

MIS Multi-Reference[®] 4-in-1 Femoral Instrumentation

For NexGen[®] Cruciate Retaining &
NexGen Legacy[®] Posterior Stabilized Knees

Surgical Technique



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Introduction

Successful total knee arthroplasty depends in part on re-establishment of normal lower extremity alignment, proper implant design and orientation, secure implant fixation, and adequate soft tissue balancing and stability. The NexGen Complete Knee Solution and Multi-Reference 4-in-1 Instruments are designed to help the surgeon accomplish these goals by combining optimal alignment accuracy with a simple, straight-forward technique.

The instruments and technique assist the surgeon in restoring the center of the hip, knee, and ankle to lie on a straight line, establishing a neutral mechanical axis. The femoral and tibial components are oriented perpendicular to this axis. Femoral rotation is determined using the posterior condyles or epicondylar axis as a reference. The instruments promote accurate cuts to help ensure secure component fixation. Ample component sizes allow soft tissue balancing with appropriate soft tissue release.

The femur, tibia, and patella are prepared independently, and can be cut in any sequence using the principle of measured resection (removing enough bone to allow replacement by the prosthesis). Adjustment cuts may be needed later.

The Multi-Reference 4-in-1 instruments provide a choice of either anterior or posterior referencing techniques for making the femoral finishing cuts. The anterior referencing technique uses the anterior cortex to set the A/P position of the femoral component. The posterior condyle cut is variable. The posterior referencing technique uses the posterior condyles to set the A/P position of the femoral component. The variable cut is made anteriorly.

The Mini-Incision TKA technique has been developed to combine the alignment goals of total knee arthroplasty with less disruption of soft tissue. To accommodate this technique, some of the original Multi-Reference 4-in-1 Instruments have been modified. However, if preferred, a standard incision can be used with the instruments. Prior to using a smaller incision, the surgeon should be familiar with implanting NexGen components through a standard incision.

Total knee arthroplasty using a less invasive technique is suggested for nonobese patients with preoperative flexion greater than 90°. Patients with varus deformities greater than 17° or valgus deformities greater than 13° are typically not candidates for an MIS technique.

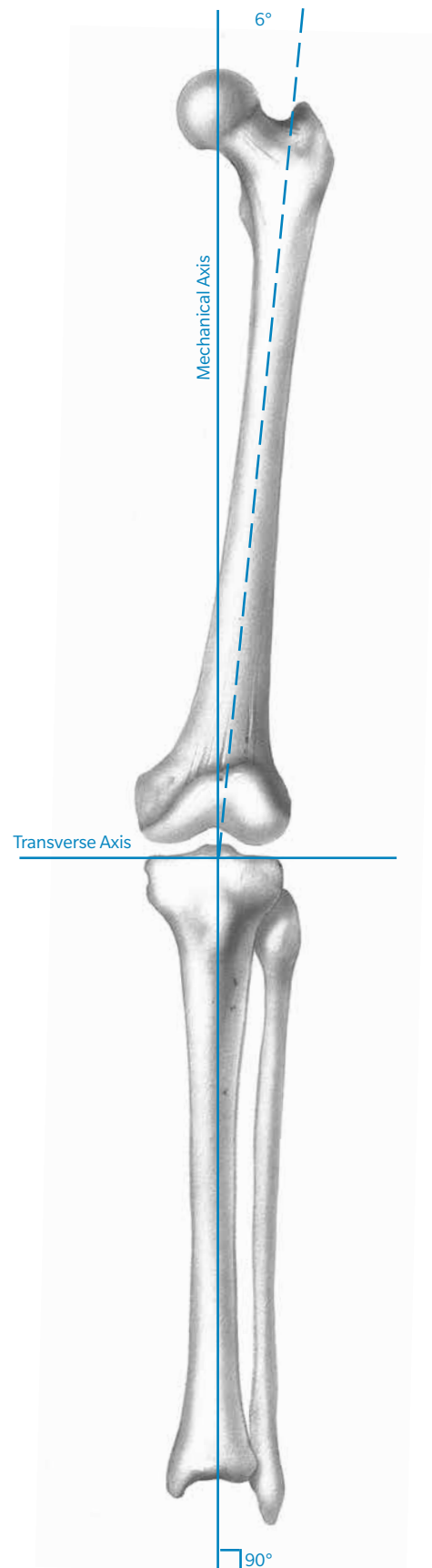
Please refer to the package inserts for complete product information, including contraindications, warnings, precautions, and adverse effects.

Preoperative Planning

Use the template overlay (available through your Zimmer Biomet representative) to determine the angle between the anatomic axis and the mechanical axis. This angle will be reproduced intraoperatively. This surgical technique helps the surgeon ensure that the distal femur will be cut perpendicular to the mechanical axis and, after soft tissue balancing, will be parallel to the resected surface of the proximal tibia.

Surgical Approach

The femur, tibia, and patella are prepared independently, and can be cut in any sequence using the principle of measured resection (removing enough bone to allow replacement by the prosthesis). Adjustment cuts may be needed later.



Patient Preparation

To prepare the limb for MIS total knee arthroplasty, adequate muscle relaxation is required. This may be accomplished with a short-acting, nondepolarizing muscle relaxant. The anesthesiologist should adjust the medication based on the patient's habitus and weight, and administer to induce adequate muscle paralysis for a minimum of 30-40 minutes. It is imperative that the muscle relaxant be injected prior to inflation of the tourniquet. Alternatively, spinal or epidural anesthesia should produce adequate muscle relaxation.

If desired, apply a proximal thigh tourniquet and inflate it with the knee in hyperflexion to maximize that portion of the quadriceps that is below the level of the tourniquet.

Once the patient is draped and prepped on the operating table, determine the landmarks for the surgical incision with the leg in extension.

Incision and Exposure

The incision may be made with the leg in extension or flexion depending on surgeon preference. The surgeon can choose a midvastus approach, a subvastus approach, or a parapatellar medial arthrotomy. Also, depending on surgeon preference, the patella can be either everted or subluxed.

The length of the incision is dependent on the size of the femoral component needed. Although the goal of a MIS technique is to complete the surgery with an approximately 10 cm-14 cm incision, it may be necessary to extend the incision if visualization is inadequate or if eversion of the patella is not possible without risk of avulsion at the tibial tubercle. If the incision must be extended, it is advisable to extend it gradually and only to the degree necessary. The advantage of a MIS technique is dependent on maintaining the extensor mechanism insertion.

Make a slightly oblique parapatellar skin incision, beginning approximately 2 cm proximal and medial to the superior pole of the patella, and extend it approximately 10 cm to the level of the superior



Figure 1

patellar tendon insertion at the center of the tibial tubercle (Figure 1). Be careful to avoid disruption of the tendon insertion. This will facilitate access to the vastus medialis obliquus, and allow a minimal split of the muscle. It will also improve visualization of the lateral aspect of the joint obliquely with the patella everted. The length of the incision should be about 50% above and 50% below the joint line. If the length of the incision is not distributed evenly relative to the joint line, it is preferable that the greater portion be distal.

Divide the subcutaneous tissue to the level of the retinaculum.

ⓘ **Note:** Using electrocautery to complete the exposure will help minimize bleeding after deflation of the tourniquet, as well as late muscle bleeding.

MIS Midvastus Approach

Make a medial parapatellar incision into the capsule, preserving approximately 1 cm of peritenon and capsule medial to the patellar tendon. This is important to facilitate complete capsular closure.

Split the superficial enveloping fascia of the quadriceps muscle percutaneously in a proximal direction over a length of approximately 6 cm. This will mobilize the quadriceps and allow for significantly greater lateral translation of the muscle while minimizing tension on the patellar tendon insertion.

Split the vastus medialis obliquus approximately 1.5 cm-2 cm (Figure 2).

Use blunt dissection to undermine the skin incision approximately 1 cm-2 cm around the patella.

Slightly flex the knee and remove the deep third of the fat pad.

The patella can be either everted or subluxed. If everting the patella, release the lateral patellofemoral ligament to facilitate full eversion and lateral translation of the patella. Then use hand held three-pronged or two-pronged hooks to begin to gently evert the patella. Be careful to avoid disrupting the extensor insertion. To help evert the patella, slowly flex the joint and externally rotate the tibia while applying gentle pressure. Once the patella is everted, use a standard-size hohmann retractor or two small hohmann retractors along the lateral flare of the tibial metaphysis to maintain the eversion of the patella and the extensor mechanism.

Note: It is imperative to maintain close observation of the patellar tendon throughout the procedure to ensure that tension on the tendon is minimized, especially during eversion of the patella and positioning of the patient.



Figure 2

Remove any large patellar osteophytes.

Release the anterior cruciate ligament, if present. Perform a subperiosteal dissection along the proximal medial and lateral tibia to the level of the tibial tendon insertion. Then perform a limited release of the lateral capsule (less than 5 mm) to help minimize tension on the extensor mechanism.

MIS Subvastus Approach

The subvastus medial arthrotomy has been slightly modified to optimize minimally invasive surgery. It provides excellent exposure for TKA while preserving all four attachments of the quadriceps to the patella. This approach does not require patellar eversion, minimizes disruption of the suprapatellar pouch, and facilitates rapid and reliable closure of the knee joint.

Dissect the subcutaneous tissue down to but not through the fascia that overlies the vastus medialis muscle.

Identify the inferior border of the vastus medialis muscle, and incise the fascia at approximately 5 cm to 8 cm medial to the patellar border (Figure 3) to allow a finger to slide under the muscle belly but on top of the underlying synovial lining of the knee joint. Use the finger to pull the vastus medialis obliquus muscle superiorly and maintain slight tension on the muscle.

Use electrocautery to free the vastus medialis from its confluence with the medial retinaculum, leaving a small cuff of myofascial tissue attached to the inferior border of the vastus medialis.

The tendonous portion of the vastus medialis extends distally to insert at the midpole of the medial border of the patella. Be careful to preserve that portion of the tendon to protect the vastus medialis muscle during subsequent steps. An incision along the inferior border of the vastus medialis to the superior pole of the patella will result in a tear, split, or maceration of the muscle by retractors. Incise the underlying synovium in a slightly more proximal position than is typical with a standard subvastus approach. This will allow a two-layer closure of the joint. The deep layer will be the synovium, while the superficial layer will be the medial retinaculum and the myofascial sleeve of tissue that has been left attached to the inferior border of the vastus medialis.

Carry the synovial incision to the medial border of the patella. Then turn directly inferiorly to follow the medial border of the patellar tendon to the proximal portion of the tibia. Elevate the medial soft tissue sleeve along the proximal tibia in a standard fashion.



Figure 3

Place a bent hohmann retractor in the lateral gutter and lever it against the robust edge of the tendon that has been preserved just medial and superior to the patella. Retract the patella and extensor mechanism into the lateral gutter. If necessary, mobilize the vastus medialis either from its underlying attachment to the synovium and adductor canal, or at its superior surface when there are firm attachments of the overlying fascia to the subcutaneous tissues and skin. Depending on surgeon preference, the fat pad can be excised or preserved.

Flex the knee. The patella will stay retracted in the lateral gutter behind the bent hohmann retractor, and the quadriceps tendon and vastus medialis will lie over the distal anterior portion of the femur. To improve visualization of the distal anterior portion of the femur, place a thin knee retractor along the anterior femur and gently lift the extensor mechanism during critical steps of the procedure. Alternatively, bring the knee into varying degrees of extension to improve visualization by decreasing the tension on the extensor mechanism.

MIS Medial Parapatellar Arthrotomy

Minimally invasive total knee arthroplasty can be performed with a limited medial parapatellar arthrotomy. Begin by making a 10 cm-14 cm midline skin incision from the superior aspect of the tibial tubercle to the superior border of the patella. Following subcutaneous dissection, develop medial and lateral flaps, and dissect proximally and distally to expose the extensor mechanism. This permits mobilization of the skin and subcutaneous tissue as needed during the procedure. In addition, with the knee in flexion, the incision will stretch 2 cm-4 cm due to the elasticity of the skin, allowing broader exposure.

The goal of minimally invasive surgery is to limit the surgical dissection without compromising the procedure. The medial parapatellar arthrotomy is used to expose the joint, but the proximal division of the quadriceps tendon should be limited to a length that permits only lateral subluxation of the patella without eversion (Figure 4). Incise the quadriceps tendon for a length of 2 cm-4 cm initially. If there is difficulty displacing the patella laterally or if the patellar tendon is at risk of tearing, extend the arthrotomy proximally along the quadriceps tendon until adequate exposure is achieved.



Figure 4

Surgical Technique

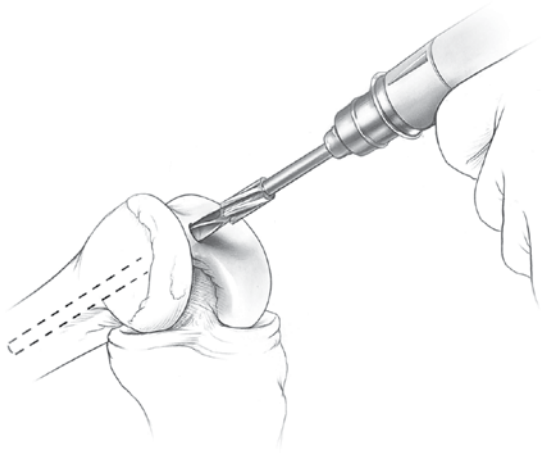


Figure 1a



Figure 1b

Step One: Establish Femoral Alignment

Use the 8 mm IM drill w/step to drill a hole in the center of the patellar sulcus of the distal femur (Figure 1a), making sure that the drill is parallel to the shaft of the femur in both the anteroposterior and lateral projections. The hole should be approximately one-half to one centimeter anterior to the origin of the posterior cruciate ligament. Medial or lateral displacement of the hole may be needed according to preoperative templating of the A/P radiograph.

The step on the drill will enlarge the entrance hole on the femur to 12 mm. This will reduce intramedullary pressure during placement of subsequent IM guides. Suction the canal to remove medullary contents.

The mini adjustable IM alignment guide is available with two intramedullary rod lengths. The rod on the standard instrument is 229 mm (9 inches) long and the rod on the short instrument is 165 mm (6.5 inches). Choose the length best suited to the length of the patient's leg, which will provide the most accurate reproduction of the anatomic axis. If the femoral anatomy has been altered, as in a femur with a long

stemmed hip prosthesis or with a femoral fracture malunion, use the adjustable IM alignment guide, short and use the optional extramedullary alignment technique.

Note: The mini adjustable IM alignment guide, short (Figure 1b) is a shortened version of the mini adjustable IM alignment guide, long. When the mini standard cut plate is attached to the mini adjustable IM alignment guide, short, the same amount of bone is removed as when it is attached to the mini adjustable IM alignment guide, long. This is different than the original Multi-Reference 4-in-1, micro IM alignment guide 165 mm (6.5 inch) which was intended for use with micro implants. When the standard cut plate was attached, the micro IM alignment guide removed one millimeter less distal bone than the standard adjustable IM alignment guide with the standard cut plate attached. The new mini IM alignment guides accommodate the resection for the micro implants with the mini micro cut plate.



Figure 1c

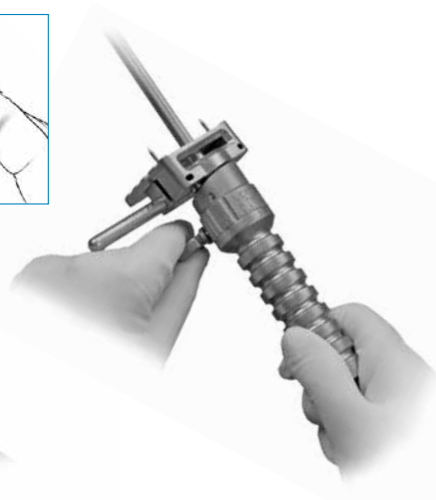


Figure 1d

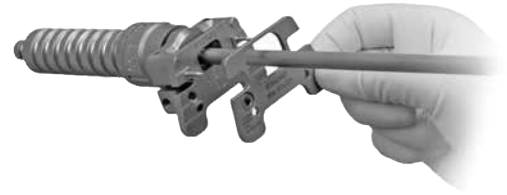


Figure 1e

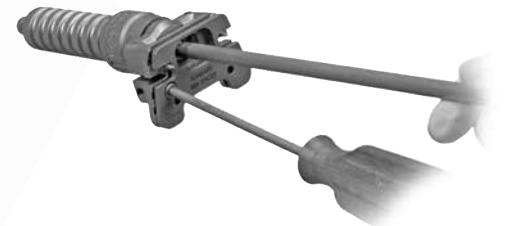


Figure 1f

Step One: Establish Femoral Alignment (cont.)

ⓘ **Note:** It is preferable to use the longest intramedullary rod to help ensure the most accurate replication of the anatomic axis.

Set the mini adjustable IM alignment guide to the proper valgus angle as determined by preoperative radiographs. Check to ensure that the proper “Right” or “Left” indication (Figure 1c) is used and engage the lock mechanism (Figure 1d).

The standard cut plate must be attached to the adjustable IM alignment guide for a standard distal femoral resection. Use a hex-head screwdriver to tighten the plate on the guide prior to use (Figures 1e and 1f), but the screws should be loosened for sterilization. If preferred, remove the standard cut plate if a significant flexion contracture exists. This will allow for an additional 3 mm of distal femoral bone resection.

ⓘ **Note:** The mini micro cut plate can be used when templating has indicated that a micro implant is likely. When the mini micro cut plate is attached to the MIS adjustable IM alignment guide, short, one millimeter (1 mm) less bone is removed. However, if a significant flexion contracture exists and no plate is attached, an additional 4 mm will be removed compared to the distal femoral cut when the mini micro cut plate is attached. For less bone resection, adjustments can be made using the +2 mm/-2 mm holes on the mini distal cut guide.

Step One: Establish Femoral Alignment (cont.)

Insert the IM guide into the hole in the distal femur. If the epicondyles are visible, the epicondylar axis may be used as a guide in setting the orientation of the adjustable IM alignment guide. If desired, add the threaded handles to the guide and position the handles relative to the epicondyles. This does not set rotation of the femoral component, but keeps the distal cut oriented to the final component rotation.

Once the proper orientation is achieved, impact the IM guide until it seats on the most prominent condyle. After impacting, check to ensure that the valgus setting has not changed. Ensure that the guide is contacting at least one distal condyle. This will set the proper distal femoral resection.

Optional Technique

An extramedullary alignment arch and alignment rod can be used to confirm the alignment. If this is anticipated, identify the center of the femoral head before draping. If extramedullary alignment will be the only mode of alignment, use a palpable radiopaque marker in combination with an A/P X-ray film to help ensure proper location of the femoral head.



Figure 2a



Figure 2b

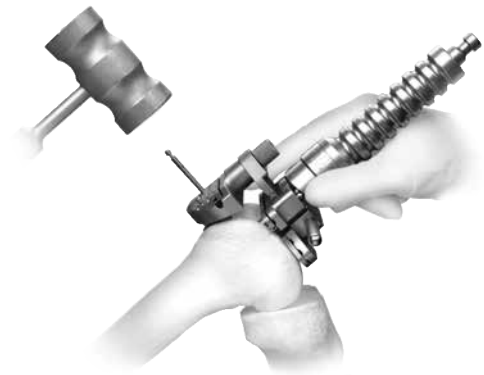


Figure 2c

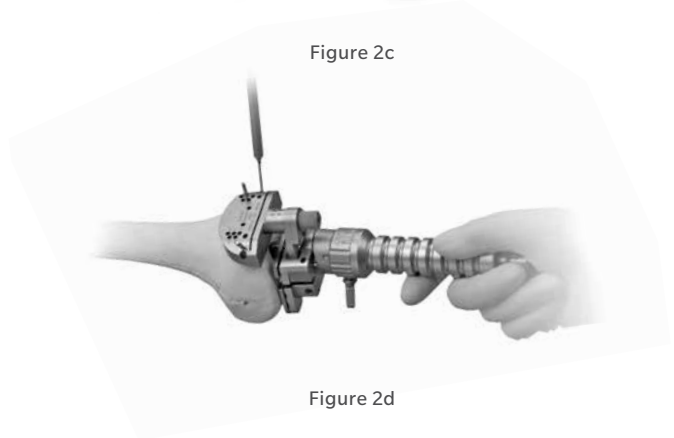


Figure 2d

Step Two: Cut the Distal Femur

While the adjustable IM alignment guide is being inserted by the surgeon, the scrub nurse should attach the mini distal femoral cutting guide to the 0° distal placement guide (Figure 2a).

Ensure that the attachment screw is tight. Insert the distal placement guide with the cutting guide into the adjustable IM alignment guide until the cutting guide rests on the anterior femoral cortex (Figure 2b). The mini distal femoral cutting guide is designed to help avoid soft tissue impingement.

Optional Technique

The 3° distal placement guide can be used to place the mini distal femoral cutting guide in 3° of flexion to protect the anterior cortex from notching.

Using the 3.2 mm drill bit, drill holes through the two standard pin holes marked "0" in the anterior surface of the mini distal femoral cutting guide, and place headless holding pins through the holes (Figure 2c).

Additional 2 mm adjustments may be made by using the sets of holes marked -4, -2, +2, and +4. The markings on the cutting guide indicate, in millimeters, the amount of bone resection each will yield relative to the standard distal resection set by the adjustable IM alignment guide and standard cut plate.

If more fixation is needed, use two 3.2 mm headed screws or predrill and insert two hex-head holding pins in the small oblique holes on the mini distal femoral cutting guide, or silver spring pins may be used in the large oblique holes (Figure 2d).

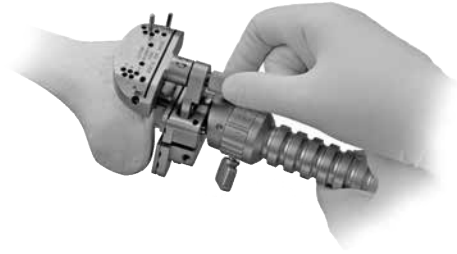


Figure 2e

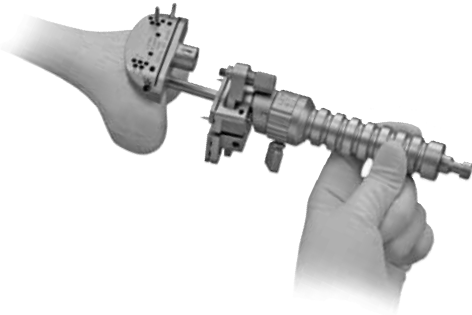


Figure 2f



Figure 2g

Optional Technique (cont.)

The IM guide can be left in place during resection of the distal condyle, taking care to avoid hitting the IM rod when using the oscillating saw.

Completely loosen the attachment screw (Figure 2e) in the distal placement guide. Then use the slaphammer extractor to remove the IM guide and the distal placement guide (Figure 2f).

Cut the distal femur through the cutting slot in the cutting guide using a 1.27 mm (0.050-in.) oscillating saw blade (Figure 2g). Then remove the cutting guide.

Check the flatness of the distal femoral cut with a flat surface. If necessary, modify the distal femoral surface so that it is completely flat. This is extremely important for the placement of subsequent guides and for proper fit of the implant.

If you prefer to complete tibial cuts prior to completing the femur, refer to page 28.

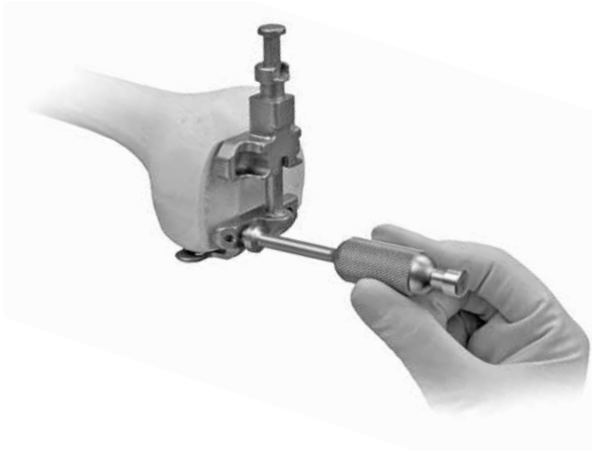


Figure 3a



Figure 3b

Step Three: Size Femur and Establish External Rotation

Flex the knee to 90°. Attach the MIS threaded handle to the mini A/P sizing guide, and place the guide flat onto the smoothly cut distal femur (Figure 3a). Apply the guide so that the flat surface of the mini A/P sizing guide is flush against the resected surface of the distal femur and the feet of the mini A/P sizing guide are flush against the posterior condyles.

Slide the body of the mini A/P sizing guide along the shaft to the level of the medullary canal. Position the guide mediolaterally, and check the position by looking through both windows of the guide to ensure that the medullary canal is not visible through either.

Note: Remove any osteophytes that interfere with instrument positioning.

While holding the mini A/P sizing guide in place, secure the guide to the resected distal femur using short 3.2 mm (1/8 inch) headed screws or predrill and insert short head holding pins into one or both of the holes in the lower portion of the guide. Do not overtighten or the anterior portion will not slide on the distal femur.

MIS screws are available in 3 lengths (27 mm, 33 mm, 48 mm). The length needed will vary depending on the patient's bone dimensions.

Note: Remove the threaded handle before using the screw inserter/extractor.

Slightly extend the knee and retract soft tissues to expose the anterior femoral cortex. Clear any soft tissue from the anterior cortex. Ensure that the leg is in less than 90° of flexion (70°-80°). This will decrease the tension of the patellar tendon to facilitate placement of the guide.

Attach the MIS locking boom to the mini A/P sizing guide. Ensure that the skin does not put pressure on the top of the boom and potentially change its position. The position of the boom dictates the exit point of the anterior bone cut and the ultimate position of the femoral component. When the boom is appropriately positioned, lock it by turning the knurled knob (Figure 3b).



Figure 3d

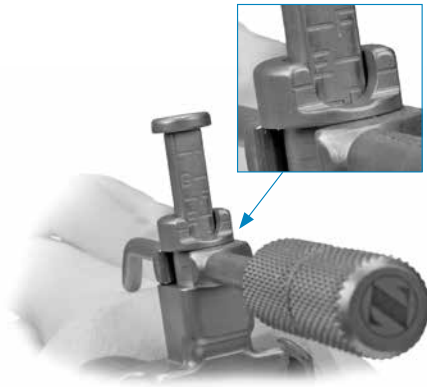


Figure 3c



Figure 3e

Step Three: Size Femur and Establish External Rotation (cont.)

See Appendix 1 for alternative MIS Telescoping Locking Boom technique.

Read the femoral size directly from the guide between the engraved lines on the sizing tower (Figure 3c). There are eight sizes labeled “A” through “H”. If the indicator is between two sizes, the closest size is typically chosen. If using a posterior referencing technique, and the indicator is between two sizes, the larger size is typically chosen to help prevent notching of the anterior femoral cortex.

If using a posterior referencing technique, remove the mini A/P sizing guide and go to page 18, “Step Four – Finish the Femur, Posterior Referencing Technique.”

There are four external rotation plates: 0°/3° Left, 0°/3° Right, 5°/7° Left, and 5°/7° Right. Choose the external rotation plate that provides the desired external rotation for the appropriate knee. The 0° option can be used when positioning will be determined by the A/P axis or the epicondylar axis. Use the 3° option for varus knees. Use the 5° option for knees with a valgus deformity from 10° to 13°. The 7° option requires a standard exposure, and is for knees

with patellofemoral disease accompanied by bone loss and valgus deformity greater than 20°. In this case, use the A/P axis to double check rotation.

Attach the selected plate to the mini A/P sizing guide (Figure 3d). Place two headless holding pins in the plate through the two holes that correspond to the desired external rotation, and impact them (Figure 3e). Leave the pins proud of the guide.

Note: Do not impact the headless holding pins flush with the external rotation plate.

Careful attention should be taken when placing the headless pins into the appropriate external rotation plate as these pins also set the A/P placement for the MIS femoral finishing guide in the next step of the procedure. It is important to monitor the location of the anterior boom on the anterior cortex of the femur to help ensure the anterior cut will not notch the femur. Positioning the anterior boom on the “high” part of the femur by lateralizing the location of the boom can often lessen the likelihood of notching the femur.

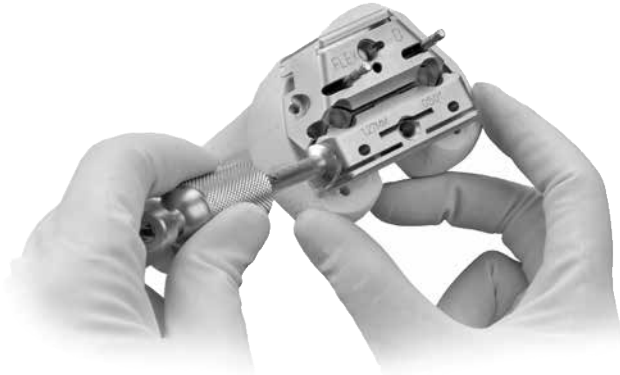


Figure 4a

Step Three: Size Femur and Establish External Rotation (cont.)

Unlock and rotate the boom of the guide medially until it clears the medial condyle. Then remove the guide, but leave the two headless pins. These pins will establish the A/P position and rotational alignment of the femoral finishing guide.

Step Four: Finish the Femur

Anterior Referencing Technique

Select the correct size MIS femoral finishing guide (silver colored) or MIS flex femoral finishing guide (gold colored) as determined by the measurement from the A/P sizing guide. An additional 2 mm (approximately) of bone is removed from the posterior condyles when using the flex finishing guide.

Place the finishing guide onto the distal femur, over the headless pins (Figure 4a). This determines the A/P position and rotation of the guide. Remove any lateral osteophytes that may interfere with guide placement. Position the finishing guide mediolaterally by sliding it on the headless pins. The width of the finishing guide replicates the width of the NexGen CR Femoral Component. The width of the flex finishing guide replicates the width of the NexGen LPS, LPS-Flex, and CR-Flex Femoral Components.

When the M/L position of the femoral finishing guide is set, use the screw inserter/extractor to insert a 3.2 mm headed screw or predrill and insert a hex-head holding pin through the superior pinhole on



Figure 4c

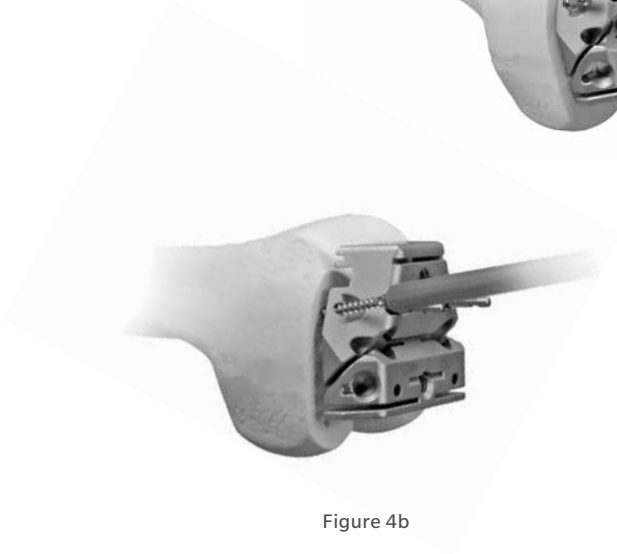


Figure 4b



Figure 4d

Anterior Referencing Technique (cont.)

the beveled medial side of the guide (Figure 4b). Then secure the lateral side in the same manner. If needed, predrill and insert two short-head holding pins through the inferior holes on one or both sides of the guide. For additional stability, use 6.5 mm screws in the peg holes.

Remove the headless pins from the femoral finishing guide (Figure 4c) with the headless pin puller.

Use the resection guide through the anterior cutting slot of the finishing guide, and check the medial and lateral sides to be sure the cut will not notch the anterior femoral cortex (Figure 4d).

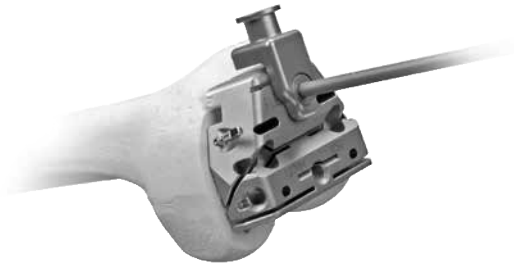


Figure 4e

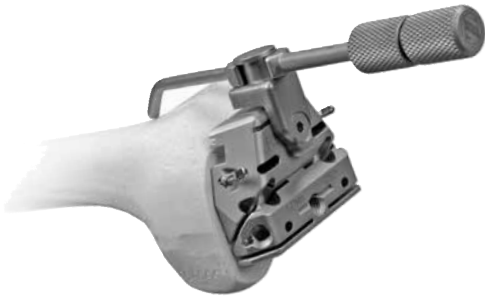


Figure 4f

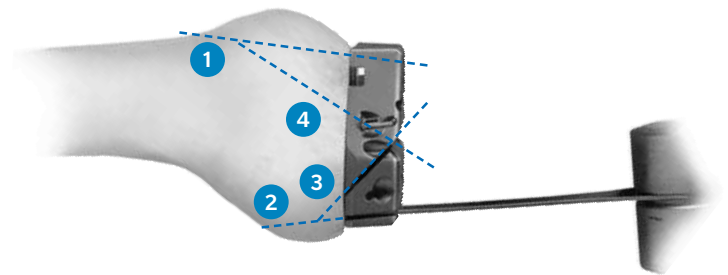


Figure 4g

Optional Technique

To check the location of the anterior cut and determine if notching will occur, securely tighten the locking boom attachment to the face of the finishing guide. Make certain that the attachment sits flush with the femoral finishing guide (Figure 4e). Connect the MIS locking boom to the attachment (Figure 4f). The boom indicates the depth at which the anterior femoral cut will exit the femur.

Use a 1.27 mm (0.050-in.) narrow, oscillating saw blade to cut the femoral profile in the following sequence for optimal stability of the finishing guide (Figure 4g):

- 1 Anterior condyles
- 2 Posterior condyles
- 3 Posterior chamfer
- 4 Anterior chamfers



Figure 4i

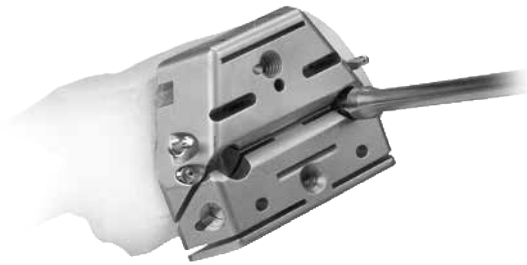


Figure 4h



Figure 4j

Optional Technique (cont.)

Use the patellar/femoral drill bit to drill the post holes (Figure 4h).

Use the 1.27 mm (0.050-in.) narrow, reciprocating saw blade to cut the base of the trochlear recess (Figure 4i) and score the edges (Figure 4j). Remove the finishing guide to complete the trochlear recess cuts.

Posterior Referencing Technique

Select the correct size MIS femoral finishing guide (silver colored) or MIS flex femoral finishing guide (gold colored) as determined by the measurement from the A/P sizing guide. An additional 2 mm (approximately) of bone is removed from the posterior condyles when using the flex finishing guide.

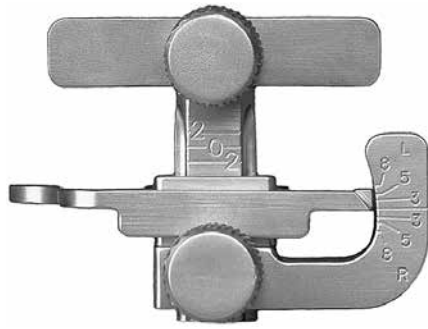


Figure 4l



Figure 4k



Figure 4m

Posterior Referencing Technique (cont.)

Attach the posterior reference/rotation guide to the selected femoral finishing guide (Figure 4k). Lock the femoral position locator on the rotation guide to the zero position (Figure 4l). This zero setting helps to ensure that, when the feet are flush with the posterior condyles, the amount of posterior bone resection will average 9 mm when using the standard MIS femoral finishing guides, and approximately 11 mm when using the MIS flex femoral finishing guides.

Place the finishing guide on the distal femur, bringing the feet of the rotation guide flush against the posterior condyles of the femur (Figure 4m).

Set the rotation of the finishing guide parallel to the epicondylar axis. Check the rotation of the guide by reading the angle indicated by the posterior reference/rotation guide. The epicondylar line is rotated externally 0° to 8° , ($4 \pm 4^{\circ}$), relative to the posterior condyles. The external rotation angle can also be set relative to the posterior condyles, lining up the degrees desired.

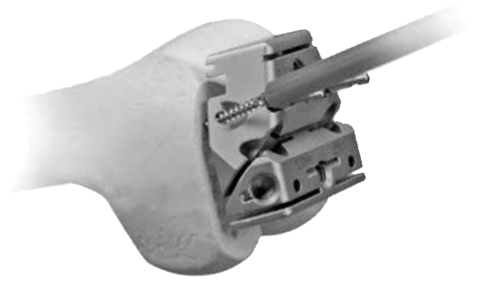


Figure 4o



Figure 4n

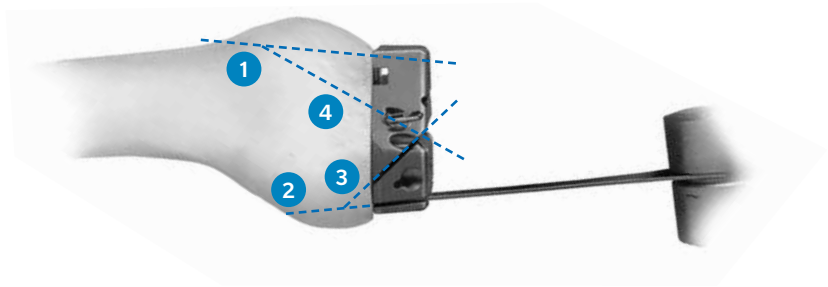


Figure 4p

Posterior Referencing Technique (cont.)

If desired, attach the MIS locking boom to the face of the finishing guide to check the location of the anterior cut and determine if notching will occur (Figure 4n). The boom tip indicates where the anterior femoral cut will exit the bone.

Remove any lateral osteophytes that may interfere with guide placement. Position the finishing guide mediolaterally. The width of the finishing guide replicates the width of the NexGen CR Femoral Component. The width of the flex finishing guide replicates the width of the NexGen LPS, LPS-Flex, and CR-Flex Femoral Components.

When the proper rotation and the mediolateral and anteroposterior position are achieved, secure the finishing guide to the distal femur. Use the screw inserter/extractor to insert a 3.2 mm headed screw or predrill and insert a hex-head holding pin through the superior pinhole on the beveled medial side of

the femoral finishing guide (Figure 4o). Then secure the lateral side in the same manner. For additional stability, predrill and insert two short-head holding pins through the inferior holes on one or both sides of the guide.

Use a 1.27 mm (0.050-in.) narrow, oscillating saw blade to cut the femoral profile in the following sequence for optimal stability of the finishing guide (Figure 4p):

- 1 Anterior condyles
- 2 Posterior condyles
- 3 Posterior chamfer
- 4 Anterior chamfers



Figure 4r

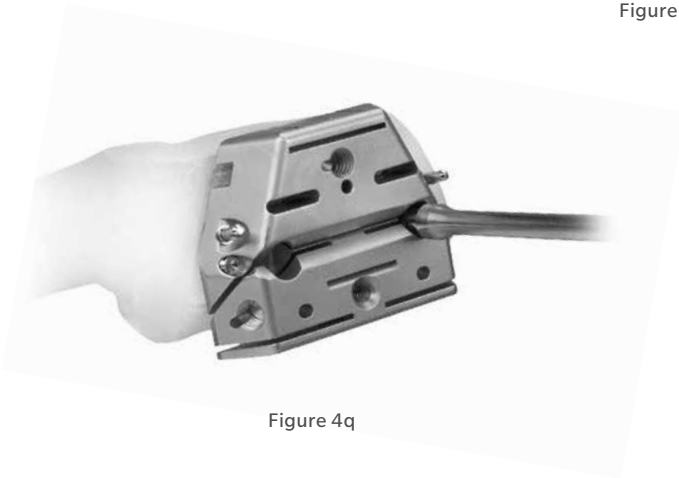


Figure 4q



Figure 4s

Posterior Referencing Technique (cont.)

Use the patellar/femoral drill bit to drill the post holes (Figure 4q).

Use the 1.27 mm (0.050-in.) narrow, reciprocating saw blade to cut the base of the trochlear recess (Figure 4r) and score the edges (Figure 4s). Remove the finishing guide to complete the trochlear recess cuts.

Option One: MIS Notch/Chamfer Trochlear Guide

The MIS notch/chamfer trochlear guide consists of 2 pieces for each size, the MIS notch/chamfer guide and the MIS trochlear guide. Matching sizes must be used.

The MIS notch/chamfer trochlear guide may be used to complete the chamfer cuts, the trochlear groove, the intercondylar box and to drill the peg holes after the anterior and posterior cuts have been made with the MIS femoral finishing guide.

After the anterior and posterior cuts have been made, check the flexion gap and the extension gap using the MIS spacer block. Make the necessary adjustments.



Figure 4t
Position the MIS Notch/Chamfer
Guide flush against the femur



Figure 4u
Insert two short headed pins or short
screws through the anterior flange

Option One: MIS Notch/Chamfer Trochlear Guide (cont.)

Knee in Slight Flexion

Position the appropriate size MIS notch/chamfer guide onto the femur so it is flush against the resected surfaces both distally and anteriorly. Ensure that no soft tissue or osteophytes interfere with instrument positioning. Position the guide mediolaterally (Figure 4t).

ⓘ **Note:** The distal mediolateral profile of the MIS notch/chamfer guides, anterior to the tabs, can be used to position the guide referencing the lateral condyle.

Insert two short headed pins or short screws through the anterior flange of the guide to secure the guide in position (Figure 4u).



Figure 4v
Secure the MIS Notch/Chamfer Guide to the femur

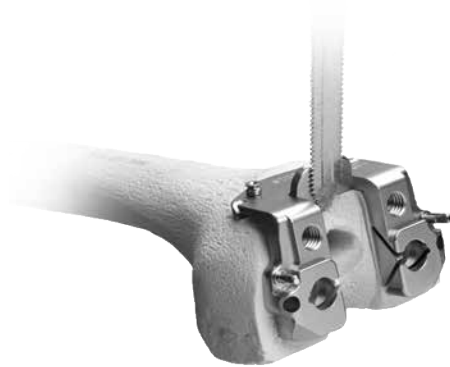


Figure 4w
Cut the sides and base of the intercondylar box

Option One: MIS Notch/Chamfer Trochlear Guide (cont.)

Knee in 90° flexion.

Secure the MIS notch/chamfer guide to the femur distally with two short spring screws or 3.2 mm (1/8-inch) headed screws. Alternatively, insert two headed pins (Figure 4v).

Use a reciprocating saw to cut the sides and base of the intercondylar box (Figure 4w). Protect the tibia with a wide osteotome.

Use the patellar/femoral drill to drill the femoral post holes.

ⓘ **Note:** Do not use the LPS-Flex femur peg drill, size A, B with the MIS notch/chamfer guide as there is no stop on the guide for this smaller drill. If using a micro size (A, B) LPS-Flex femoral component, the femoral post holes must be drilled when the anterior and posterior condyle cuts are made using the appropriate size MIS flex femoral finishing guide and the LPS-Flex femur peg drill



Figure 4y
Apply the matching size MIS Trochlear Guide with the holes aligned



Figure 4x
Cut the anterior and posterior chamfers



Figure 4z
MIS Trochlear Guide secured to MIS Notch/Chamfer Guide

Option One: MIS Notch/Chamfer Trochlear Guide (cont.)

Then use an oscillating saw to cut the anterior chamfer and the posterior chamfer (Figure 4x).

Apply the matching size MIS trochlear guide to the MIS notch/chamfer guide with the holes in the trochlear guide aligned with the threaded holes in the notch/chamfer guide (Figure 4y). Thread the MIS threaded handle through one of the threaded holes to secure the trochlear guide to the MIS notch/chamfer guide (Figure 4z).



Figure 4aa
Cut the sides and base of the trochlear groove

Option One: MIS Notch/Chamfer Trochlear Guide (cont.)

Protect the tibia. Use a reciprocating saw through the slots in the trochlear guide to cut the sides and base of the trochlear groove (Figure 4aa). Remove the trochlear guide, and insert an osteotome over the resected tibial surface below the trochlear groove. Then use the reciprocating saw to finish the trochlear cuts.

Remove the MIS notch/chamfer guide.

Using the MIS Notch/Chamfer Guide to downsize the femur

If there is a need to downsize the femur, the MIS notch/chamfer and trochlear guide can be used for sizes C-G standard implants and the notch/chamfer guide can be used for all flex sizes.

ⓘ **Note:** Size A, B and H MIS trochlear guides cannot be used for downsizing.

Select the preferred size notch/chamfer guide and pin to the distal femur with two short spring screws or 3.2 mm (1/8-inch) headed screws (48 mm length). Alternatively, insert two hex headed pins. Ensure that the guide is seated on the anterior and distal femur. Use a reciprocating saw to recut the sides of the intercondylar box. Use an oscillating saw to recut the anterior and posterior chamfers.

Using the MIS Notch/Chamfer Guide to downsize the femur (cont.)

If downsizing for a CR-Flex or LPS-Flex implant, use the posterior surface of the MIS notch/chamfer guide for the posterior cut. If downsizing for a CR or LPS implant, use the MIS threaded handle to attach the matching size MIS trochlear guide to the notch/chamfer guide, and use the posterior surface of the MIS trochlear guide for the posterior cut.

Remove the MIS trochlear and notch/chamfer guides.

Surgeon Notes and Tips

- Although a sequence of femoral cuts has been provided, the cuts may be made in any sequence. It is recommended for the surgeon to complete the cuts in a consistent sequence to help ensure that all cuts are performed. However, the peg holes should be drilled prior to assembling the MIS trochlear guide.
- If the MIS femoral finishing guide is used, the flexion gap should equal the extension gap.
- If the MIS flex femoral finishing guide is used, then the flexion gap will be approximately 2 mm greater. For a flex implant, use an MIS spacer block with the MIS spacer block flex adapter to check flexion gap.
- An oscillating saw with a narrow blade may also be used, or a reciprocating blade may be used to cut the sides and a chisel or osteotome used to cut the base of the notch.
- Remember that the incision can be moved both medial-to-lateral and superior-to-inferior as needed to gain optimal exposure.
- To facilitate the use of the mobile window, when resecting on the medial side, use retraction on the medial side while relaxing the lateral side. Likewise, when resecting on the lateral side, use retraction on the lateral side while relaxing the medial side.



Figure 4cc



Figure 4bb

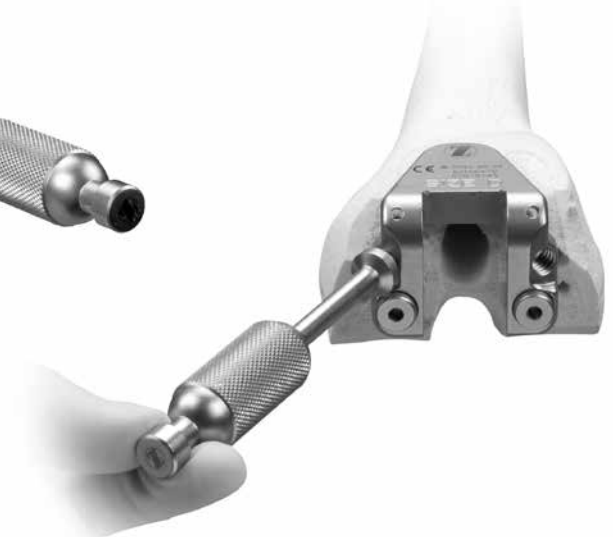


Figure 4dd

Option Two: MIS QS Notch Guide

Position the appropriate size MIS QS notch guide onto the femur so it is flush against the resected surfaces both distally and anteriorly. The MIS QS notch guide will not contact the anterior chamfer. Use the previously prepared trochlear recess and/or the femoral post holes to position the MIS QS notch guide mediolaterally. Use the recut guide modular peg with MIS QS notch guides sizes C-H for mediolateral positioning.

Secure the MIS QS notch guide to the femur with two 3.2 mm (1/8-inch) headed screws or predrill and insert two 3.2 mm (1/8-inch) holding pins (Figure 4bb). Use a reciprocating saw to cut the sides and the base of the intercondylar notch (Figure 4cc). Then remove the MIS QS notch guide (Figure 4dd).

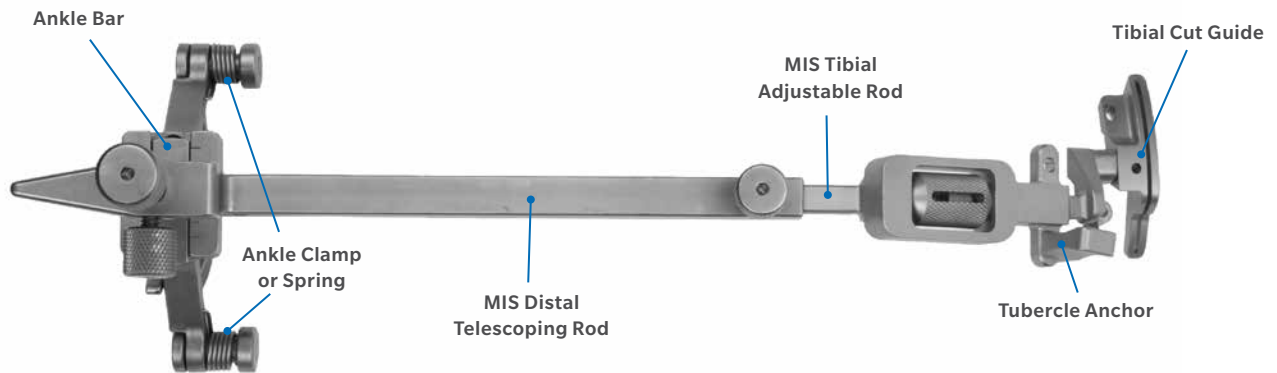


Figure 5a
MIS Tibial Cut Guide Assembly

Step Five: Resect Proximal Tibia

This step explains the alignment of the tibial cut to help ensure proper posterior slope and rotation, and the resection of the tibia perpendicular to the mechanical axis. The MIS tibial cut guide assembly is designed to facilitate tibial preparation through a shorter incision and without everting the patella.

Instruments Used

- MIS tibial cut guide assembly
 - MIS tibial cut guide (right or left)
 - MIS tubercle anchor (right or left)
 - MIS tibial adjustable rod
 - MIS distal telescoping rod
 - ankle clamp or spring
 - ankle bar
- resection guide
- MIS tibial depth resection stylus
- osteotome
- various retractors
- kocher clamp
- hex-head screwdriver

- drill/reamer
- MIS screw inserter/extractor
- MIS screws
- assemble the guide

Assemble the Guide

The MIS tibial cut guide assembly consists of instruments for right or left (Figure 5a).

- tibial cut guide
- tubercle anchor
- MIS tibial adjustable rod
- MIS distal telescoping rod
- ankle clamp or spring
- ankle bar

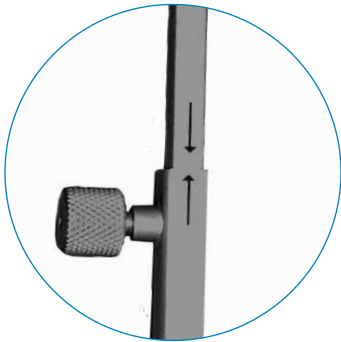


Figure 5b
Arrows showing correct alignment



Figure 5c

Step Five: Resect Proximal Tibia (cont.)

Attach the ankle clamp or optional spring to the ankle bar. Then slide the ankle bar onto the dovetail at the bottom of the MIS distal telescoping rod. Turn the knob opposite the dovetail to temporarily hold the bar in place.

Arrows are etched onto both the MIS tibial adjustable rod and the MIS distal telescoping rod to indicate the correct orientation during assembly. With the arrows aligned, insert the MIS tibial adjustable rod into the distal telescoping rod (Figure 5b). Adjust the length to approximate the length of the patient's tibia and temporarily tighten the thumb screw at the proximal end of the distal rod.

Attach the correct right or left tubercle anchor onto the corresponding side of the MIS tibial adjustable rod. For a left knee, the left anchor is inserted into the right hole (Figure 5c).



Figure 5d



Figure 5e

Step Five: Resect Proximal Tibia (cont.)

For a right knee, the right anchor is inserted into the left hole (Figure 5d).

Be sure that the etched line on the side of the tubercle anchor aligns with the corresponding etched line on the anterosuperior face of the adjustable rod (Figure 5e).

ⓘ **Note:** The tibial cut guide and tubercle anchor are available in left and right configurations. If the incorrect tubercle anchor is used, the cut guide will not fully retract into the adjustable rod and the varus/valgus angle of the tibial cut may be affected.

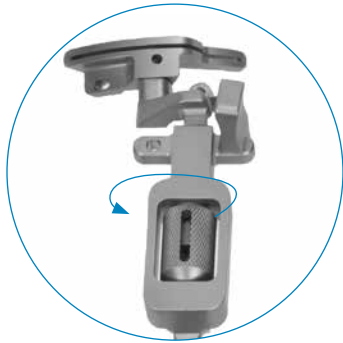


Figure 5f



Figure 5g

Step Five: Resect Proximal Tibia (cont.)

Insert the correct right or left tibial cut guide into the adjustable rod and rotate the thumb wheel counterclockwise until the threads engage (Figure 5f).

Continue to rotate the thumb wheel until the guide is approximately midway through its range of travel. This will allow the depth of the tibial resection to be adjusted after the assembly is secured to the bone via the tubercle anchor.

Position the Guide

Place the spring arms of the ankle clamp around the ankle proximal to the malleoli and loosen the anterior knob that provides mediolateral adjustment at the ankle. If preferred, the ankle spring may be used instead of the ankle clamp.

Loosen the knob on the proximal end of the distal telescoping rod and adjust the length of the guide until the tibial cut guide is positioned at the approximate depth of cut. With the tibial cut guide and tubercle anchor contacting the bone, move the tibial cut guide mediolaterally to align the rod with the medial third of the tibial tubercle (Figure 5g). This will usually place the proximal end of the adjustable rod so it is centered below the intercondylar eminence. The tibial cut guide will contact the tibia at an oblique angle and the low profile portion of the cutting head will fit under the patellar tendon. The tubercle anchor is shaped to fit between the patellar tendon and the base of the cutting head.



Figure 5h

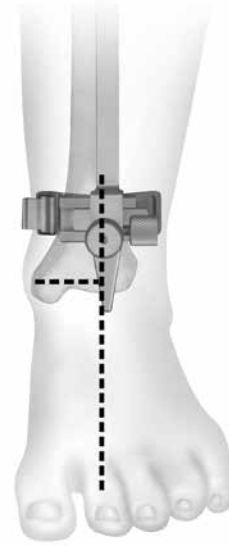


Figure 5i

Position the Guide (cont.)

Note: Be sure that only the low-profile portion of the cutting head extends beneath the patellar tendon (Figure 5h).

When correctly aligned, the distal telescoping rod and adjustable rod should be parallel to the tibia in the coronal and sagittal planes. To help avoid rotational malalignment of the rod, check its position from a direct anterior view, ie, stand at the foot of the operating table.

Adjust the distal end of the MIS distal telescoping rod by moving the slide at the foot of the rod medially or laterally until the guide is aligned with the mechanical axis of the tibia. The end of the MIS distal telescoping rod should be positioned about 5 mm-10 mm medial to the midpoint between the palpable medial and lateral malleoli. The tip should point to the second toe (Figure 5i). When the proper M/L position is achieved, tighten the anterior knob to secure the MIS distal telescoping rod to the ankle bar.

Loosen the knob on the side of the distal end of the MIS distal telescoping rod. Then use the slide adjustment to align the rod in the sagittal plane so it is parallel to the anterior tibial shaft. This will create a 7° posterior tibial slope. If more or less slope is desired, use the slide adjustment to obtain the desired slope. Then tighten the knob. If there is a bulky bandage around the ankle, adjust the rod to accommodate the bandage. This will help ensure that the tibia will be cut with the proper slope.



Figure 5j



Figure 5k

Position the Guide (cont.)

Insert an MIS screw near the tibial tubercle through the hole in the tubercle anchor (Figure 5j).

ⓘ **Note:** The tubercle anchor position does not determine the varus/valgus of the tibial cut.

Then use the resection guide through the cutting slot to assess the slope of the cut (Figure 5k).



Figure 5l



Figure 5m

Set the Final Resection Level

With the tibial cut guide flush against the anteromedial edge of the tibia, insert the MIS tibial depth resection stylus into the hole on the top of the tibial cut guide. For a minimal cut, swing the 2 mm arm of the stylus over the defective tibial condyle. Adjust the tibial cut guide up or down by rotating the thumb wheel until the tip of the 2 mm stylus rests on the surface of the condyle (Figure 5l). This will position the tibial cut guide to remove 2 mm of bone below the tip of the stylus.

Alternatively, swing the 10 mm arm of the MIS tibial depth resection stylus over the least involved tibial condyle. Adjust the tibial cut guide until the tip of the 10 mm arm rests on the surface of the condyle (Figure 5m). This will position the tibial cut guide to remove 10 mm of bone below the tip of the stylus.

These two points of resection will usually not coincide. The surgeon must determine the appropriate level of resection based on patient age, bone quality, and the type of prosthetic fixation planned.

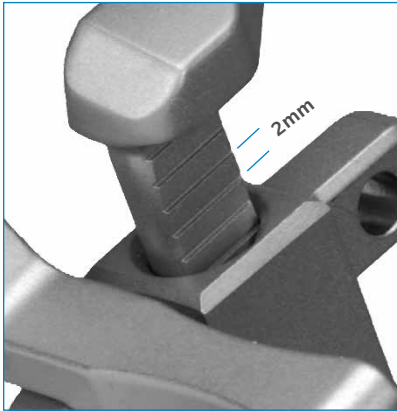


Figure 5n



Figure 5o



Figure 5p

Set the Final Resection Level (cont.)

ⓘ **Note:** The grooves on the stem of the tibial cut guide represent 2 mm increments (Figure 5n).

Use the hex-head screwdriver to tighten all of the screws on the tibial assembly to maintain position.

Insert an MIS screw through the medial oblong hole on the cutting head (Figure 5o). This hole is angled to facilitate screw insertion.

Place another MIS screw through the central anterior hole on the cutting head (Figure 5p).

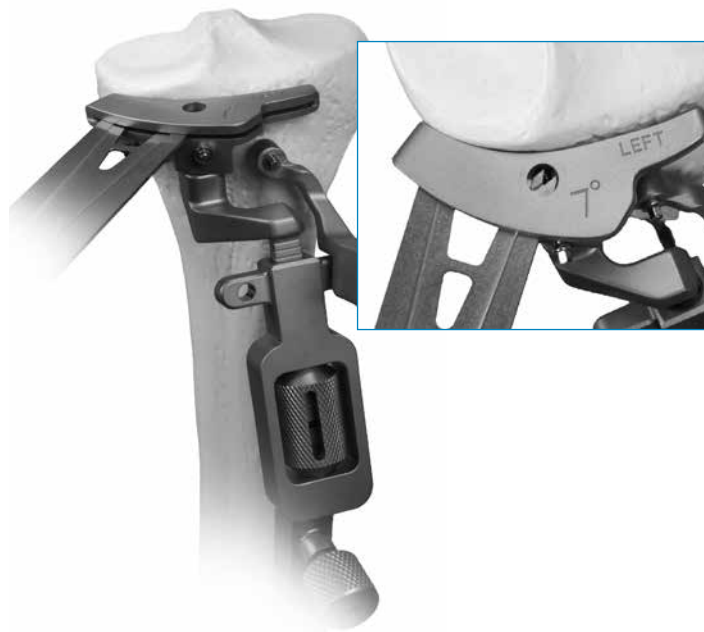


Figure 5q

Resect the Proximal Tibia

Use a 1.27 mm (0.050-in) oscillating saw blade through the slot on the tibial cut guide to cut the proximal surface of the tibia flat (Figure 5q). After cutting through the medial side and as far as possible into the lateral side, remove the cut guide assembly. Extend the knee and retract soft tissue on the lateral side.

ⓘ **Note:** Take care to protect the patellar tendon when cutting the lateral side.

Use a kocher clamp to remove the tibial bone fragment. Then trim any remaining bone spikes and meniscus on the posterior and lateral aspects of the resected tibial surface.



Figure 6a

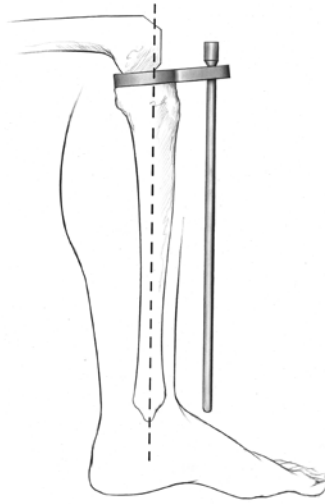


Figure 6b



Figure 8c

Step Six: Check Flexion/Extension Gaps

Use the spacer/alignment guides to check the flexion and extension gaps. With the knee in extension, insert the thinnest appropriate spacer/alignment guide between the resected surfaces of the femur and tibia (Figure 6a). Insert the alignment rod into the guide and check the alignment of the tibial resection (Figure 6b). If necessary insert progressively thicker spacer/alignment guides until the proper soft tissue tension is obtained.

Then flex the knee and check ligament balance and joint alignment in flexion. When using the MIS flex femoral finishing guide, the flexion gap will be approximately 2 mm greater than the extension gap. For example, if the extension gap is 10 mm, the flexion gap will be 12 mm. To account for this difference, the appropriate MIS CR-Flex spacer adapter or MIS LPS-Flex spacer adapter (Figure 6c) should be placed on top of the spacer/alignment guide that was used in extension to accurately check ligament balance in flexion. The combined construct will equal the total posterior condylar thickness of the final implant.

If the tension is significantly greater in extension than in flexion, re-cut the distal femur using the appropriate instrumentation. This will enlarge the extension space.

If the tension is significantly less in extension than in flexion, either downsize the femur or perform additional ligament releases.

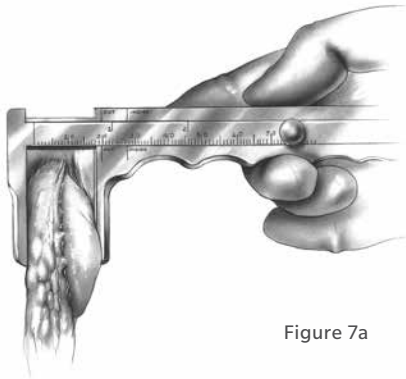


Figure 7a

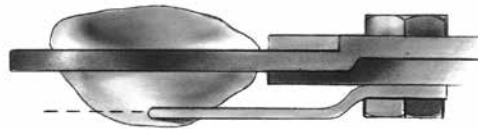


Figure 7b

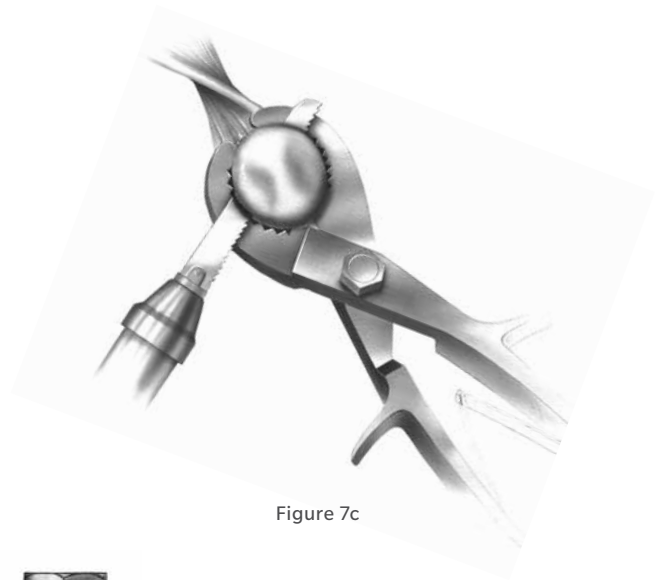


Figure 7c

Step Seven: Prepare the Patella

Sharply dissect through the prepatellar bursa to expose the anterior surface of the patella. This will provide exposure for affixing the anterior surface into the patellar clamp.

Remove all osteophytes and synovial insertions from around the patella. Be careful not to damage tendon insertions on the bone. Use the patellar caliper to measure the thickness of the patella (Figure 7a). Subtract the implant thickness from the patella thickness to determine the amount of bone that should remain after resection.

Resect the Patella

Universal Saw Guide Technique

Apply the universal patellar saw guide in line with the patellar tendon. Push the patella up between the jaws of the saw guide. Level the patella within the saw guide jaws and use the thumbscrew to tighten the guide.

The amount to be resected across the top of the saw guide jaws should be approximately the same on all

sides. Check to be sure that the 10 mm gauge does not rotate beneath the anterior surface of the patella. If the gauge hits the anterior surface of the patella as it is rotated, this indicates that at least 10 mm of bone stock will remain after the cut (Figure 7b).

Cut the patella flat so that a smooth surface remains (Figure 7c).

Patella Thickness – Implant Thickness = Bone Remaining

Implant Thicknesses

	Micro	Standard
26 mm	7.5 mm	–
29 mm	7.5 mm	8.0 mm
32 mm	8.0 mm	8.5 mm
35 mm	8.0 mm	9.0 mm
38 mm	–	9.5 mm
41 mm	–	10.0 mm

Note: At least 11 mm of total bone will remain to allow for implant pegs if the patella reamer is used.



Figure 7d

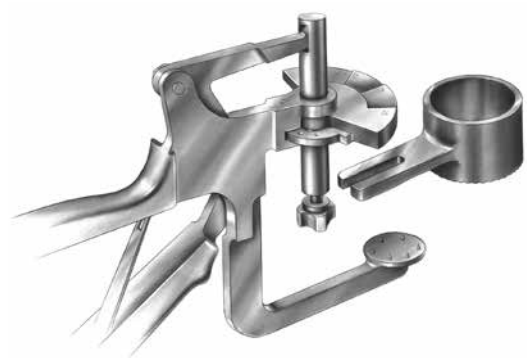


Figure 7e

Patellar Reamer Technique **Total Surfacing Procedure**

Use the patellar reamer surfacing guides as templates to determine the appropriate size guide and reamer. Choose the guide which fits snugly around the patella, using the smallest guide possible (Figure 7d). If the patella is only slightly larger than the surfacing guide in the mediolateral dimension, use a rongeur to remove the medial or lateral edge until the bone fits the guide.

Insert the appropriate size patellar reamer surfacing guide into the patella reamer clamp (Figure 7e). Turn the locking screw until tight.

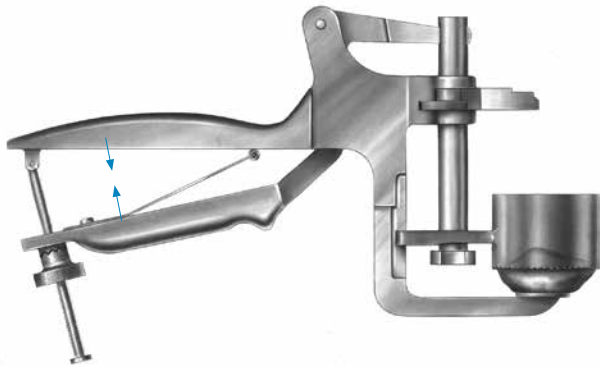


Figure 7f

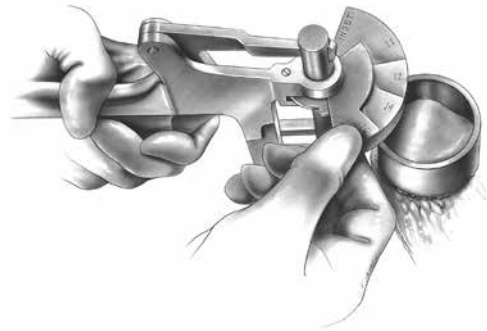


Figure 7g

Patellar Reamer Technique
Total Surfacing Procedure (cont.)

Apply the patellar reamer clamp at a 90° angle to the longitudinal axis with the patellar reamer surfacing Guide encompassing the bearing of the patella. Squeeze the clamp until the anterior surface of the patella is fully seated against the fixation plate (Figure 7f). Turn the clamp screw to hold the instrument in place. The anterior surface must fully seat upon the pins and contact the fixation plate.

Turn the depth gauge wing on the patellar reamer clamp to the proper indication for the correct amount of bone that is to remain after reaming (Figure 7g).

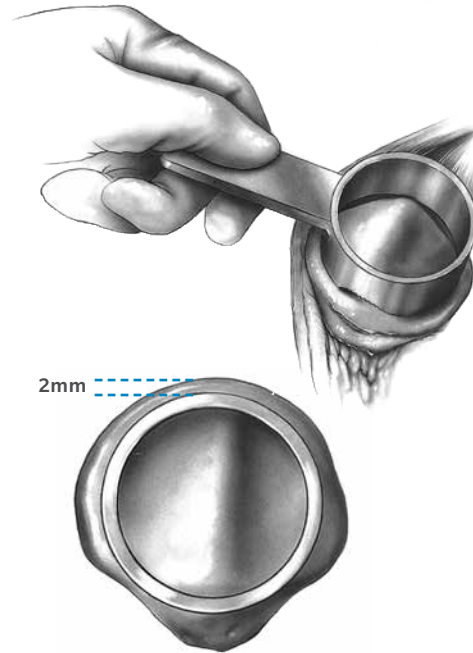


Figure 7h

Patellar Reamer Technique **Total Surfacing Procedure (cont.)**

Attach the appropriate size patellar reamer blade to the appropriate size patellar reamer shaft. Use only moderate hand pressure to tighten the blade.

Note: Patella reamers that use the pilot drill can also be used.

Do not overtighten the blade. Insert the patellar reamer shaft into a drill/reamer. Insert the reamer assembly into the patellar reamer surfacing guide. Raise the reamer slightly off the bone and bring it up to full speed. Advance it slowly until the prominent high points are reamed off the bone. Continue reaming with moderate pressure until the step on the reamer shaft bottoms out on the depth gauge wing of the Patellar Reamer Clamp. Remove the reamer clamp assembly.

Proceed to “Finish the Patella” on page 43.

Insetting Technique

Use the patellar reamer inseting guides as templates to determine the appropriate size guide and reamer. Choose the guide which will allow approximately 2 mm between the superior edge of the patella and the outer diameter of the guide (Figure 7h).

Insert the appropriate size patellar reamer inseting guide into the patellar reamer clamp. Turn the locking screw until tight. Apply the patellar reamer clamp at a 90° angle to the longitudinal axis with the patellar reamer inseting guide on the bearing. Squeeze the clamp until the anterior surface of the patella is fully seated against the fixation plate. Turn the clamp screw to hold the instrument in place. The anterior surface must fully seat on the pins and contact the fixation plate.

Turn the clamp wing to the “inset” position.

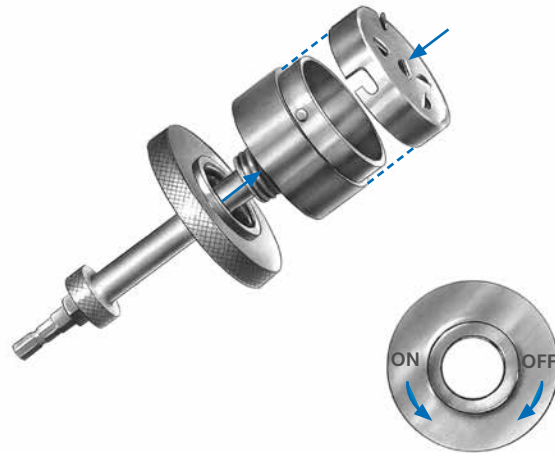


Figure 7i

Insetting Technique (cont.)

Attach the appropriate size patellar reamer blade to the appropriate size patellar reamer shaft (Figure 7i). Use only moderate hand pressure to tighten the blade. **Do not overtighten the blade.** Insert the patellar reamer shaft into a drill/reamer.

Use the patellar reamer depth stops to control the amount of bone to be removed based on the thickness of the implant chosen.

ⓘ **Note:** If using a primary porous patella with Trabecular Metal™ Material, all implants are 10 mm thick.

The depth gauge wing on the patellar reamer clamp can be used instead of the stops to control the amount of bone remaining, rather than the amount of bone removed.

Insert the reamer assembly into the patellar reamer inseting guide. Raise the reamer slightly off the bone and bring it up to full speed. Advance it slowly until the prominent high points are reamed off the bone. Continue reaming with moderate pressure. Remove the reamer clamp assembly.



Figure 7j

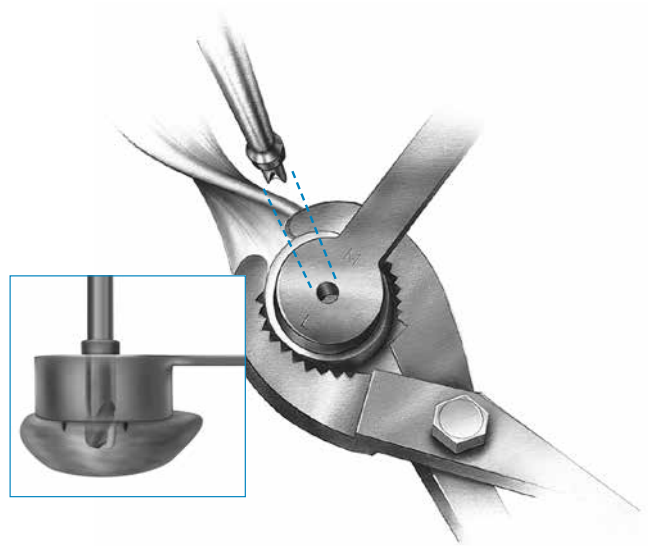


Figure 7k

Finish the Patella

NexGen Primary Porous Patella With Trabecular Metal Material

Center the appropriate patellar drill guide over the resected patella surface with the handle on the medial side of the patella and perpendicular to the tendon. Press the drill guide firmly in place so that the teeth fully engage and the drill guide sits flat on the bone surface (Figure 7j). Drill the peg hole making sure the drill stop collar contacts the top of the drill guide (Figure 7k).

- ⓘ **Note:** The primary porous patellar clamp may be used to fully seat the drill guide on hard sclerotic bone surfaces.

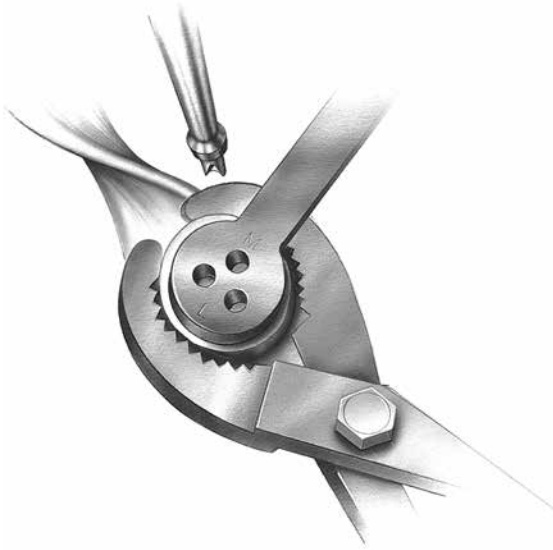


Figure 7l

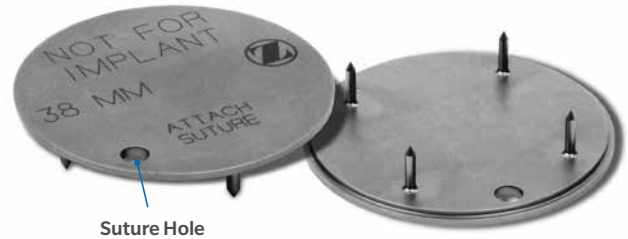


Figure 7m

NexGen All-Polyethylene Patella

Center the appropriate patellar drill guide over the patella with the handle on the medial side of the patella and perpendicular to the tendon. Holding the drill guide firmly in place, drill the three peg holes using the patellar/femoral drill bit (Figure 7l).

Patella Protectors

- ⓘ **Note:** If the patella will not be resurfaced, be careful to avoid injury to the patella during surgery.
- ⓘ **Note:** The patella protectors are not recommended for use in an inseting technique.

There are 3 sizes of patella protectors available to cover the patella while completing the remaining bone resections. Choose the size that best covers the patella – 26 mm, 32 mm, or 38 mm. Handle with care; the spikes may be sharp.

A suture needs to be placed through the hole in the patella protector (Figure 7m). Loosely tie a suture through the hole on the patella protector. Attach a hemostat to the end of the suture material. Leave an adequate amount of suture material to position the hemostat away from the incision.

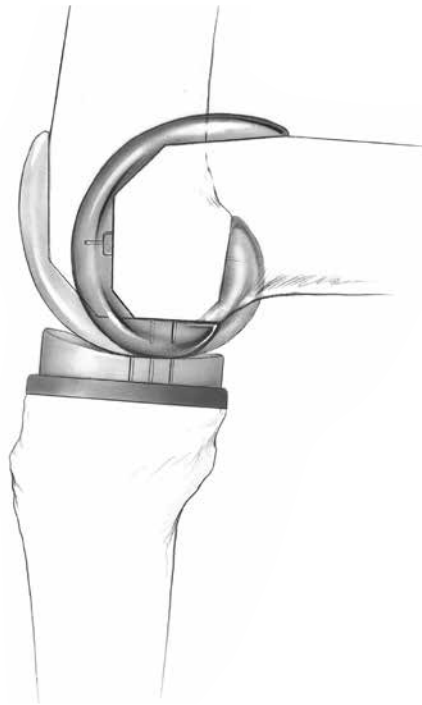


Figure 8a

Patella Protectors (cont.)

After the initial patella cut is completed, use thumb pressure to press the patella protector against the bone. If the bone is particularly hard, apply the patellar clamp against the patella protector. Squeeze the clamp until the patella protector is fully seated against the bone.

The patella protector should be part of the instrument count before closing the wound. It is not intended for implantation. Completely remove the suture material at the end of the operation and before sending the instrument for cleaning.

Surgeon Notes and Tips

- The suture placed through the hole in the patella protector provides a tether for finding and removing the patella protector.

Step Eight: Perform a Trial Reduction

After preparing the tibia, select the appropriate pegged or stemmed tibial sizing plate/provisional that provides the desired tibial coverage. Check the size matching chart (for the style of NexGen Knee implant) for component matching instructions.

Insert the femoral provisional, patellar provisional, tibial sizing plate/provisional, and bearing provisional.

Flex and extend the knee with the provisionals in place. Check the range of motion and ligament stability. Perform any necessary soft tissue releases. With proper soft tissue balancing complete the tibial component tends to seat itself in the position where it best articulates with the femur (Figure 8a)

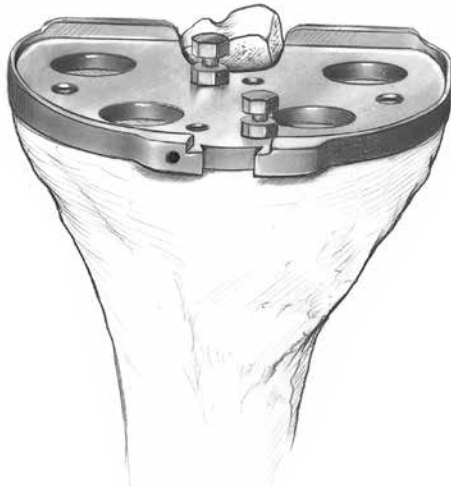
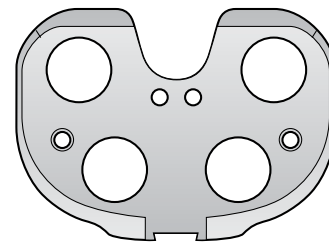
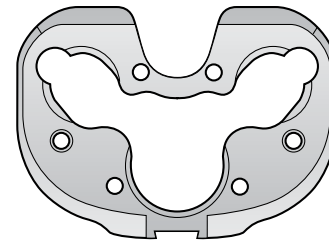


Figure 8b



Pegged Tibial Sizing Plate



Stemmed Tibial Sizing Plate

Figure 8c

Step Eight: Perform a Trial Reduction (cont.)

Note: During the trial reduction, observe the relative position of the femoral provisional on the tibial bearing provisional by using the lines on both provisionals. The lines can be used to determine if posterior rollback is occurring, whether the PCL is functional, and if the femoral component will contact the tibial bearing in the proper location. If the PCL is properly balanced, the femoral provisional should sit near the anterior or center lines on the tibial bearing provisional in extension and near the posterior line in flexion.

If the femoral provisional sits posterior to the lines, the PCL may be too tight or the bearing may be too thick. If the femoral provisional sits anterior to the lines, the PCL may be too loose.

After this self-centering process has occurred, mark the position of the component with methylene blue or electrocautery (Figure 8b). Then remove the provisional components. The femoral extractor can be used to remove the femoral provisional.

Tibial Position based on Anatomic Landmarks

The position of the tibial component can also be determined based on anatomic landmarks prior to trial reduction. Select the appropriate pegged or stemmed tibial sizing plate/provisional that provides the desired tibial coverage (Figure 8c). Please refer to the NexGen® MIS Tibial Component Cemented Surgical Technique (97-5950-002-00) for complete product information and instructions for the MIS tibial stemmed component.



Figure 8d



Figure 8e

Tibial Position based on Anatomic Landmarks (cont.)

Attach the universal handle to the selected tibial sizing plate/provisional by depressing the button on the handle and engaging the dovetail on the handle with the dovetail on the sizing plate/provisional and secure it by tightening the thumbscrew (Figure 8d).

Generally, the handle aligns with the anterior aspect of the tibia. Rotate the sizing plate/provisional so the handle points at, or slightly medial to, the tibial tubercle (Figure 8e). The alignment rod can be used to aid in double checking varus/valgus alignment.

Pin the plate in place with two short head holding pins.

- A** PS or CR femoral rotation setting
- B** PS or CR tension setting
- C** Femoral rotation adjustment knob
- D** Tension adjustment knob
- E** Trigger
- F** Instrument hook
- G** Locking handle
- H** Slaphammer slot

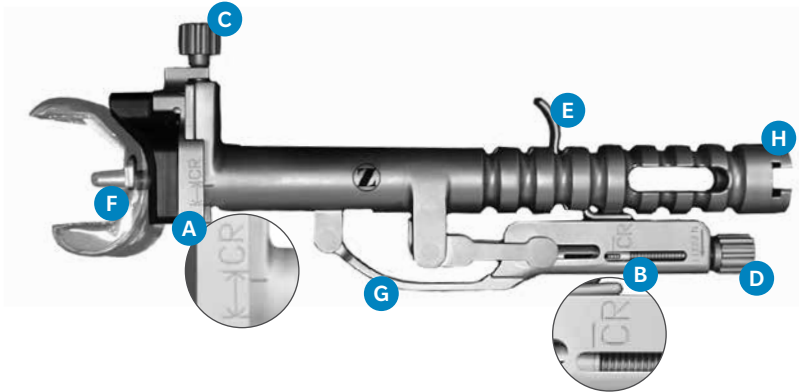


Figure 9a

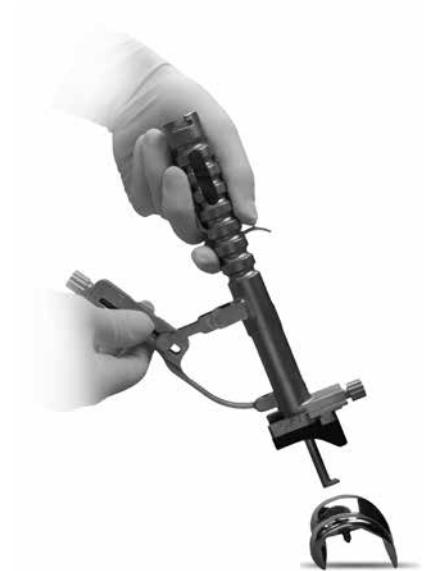


Figure 9b

Step Nine: Perform a Trial Reduction

In this step, a trial reduction is performed to check component position, patellar tracking, ROM, and joint stability.

The tibial sizing plate is in place.

Knee in 70°-90° Flexion

Place the collateral retractor laterally, an army-navy retractor anteriorly, and a rake retractor on the meniscal bed medially.

Insertion of Femoral Provisional using Optional MIS Femoral Inserter/Extractor

Determine type of NexGen implant or provisional being used – posterior stabilized (PS) or cruciate retaining (CR). Refer to the side of the instrument, labeled PS or CR (see (A) & (B)) which corresponds with the implant or provisional type (Figure 9a).

Initially adjust femoral rotation setting and tension setting. For the femoral rotation setting, a good starting point is between the lines of the implant type (A). For the tension setting, start with the two lines aligned (B).

Open locking handle (G) to attach implant or provisional. Attach implant or provisional by positioning the instrument hook (Figure 9b).



Figure 9c



Figure 9d



Figure 9e

Step Nine: Perform a Trial Reduction (cont.)

If needed, turn adjustment knob (C) to achieve desired rotation of the femoral component (Figure 9c).

Turn tension adjustment knob (D) to increase (tighten) or decrease (loosen) the clamping force (Figure 9d).

Close locking handle to secure instrument to implant or provisional (Figure 9e).

Align implant or provisional onto prepared bone, impact end (H).

Open locking handle by pressing trigger (E) to release instrument from implant or provisional.

If preferred, the femoral provisional may be positioned by hand.

Translate the femoral provisional laterally until the lateral peg of the provisional aligns with the drill hole in the lateral femoral condyle. Push the provisional in place beginning laterally, then medially. Be sure that soft tissue is not trapped beneath the provisional component.

Knee in Extension

Check to ensure that the femoral provisional is flush against the resected surface on the medial condyle. Then retract the lateral side and check to make sure it is flush on the lateral side. The femoral provisional should be centered mediolaterally on the distal femur.

Attach the appropriate tibial bearing provisional and perform a trial reduction. Check ligament stability in extension and in 30°, 60°, and 90° flexion. Attempt to distract the joint in flexion to ensure that it will not distract. If a posterior stabilized component is used, hyperflex the knee and check to make sure that the spine still engages the cam.

Insert the patellar provisional onto the resected patellar surface. Perform a ROM to check patellar tracking.

When component position, ROM, and joint stability have been confirmed, remove all provisional components.



Figure 9f

Removal of Femoral Provisional using Optional MIS Femoral Inserter/Extractor

Ensure (A) and (B) are still set properly for provisional type being used (PS or CR).

Position instrument hook under provisional (F) (Figure 9f).

Turn tension adjustment knob (D) to tighten or loosen as needed.

Close locking handle (G).

Attach slaphammer (H), extract.

Surgeon Notes and Tips

- In performing the trial reduction and during implantation of the femoral provisional or prosthesis, make certain that no portion of the quadriceps or soft tissue is pinned beneath the component.

Step Ten: Implant Components

In this step, the final components are implanted, and the tibial bearing is secured to the implanted tibial base plate. When using cemented components, it is recommended to use two batches of cement.

After the implants have been chosen, make a final check to ensure that the femoral, tibial base plate, and tibial bearing components match. If using a cemented component, mix the first batch of cement. The cement should have a doughy consistency when ready for use.

Tibial Base Plate

If a stemmed tibial base plate will be used with a stem extension, attach the desired stem extension to the stem and strike it once with a mallet. If a 10 mm-14 mm thick tibial bearing will be used, insert the locking screw for the stem extension.

If a stemmed tibial base plate will be used without a stem extension, consider the need for a taper plug. If a 17 mm or 20 mm bearing will be used, a stem extension or taper plug is required. A taper plug also can be used with the 10 mm-14 mm tibial bearing. If it is planned to use a 14 mm bearing or if the flexion and extension gaps are not balanced, consider using the taper plug in case the final reduction reveals that it is necessary to switch to a 17 mm or 20 mm bearing. Furthermore, if the bearing should ever require revision with a 17 mm or 20 mm thick component, the taper plug is already in place and revision of the tibial base plate may not be necessary. Assemble the taper plug onto the tibial plate by striking it several times with a mallet to allow the ring on the taper to deform.

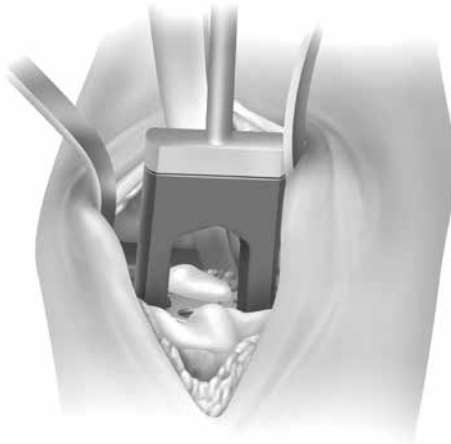


Figure 10a

Use the Tibial Impactor to impact the tibial base plate.

Tibial Base Plate (cont.)

Position the PCL retractor posteriorly, the collateral soft tissue protector laterally, and the collateral retractor medially. Sublux the tibia anteriorly. Place a layer of cement on the underside of the tibial base plate, around the keel, on the resected tibial surface and in the tibial IM canal. Position the tibial base plate onto the tibia and use the tibial impactor to impact it until fully seated (Figure 10a). Thoroughly remove any excess cement in a consistent manner.

Femoral Component

Attach the femoral component to the femoral impactor/extractor.

Knee in 70°-90° Flexion

Place the collateral retractor laterally, an army-navy retractor anteriorly, and a rake retractor on the meniscal bed medially.

Place a layer of cement on the underside of the prosthesis and in the holes drilled in the femur.

Attach the femoral/impactor/extractor to the femoral component. Insert the femoral component onto the distal femur by translating the component laterally until the lateral peg aligns with the drill hole in the lateral femoral condyle. Take care to avoid scratching the implant component surfaces. Disposable, plastic tibial plate protectors may be temporarily inserted onto the tibial base plate to protect the implant surfaces during insertion of the femoral component. Remove the tibial plate protector after the femur is seated. Be sure that soft tissue is not trapped beneath the implant. Use a mallet to impact the component until fully seated.

Femoral Component (cont.)

Remove the femoral impactor/extractor, and the retractors. Check the medial and lateral sides to make sure the femoral component is fully impacted. Remove any excess cement in a thorough and consistent manner.

Alternatively, push the component in place by hand beginning laterally, then medially.

Component Implantation

After the implants have been chosen, make one last check to ensure that the femoral, tibial, and bearing components match.

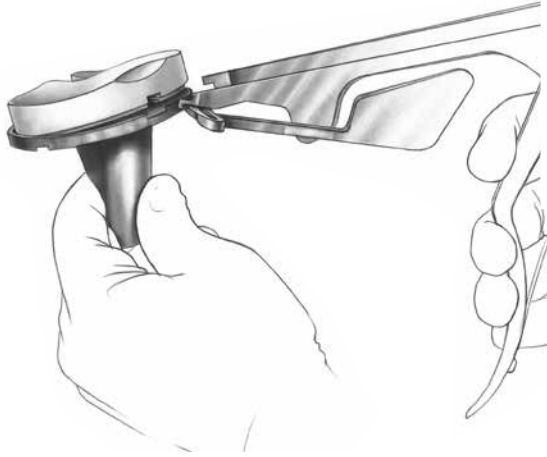


Figure 10b

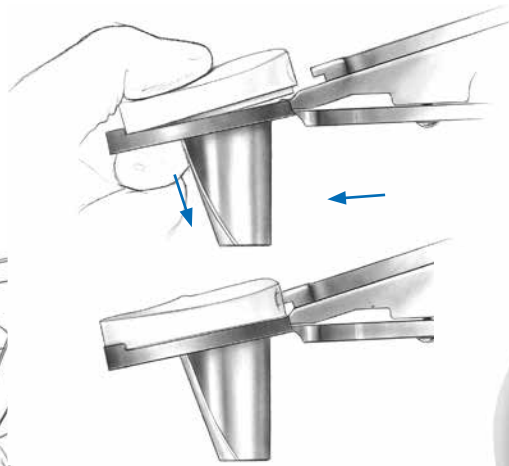


Figure 10c



Figure 10d
Insert the tibial bearing
onto the tibial base plate.

Bearing Insertion

The bearing inserter applies both downward and rearward forces to aid in the insertion of the bearing onto the tibial base plate. Push the lever on the inserter fully to either side. Place the bearing onto the tibial base plate, engaging the dovetails (Figure 10b). Steady the surface on the base plate with one hand by applying downward pressure near the posterior cruciate cutout. Engage the hook on the inserter with the mating slot in the front of the base plate and close the lever with your index finger. This should lock the inserter to the base plate. Squeeze the handles of the inserter to seat the bearing (Figure 10c). Open the lever and remove the inserter. **Insert an bearing only once. Never reinsert the same bearing onto a tibial base plate.**

Patellar Component NexGen Primary Porous Patella with Trabecular Metal Material Knee in 70°-90° Flexion

⊖ **Note:** If the implant post begins to engage at an angle, the implant should be removed and repositioned perpendicular to the resected surface. Insert the patella again and reclamp, applying an even distribution of pressure on the patellar surface.

NexGen All-polyethylene Patella Knee in 70°-90° Flexion

Apply cement to the anterior surface and pegs of the patellar component while in a doughy consistency. Locate the drilled peg holes and use the patellar clamp to insert and secure the patella in place. Fully open the jaws of the clamp and align the teeth to the anterior surface of the patella and the plastic ring to the posterior surface of the implant. Use the clamp to apply a significant amount of pressure to the implant to fully seat the implant on the patellar surface. Then remove excess cement.

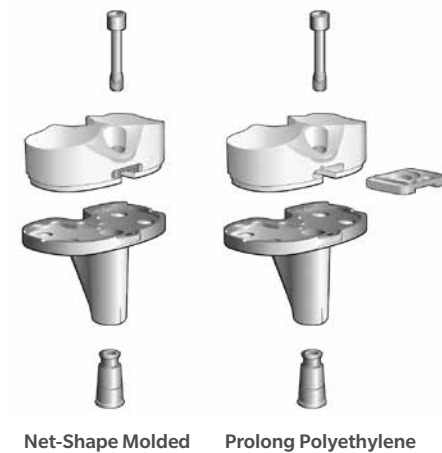


Figure 10e

Tibial Bearing Knee in 70°-90° Flexion

Use the bearing insertion instrument to attach the appropriate tibial bearing onto the tibial base plate (Figure 10d).

Technique for 17 mm and Thicker Tibial Bearing Assemblies

A secondary locking screw is required for the 17 mm and thicker tibial bearing components if using a flex femoral component. Therefore, stemmed tibial base plates with either a stem extension or taper plug must be used with these thicker components (Figure 10e). This assists in lift off resistance at higher flexion positions.

Note: The pegged plate cannot be used with the 17 mm or thicker net-shape molded or Prolong® Highly Crosslinked Polyethylene Bearing.

With the Prolong Highly Crosslinked Polyethylene Bearing component (17 mm and thicker only), the metal locking clip and screw are packaged separately from the tibial bearing container, but in the same box. Before inserting the tibial bearing, insert the metal

locking clip into the anterior slot of the compartment. The rail should be aligned with the space in the slot. There is an arrow on the superior side of the locking clip that indicates the correct direction for insertion. The purpose of the rail is to prevent the clip from being assembled incorrectly. The metal locking clip should glide easily into the slot. The clip is properly seated when a click is heard. For the molded tibial bearing, the metal locking clip is preassembled into the component.

A taper plug also can be used with the 10 mm to 14 mm bearing components. If you plan to use a 14 mm component or the flexion and extension gaps are not balanced, consider using the taper plug in case, during final reduction, it would be necessary to use a 17 mm or thicker component. Then, if the bearing should ever require revision with a 17 mm or thicker component, the taper plug is already in place and revision of the tibial plate component may not be necessary.

For Back Table Assembly

Assemble the stem extension or the taper plug onto the tibial plate by striking it with a mallet once for the stem extension or several times for the taper plug to allow the ring on the taper plug to deform.

Place the tibial plate onto the holding fixture, which is an integral part of the instrument case.

Use the bearing Inserter to insert the bearing onto the tibial plate.

With the bearing in place, insert the secondary locking screw (packaged with the articular surface).

Use the LCCK deflection beam torque wrench with the 4.5 mm hex driver bit attached to torque the screw to 95 in.-lbs. Alternatively, if using a stem extension, use the tibial plate wrench to assist when torquing the screw. Do not over or under torque.

For In Vivo Assembly

If preferred, 17 mm or thicker bearing can be inserted after the tibial plate has been implanted.

1. Assemble the stem extension or the taper plug onto the tibial plate by striking it with a mallet once for the stem extension or several times for the taper plug to allow the ring on the taper plug to deform.

It is recommended to secure the taper plug/stem extension using a replacement stem extension locking screw: 00-5980-090-00 (available as a separate sterile item) before implanting the tibial component. This screw will hold the taper plug/stem extension in place when the tibial plate is impacted.

2. Implant the tibial plate*. Remove the replacement stem extension locking screw and discard. If bone cement is being used, wait for the cement to completely cure before inserting the articular surface. An bearing provisional may be inserted to use as space while the cement cures.

For In Vivo Assembly (cont.)

3. Remove the bearing provisional and insert the bearing onto the plate using the bearing inserter.
4. Select the tibial plate wrench that matches the size of the implant to be assembled. Place the end of the wrench over the tibial plate. Ensure that the wrench is in line with the base of the tibial plate.
5. Place the locking screw (packaged with the bearing) through the hole in the bearing.
6. Use the LCCK deflection beam torque wrench attached to the 4.5 mm hex driver bit to torque the screw to 95 in.-lbs.

*For cemented applications, apply a layer of bone cement to the underside of the tibial plate, around the keel, on the resected tibial surface and in the tibial IM canal. Remove the excess cement.

Recheck the ROM and stability of the knee.

Surgeon Notes and Tips

- Take care that the retractors do not inadvertently dislodge the tibial base plate, particularly on the posterolateral corner.
- Verify that the femoral component is fully seated before closing the wound.
- Confirm that no portion of the quadriceps mechanism has been pinned beneath the femoral component.



Figure 10f

Surgical Support Team Tips

- The cement may need to be prepared in two separate batches to implant the components. Place cement onto the tibial bone, position the implant, and impact into place. Remove excess cement. Place cement onto the femoral component, then position the implant and impact into place. Remove all excess cement in a consistent manner.
- After the tibial base plate component has been implanted, ensure that the tibial base plate component has not been dislodged when the femur is subluxed anteriorly to implant the femoral component.

Apply cement to the Trabecular Metal surface and post while in a doughy consistency. Locate the drilled post hole and use the primary porous patellar clamp to insert and secure the patella in place. Fully open the jaws of the clamp and align the teeth to the anterior surface of the patella and the plastic ring to the posterior surface of the implant. Use the clamp to apply a significant amount of pressure to the implant to fully seat the implant on the patellar surface (Figure 10f). Remove excess cement.

- ⓘ **Note:** If the implant post begins to engage at an angle, the implant should be removed and repositioned perpendicular to the resected surface. Insert the patella again and reclamp, applying an even distribution of pressure on the patellar surface.

Apply cement to the anterior surface and pegs of the patellar component while in a doughy consistency. Locate the drilled peg holes and use the Patellar Clamp to insert and secure the patella in place. Fully open the jaws of the clamp and align the teeth to the anterior surface of the patella and the plastic ring to the posterior surface of the implant. Use the clamp to apply a significant amount of pressure to the implant to fully seat the implant on the patellar surface. Remove excess cement.

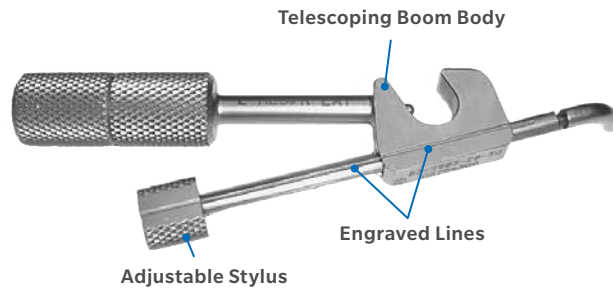


Figure A

Step Eleven: Close Incision

Freely irrigate the wound with the solution of choice. A drain may be placed intracapsularly. Then close the wound with sutures, and apply a bandage.

Appendix 1

This appendix should be used as a supplement to the MIS Quad-Sparing™ and MIS Multi-Reference 4-in-1 Surgical Technique when the optional MIS telescoping locking boom (Figure A) is used. Follow the instructions for the MIS locking boom (00-5983-028-00) within the MIS Quad-Sparing and MIS Multi-Reference 4-in-1 Surgical Techniques with the following additional instructions.

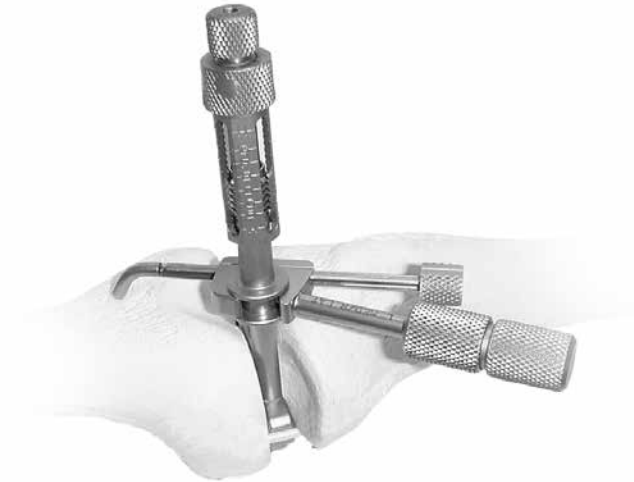


Figure B

Surgical Technique

Attach the MIS telescoping locking boom to the yoke on the appropriate MIS Quad-Sparing A/P sizing tower or MIS Multi-Reference 4-in-1 A/P sizing guide. The position of the boom dictates the exit point of the saw blade for anterior bone cut and the desired anterior position of the femoral component.

Adjustable stylus: The telescoping boom is attached to the yoke of the A/P sizing instrument (Figure B). The stylus tip is extended to the ideal point on the anterior femoral cortex which is located slightly lateral of patellar femoral groove, proximal of the lateral condyle where the slope begins to flatten (i.e. valley).

The telescoping boom can easily be adapted for use on either left medial/right lateral or right medial/left lateral cases. For left medial/right lateral use, the etching - L MED/R LAT must be facing up with the stylus tip pointing down. If the stylus tip is pointing up, slide the stylus fully distally using the knob and rotate the knob 180 degrees counterclockwise.

ⓘ **Note:** The stylus is designed to be rotated at only one position.

The engraved lines on the stylus and the body of the telescoping locking boom must be in alignment during sizing.

ⓘ **Note:** Clear any soft tissue or bony fragments that interfere with the telescoping boom body prior to sizing.

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Please refer to the package inserts for important product information, including, but not limited to, indications, contraindications, warnings, precautions, and adverse effects.

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