cutting block by the numbers one through four:

1. Posterior condyles
2. Posterior chamfer
3. Anterior chamfer
4. Anterior cortex

Making the posterior chamfer cut before the anterior chamfer maintains a larger surface of bone upon which to support the A/R Femoral 4:1 Resection Guide. The resection slots are uniquely designed so that all resections can be started on the medial side.

Note:

Extreme caution should be taken when cutting towards the medial or lateral collateral ligaments and the patellar tendon. With a smaller incision, it may be difficult to account for the blade excursion.

If using a femoral component with pegs, be sure to pre-drill both straight 1/8" holes into the distal femur located on the A/R Femoral 4:1 Resection Guide.

Figures 11a and 11b illustrate the four-in-one cutting block, which allows cuts to be made on the anterior femur, anterior and posterior chamfers and the posterior condyle. The combination of the 18mm wide saw blade and rounded posts within the cutting slots enable the surgeon to complete all bone cuts through the slots.

Scorpio Femoral A/P Sizer
8050-0313

Scorpio Femoral Resection Guide

8050-5103	Size 3
8050-5105	Size 5
8050-5107	Size 7
8050-5109	Size 9
8050-5111	Size 11
8050-5113	Size 13

8050-5107

The Scorpio® Patellar Recess Rasp is used to prepare the patellar recess on the anterior chamfer for proper femoral component fit on both cruciate retaining and posterior stabilized designs.

- Select the appropriate size Scorpio® Patellar Recess Rasp and attach it to the "quick connection" on the Modular Handle. Proceed to prepare the patellar recess by centering the rasp on the anterior chamfer in the location that was previously marked using the 4:1 Femoral Resection Guide. Continue rasping until the rails are seated flush against the bone. *(Figure 11a and 11b)*

Note:
A Rongeur may be used to start the recess preparation prior to the patellar rasping

If the incision size permits, the PS Preparation Guide may be used to prepare the Patellar Recess using a saw blade *(refer to the Posterior Stabilized Preparation section of the surgical technique).*

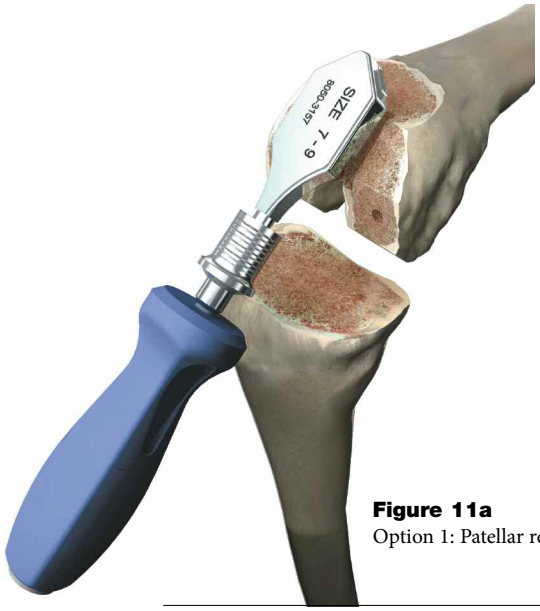


Figure 11a
Option 1: Patellar recess preparation.

Figure 11b
Patellar Recess Rasp.

8050-3157

Patella Recess Rasp
8050-3153 Size 3/5
8050-3157 Size 5/7
8050-3151 Size 11/13

Modular Handle
8050-1300

Posterior Stabilized Preparation (PS Only):

Should the need for the additional constraint of the Posterior Stabilized components be required, the Scorpio® PS Femoral Preparation Guide can be used to prepare the femur using a saw technique. A narrow sagittal saw blade (11mm) or double-edged reciprocating saw blade is used to resect the bone from the intercondylar notch.

- Align the Scorpio® PS Femoral Preparation Guide to the femur noting that the distal "wings" are the same M-L width as the corresponding femoral implant. Use two 1/8" diameter pins to secure the guide *(pin points inward)*.
- Using the inner walls of the Scorpio® PS Femoral Preparation Guide as a reference, lay the saw blade flat and resect through the intercondylar notch medially, laterally, and posteriorly until complete. *(Figure 12a)*
- If desired, the Patellar Recess can be completed using the cutting surface on the anterior portion of the PS Femoral Preparation Guide (*Figure 12b)*. Final check of removed bone should be done using the rasp. Once the rails on the rasp are flush with the bone, this step is complete.

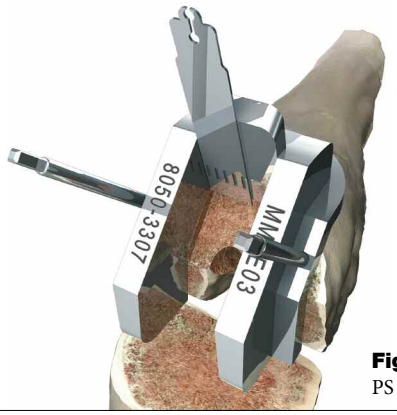


Figure 12a
PS preparation

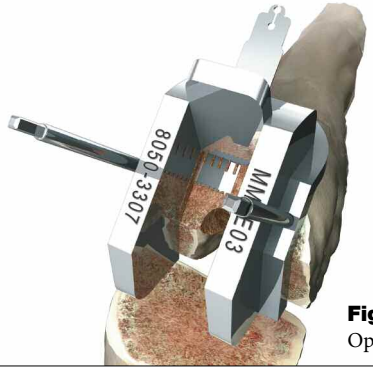


Figure 12b
Option 2: recess preparation.

Note:

A broad osteotome should be used to protect the tibial surface.

Note: Pins used with the size 3, 4 and 5 Notch Blocks should be used with no more than one pin per side to avoid the potential for the pins intersecting with each other. Pins should be used on the contra-lateral side from each other. For example, if a pin is placed through the medial anterior chamfer hole, a second pin should only be placed on the lateral side through either the chamfer or anterior flange hole. Towel clamps may be used for additional stability if necessary in the indicated holes on the distal plane.

8050-3307

Scorpio Posterior Stabilized Preparation Guides

8050-3303 Size 3
8050-3305 Size 5
8050-3307 Size 7
8050-3309 Size 9
8050-3311 Size 11
8050-3313 Size 13

Assessing the Femoral Preparation

Place the appropriately sized Femoral Trial onto the prepared femur.

The fixation lugholes are created by drilling through the Femoral Trial with a 1/4" diameter Lug Drill with stop. *(Figure 13)*

Note:

Size No. 3 Scorpio® Femoral Trials accept only a 1/8" diameter drill. The drill hole diameter is increased to 1/4" after removal of the trial.

If a smaller femoral component is desired after the femur has already been cut for a larger size, assemble the next smaller size Femoral Cutting Guide to the femur by driving a 1/8" diameter pin into the same angled, medial fixation hole used with the previous cutting guide.

Insert a bladerunner through the anterior slot (cut three) to locate the proper anterior resection level and drive a 1/8" diameter pin into the straight lateral fixation hole. Repeat the posterior, posterior chamfer, and anterior chamfer resections.

Using visual and tactile cues, remove any residual osteophytes or remnants of the four-in-one cuts with a rongeur or saw.

Figure 13
Femoral lug preparation.

1/4" Femoral Lug Drill
7650-1034

T70-4007R

Scorpio Femoral Trial
T7_ -40 _ _ _

L=Left, R=Right

size= 03,05,07,09,11,13

0=CR, 1=PS

- Use an oscillating saw to clean the proximal tibial resection as needed. At this time any remaining osteophytes and menisci are also removed. Exposure to the tibia is achieved by sequential flexing, extending, and rotating the leg to deliver the appropriate portions of the proximal tibia through the incision. If posterior cruciate ligament balancing is required, the leg is distracted with the suspended leg technique.

  Using rongeurs while the leg is distracted facilitates exposing the posterior capsule. When the joint is distracted 2 to 3cm, the posterior joint is exposed and posterior osteophytes, the capsule, menisci and debris can be removed. This may also enhance post-operative flexion. With the suspended leg technique, the weight of the lower leg distracts the joint facilitating a more natural soft-tissue distraction, which facilitates natural tissue balancing.

- Maximally flex the knee and deliver the tibia forward. Assemble a Tibial Trial Baseplate to the Alignment Handle and place it on the resected tibial plateau. Select the size that best covers the tibial plateau. Occasionally, 45˚ of knee flexion with an anterior drawer will best deliver the tibia.

Note:
The alignment handle can be secured to the tibial baseplate trial.

- With the Femoral Trial seated on the femur, assemble a Tibial Insert Trial to the Tibial Trial Baseplate by first positioning it posteriorly on the Tibial Trial Baseplate and then fully seating it anteriorly *(Figure 14a)*.

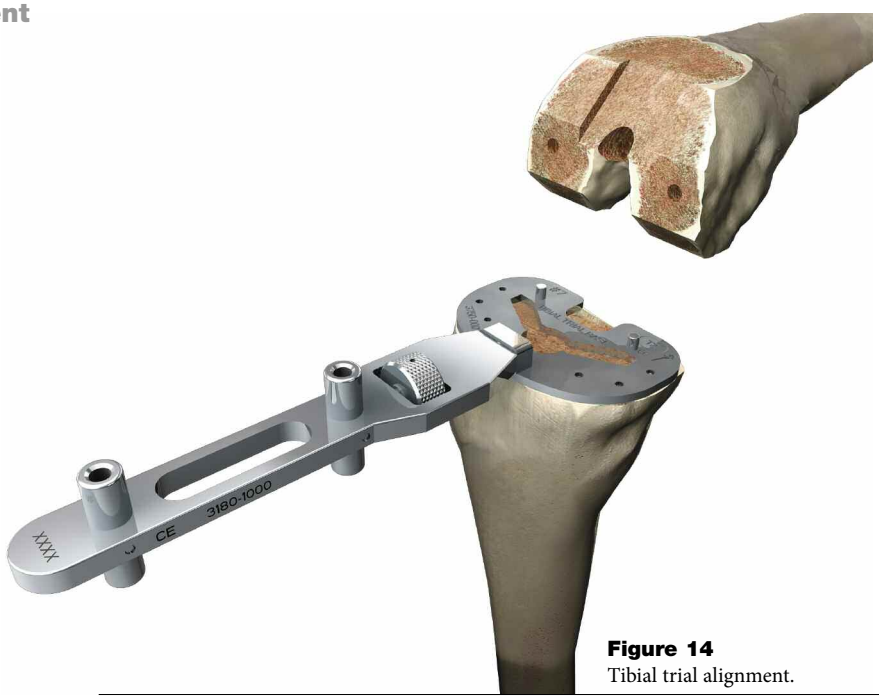


Figure 14
Tibial trial alignment.

Figure 14a
Trial reduction.

T72-13-0710

Tibial Insert Trial

T72- _ - _ _ _ _

Thickness (mm)= 08,10,12,15,18,21,24

CR=12, PS=13

Size= 03,05,07,09,11

- Carry out a trial reduction while the tibial trialing construct is in place, assessing overall component fit, ligament stability, and range of motion.

- As the joint is taken through flexion and extension, the Femoral Trial helps position the Tibial Trial Baseplate. Final position of the tibial trial assembly is achieved when tibio-femoral articular contact is most congruent. This is best assessed when the knee is in extension.

- Overall leg alignment may be assessed by re-attaching the Alignment Handle to the Tibial Trial Baseplate and inserting two Alignment Rods into the Alignment Handle. The rods should be parallel to the mechanical axis of the leg in both the coronal (A/P) and sagittal (M/L) planes *(Figure 14b)*. Once satisfactory alignment and tibial component orientation is achieved, mark the anterior tibial cortex in line with the reference marks on the anterior border of the baseplate with an electrocautery.

- Remove the trial components and disassemble the Tibial Insert Trial from the Tibial Trial Baseplate. Reposition the Tibial Trial Baseplate, aligning the anterior reference marks on the Tibial Trial Baseplate with the reference marks on the anterior cortex. The Tibial Trial Baseplate should be positioned flush to the anterior tibial cortex.

Note:

While the pinhole selection is not necessarily critical, be aware that a longer pin may crack or penetrate the bone's cortex.

Pin the Tibial Trial Baseplate to the tibial plateau by placing two short-headed fixation pins through a medial and lateral hole in the Tibial Trial Baseplate. The Tibial Insert Trial may be re-assembled to the pinned Tibial Trial Baseplate for any subsequent trial reductions.

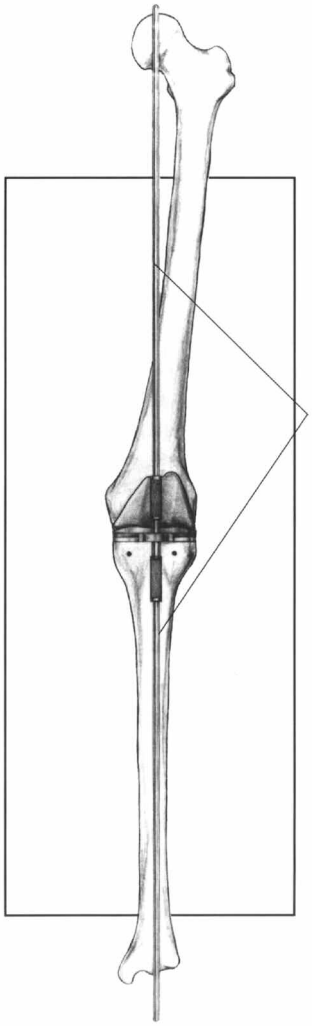
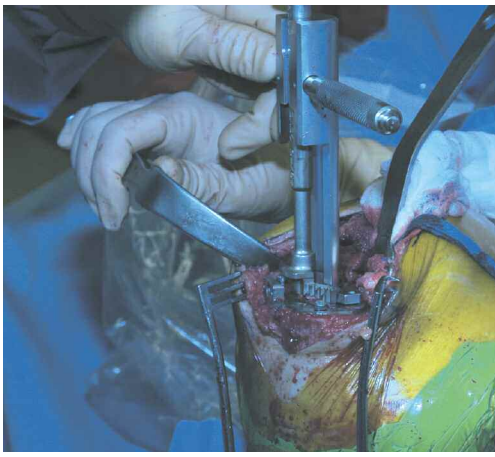


Figure 14b
Trial component alignment.

Tibial Keel Punching

Tibial Punches are identified by keel size (3/5, 7/9, 11/13) and bone preparation. “Cement Keel” creates a cement mantle around the keel. “Press Fit Keel” creates an interference fit around the keel. In relatively soft bone, only one punching step with the final tibial size/preparation punch may be required. In normal, hard bone, it is recommended that the smaller “Press Fit Keel” punch be used first, followed by the final size/preparation punch. In denser bone, several intermediate punching steps may be required prior to final punching. If sequential punching is undertaken, only “Press Fit Punches” should be used until the final size is reached. If extremely dense bone is encountered, a 3/8" Guide Bushing may be assembled to the baseplate and a pilot hole drilled prior to tibial punching.



Tibial Punch Tower Assembly.

- In order to position the Tibial Punch Tower to the Proximal Trial Baseplate, the tibia must be drawn anteriorly to allow access. The OR assistant may need to facilitate this while positioning the Punch Tower and using the keel punch.
- Assemble the Tibial Punch Tower to the trial baseplate by placing the tower onto the two small locating pins on top of the baseplate. During the subsequent tibial punching, the tower will maintain correct position of the punches.
- Fit the appropriate Tibial Keel Punch into the Tibial Punch Tower *(Figure 15a)*. Handles may be assembled to the tower to aid in maintaining position and stability of the assembly during punching. A mallet may be used to impact the punch.
- Advance the Tibial Keel Punch until it seats fully on the trial baseplate. During extraction, take care to avoid toggle or angulation of the punch as this may distort the bone preparation. The Quick Release Slide Hammer connects to the punches for extraction.

- **Be sure to carefully insert and remove the Tibial Keel Punch, as it may scrape and damage the femoral bone cuts.**

- Tibial preparation is complete once the tibial punch is seated.

Figure 15a
Tibial keel preparation.

Alignment Handle
3180-1000

Alignment Rods
3180-2000

Tibial Punch Tower
8050-1089

Tibial Punch
3760-0305 Size 3/5 press-fit
3760-0709 Size 7/9 press-fit
3760-1113 Size 11/13 press-fit
3761-0305 Size 3/5 cemented
3761-0709 Size 7/9 cemented
3761-1113 Size 11/13 cemented

Patellar Preparation

After the tibial, femoral, and soft-tissue preparation, the patella preparation is completed. The leg is extended and the patella is fully exposed *(Figure 16)*. The appropriate portion of the patella is removed using either an oscillating saw or a milling system. It is recommended that at least 14 to 15mm of residual patellar bone is left for vascular supply and osseous integrity. The patellar preparation is finished by removing the synovium and residual debris, superiorly and inferiorly, around the patella. The implant preparation is easily aligned with the leg in extension.

Figure 16
Patellar resection exposure.

NOTE:
The patella may be resected in a partially everted position.

Patellar tracking is checked with the implant trials in place. There might be slight tilting of the patella due to the lateral retraction of the patellofemoral mechanism during knee exposure. It is therefore recommended that one suture be placed inferiorly and that the knee be flexed and extended throughout the full range of motion. A final range of motion includes a check for hyperflexion by flexing the hip to allow flexion of the knee to 130–140.° During this time the surgeon can sit or stand, progressively checking the range of motion, allowing a unique approach to ligament balancing.

Note:
Due to the reduced incision, the tibia will need to be drawn anteriorly, thumb up. This may require assistance from OR staff. Care should be taken to not dislocate the joint.

Tibial Component

- If tibia fixation is to be augmented by bone screws, remove the polyethylene plugs in the tibial tray screw holes prior to implantation.

- Assemble the Tibia Component Impactor/Extractor to the implant. To assemble, retract the slide rod levers and insert the "feet" into the central hole in the tibial tray. Release the levers and tighten the knurled thumbscrew by hand to securely engage the impactor/extractor to the implant. Introduce the tibial tray into the prepared tibia and impact it until the tray is fully seated *(Figure 17)*. Clear all excess bone cement while maintaining implant positioning.

Figure 17
Tibia component implantation.

Femoral Component

- Place femoral implant onto the prepared femur. The Starter Femoral Impactor is used to guide and position the femoral implant into proper orientation. The Starter Femoral Impactor allows for impaction within the trochlear groove to help control rotation and alignment of the femoral implant *(Figure 18a)*. The Femoral Impactor is then used for final femoral implant seating onto the prepared femoral bone. *(Figure 18b)*

Note:
The components shall be positioned to avoid excessive hyperextension. Excessive femoral flexion and tibial slope should be avoided when implanting the components. Implant positioning resulting in excessive hyperextension may result in premature wear and damage to the implant.

Figure 18a
Controlling femoral component orientation.

Figure 18b
Final implant seating.

Tibial Impactor/Extractor
3770-0000

Starter Femoral Impactor
8050-2000

Femoral Impactor
3179-0000

Tibial Bearing Component

Prior to assembly of the prosthetic UHMWPE bearing insert, the trial insert may be placed in the tibial tray to once more assess joint stability and range of motion.

To assemble the prosthetic bearing insert, the tibial tray interior must first be free of all debris and soft-tissue. After cleaning tray interior, distract the joint and angle the insert posteriorly into the tray. The posterior lips of the bearing insert must fit beneath the lips on the interior posterior tray wall.

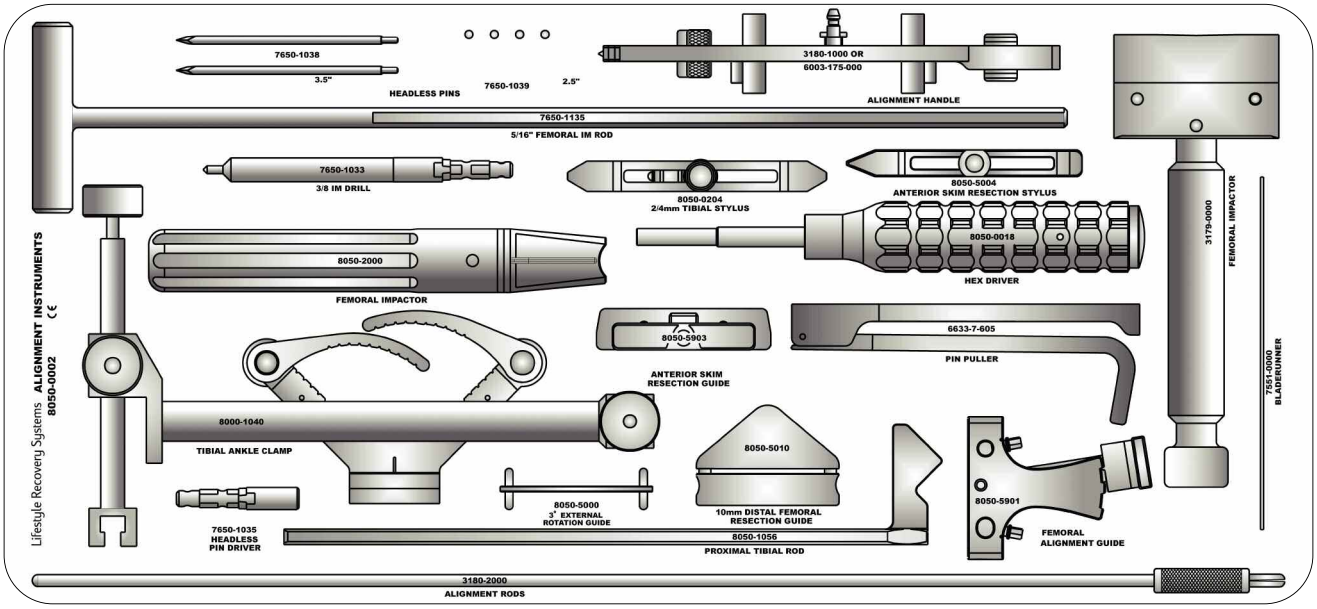
Fully seat the plastic poster then impact 45˚ posteriorly. Insert in place anteriorly. Hand pressure or a light tap with a mallet is required. The tibial bearing insert is fully seated once the metal retaining wire locks under the barbs on the anterior interior surface of the tray wall. *(Figure 19)*

The leg is flexed, extended and rotated to check collateral ligament balancing throughout the full range of motion. Special consideration should be given to ligament balancing with the knee in flexion when using the suspended leg approach. Suspending the leg allows the surgeon to externally and internally rotate the knee, providing an excellent indication of accurate medial and lateral collateral ligament balancing.

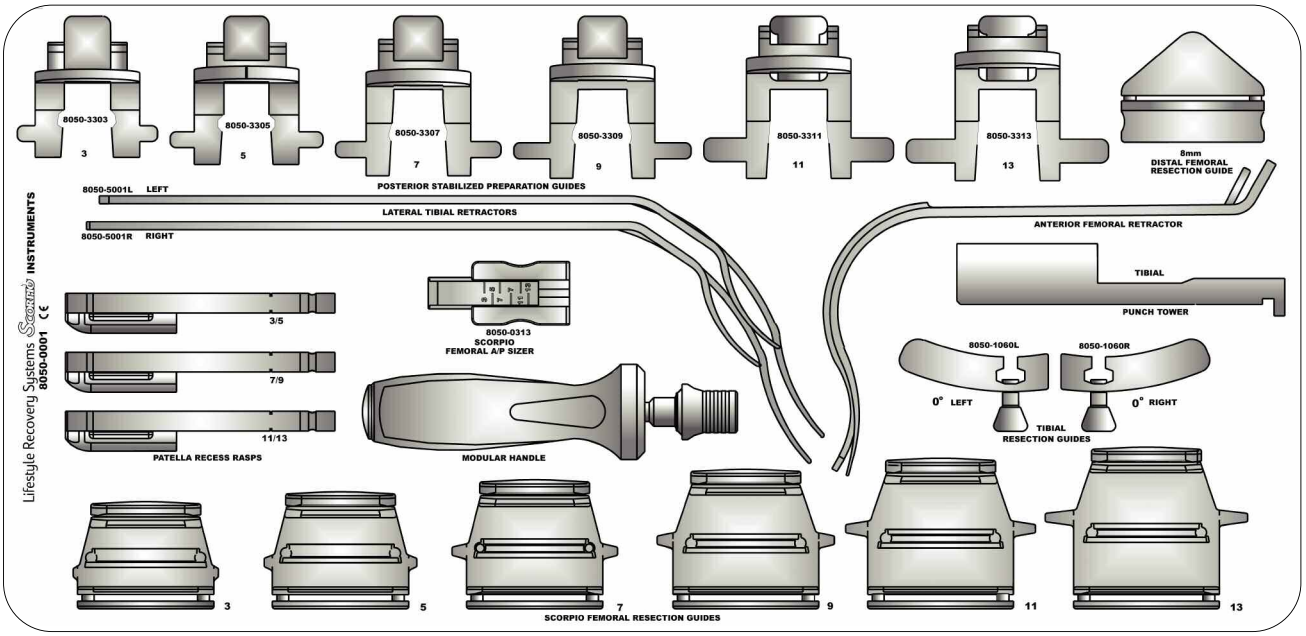
Figure 19
Assembled total knee prosthesis.

Closure

- After cement polymerization, thoroughly irrigate the joint.
- Deep tissue is closed with a resorbable #0, #1, or #2 suture, subcutaneous tissues are closed with a 2-0 suture, and the skin can be closed with either a subcutaneous closure or with staples.
- Cemented knee in position with the patella retracted laterally.
- Patella tracking in its groove after the prosthesis is implanted.



Alignment Instruments



Scorpio Instruments

Technical Tips for Minimally Invasive Total Knee Arthroplasty (MIS)

There is a learning curve involved with this approach and should be appreciated when undertaking this type of minimally invasive surgery. This is supplemental material that should be read in addition to the MIS–TKA manual. Future technical guidelines will be provided as an update to this appendix.

MIS–TKA Technical Tips:

1. As with all new surgical instruments, the surgeon should become thoroughly familiar with the MIS instrumentation prior to undertaking any MIS cases.

2. It is imperative to begin with a standard length incision (12cm) and then decreasing the length as experience is acquired. The Investigators do not recommend committing to a smaller 8cm incision or less to a patient if it is the surgeon's first attempt at using the minimally invasive approach.

3. The surgeon should be prepared to convert a small incision into a large incision if he/she experiences difficulty with exposure.

4. The surgeon should be extremely aware of damaging the skin, patellar tendon, and collateral ligaments with any cuts that are being made. This is more likely to occur when a saw blade is used to cut the opposite condyles (lateral femoral or tibial condyles).

5. While the vast majority of bone resections can be completed with a cutting guide in situ, on occasion, it may be necessary to remove the cutting guides and complete the resection using the bone plate.

6. A critical element of this technique is the ability to relax the retractors on one side of the knee to gain exposure to the etraction. The surgeon should realize that varying flexion and extension permits variable access to the femur and tibia. In summary, the concepts of varying flexion of the knee and working the medial and lateral retractors synergistically are key to the MIS –TKA procedure.

7. The common concept of knee replacement is to gain exposure by dislocating the tibio-femoral joint. This can be done in MIS –TKA surgery. However, the surgeon may attempt to cut the distal femur and proximal tibia in situ. If this is performed, the femur and tibia may slide after the cuts are made and lead to less disruption of the posterior capsule. Dislocating the tibio-femoral joint before the cuts are made, induces more soft-tissue and capsular damage. Therefore, rather than dislocating the joint for exposure, allow the soft-tissues to open sequentially for visualization.

8. There is a tendency in some cases for the femoral components to be slightly flexed. Surgeons should be aware of this and avoid flexion in the final seating of the femoral component. Take care to set the component with the intracondylar impactor.

9. A useful guide for tibial bone resection is to use the top of the tibia as assessed from the middle of the intercondylar spines. The surgeon may cut 9 or 11mm off of this consistent anatomic location.

10. Excessive levering while retracting the quadriceps mechanism may be more invasive than the small quad snip. The surgeon should monitor this continuously to minimize traction.

11. Preparing the patella should not be trivialized. Patellar preparation is easier after the femoral and tibial resections are made and before trial components are inserted into the knee joint. The surgeon should try to release as much soft-tissue surrounding the patella as possible, especially the synovium and patellofemoral ligaments. This type of soft-tissue dissection does not take much time but is an important step for adequate patellar preparation.

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