

# NexGen<sup>®</sup> Intramedullary Instrumentation

Surgical Technique





# Table of Contents

<b>Introduction</b> .....	2
Preoperative Planning .....	2
<b>Surgical Technique</b> .....	3
Step One: Size the Femur/Establish External Rotation .....	3
Step Two: Establish Femoral Alignment .....	4
Optional Technique	
Step Three: Cut the Anterior Femoral Condyles .....	5
Step Four: Cut the Distal Femur .....	5
Removing Additional Bone	
Optional Technique	
Surgical Option	
Step Five: Finish the Femur .....	8
Optional Technique	
Step Six: Cut the Proximal Tibia.....	10
Using the TM Tibial Resector	
Using the Extramedullary Tibial Cutting Guide	
Optional Technique	
Step Seven: Prepare the Patella .....	16
Patella Reamer Technique	
Universal Saw Guide Technique	
Finish the Patella	
Step Eight: Perform a Trial Reduction.....	22
Universal Saw Guide Technique	
Surgical Option	
Step Nine: Finish the Tibia .....	24
Tibial Plate Preparation For Pegged Tibial Component	
Tibial Plate Preparation For Stemmed Tibial Component	
Component Implantation .....	26
Bearing Insertion.....	26
<b>Appendix</b> .....	27
Optional Techniques.....	27
Check Flexion/Extension Gaps	
Recutting the Distal Femur	
“Crossover” Technique Option .....	29
Crossover Technique with the 5-in-1 Femoral Finishing Guide	
Crossover Technique with the PS Notch Milling Guide	
Crossover Technique with the EPI Notch/Chamfer Guide	
Crossover Technique with the Notch Chamfer Guide	

## Introduction

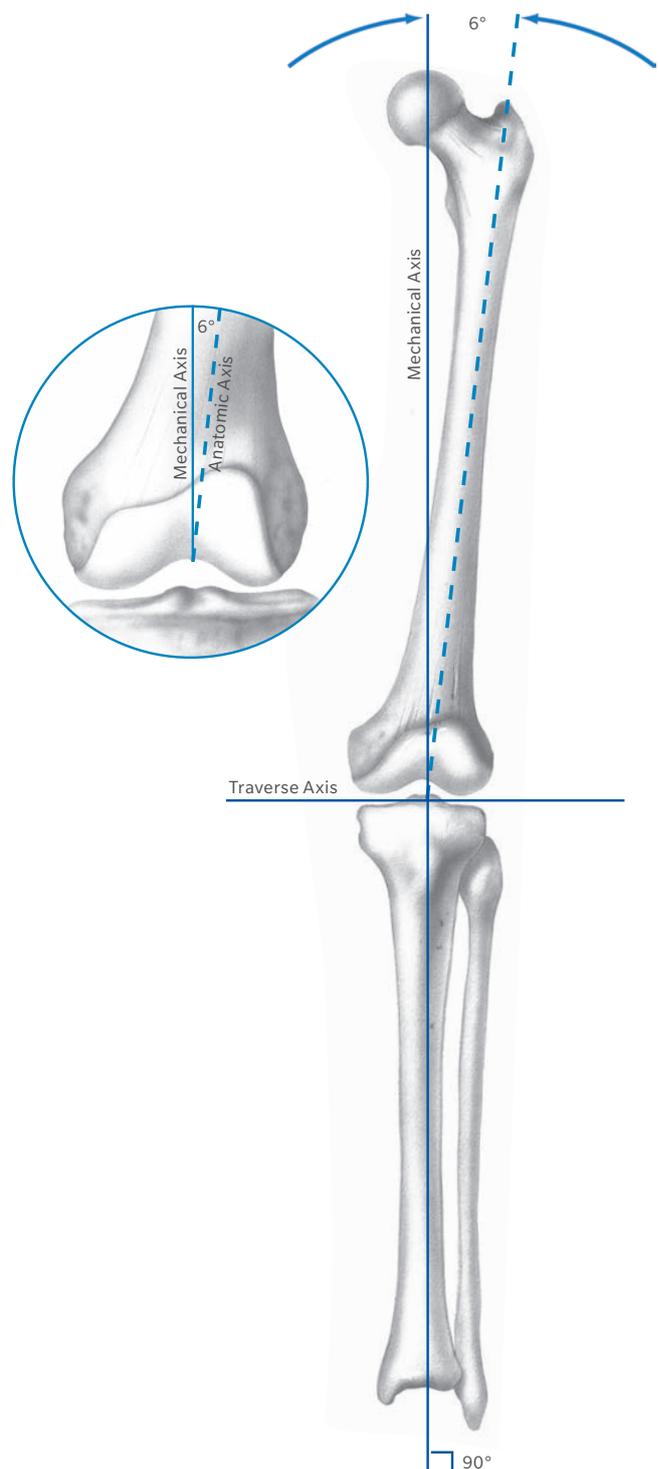
Successful total knee arthroplasty is directly dependent on reestablishment of normal lower extremity alignment, proper component design and orientation, secure component fixation, and adequate soft tissue stability. The Intramedullary Knee Instrument System was designed to easily accomplish these goals, combining optimal alignment accuracy with a simple, straightforward technique.

The center of the hip, knee, and ankle are restored to lie on a straight line, establishing a neutral mechanical axis. The femoral and tibial components are oriented perpendicular to this axis. Well-designed instruments allow accurate cuts to help ensure secure component fixation. Ample component sizes allow soft tissue balancing with appropriate soft tissue release.

In addition, implant flexibility offers the opportunity to switch from a cruciate retaining prosthesis to a posterior stabilized prosthesis quickly and easily.

## 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 ensures 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 Technique

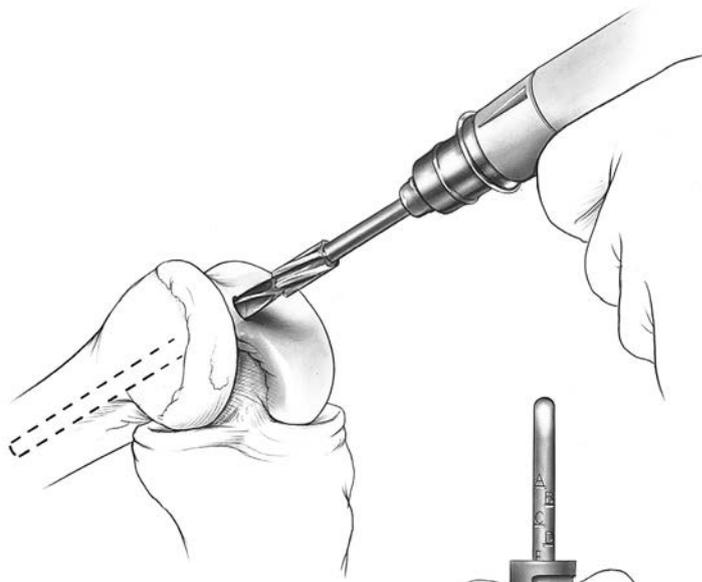


Figure 1

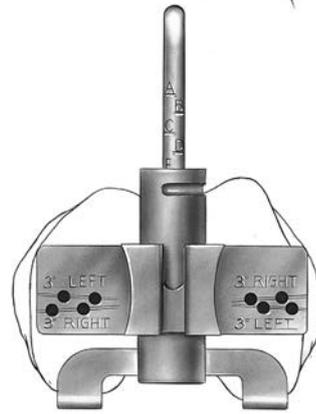


Figure 2

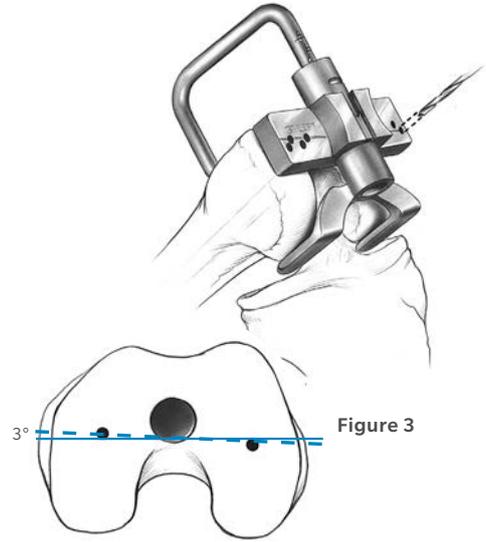


Figure 3

### Step One: Size the Femur/Establish External Rotation

Drill a hole in the center of the patellar sulcus of the distal femur (Figure 1), making sure that the hole is parallel to the shaft of the femur in both the anteroposterior and lateral projections. The hole should be approximately one centimeter anterior to the origin of the posterior cruciate ligament.

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

Insert the IM femoral A/P sizing guide into the hole until it contacts the distal femur. Compress the guide until the anterior boom contacts the anterior cortex of the femur, and both feet rest on the cartilage of the posterior condyles. Flexion or extension of the guide can produce inaccurate readings. Check to ensure that the boom is not seated on a high spot, or an unusually low spot on the anterior cortex.

Read the femoral size directly from the guide (Figure 2). If the indicator is between two sizes, choose the smaller size. The sizing can be confirmed in **STEP FIVE**, after the distal femoral cut has been made.

The IM femoral A/P sizing guide can also be used to aid in setting 3° of external rotation of the femoral component in relation to the **non-deformed** posterior condyles. Select and drill through the appropriate holes in the guide being sure that the proper “Right” or “Left” indication is used. Drill one hole on each side, medial and lateral. This will place two reference holes on the femur at 3° of external rotation (Figure 3). These holes will be used in conjunction with the IM alignment guide to set external rotation.

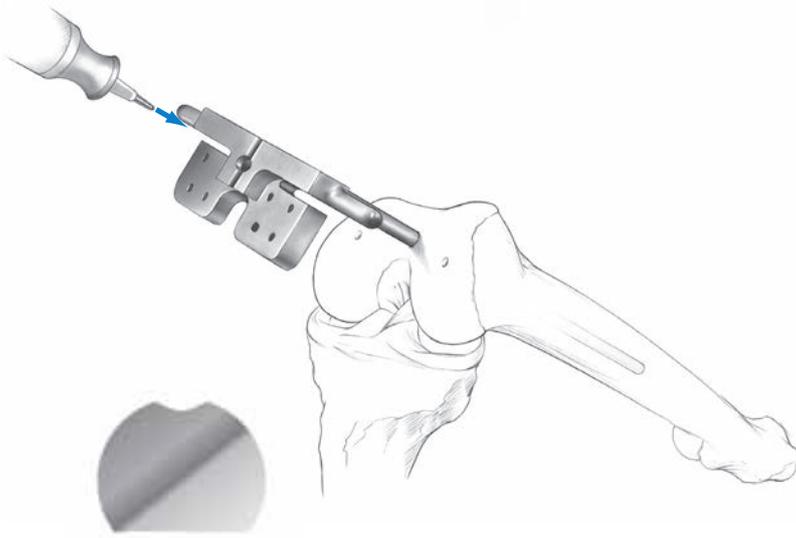


Figure 4

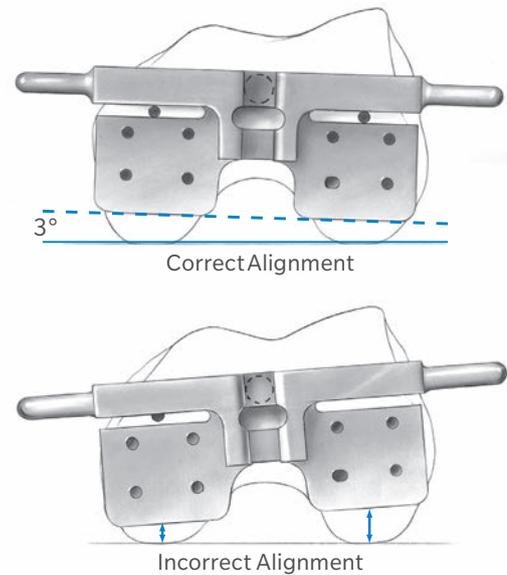


Figure 5

## Step Two: Establish Femoral Alignment

The IM alignment guide has two intramedullary rod lengths which can be used. The standard instrument has a rod which is 9 inches long and provides the most accurate reproduction of the anatomic axis. If the femoral anatomy has been altered, as in a femur with a long-stem hip prosthesis or with a femoral fracture malunion, then the optional IM alignment guide with a 4-inch rod should be used. If the 4-inch rod is used, the extramedullary alignment technique **MUST** be used. It is preferable to use the longest intramedullary rod to guarantee the most accurate replication of the anatomic axis.

Using the universal handle, insert the IM alignment guide into the femur (Figure 4). The rod is fluted and D-shaped to allow pressure to be released during the insertion. It is important to control rotation of the guide as it approaches the bearing of the medial femoral condyle.

To achieve 3° of femoral component external rotation, use the alignment holes made in Step One. Line the holes up with the alignment slots on the IM guide (Figure 5). If needed to guide insertion, place

1/8-inch pins through the alignment slot on the IM guide and into the alignment holes.

### Optional Technique

The external rotation can also be set by referencing the epicondyles while positioning the handles of the guide, or by using the posterior condyles and referencing the posterior aspect of the IM guide. A rotational alignment guide is available for easier referencing of the posterior condyles in large knees.

Once the proper external rotation is achieved, impact the IM guide until it seats on the most prominent condyle. Ensure that the guide is contacting at least one distal condyle. This will set the proper distal femoral resection.

If an extensive medial release is anticipated, it may be best to position the femoral component parallel to the posterior condyles with no external rotation.

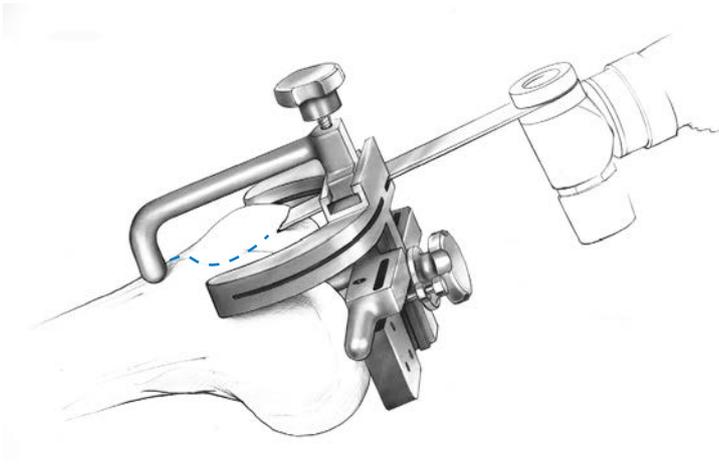


Figure 6

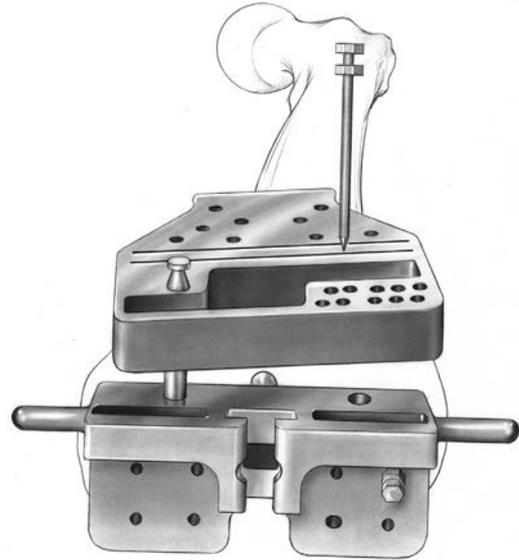


Figure 7

### Step Three: Cut the Anterior Femoral Condyles

Attach the anterior femoral cutting guide to the IM alignment guide. The boom of the guide should contact the anterior cortex of the distal femur just proximal to the anterior condyles. The boom should be placed in the same position as the AP sizing guide. With the boom touching this point, the cut will remove the anterior condyles flush with the anterior cortex of the femur. This should reduce the possibility of notching the anterior surface of the femoral cortex. Although this cut will be slightly modified with the femoral finishing guide, it must be accurate for placement of subsequent cutting guides and for measurement.

Knees vary somewhat in size and configuration. If, on inspection of the instrument positioning, it is felt that excessive resection or notching might occur, the position of the anterior femoral cutting guide can be modified slightly. Loosen the knob and raise the guide so that the tip of the boom is clear of the femoral cortex by 1 or 2 mm. Then re-tighten and reset as described above.

Use an oscillating saw [1.27 mm (.050") sawblade] to cut the anterior femoral cortex (Figure 6), and remove the anterior femoral cutting guide when the cut is complete. Leave the femoral IM alignment guide in the femur.

### Step Four: Cut the Distal Femur

Attach the distal femoral cutting guide to the IM alignment guide. Place the RIGHT or LEFT label up, depending on which knee joint is being replaced. Drop the pivot pin into the pivot hole in the IM alignment guide. Observe the numbers on the anterior surface of the guide and select the appropriate angle as determined by preoperative radiographs.

Insert a pin through the appropriate angle-setting hole in the cutting guide until it drops into the slot in the IM alignment guide (Figure 7). This locks the angle and prevents movement of the guide.

Place holding pins through two or three of the pin holes in the anterior surface of the distal femoral cutting guide to secure it further to the femur. Silver spring pins may also be used to secure the guide.

**Note:** If using spring pins, take care not to insert the pins in an area over the IM rod in the medullary canal.

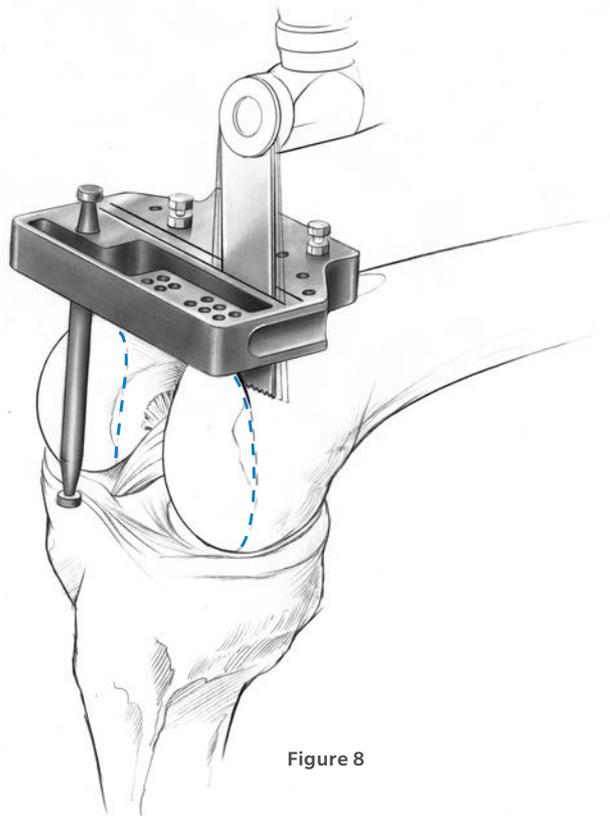


Figure 8

## Step Four: Cut the Distal Femur (cont.)

The IM alignment guide can either be removed or left in place. The advantage of removal is that one does not have to cut around the rod. If fixation is tenuous, the advantage of leaving the device in place is that additional stability will be provided by the rod and distal pins.

Remove the IM alignment guide with the slap-hammer extractor.

(For an optional extramedullary alignment technique see page 7).

Cut the distal femur through the distal slot labeled “standard cutting slot” in the cutting guide (Figure 8). This slot removes the same amount of bone that will be replaced by the femoral component. (The correct thickness of bone resection is determined in the previous step by having the IM alignment guide flush against the medial femoral condyle.) Cut both the medial and lateral condyles before removing the guide. A cut made through the “Optional” Cutting Slot will remove an additional 3.5 mm of bone. This slot can be used if a flexion contracture exists or if the surgeon needs to resect additional bone for other reasons.

Check the flatness of the distal femoral cut with a flat surface. One of the femoral finishing guides or the viewing template is useful for this. 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.

### Removing Additional Bone

In some complex cases, such as a knee with a significant flexion contracture or a hypoplastic lateral femoral condyle associated with a valgus deformity, it may be necessary to cut additional bone from the distal femur. The proximal cutting slot labeled “Optional 3.5 mm Cutting Slot” can be used to make this cut.

If there is any question as to how much bone to remove, the “Standard Cutting Slot” should be used initially and the cut repeated later if more bone removal is necessary. This situation might arise if, after provisional components have been inserted for trial reduction, it is found that the ligament tightness in extension is excessive after appropriate soft tissue release. This would be an indication for slightly more distal femoral resection (See page 28 of the Appendix for distal femoral recutting techniques).

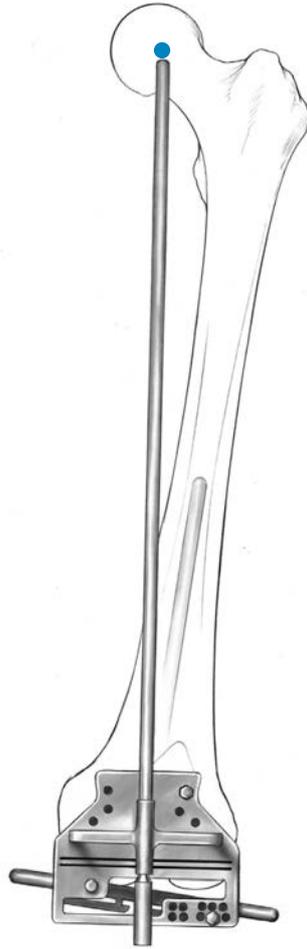


Figure 9

### Optional Technique

To use an extramedullary alignment system to orient the distal femoral cut, insert the extramedullary alignment arch onto the distal femoral cutting guide after it has been secured to the IM alignment guide with the pivot pin. Insert a rod through the apex of the arch and pass it proximally toward the hip (Figure 9). If the proximal tip of the rod points to the center of the femoral head, the distal femoral cutting guide is properly positioned to cut the distal femur exactly perpendicular to the mechanical axis. Pin the cutting guide to the femur and cut the bone.

This technique can be used to double check the intramedullary method and **MUST** be used if the 4-inch IM alignment guide is used.

If the use of extramedullary alignment is anticipated, it is best to identify the center of the femoral head before draping. This can be done by placing a palpable radiopaque marker (e.g. an EKG electrode) over the area where the femoral head is thought to be and then taking an A/P X-ray of the hip. The X-ray will show if the marker needs to be moved. This palpable appliance will then direct positioning of the rod during surgery.

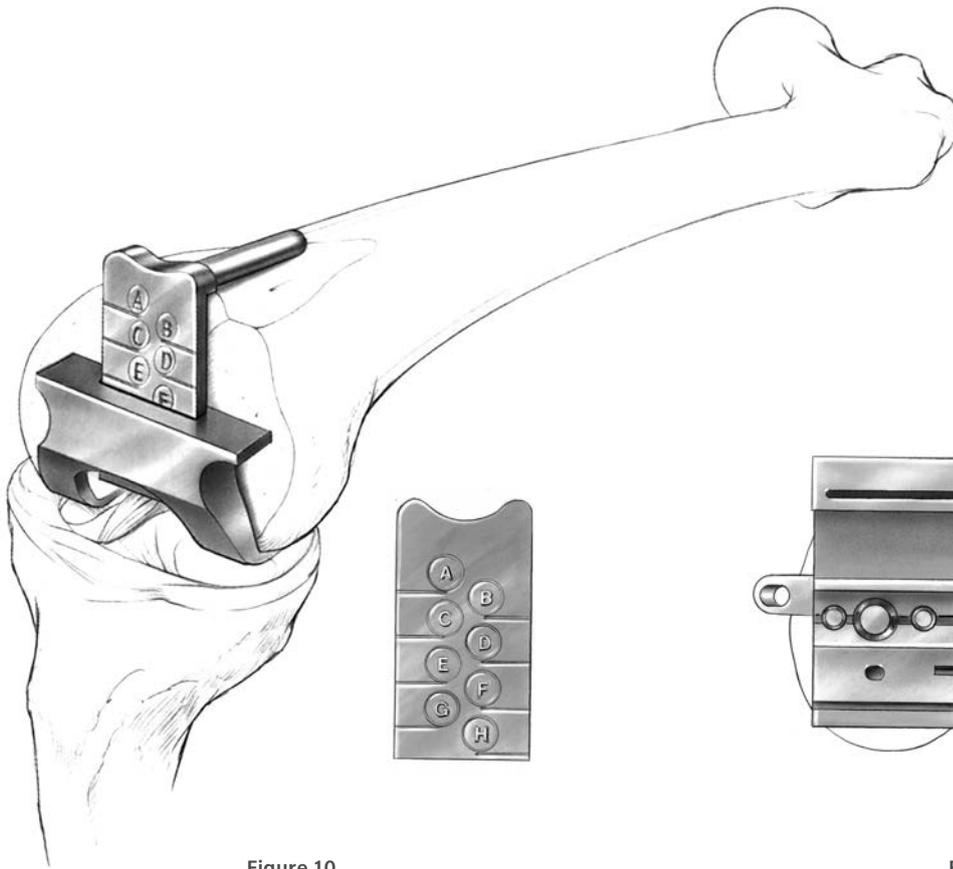


Figure 10

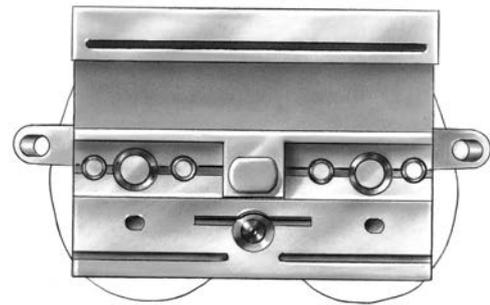


Figure 11

## Surgical Option

### Determine the A/P Dimension of the Distal Femur

To measure the A/P dimension of the distal femur, or check the measurement made with the IM femoral A/P sizing guide in STEP ONE, place the femoral A/P measuring guide flat onto the smoothly cut distal femur (Figure 10). The feet of the guide should rest on the cartilage of the posterior condyles. Hyperflexion of the knee assists in positioning the feet of the guide against the posterior condyles. In uncommon cases the proximal tibia may have to be resected first, before the guide can be properly positioned.

Lower the gauge and read the proper size on the indicator of the gauge. The gauge should rest on the anterior femoral surface. There are eight sizes labeled “A” through “H”. If the reading is between two sizes, choose the SMALLER size. This prevents excessive ligament tightness in flexion.

### Step Five: Finish the Femur

Select the correct size femoral finishing guide as determined by the measurement from the A/P measuring guide. Position the guide by setting the top ledge on the cut surface of the anterior femur. This determines the rotation of the instrument. It must be centered mediolaterally on the femur (Figure 11).

Drill the first hole through the guide and insert a femoral holding peg. Then drill the second hole and insert another femoral holding peg. Use the universal handle to impact these pegs completely. These holding pegs fix the femoral finishing guide in place and also determine the final mediolateral position of the femoral component.

ⓘ **Note:** After drilling the two femoral post holes, do not use femoral holding pegs in the size A and B femoral finishing guides. The pegs will not allow for clearance of the saw blade in these sizes. Use 1/8” pins and the silver spring pins for proper stability.

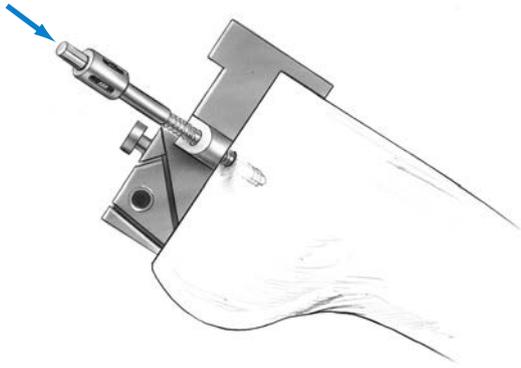


Figure 12

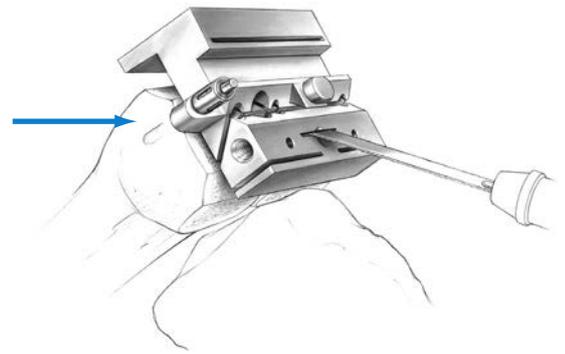


Figure 14

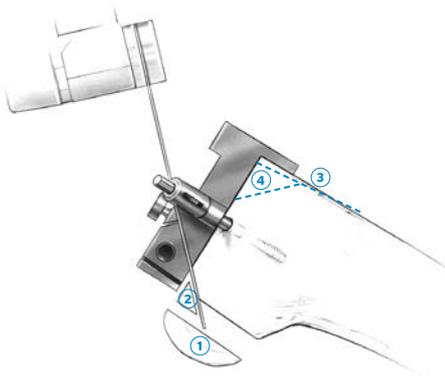
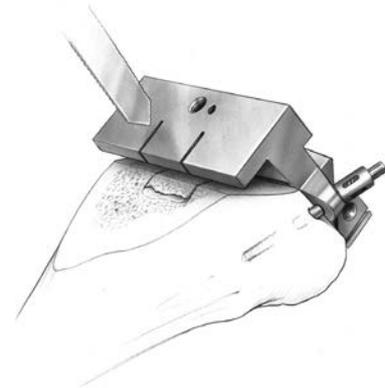


Figure 13

- 1 posterior condyles
- 2 posterior chamfers
- 3 anterior condyle
- 4 anterior chamfer
- 5 trochlear recess



## Step Five: Finish the Femur (cont.)

To further stabilize the guide, insert a silver spring pin through the tab on each side of the guide (Figure 12) using the female hex driver and drill reamer. The pins are designed to automatically disengage the pin driver when fully inserted on the guide.

### Optional Technique

If additional stability is desired or, if you do not want to commit to the location of the femoral peg holes at this point, the femoral finishing guide can be secured with up to four short-head pins through the front. Use the universal handle to impact these pins.

Perform the final femoral cuts in the following sequence (Figure 13) to allow the guide to maintain optimal stability during bone resection.

Use the center slot on the distal face of the guide to cut the base of the trochlear recess with a reciprocating saw (Figure 14). Ensure that the saw blade is in line with the femur throughout the cut, and do not angle or fan the blade medially or laterally.

Use the two slots on the anterior face of the guide to make reference marks by scoring the femur with a reciprocating sawblade to determine the sides of the trochlear recess (Figure 15). (See page 29 in the Appendix for femoral finishing techniques when crossing over to a PS design).

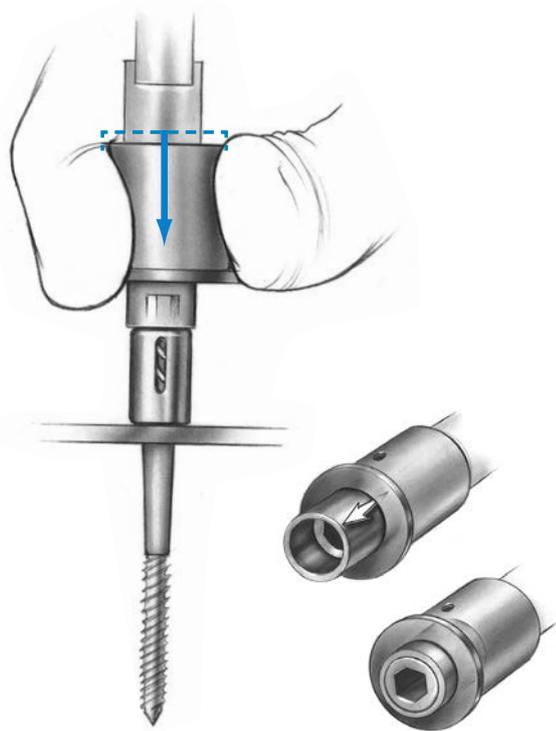


Figure 16

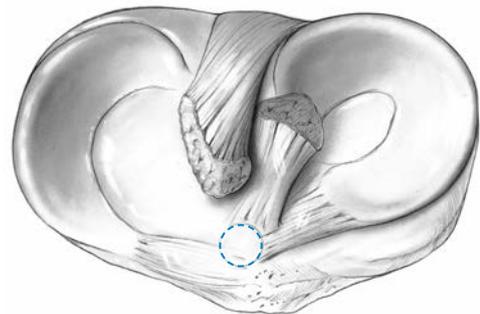


Figure 17

### Step Five: Finish the Femur (cont.)

When complete, use the female hex driver to remove the two silver spring pins.

Place the female hex driver over the spring pin and apply a downward force on the driver sleeve (Figure 16). Start the drill/reamer slowly until the driver hex engages the hex head of the pin. Continue until the spring pin disengages bone.

Use the slaphammer extractor to remove the femoral finishing guide, and use a reciprocating saw to complete the sides of the trochlear recess at the two reference marks. (See pages 28–29 in the Appendix for optional methods of cutting the trochlear recess.)

Check the cut surfaces for flatness.

### Step Six: Cut the Proximal Tibia

To improve the exposure of the tibial surface, lever the tibia anteriorly using the tibial retractor. This instrument should be carefully positioned hugging the posterior cortex of the tibia sub-periosteally to prevent neurovascular injury. Another tibial retractor can be used to retract the patella laterally.

#### Using the IM Tibial Resector

A preoperative radiograph of the tibia is necessary to make sure that the tibial shaft is straight and will accept the 8 mm intramedullary rod. Some tibias are crooked or have too small a canal and will not accept the rod. The acetate template used for femoral planning can be inverted and used on the tibia.

Use the universal handle to start a hole in the proximal tibia just anterior to the anterior cruciate ligament insertion and centered mediolaterally (Figure 17). This may seem too far anterior; however, it is the straight proximal extension of the tibial medullary canal. If a hole is started further posteriorly, excessive posterior slope may be cut into the proximal tibia.

Drill a hole using the 8 mm IM drill. Suction the canal to remove medullary contents.



Figure 18



Figure 19

### Step Six: Cut the Proximal Tibia (cont.)

Slowly insert the rod of the IM tibial resector up to the shoulder of the larger portion of the rod. The flutes on the rod will allow decompression of the canal during insertion. Attach the cutting platform to the rod and adjust the platform so that it contacts the anterior tibia (Figure 18). Rotate the platform so that it is on the front of the tibia.

Use the extramedullary alignment rod to make sure the cutting platform is perpendicular to the mechanical axis of the tibia. Place the rod through the anterior slotted extension of the guide and extend it to the center of the ankle. The center of the talus (the true center of the ankle) is, surprisingly, about 5–10 mm medial to the midpoint between the subcutaneous palpable medial and lateral malleoli. Another accurate landmark is the subcutaneous tibial crest about 3 inches above the ankle joint. This usually corresponds with the true center of the ankle. This step is important because

some tibias have a curve in the shaft. If necessary, adjust the angle of the cutting platform to position it perpendicular to the mechanical tibial axis (Figure 19).

Slide the cutting platform posteriorly until it contacts the anterior tibia. Tighten the thumb screw to lock it into position.

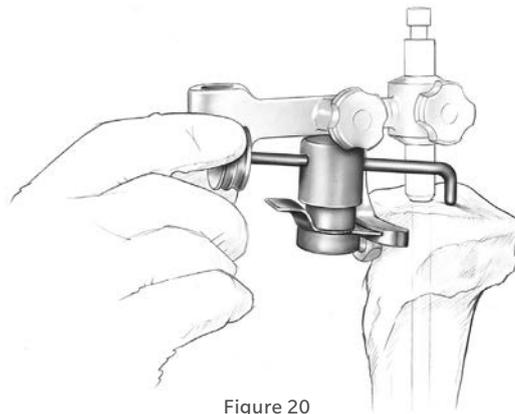


Figure 20

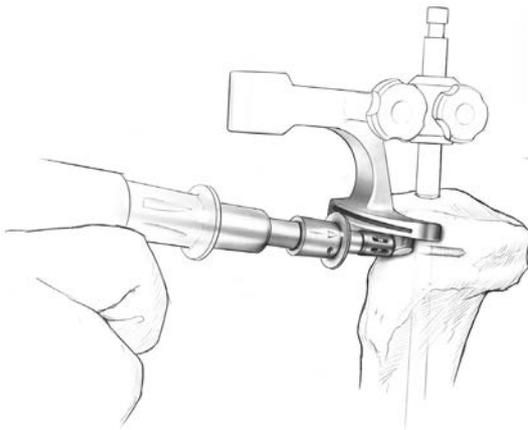


Figure 21

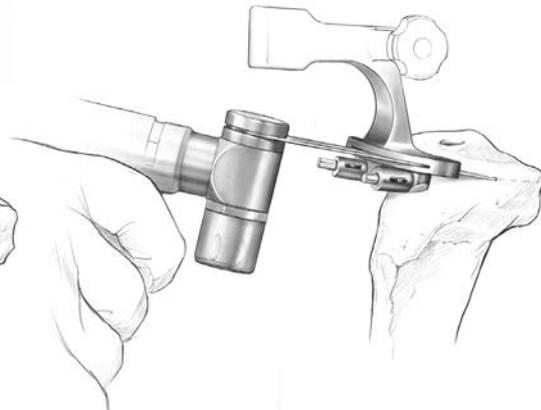


Figure 22

## Step Six: Cut the Proximal Tibia (cont.)

Adjust the height of the cutting platform for the desired depth of cut. A tibial depth resection gauge is available to help determine the position of the cutting platform (Figure 20). This gauge has two tabs. One tab is located at 2 mm and is used to check the depth from the defective tibial condyle for a minimal cut. The other tab is located at 10 mm and can be used to check the depth from the good tibial condyle for an anatomic cut.

Place the 2 mm tab into the cutting slot. The arm of the gauge should rest in the deepest part of the defective condyle. Be sure the mark on the arm of the gauge is lined up with the mark on the base of the gauge. This ensures that the arm is properly rotated within the base. This positions the cutting slot to remove 2 mm of bone below the tip of the gauge.

Place the 1 mm tab into the cutting slot, and adjust the platform until the arm of the gauge rests on the cartilage of the good condyle. This will allow the removal of the same amount of bone that the thinnest tibial component would replace.

These two points of resection will not frequently coincide. The surgeon must decide between an anatomic and a minimal resection based on patient age, bone quality, and the type of prosthetic fixation planned.

Before pinning the cutting platform to the bone, check the location of the cut on the posterior tibia by placing the tibial resection guide through the cutting slot.

Then secure the cutting platform to the tibia with two silver spring pins (Figure 21). With the platform properly positioned and pinned to the tibia, loosen the knobs fixing the guide to the IM rod and remove the IM rod with the slaphammer extractor. Make the proximal tibia cut using the slot in the guide (Figure 22).

Remove the spring pins and guide.

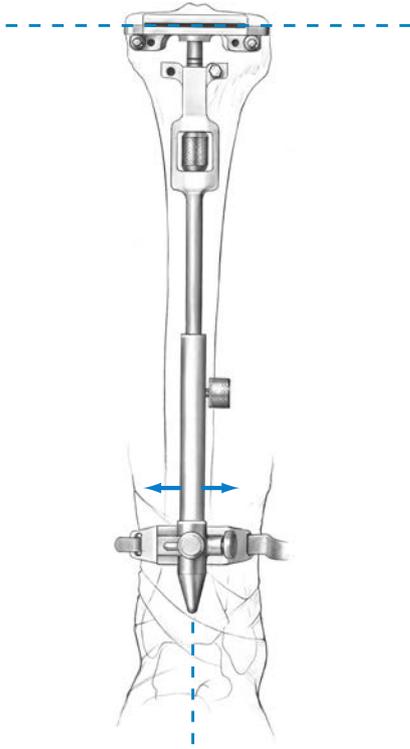


Figure 23

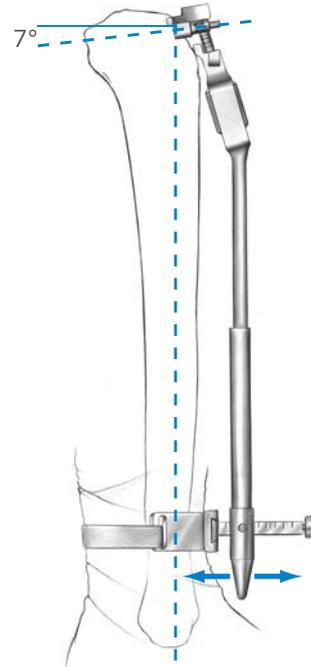


Figure 24

### Using the Extramedullary Tibial Cutting Guide

The extramedullary tibial cutting guide allows for variability in the thickness of tibial resection after the alignment of the guide has been secured. This facilitates the handling of bone defects in the proximal tibia. Initially set the cutting platform in the middle of its range of travel so it can be adjusted up or down.

Determine the center of the ankle and place the foot of the extramedullary tibial cutting guide over the distal tibia pointing to the center of the ankle (Figure 23). The center of the talus (the true center of the ankle) is, surprisingly, about 5–10 mm medial to the midpoint between the subcutaneous palpable medial and lateral malleoli. Another accurate landmark is the sub-cutaneous tibial crest about 3 inches above the ankle joint. This usually corresponds with the true center of the ankle.

Adjust the slide at the foot of the guide so that the body of the guide is parallel with the anterior tibial shaft (Figure 24). If there is a bulky bandage around the ankle, adjust the slide to accommodate the bandage. This will ensure that the tibia will be cut at a 7-degree posterior slope.

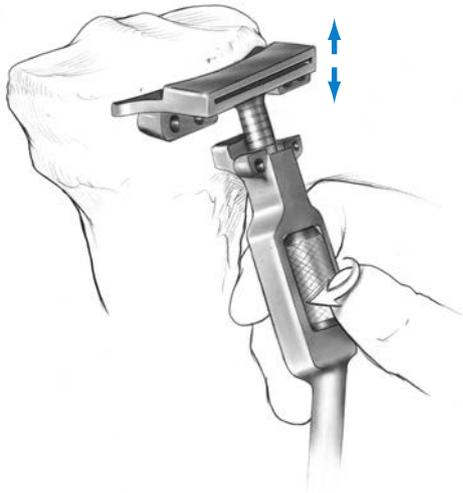


Figure 25

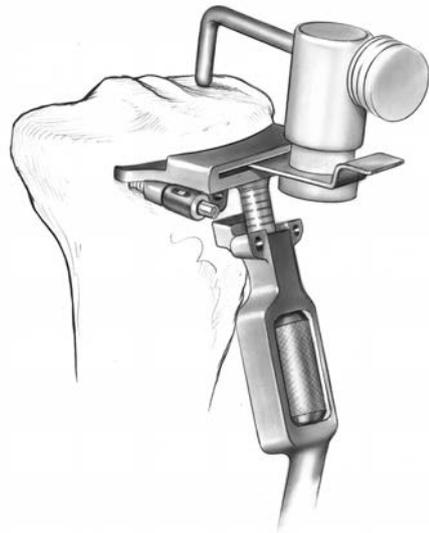


Figure 26

## Step Six: Cut the Proximal Tibia (cont.)

Position the guide at the proximal tibia so it is proximal to the tibial tubercle beneath the infrapatellar ligament. Center the guide over the proximal tibia in the mediolateral direction so it parallels the mechanical axis of the tibia. The longitudinal axis of the guide will usually lie just medial to the mid-point of the tibial tubercle and be centered over the intercondylar eminence.

Hold the guide in position and pin it to the proximal tibia with one pin on the lateral side. Fine tune all the distal guide positions. Then, insert a second pin in the proximal portion to secure the guide.

Adjust the cutting platform proximal or distal to the desired level of tibial resection (Figure 25). It is helpful to position the cutting platform in the mid-position prior to using the guide so that, after the guide is fixed to the tibia, the cutting platform can move proximally or distally.

A tibial depth resection gauge is available to help determine the position of the cutting platform (Figure 26). This gauge has two tabs. One tab is located at 2 mm and is used to check the depth from the defective tibial condyle for a minimal cut. The other tab is located at 10 mm and can be used to check the depth from the good tibial condyle for an anatomic cut.

Place the 2 mm tab into the cutting slot. The arm of the gauge should rest in the deepest part of the defective condyle. Be sure the mark on the arm of the gauge is lined up with the mark on the base of the gauge. This ensures that the arm is properly rotated within the base. This positions the cutting slot to remove 2 mm of bone below the tip of the gauge.

Place the 10 mm tab into the cutting slot, and adjust the platform until the arm of the gauge rests on the cartilage of the good condyle. This will allow the removal of the same amount of bone that the thinnest tibial component would replace.

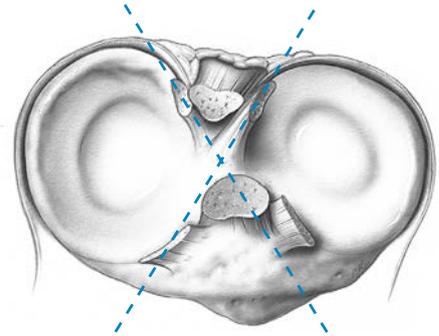
These two points of resection will not frequently coincide. The surgeon must decide between an anatomic and a minimal resection based on patient age, bone quality, and the type of prosthetic fixation planned.



Figure 27



Figure 28



Reciprocating Saw Cuts

Figure 29

## Step Six: Cut the Proximal Tibia (cont.)

Before pinning the cutting platform to the bone, check the location of the cut on the posterior tibia by placing the tibial resection guide through the cutting slot (Figure 27).

Secure the cutting platform by inserting two 1/8" fixation pins or two silver spring pins. The posterior surface of the guide should parallel the anterior surface of the tibia. The cutting platform is designed so the tibial cut can be made either on top of the guide or through the slot in the guide. Both of these cutting surfaces are sloped posteriorly 7 degrees to the mechanical axis and only the height of resection varies. If the tibial depth resection gauge was used to determine the amount of resection, the slot should be used to make the cut. Use a 1.27 mm (.050") oscillating sawblade to cut the upper surface of the tibia flat (Figure 28). Remove the extramedullary tibial cutting guide when the tibial preparation is complete.

If the first cut of the proximal tibia is not deep enough, lower the cutting platform to the desired level. Secure the telescoping portion of the guide using different pin holes on the cutting platform and recut the tibia. Calibrations on the telescoping portion of the guide are 2 mm apart.

### Optional Technique

The 2 mm recutter can be used or if varus/valgus correction is required, the 2° varus/valgus recutter is available. Both recutters reference the existing cut and are secured to the bone with 1/8" pins.

The posterior cruciate ligament insertion onto the tibia will usually be compromised by a flat cut and the surgeon may decide to leave an island of bone to preserve the PCL insertion. This may be more easily done using a reciprocating saw to outline the island after cutting the two condyles with a reciprocating saw (Figure 29).

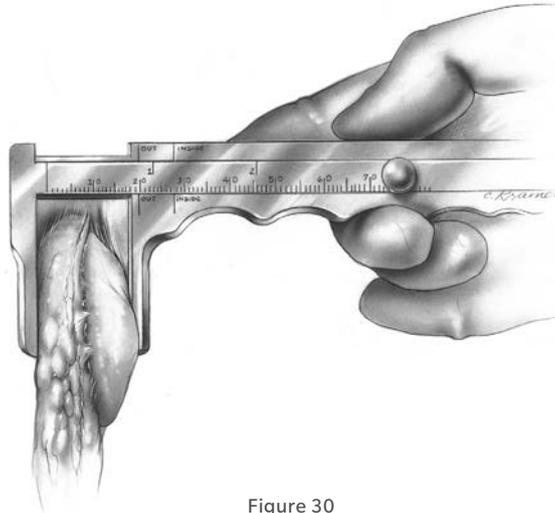


Figure 30

### Step Seven: Prepare the Patella

Sharply dissect through the pre-patellar bursa to expose the anterior surface of the patella. This will provide exposure for affixing the anterior surface into the patella clamp and assures accurate bone resection.

Remove all osteophytes and synovial insertions from around the patella. Be careful not to damage tendon insertions onto the bone. Use the caliper to measure the thickness of the patella (Figure 30). Subtract the implant thickness from the patella thickness to determine the amount of bone that should remain after resection.

#### 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

\*\* 26 mm, 29 mm and 32 mm patellas not for use with size G and H femoral components, unless used in an inset mode.

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

	Trabecular Metal			
	NexGen		Standard	
32 mm*	19.5 mm	32 mm	19 mm	
32 mm*	22.5 mm	32 mm	22 mm	
35 mm**	20 mm	35 mm	19 mm	
35 mm**	23 mm	35 mm	22 mm	

\*NexGen Poly Thickness 10.5 mm

\*\*NexGen Poly Thickness 11.0 mm

CKS poly thickness 10 mm

The CKS continuum augmentation patella is not recommended for use with NexGen Knee System

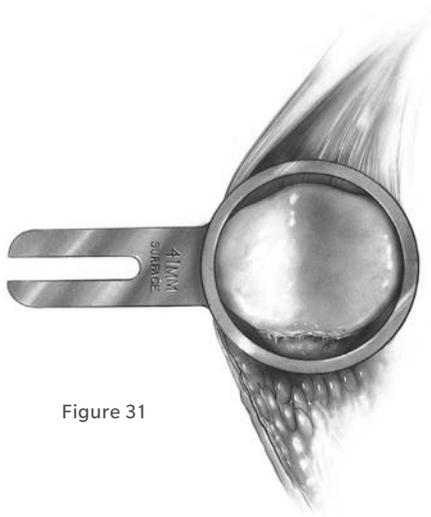


Figure 31

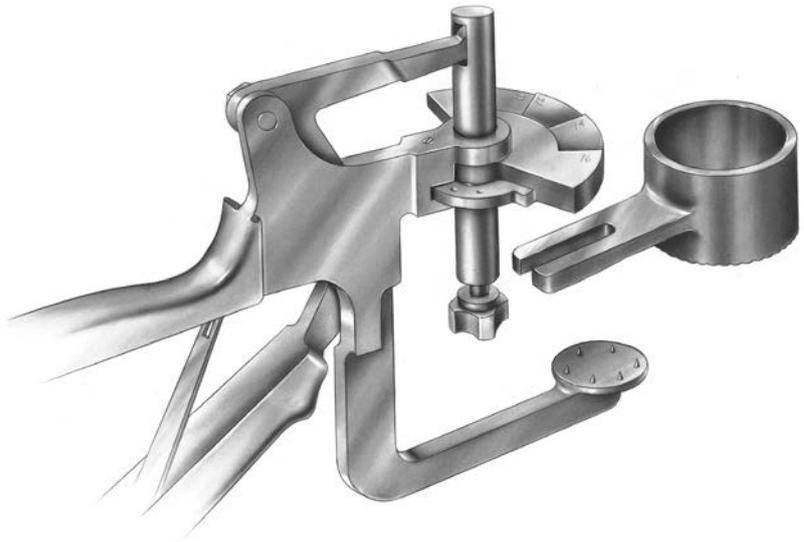


Figure 32

## Patella Reamer Technique

### **Total Surfacing Procedure**

Use the patella 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 31). If the patella is only slightly larger than the total 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 patella reamer surfacing guide into the patella reamer clamp (Figure 32). Turn the locking screw until tight.

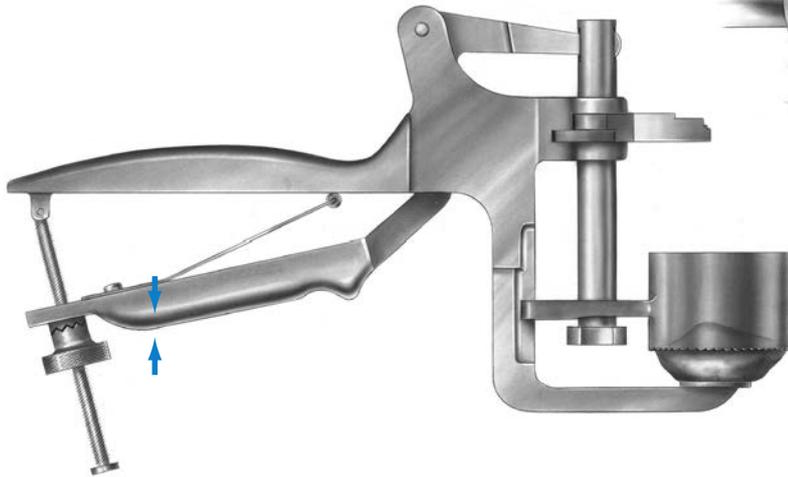


Figure 33

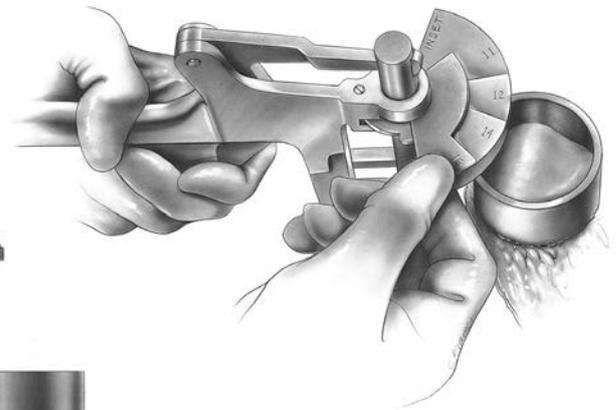


Figure 34

## Patella Reamer Technique (cont.)

### Total Surfacing Procedure (cont.)

Apply the patella reamer clamp at a 90° angle to the longitudinal axis with the patella reamer surfacing guide encompassing the articulating surface of the patella. Squeeze the clamp until the anterior surface of the patella is fully seated against the fixation plate (Figure 33). Turn the clamp screw to hold the instrument in place. The anterior surface must fully seat upon the pins and achieve parallel contact with the fixation plate.

Turn the clamp wing to the proper indication for the correct amount of bone that is to remain after reaming (Figure 34).

Attach the appropriate size patella reamer blade to the appropriate size patella reamer shaft. Use only moderate hand pressure to tighten the blade. Do not overtighten the blade.

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

Insert the patella reamer shaft into a drill/reamer. Insert the reamer assembly into the patella 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. Continue reaming with moderate pressure until the step on the reamer shaft bottoms out on the clamp wing. Remove the reamer clamp assembly.

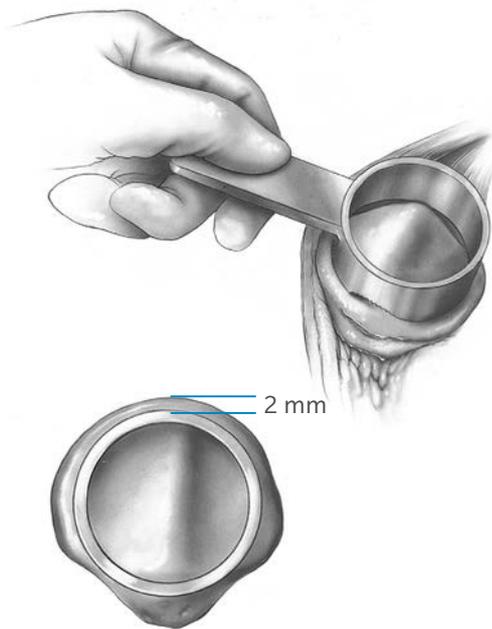


Figure 35



Figure 36

## Patella Reamer Technique (cont.)

### Insetting Procedure

Use the patella 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 35). Insert the reamer assembly into the patella 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. Continue reaming with moderate pressure until the step on the reamer shaft bottoms out on the clamp wing. Remove the reamer clamp assembly.

Insert the appropriate size patella reamer inseting guide into the patella reamer clamp. Turn the locking screw until tight.

Apply the patella reamer clamp at a 90° angle to the longitudinal axis with the patella reamer inseting guide on the articulating surface. 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 upon the pins and achieve parallel contact with the fixation plate.

Turn the clamp wing to the “inset” position.

Attach the appropriate size patella reamer blade to the appropriate size patella reamer shaft. Use only moderate hand pressure to tighten the blade. Do not overtighten the blade (Figure 36).

Use the patella reamer depth stops to control the amount of bone to be removed based on the thickness of the implant chosen. The depth gauge wing can be used instead of the stops to control the amount of bone remaining, rather than the amount of bone removed. The procedure is then the same as that described under total surfacing.

Insert the reamer assembly into the patella 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. Continue reaming with moderate pressure. Remove the reamer clamp assembly.

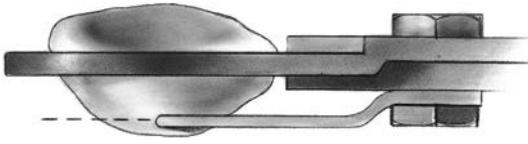


Figure 37

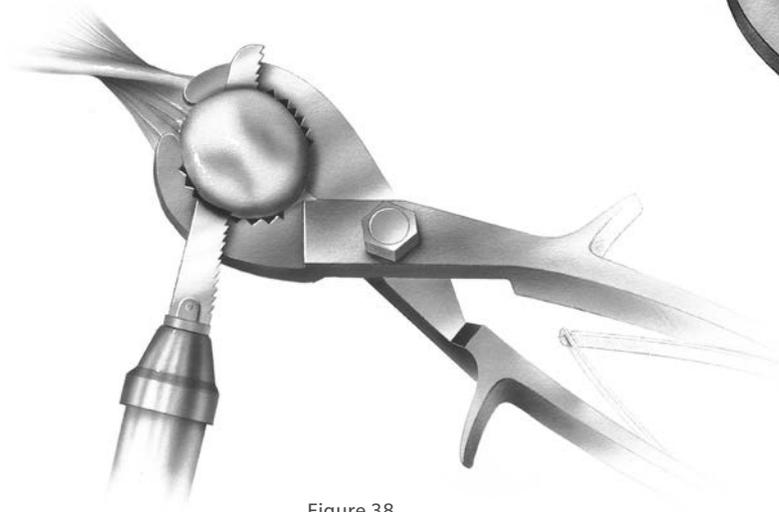


Figure 38



Figure 39

### 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 thumb screw 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 ten millimeter 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 ten millimeters of bone stock will remain after the cut (Figure 37).

Cut the patella flat so that a smooth surface remains (Figure 38).

### Finish the 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 39).

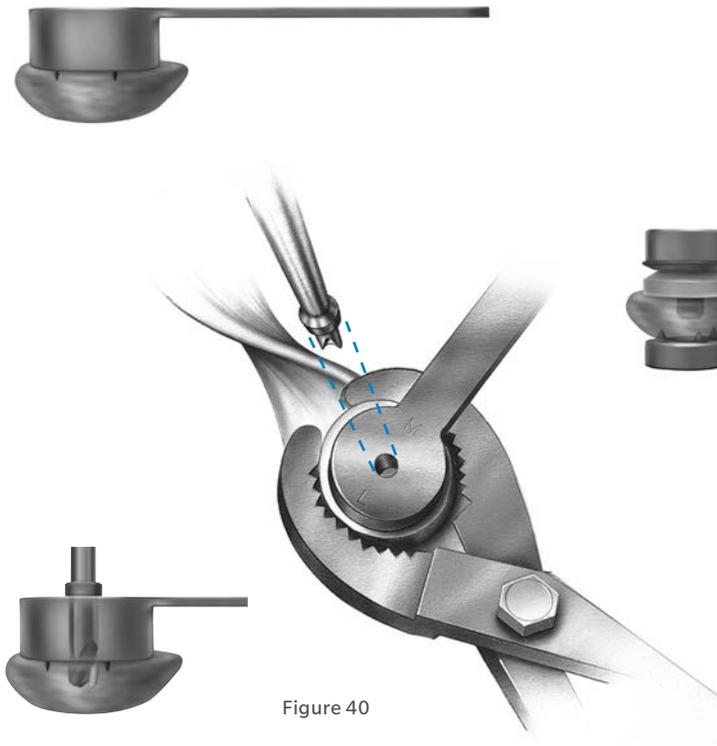


Figure 40

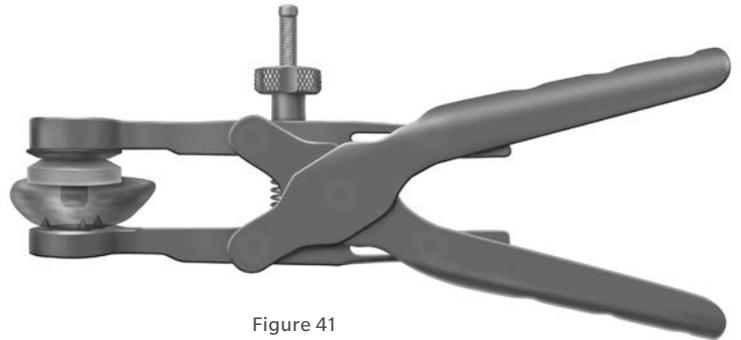


Figure 41

### Finish the Patella (cont.)

#### **NexGen Primary Porous Patella with Trabecular Metal™**

Center the appropriate patella 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 41). Drill the peg hole making sure the drill stop collar contacts the top of the drill guide (Figure 40).

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

Apply cement to the Trabecular Metal 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 41). 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.

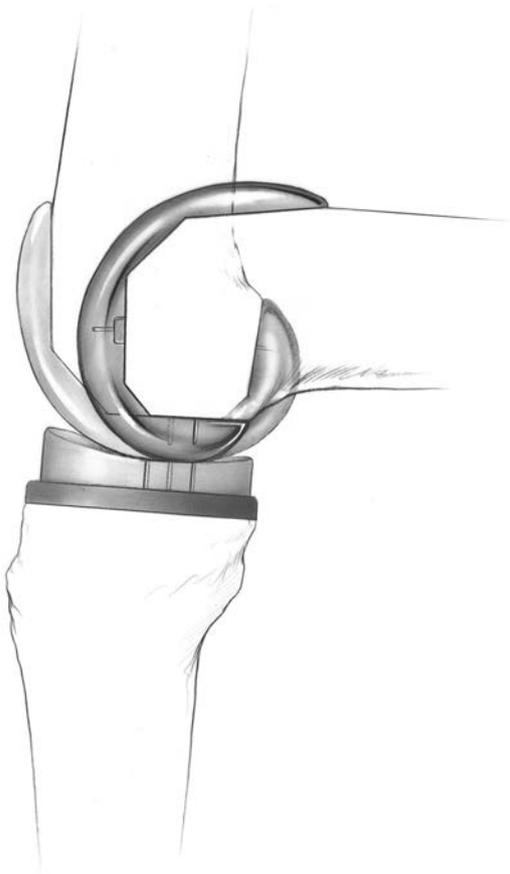


Figure 42



Figure 43

## Step Eight: Perform A Trial Reduction

### Universal Saw Guide Technique

Select the appropriate pegged or stemmed tibial sizing plate provisional that provides the desired tibial coverage. Insert the correct size tibial provisional base plate. At least one of the colors listed on the femoral trial must match at least one color on the sizing plate to ensure that the components in combination with the bearing will be kinematically matched. The colors must match exactly. For example, Yellow=Yellow. The striped colors are not the same as the standard colors (Yellow Striped Yellow) and should not be viewed as a match. If there is no match between the femoral provisional and sizing plate, adjust the size of the sizing plate being used to yield a match.

Insert the femoral and patellar provisional components.

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 42).

- 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 articular 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 43). Then remove the provisional components. The femoral extractor can be used to remove the femoral provisional.

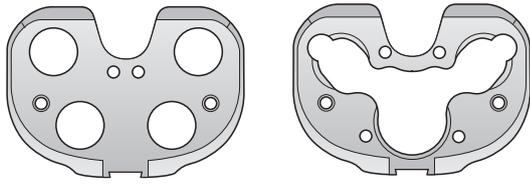


Figure 44

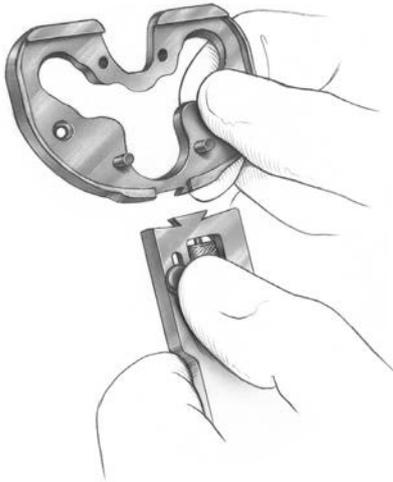


Figure 45

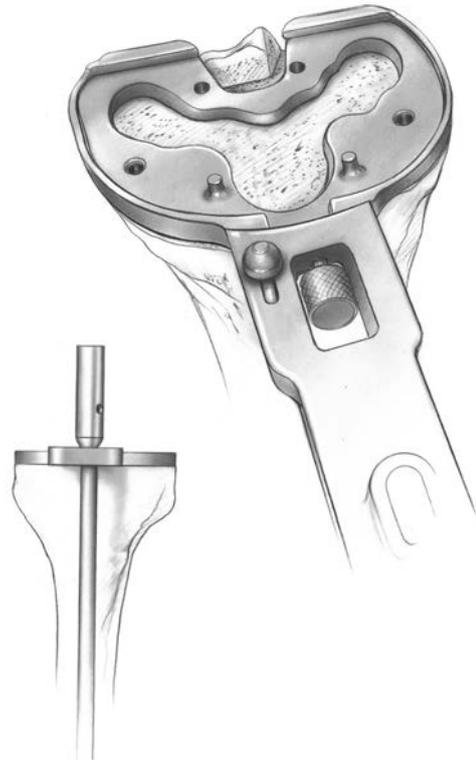


Figure 46

## Surgical Option

### **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 proper style of tibial sizing plate provisional (for either stemmed or pegged tibias) and the plate size that provides the desired tibial coverage (Figure 44).

The selected color code designation on the tibial sizing plate should be compared to the color code designations on the anterior flange of the selected femoral provisional. At least one of the colors listed on the femoral trial must match at least one color on the sizing plate to ensure that the components in combination with the bearing will be kinematically matched. The colors must match exactly. For example, Yellow = Yellow. The striped colors are not the same as the standard colors (Yellow Striped Yellow) and should not be viewed as a match. If there is no match between the femoral provisional and sizing plate, adjust the size of the sizing plate being used to yield a match.

Attach the modular handle to the selected sizing plate by depressing the button on the handle and engaging the dovetail on the handle with the dovetail on the sizing plate and secure by tightening the thumb screw (Figure 45).

Generally, the handle aligns with the anterior aspect of the tibia. Rotate the sizing plate so the handle points at, or slightly medial to, the tibial tubercle (Figure 46). 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.

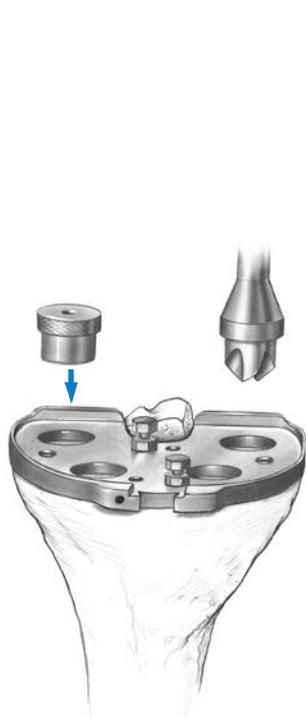


Figure 47

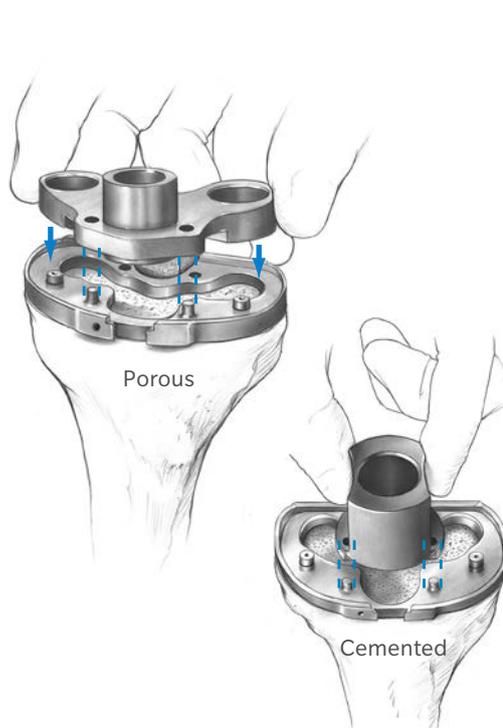


Figure 48

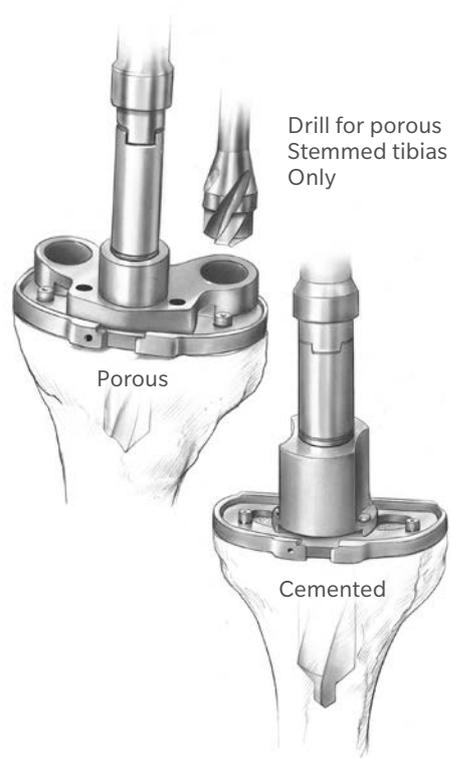


Figure 49

## Step Nine: Finish the Tibia

### Tibial Plate Preparation for Pegged Tibial Component

Pin the appropriate pegged tibial sizing plate to the bone in line with the mark made earlier. Ensure that the sizing plate remains in the proper position when pinning. Drill the four peg holes with the tibial peg drill. After drilling each hole, place a holding peg in each (Figure 47).

### Tibial Plate Preparation for Stemmed Tibial Component

Pin the stemmed tibial sizing plate to the bone in line with the mark made earlier. Place the appropriate size porous or cemented stem tibial drill guide on the sizing plate and drill for the stem with the porous or cemented stem tibial drill (Figure 48). Drill until the engraved line on the drill is in line with the top of the drill sleeve (Figure 49). If one is using a porous stemmed tibial plate, drill for the posterior pegs with the tibial peg drill. Remove the drill and drill guide.

- ⓘ **Note:** When cementing the stemmed tibia, (precoat or porous), you must use the cemented stem tibial drill guide and cemented stem tibial drill to allow for optimal cement fixation.

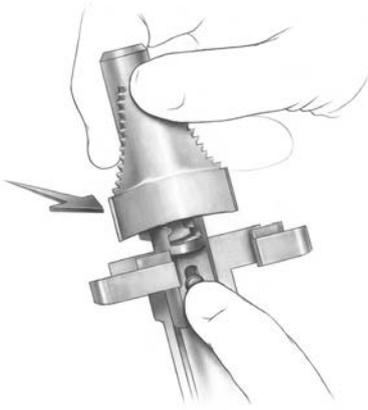


Figure 50

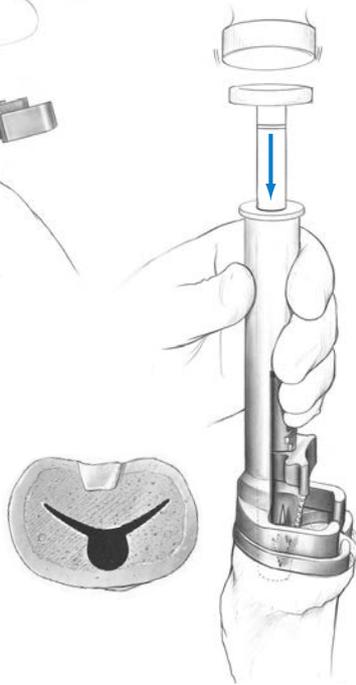


Figure 51



Figure 52

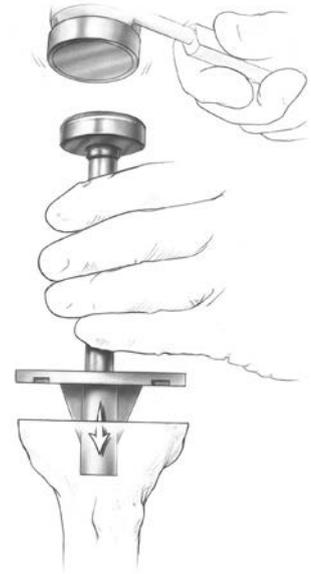


Figure 53

### Step Nine: Finish the Tibia (cont.)

Assemble the proper sized broach to the broach impactor (Figure 50). **The broach can only be assembled from the front.** Seat the impactor on the sizing plate and impact the broach to the proper depth indicated by the etched groove on the shaft aligning with the impactor handle. The broach has a built-in stop so it cannot be overimpacted (Figure 51).

Remove the broach impactor assembly and sizing plate. Use the correct size trial tibia to ensure proper fit before implanting the final components. Assemble the impactor onto the trial tibial provisional until completely seated. Impact the stemmed tibial provisional (Figures 52 and 53).

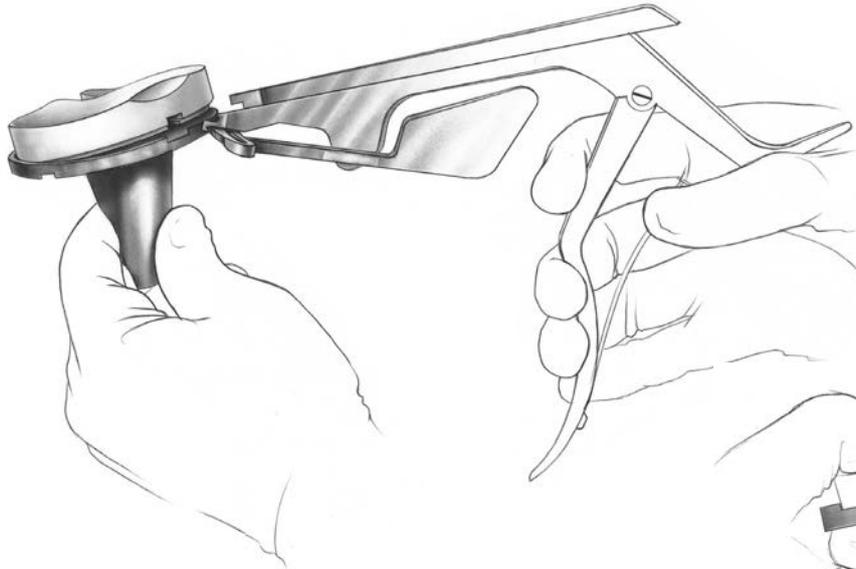


Figure 54

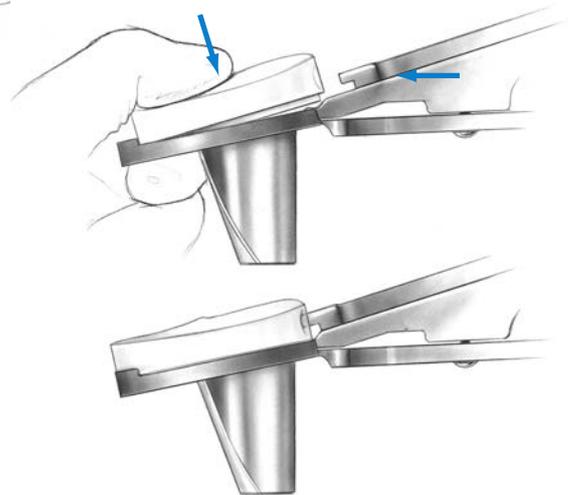


Figure 55

## Component Implantation

After the implants have been chosen, make one last check to ensure that the femoral, tibial and bearing components match. There are colored squares on each box. There should be a three-of-a-kind color match. If there is, the components are matched.

## Bearing Insertion

The bearing inserter applies both downward and rearward forces to aid in the insertion of the bearing onto the tibial tray. Push the lever on the inserter fully to either side. Place the bearing onto the implant tray, engaging the dovetails (Figure 54). Steady the surface on the tray with one hand by applying downward pressure near the posterior cruciate cutout. Engage the hook on the insertion tool with the mating slot in the front of the plate and close the cam arm with your index finger. This should lock the insertion tool to the tray.

Squeeze the handles of the insertion tool to seat the bearing (Figure 55). Open the cam arm and remove the insertion tool. **Only insert an bearing once. Never reinsert the same bearing onto a tibial tray.**

## Appendix

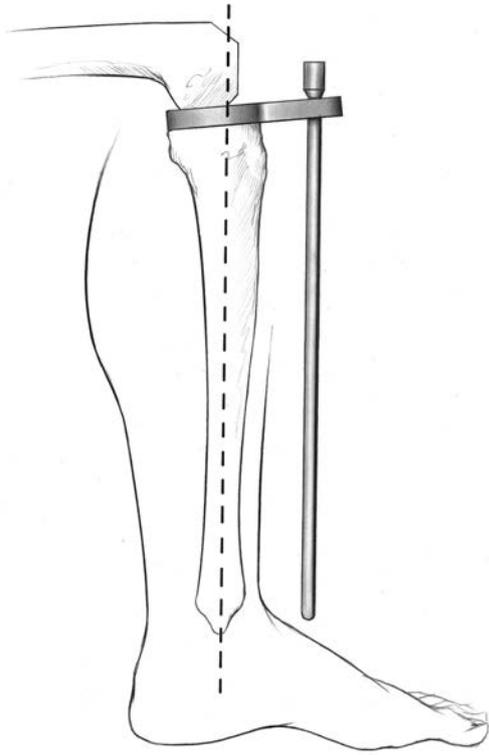


Figure 56



Figure 57

## Optional Techniques

### Check Flexion/Extension Gaps

Check the thickness and alignment of the femoral cuts in both flexion and extension. With the knee flexed, insert the thinnest spacer/alignment guide between the resected surfaces of the femur and tibia. Insert progressively thicker spacer/alignment guides until the proper soft tissue tension is obtained. Center the arm of the guide over the tibial tubercle and insert the alignment rod with coupler through the hole in the arm. The rod should be parallel to the anatomic axis of the tibia (Figure 56), and the distal end of the rod should be near the center of the ankle, but slightly closer to the medial malleolus.

Remove the spacer/alignment guide and extend the knee. Reinsert the spacer/alignment guide and the alignment rod with coupler. With the knee fully extended and the foot dorsiflexed, the distal end of the rod should be slightly closer to the medial malleolus. Attach the alignment rod extension to the coupler. The proximal end of the rod should be inside the anterior superior iliac spine about three finger breathes (Figure 57).

If the spacing is not correct in both flexion and extension, additional bone removal or soft tissue releases will be necessary.

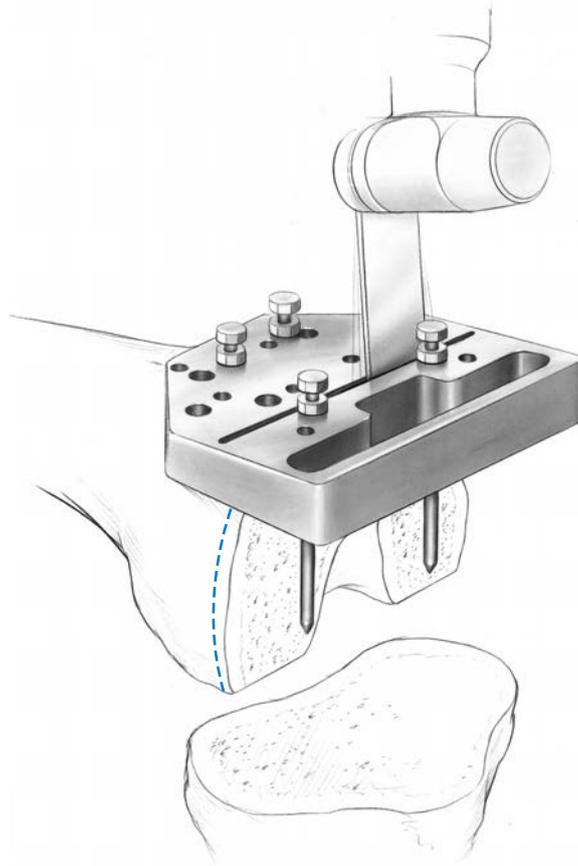


Figure 58

### Recutting the Distal Femur

The distal femoral recutting guide provides quick, reproducible results to recut 3 or 5 mm of bone.

Lay the guide on the anterior cut surface of the femur with the engraving facing up. Place pins through the appropriate holes for the amount of additional resection desired (3 or 5 mm) and slide the guide proximal so the pins contact the existing distal cut surface. Pin the recutting guide in place with standard or silver spring pins and recut through the slot (Figure 58).

#### Optional Technique

Reinsertion of the IM alignment guide coupled with the distal femoral cutting guide makes this resection simple, accurate, and adjustable for the removal of the amount of bone necessary for appropriate ligament tension. When reinserting the IM alignment guide and the distal femoral cutting guide, be sure they reference the same point as

the first cut. If the IM alignment guide touches the distal femur, an erroneous additional 12 mm could be removed using the optional slot. Reestablish the original reference point by re-inserting a saw blade through the standard slot and touching the blade against the cut distal surface. Pin the guide in place and make the cut through the “optional 3.5 mm cutting slot” leaving the IM alignment guide in place.

After recutting the distal femur, reinsert the correct size of femoral finishing guide coupled with the femoral holding pegs and repeat the chamfer and condyle cuts. The guide can be placed in the proper ap position by inserting a 1.27 mm (.050”) sawblade through the anterior slot and resting the blade on the existing anterior cut surface. This will position the guide in the same A/P location as the original cuts.

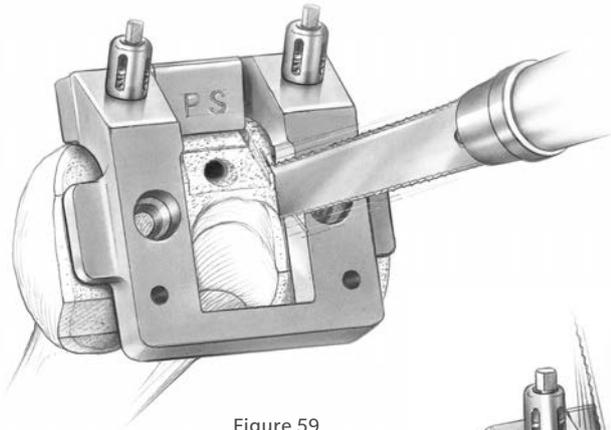


Figure 59

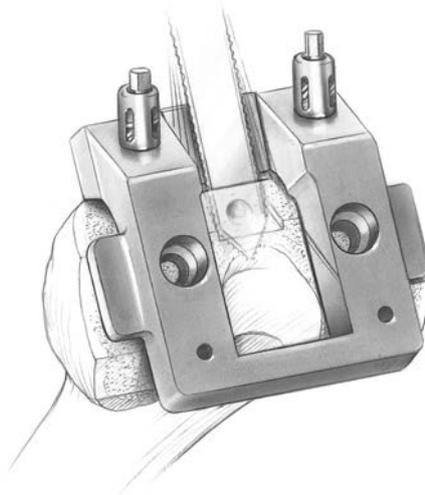


Figure 60

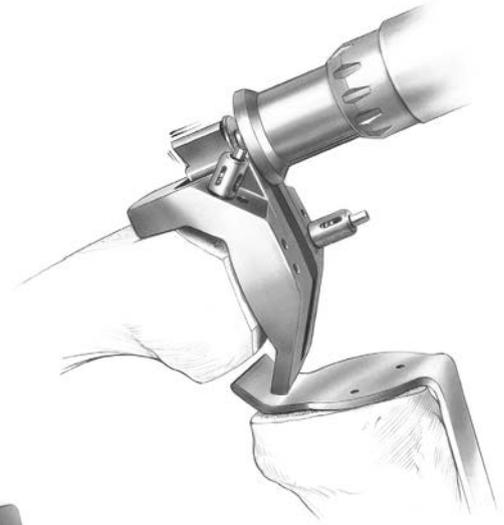


Figure 61

## “Crossover” Technique Options

(When crossing over to a posterior stabilized design)

### Crossover Technique with the 5-in-1 Femoral Finishing Guide

Place the appropriate size 5-in-1 femoral finishing guide onto the femur. It will rest on the resected surface of the anterior and distal femur. The guide will not contact the anterior chamfer. Use the previously prepared trochlear recess and/or femoral peg holes to locate the guide.

Secure the guide to the femur with two short threaded silver spring pins using the female hex driver and drill reamer. The pins are designed to automatically disengage the pin driver when fully engaged on the guide.

### Optional Technique

The guide can also be attached with standard 1/8-inch pins through the holes in the anterior and distal portion of the guide. Ensure that the proper sized holes are selected for the spring pins or 1/8-inch pins.

Use a reciprocating saw to cut the sides (Figure 59) and the base of the intercondylar notch (Figure 60).

### Crossover Technique with the PS Notch Milling Guide

Use the tibial/femoral retractor to protect soft tissue. Place the PS notch milling guide on the cut surface of the distal femur with the anterior tab resting in the trochlear recess. Pin the guide to the bone and use the micro-mill to cut the intercondylar notch (Figure 61).

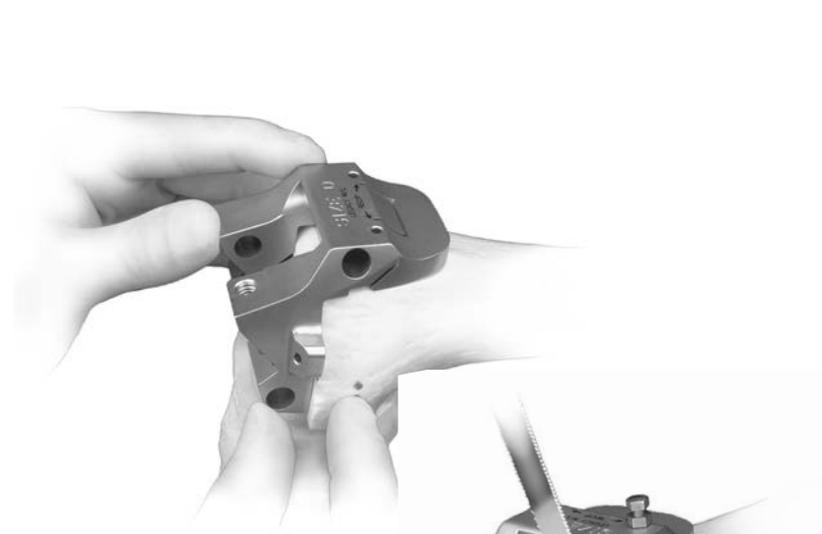


Figure 62

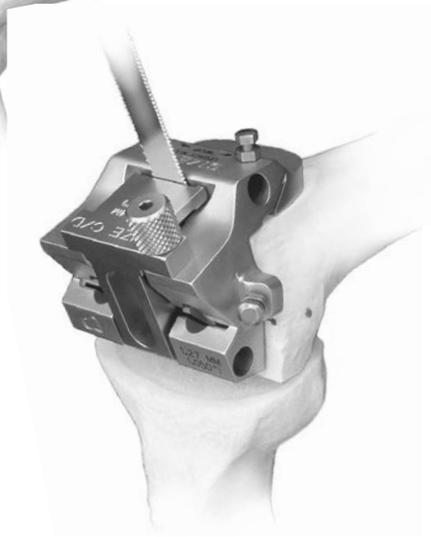


Figure 63



Figure 64

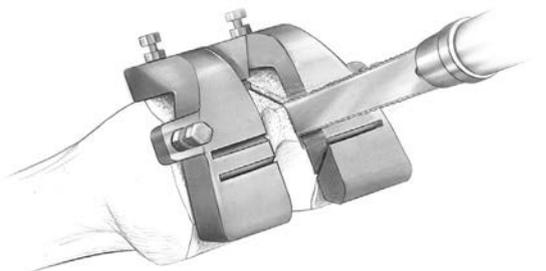


Figure 65

### Crossover Technique with the EPI Notch/Chamfer Guide

Select the EPI notch/chamfer guide that is the same size as the A/P cutting guide used in the previous step. Place the EPI notch/chamfer guide flush with the anterior and distal surfaces of the femur (Figure 62).

Position the guide mediolaterally, using the anterior portion of the guide to replicate the location for the anterior lateral flange of the femoral component. This is important because it dictates the mediolateral positioning of the femoral component. Also, the width of the guide equals the distal width of the Legacy LPS femoral component. (Pin the anterior flange first to stabilize the M/L position.) Finish the box cut by cutting the base of the intercondylar notch with a reciprocating or narrow oscillating sawblade (Figure 63).

Use a reciprocating sawblade or narrow oscillating blade to first cut the base of the trochlear recess (Figure 64). Cut the sides of the trochlear recess through the slot with a reciprocating sawblade.

### Crossover Technique with the Notch Chamfer Guide

Place the notch chamfer guide on the cut surface of the distal femur with the anterior tab resting in the trochlear recess. Pin the guide to the bone and use a saw to cut the sides of the notch (Figure 65). Then use an osteotome to remove the notch.







All content herein is protected by copyright, trademarks and other intellectual property rights, as applicable, owned by or licensed to Zimmer Biomet or its affiliates unless otherwise indicated, and must not be redistributed, duplicated or disclosed, in whole or in part, without the express written consent of Zimmer Biomet.

This material is intended for health care professionals. Distribution to any other recipient is prohibited.

Zimmer Biomet does not practice medicine. This technique was developed in conjunction with health care professionals. This document is intended for surgeons and is not intended for laypersons. Each surgeon should exercise his or her own independent judgment in the diagnosis and treatment of an individual patient, and this information does not purport to replace the comprehensive training surgeons have received. As with all surgical procedures, the technique used in each case will depend on the surgeon's medical judgment as the best treatment for each patient. Results will vary based on health, weight, activity and other variables. Not all patients are candidates for this product and/or procedure. Caution: Federal (USA) law restricts this device to sale by or on the order of a surgeon.

For product information, including indications, contraindications, warnings, precautions, potential adverse effects and patient counseling information, see the package insert and [zimmerbiomet.com](http://zimmerbiomet.com).

Check for country product clearance and reference product specific instructions for use.

© 2017 Zimmer Biomet



1392.1-GLBL-en-REV0517

 **Legal Manufacturer**  
Zimmer, Inc.  
1800 West Center Street  
Warsaw, Indiana 46580  
USA  
[zimmerbiomet.com](http://zimmerbiomet.com)



CE mark on a surgical technique is not valid unless there is a CE mark on the product label.