Minimally Invasive Surgical Techniques for the Medial Compartment

JOURNEY® UNI Femur with ZUK Tibia combined surgical technique

Spacer block technique
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The following technique guide was prepared under the guidance of physicians under close collaboration with each physician. It contains a summary of medical techniques and opinions based upon their training and expertise in the field, along with their knowledge of Smith & Nephew products. It is provided for educational and informational purposes only. Smith & Nephew does not provide medical advice and it is not intended to serve as such. It is the responsibility of the treating physician to determine and utilize the appropriate products and techniques according to their own clinical judgment for each of their patients. For more information on the products in this surgical technique, including indications for use, contraindications, effects, precautions and warnings, please consult the products’ Instructions for Use (IFU).

If no surgeon authorship, add this disclaimer and fill in the necessary information:

The following technique is for informational and educational purposes only. It is not intended to serve as medical advice. It is the responsibility of treating physicians to determine and utilize the appropriate products and techniques according to their own clinical judgment for each of their patients. For more information on the JOURNEY® UNI Femur with ZUK Tibia, including its indications for use, contraindications, and product safety information, please refer to the product’s label and the Instructions for Use packaged with the product.
Introduction

Unicompartmental knee arthroplasty (UKA) has been shown to be an effective treatment for isolated osteoarthritis affecting the medial or lateral compartment.

The MIS® Instruments for the ZUK Unicompartmental High Flex Knee and JOURNEY® UNI are designed to provide accurate, reproducible results using a minimally invasive technique.

The goals of a minimally invasive surgical procedure are to:

- Facilitate the patient's recovery
- Provide less pain
- Provide earlier mobilization
- Provide shorter hospital stay
- Provide quicker rehabilitation

This instrumentation allows the surgeon to operate without everting the patella.

This guide to the surgical technique is a step-by-step procedure written for a medial compartment UKA. Many of the same principles can be applied to the lateral compartment but it may be necessary to extend the incision a few centimeters given the proximity of the patella to the lateral condyle.

Combined with surgeon judgment, proper patient selection, and appropriate use of the device, this guide offers a comprehensive technique that discusses the procedure for component selection, bone preparation, trial reduction, cementing techniques, and component implantation. It is strongly recommended that the surgeon read the complete procedure for details, notes, and technique tips.
Indications for Unicompartmental Knee Replacement

Unicompartmental knee implants are indicated for restoring either compartment of a knee that has been affected by the following:

- Noninflammatory degenerative joint disease including osteoarthritis, traumatic arthritis, or avascular necrosis;
- Correction of functional deformity;
- Revision procedures where other treatments or devices have failed; and
- Treatment of fractures that are unmanageable using other techniques.

Unicompartmental knee implants are single use only and are intended for implantation only with bone cement. HA coated unicompartmental knee implants are available outside the US for use without bone cement.

Contraindications for Unicompartmental Knee Replacement

- Previous history of infection in the affected joint and/or local/systemic infection that may affect the prosthetic joint
- Insufficient bone stock on femoral or tibial surfaces
- Skeletal immaturity
- Neuropathic arthropathy
- Rheumatoid arthritis
- Obesity
- Varus/valgus deformities greater than 15°
- Chondrocalcinosis
- Osteoporosis
- Damage to the articular cartilage of the opposite compartment
- Inflammatory synovitis
- Eburnated bone in the patellofemoral joint
- Eburnated bone in the patellofemoral joint
Rationale

The basic goals of unicompartmental knee arthroplasty are to improve limb alignment and function, and to reduce pain. Routinely, an effort is made to minimize disruption of the surrounding soft tissue during the procedure. The development of instruments specifically designed to be used through a smaller exposure has had a significant impact on this effort.

Accurate limb alignment is described by the mechanical axis of the lower extremity, which is a straight line running from the center of the femoral head to the center of the ankle. When the center of the knee lies on this mechanical axis (the point between the two tibial spines), the knee is said to be in neutral alignment. Unicompartmental knee disease typically reduces the joint space in the affected compartment, causing a malalignment of the joint. Full correction of the malalignment would return the knee to neutral alignment (Figure 1).

The alignment goals for unicompartmental arthroplasty differ from those that are customary in an osteotomy where overcorrection is desirable to displace the weight-bearing forces away from the diseased compartment. In contrast, when adjusting limb alignment in a unicompartmental procedure, it is particularly important to avoid overcorrection of the limb as this may increase the stress in the contralateral compartment and heighten the potential for cartilaginous breakdown. Studies of unicompartmental procedures have shown that slight undercorrection of the limb alignment correlates to long-term survivorship.1

It is important to recognize that the methods used to adjust alignment in TKA are very different from those used in unicompartmental arthroplasty. In TKA, the angle of the femoral and tibial cuts determines the postoperative varus/valgus alignment.

In UKA, the angle of the cuts does not affect varus/valgus alignment. Instead, postoperative varus/valgus alignment is determined by the composite thickness of the prosthetic unicompartmental components. The amount of tibial bone resection is variable, while the amount of distal femoral bone resection is constant.

The mechanical axis of the femur is represented by a line between the center of the femoral head and the intercondylar notch at the knee.

**Spacer Block Option**

The Spacer Block option provides an alternate extramedullary method for resecting the distal femoral condyle. After resecting the tibia, the Spacer Block is inserted into the joint space with the chosen tibial thickness, the Distal Femoral Resector is then attached to the Spacer Block, providing a linked cut, and to help ensure that the proximal tibial cut and distal femoral cut are parallel.
Preoperative Planning

For the Spacer Block technique, the tibia must be resected first as the femoral resection is based off the tibial cut.

Take standing weight-bearing A/P and lateral radiographs of the affected knee, and a skyline radiograph of the patella. Then take a long standing A/P radiograph showing the center of the femoral head, the knee, and as much of the tibia as possible (preferably including the ankle). Alternatively, a single A/P radiograph of the entire femur allows correct calculations and can be made on a 35cm x 42cm (14 x 17-inch) film.

The tibial assembly is aligned visually with the mechanical axis of the tibia, and the cut is made perpendicular to this axis.

It is important to avoid overcorrection. An additional radiograph while stressing the limits of the tissues may be helpful in assessing the appropriate correction.

When evaluating the patient and planning for the procedure, consider TKA if:

- Degenerative changes are present in the contralateral compartment and/or patellofemoral joint.
- The ACL is deficient.
- A significant flexion contracture exists.
- Slight undercorrection is not attainable.
- There is significant overcorrection with a valgus stress.
- There is an existing valgus or varus deformity $\geq 15^\circ$.

Patient Preparation

With the patient in the supine position, test the range of hip and knee flexion. If unable to achieve 120° of knee flexion, a larger incision may be necessary to create sufficient exposure. Wrap the ankle area with an elastic wrap. Do not place bulky drapes on the distal tibia, ankle, or foot. A bulky drape in this area will make it difficult to locate the center of the ankle, and will displace the Tibial Resector, which may cause inaccurate cuts.

Be sure that the proximal femur is accessible for assessing the femoral head location. Use anatomic landmarks to identify the location of the femoral head. Alternatively, the surgeon may prefer to reference the anterior-superior iliac spine.

**Tip:** Place a marker, such as an EKG electrode, over the center of the femoral head. Then confirm the location with an A/P radiograph.
Exposure

The incision can be made with the leg in flexion or extension, according to preference. Make a medial parapatellar skin incision extending from the superior pole of the patella to about 2cm-4cm below the joint line adjacent to the tibial tubercle (Figure 3).

Incise the joint capsule in line with the skin incision beginning just distal to the vastus medialis muscle and extending to a point distal to the tibial plateau (Figure 4). Excise the fat pad, as necessary to facilitate visualization, being careful not to cut the anterior horn of the lateral meniscus.

Reflect the soft tissue subperiosteally from the tibia along the joint line back towards, but not into, the collateral ligament. Excise the anterior third of the meniscus. The remainder of the meniscus will be removed after bone resection.

A subperiosteal dissection should be carried out towards the midline, ending at the patellar tendon insertion. This will facilitate positioning of the tibial cutting guide.

Debride the joint and inspect it carefully. Remove intercondylar osteophytes to avoid impingement with the tibial spine or cruciate ligament. Also, remove peripheral osteophytes that interfere with the collateral ligaments and capsule. With medial compartment disease, osteophytes are commonly found on the lateral aspect of the medial tibial eminence and anterior to the origin of the ACL. Final debridement will be performed before component implantation. Careful osteophyte removal may be important in achieving full extension.
The ZUK Unicompartmental Knee System is designed for an anatomic position with a 5° posterior slope. It is important that the proximal tibial cut be made accurately. The tibial assembly consists of a Tibial Resector, a Tibial Resector Base, a Tibial Resector Stem, a Distal Telescoping Rod, and an Ankle Clamp (Figure 5). Positioning of the Tibial Resector is crucial.

Slide the Ankle Clamp onto the dovetail at the bottom of the Distal Telescoping Rod, and tighten the knob opposite the dovetail to temporarily hold the clamp in place. Then insert the appropriate length Tibial Resector Stem into the proximal end of the Distal Telescoping Rod and tighten the knob. Attach the appropriate Tibial Resector to the corresponding Tibial Resector Base. Note that the resector and base are available in two configurations: LT MED/RT LAT and RT MED/LT LAT. Then slide the dovetail on the Tibial Resector Base onto the proximal end of the Tibial Resector Stem and tighten the knob on the stem. The dovetail provides a slide adjustment that allows M/L positioning.

Secure the distal portion of the assembly by placing the spring arms of the Ankle Clamp around the ankle proximal to the malleoli (Figure 6). Loosen the knob at the top of the Distal Telescoping Rod, position the Tibial Resector proximal to the tibial tubercle with the cutting slot at the approximate desired level of resection, then retighten the knob.
While holding the proximal portion of the assembly in place, loosen the knob that provides mediolateral adjustment of the Distal Telescoping Rod. Adjust the distal end of the rod so it lies directly over the tibial crest. Then fully tighten the knob to secure it in place. This will help ensure that the proximal portion of the guide is parallel to the mechanical axis of the tibia. Mediolateral adjustments can also be made proximally, but the proximal portion will always remain parallel to the distal portion and, therefore, parallel to the mechanical axis of the tibia.

Use the proximal M/L slide adjustment at the midshaft of the assembly to position the fixation arm of the Tibial Resector Base and Tibial Resector so it lies just medial to the midpoint of the tibial tubercle and is in line with the center of the intercondylar eminence (Figure 7).

In the sagittal plane, align the assembly so it is parallel to the anterior tibial shaft (Figure 8) by using the A/P slide adjustment at the distal end of the Distal Telescoping Rod. Tighten the knob for the adjustment. If there is a bulky bandage around the ankle, adjust the assembly to accommodate the bandage. This will help with cutting the tibia in the proper slope.

Optional Technique: If the patient has a slight flexion contracture, cutting less posterior slope may help as it would result in less bone resection posteriorly than anteriorly, thereby opening the extension gap more relative to the flexion gap. This can be accomplished by moving the assembly closer to the leg distally. Then check the depth and angle of resection with the Resection Guide.

Secure the assembly to the proximal tibia by inserting a 48mm Headed Screw, or predrilling and inserting a Holding Pin, through the hole in the fixation arm of the Tibial Resector Base (Figure 9). **Do not completely seat the screw/pin until the final adjustments have been made to the position of the Tibial Resector.** Use the 2mm tip of the Tibial Depth Resection Stylus to help achieve the desired depth of cut. Insert the stylus into the hole on the top of the Tibial Resector and gently tighten the screw.
The tip of the stylus should rest in the deepest defect in the tibia (Figure 10). This indicates a cut that will remove 2mm of bone below the tip of the stylus. If necessary, use the thumb screw on the Tibial Resector Base to adjust the resection level.

**Note:** The 4mm tip of the Tibial Depth Resection Stylus indicates a cut that will remove 4mm of bone below the tip of the stylus.

Seat the screw/pin that was inserted into the Tibial Resector Base. Then secure the Tibial Resector to the proximal tibia by predrilling and inserting Gold Headless Holding Pins, or inserting 48mm Headless Holding Screws, through the two holes. Use electrocautery or the reciprocating saw to score the tibial surface where the sagittal cut will be made. Check this point both in extension and flexion.

If desired, the depth of cut can be verified by inserting the Resection Guide (Figure 11).

Insert a retractor medially to protect the medial collateral ligament. Use 1.27mm (0.050-inch) oscillating saw blade through the slot in the cutting guide to make the transverse cut. The Tibial Resector must remain against the bone during resection.

**Note:** Use a sawblade with a thickness of 1.27mm or greater to insure accurate cuts.

With the knee flexed, use the reciprocating blade at the base of the tibial eminence, and parallel to the eminence in the A/P plane. **Cut along the edge of the ACL down to, but not beyond, the intended level of the transverse cut (Figure 12). Be careful to avoid the ACL attachment.**

When the tibial preparation is complete, remove the tibial assembly.

**Fine tuning tibial resections**
- The JOURNEY® bone rasp may be used to clean up the resections, including the corner.
- The JOURNEY bone rasp has teeth along three faces of the instrument.
- In the event that bone removal is necessary on the sagittal resection but not the transverse, the rasp may be turned upside-down.
Note: JOURNEY® UNI gap sticks are to be used for balancing and are pictured in the surgical technique. ZUK gap sticks are not preferred for balancing due to inaccuracy of the flexion check of the ZUK gap sticks with the JZ procedure.

Note: If ZUK gap sticks are preferred, a rasp or saw should be used to remove 2mm of bone from the posterior femoral condyle. This will decompress the flexion space and match the balancing simulated with the ZUK gap sticks.

- Place the appropriate gap stick into the flexion/extension space between the femur and resected tibia to balance the joint.
- The thickness of gap stick that balances the joint in flexion and extension will determine the thickness of tibial insert poly to be used in conjunction with the distal cutting block as well as implant trialing and implantation.
- Typically when extension is balanced, flexion will be tight due to distal condyle disease.

Note: The JOURNEY UNI and ZUK systems have gap stick thicknesses of 7-11mm in 1mm increments.

Note: The ZUK system additionally has tibia polyethylene thicknesses of 12mm and 14mm. These thicknesses will not be measurable with JOURNEY UNI gap sticks. ZUK gap sticks will need to be used.

Tip: Many surgeons advise checking the extension gap in 10° – 20° of flexion to account for the screw-home mechanism.
Joint Balancing continued...

**Fine tuning**

- The bone rasp can be used to fine-tune the gap balancing by removing 1 or 2mm of cartilage off of either the posterior or distal condyle as appropriate (see gap balancing chart below).
- The joint should be balanced in flexion and extension.

**Tip:** Many surgeons consider a 2mm flexion and extension gap when valgus stress is applied to a medial uni to be a good rule of thumb. Some accept a slightly larger gap in flexion when using a fixed bearing tibia. The ZUK tension gage may be used to assess this laxity.

<table>
<thead>
<tr>
<th>Flexion gap</th>
<th>Extension gap</th>
<th>Balancing step</th>
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<tr>
<td><strong>Good</strong></td>
<td><strong>Good</strong></td>
<td>Remove equal thickness distal and posterior femoral bone. Proceed to the next step.</td>
</tr>
<tr>
<td></td>
<td><strong>Tight</strong></td>
<td>Use bone rasp to remove measured difference from the distal condyle prior to femoral resections, or recut the tibia with less or no slope.</td>
</tr>
<tr>
<td></td>
<td><strong>Loose</strong></td>
<td>Verify extension gap does not exceed maximum poly thickness. Use bone rasp to remove measured difference from the posterior condyle prior to femoral resections.</td>
</tr>
<tr>
<td><strong>Tight</strong></td>
<td><strong>Good</strong></td>
<td>Use bone rasp to remove measured difference from the posterior condyle prior to femoral resections.</td>
</tr>
<tr>
<td></td>
<td><strong>Tight</strong></td>
<td>Recut proximal tibia.</td>
</tr>
<tr>
<td></td>
<td><strong>Loose</strong></td>
<td>Verify extension gap does not exceed maximum poly thickness. Use bone rasp to remove measured difference from the posterior condyle prior to femoral resections.</td>
</tr>
<tr>
<td><strong>Loose</strong></td>
<td><strong>Good</strong></td>
<td>Verify flexion gap does not exceed maximum poly thickness. Use bone rasp to remove measured difference from the distal condyle prior to femoral resections.</td>
</tr>
<tr>
<td></td>
<td><strong>Tight</strong></td>
<td>Verify flexion gap does not exceed maximum poly thickness. Use bone rasp to remove measured difference from the distal condyle prior to femoral resections.</td>
</tr>
<tr>
<td></td>
<td><strong>Loose</strong></td>
<td>Trial with the next thicker increment of gap stick. Verify flexion and extension gaps do not exceed maximum poly thickness. If balance can be achieved without exceeding maximum poly thickness proceed to the next step.</td>
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**Optional**

The drop rod can be used with the gap sticks to check A/P slope and varus/valgus of the tibial resection and overall limb alignment.
After resecting the proximal tibia, bring the knee to full extension. Insert the 8mm Spacer Block into the joint space until the anterior stop contacts the anterior tibia (Figure 18). The Spacer Block must be fully inserted and sit flat on the resected tibial surface to ensure that the proper amount of femoral bone will be resected.

If the 8mm Spacer Block will not fit into the joint, remove an additional 2mm from the proximal tibia. If the 8mm Spacer Block is too loose, use a thicker Spacer Block.

Insert a 48mm Headed Screw or predrill and insert a Short-head Holding Pin into the anteromedial angled hole in the Spacer Block (Figure 19).

Attach the Alignment Tower to the Spacer Block (Figure 20) and insert the Alignment Rod through the Alignment Tower. Then insert the Targeting Guide onto the Alignment Rod, and position the guide relative to the femoral head to check alignment (Figure 21).
The ZUK Unicompartmental High Flex Knee System has been designed for 5° of posterior tibial slope. The angle on the handle of the Spacer Block is angled 5° relative to the Spacer Block. This ensures that the distal femoral resection is made perpendicular to the long axis of the femur.

Place the Distal Femoral Resector over the handle of the Spacer Block (Figure 22). Then secure the guide by inserting a 48mm Headed Screw or predrill and insert a Holding Pin through the hole (Figure 23).

Use a 1.27mm (0.050-inch) oscillating saw blade to resect the distal femur (Figure 24). Do not extend the saw blade posteriorly past the distal femur to avoid damaging the posterior popliteal area. If desired, the femoral cut can be started in extension and finished in flexion. Before flexing the knee, remove the Distal Femoral Resector and Spacer Block. Then return to Check Flexion/Extension Gaps (Step 4) in the IM surgical technique.
Checking gap balance:

Insert the thick end of the same gap stick previously used to balance the joint in extension bullet point. The thick end of the gap stick represents the total thickness of the selected poly insert, tibial baseplate and distal femoral condyle implant.

**Note:** Femoral implant sizes 1 and 2 are 1mm thinner in the posterior and distal condylar thickness dimensions than sizes 3-7 (sizes 1 and 2 are 5.5mm and sizes 3-7 are 6.5mm). When trialing with a size 1 or 2 femur, it is possible for gap balancing with the gap stick to be perfect after the tibial and femoral cuts, and then have 1mm of laxity in flexion and extension. If the patient is very small and has the potential for a size 1 or 2, ensure that your initial tibial cut does not require the largest insert thickness of 11mm.

**Femoral block sizing, positioning and fixation**

- The size of block is determined by optimizing the coverage of the distal resection without overhang and positioning to touch the posterior condyle.
- The anterior edge of the block should not go beyond the anterior edge of the distal resection but should be 1mm to 1.5mm posterior of the edge.
- The M/L position of the 2-in-1 femoral block is obtained by locating it to give optimal coverage of the distal resection and positioning to touch the posterior condyle.

**Note:** To assist in component positioning, the blocks have the same footprint as the implants.

**Tip:** The A/P cuts and peg hole location are the same for sizes 3, 4, 5, 6, and 7. Once cuts are made and peg holes drilled, up- or down-sizing is still available.

**Tip:** The A/P cuts and peg hole location are the same for sizes 1 and 2. Once cuts are made and peg holes drilled, up- or down-sizing is still available between these two sizes. If between sizes 2 and 3; size 2 should be selected.

**Note:** There is a laser-etched line down the middle of the block to assist with M/L positioning.

**Tip:** Use the JOURNEY™ UNI 2-in-1 block Quick Connect handle to assist in cutting block positioning.
Anterior pin and toggle
- Ensure that the 2-in-1 block is flush to the distal resection and posterior condyle once the optimal position has been achieved.
- Insert a headed pin into anterior pin hole.
- Finalize rotation of the block.

Second and third pin
- Insert the medial outboard pin.
- Insert the lateral distal pin. – optional

Tip: Adequate fixation can be possible without inserting the medial outboard pin when the Alignment peg is used.

Note: When positioning the 2-in-1 block, keep in mind that the footprint is the same as the corresponding implant.

Note: You do not want the block or the implant to overhang off the most anterior part of the distal cut.

Note: If there is 1 – 2mm of uncovered anterior bone between the anterior edge of the implant and the perimeter of the resection, this is acceptable.
Femoral peg hole preparation

- Drill the anterior peg hole.

- Insert the alignment peg into the prepared anterior peg hole.

- Drill the posterior peg hole.
Resect the posterior condyle.

**Note:** The posterior cut is a flexed cut at 105° from the distal cut, allowing for optimal bone coverage in flexion while maintaining the 6.5mm thickness.

- Remove the alignment peg and resect the posterior chamfer.

**Note:** The posterior paddle serves as a blade stop when the posterior chamfer cut is being made.

- Remove pins and block.
Finish the Tibia

Resect the remaining meniscus and remove any osteophytes, especially those interfering with the collateral ligament.

Place the head of the Tibial Sizer on the cut surface of the tibia with the straight edge against the surface created by the sagittal cut. Verify the proper rotation of the sagittal cut in the transverse plane. The rotation is correct when the sizer handle is 90° to the coronal plane (Figure 36). Select the Tibial Sizer that best covers the resected proximal tibia in both the A/P and M/L dimensions.

If desired, use the resected tibial bone fragment as an aid in sizing. If necessary, a second sagittal cut can be made to allow for optimal coverage with the next larger size tibial base plate.

The Tibial Sizer has a sliding ruler which facilitates measuring in the A/P dimension (Figure 37). Be sure that the head of the sizer rests on cortical bone near the edge of the cortex around its entire perimeter. **Be sure that it does not overhang.** Pull the Tibial Sizing Slider anteriorly until the hook on the tip of the slider contacts the posterior edge of the tibia (Figure 38).

**Tip:** Clean the edge of the bone cut with a curette so the sizer will fit flush against the cut.
There are a number of indicators on the Tibial Sizer. If the slider is used without the sizer, the etch marks 1 through 6 on the slider indicate the A/P length of the corresponding implant. If the slider is used with the sizer, the A/P length is indicated on the sizer handle (Figure 39). An additional measurement on the slider at the tip of the sizer handle indicates the length of exposed bone posteriorly (behind the implant) with the sizer head in this particular position (Figure 39). Also, the cutout on the straight edge of the sizer head indicates the location of the tibial keel for marking. Remove the Tibial Sizer. Then remove all soft tissue debris from the popliteal region.

**Tip:** To facilitate insertion of the Tibial Fixation Plate Provisional, externally rotate the tibia while the knee is flexed.

Place the corresponding size Tibial Fixation Plate Provisional onto the cut surface of the tibia. Insert the Tibial Plate Impactor into the recess on the provisional and impact it so the central fin engages the bone and the provisional sits flush on the tibial surface (Figure 40).

Predrill and insert a 17mm Short-head Holding Pin (00-5977-056-02) into the anterior fixation hole (Figure 41).

Use the Tibial Drill w/Stop to drill the two tibial peg holes (Fig. 42). Note that these holes are angled 20° posteriorly to facilitate drilling. Although the pegs on the implant are at 90°, the drill is designed so that the pegs will fit into these angled holes.

Leave the Tibial Fixation Plate Provisional in place on the bone.
Remove the IM Patellar Retractor. With all bone surfaces prepared, perform a trial reduction with the appropriate size Femoral Provisional, Tibial Fixation Plate Provisional, and Tibial Articular Surface Provisional. The Concave Tibial Spacer can be used in place of the combined Tibial Fixation Plate Provisional and Tibial Articular Surface Provisional.

Use femoral impactor to seat femoral trail (Figure 43).

To help guide the femoral provisional past the patella, place the leg in deep flexion to begin the insertion. Insert the long post first. Then adjust the leg to a midflexion position, rotating the provisional around and in back of the patella. Reposition the leg in deep flexion to complete the insertion. Impact the provisional onto the femur with a mallet (Figure 44).

Slide the rails on the bottom of the Tibial Articular Surface Provisional into the grooves on the Tibial Fixation Plate Provisional (Figure 45). Check the fit of the provisional components. If necessary, perform minor trimming of bone surfaces.

With all trial components in place, check for proper range of motion and ligament stability. The Tibial Articular Surface Provisional or Concave Tibial Spacer used should permit full flexion and full extension. Overstuffing should be avoided, as this will transfer stress to the contralateral compartment.
Evaluate soft tissue tension in flexion and extension. Use the 2mm end of the Tension Gauge to help ensure that flexion and extension gaps are not too tight (Figure 45).

The correct thickness of the prosthesis is one that produces the desired alignment and does not cause excessive stress on the collateral ligaments. As a rule, the correct prosthesis should allow the joint space to be opened approximately 2mm when a stress is applied, with the knee in full extension and without soft tissue release.

The knee must also be tested in 90° of flexion to allow a 2mm flexion gap. Excessive flexion tightness will prevent postoperative flexion and may cause the tibial prosthesis to lift up anteriorly as the femoral component rolls posteriorly on the tibial component. If the joint is too tight in flexion, try using a thinner tibial articular surface component or increasing the posterior slope of the tibial resection.

Tip: Use the 2mm end of the Tension Gauge to help balance the knee in both flexion and extension. With the knee flexed 90°, position the 2mm end of the Tension Gauge between the Femoral Provisional and the Concave Tibial Spacer. This should be a snug, but not an overly tight fit. Then use the same test with the knee in full extension.
Implant Final Components

Obtain the final components and implant the tibial component first.

Tip: With the modest amount of bone removed, particularly from the tibia, there may be a sclerotic cut surface. If the resected surfaces of the tibia and/or femur are sclerotic, drill multiple holes with a small drill (2.0mm-3.2mm) to improve cement intrusion.

Tibial Component

To facilitate insertion, flex the knee and externally rotate the tibia. If desired, place an opened and slightly moist sterile gauze sponge behind the tibia before implanting the components to help collect excess cement behind the tibia.

Apply cement and press the tibial base plate or the all-polyethylene tibial component onto the tibia. Position and press down the posterior portion of the component first. Then press the anterior portion of the component, expressing excess cement anteriorly.

Use the Tibial Plate Impactor to impact the tibial base plate (Figure 46).

Note: Do not use the Tibial Plate Impactor to impact an all-polyethylene tibial component.

Remove the sterile gauze sponge slowly from behind the joint, and use the Cement Removal Tool to remove any excess cement.
Femoral Component

Apply cement and begin the femoral component insertion with the leg in deep flexion. Insert the long post first. Adjust the leg to a midflexion position, rotating the implant around and in back of the patella. Then reposition the leg in deep flexion and seat the component with the Femoral Impactor (Figure 47).

If using a modular tibial component, confirm the correct size and thickness of the final tibial articular surface by testing with the Tibial Articular Surface Provisionals in maximum flexion and extension. Use the Tension Gauge to assess the flexion and extension gaps. Then recheck alignment to verify that the joint has not been overcorrected.

Tibial Articular Surface

After the cement has cured, remove any remaining excess cement before the final placement of the tibial articular surface. Do not proceed with locking the final articular surface component until cement has fully cured.

With the engraved side down, slide the edge of the polyethylene component under the posterior lip of the base plate. Then insert the tab on the lower jaw of the Tibial Articular Surface Inserter into the notch on the front of the tibial base plate. Bring the polyethylene tip on the upper jaw of the inserter down until it contacts the articular surface implant. Squeeze the handles of the inserter together until the articular surface implant snaps into place (Figure 48).

Closure

Irrigate the knee for the final time and close. Cover the incision with a sterile dressing and wrap the leg with an elastic bandage from the toes to the groin.