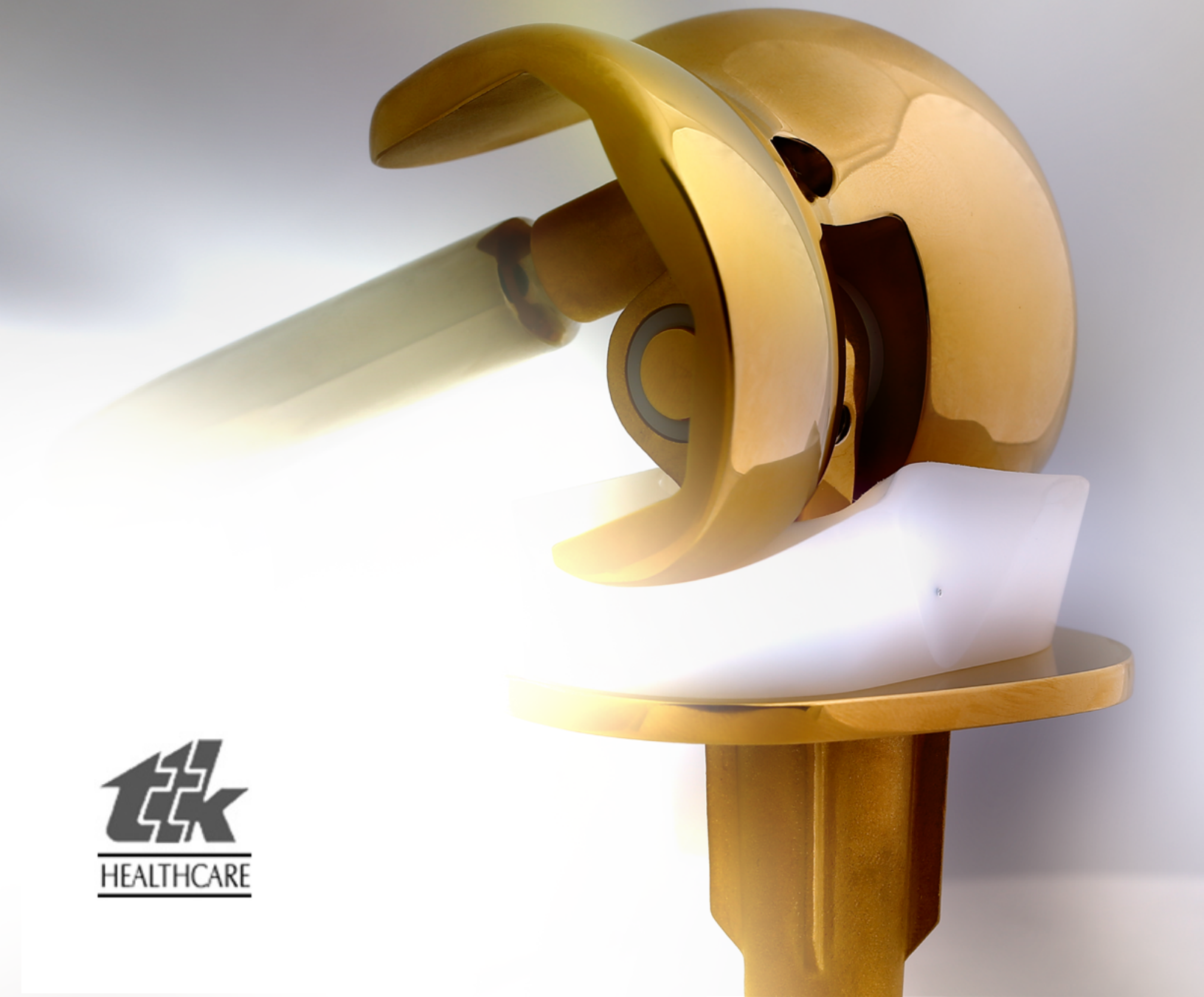
Buechel-Pappas™ Revision

Knee Replacement

System Surgical Procedure



HEALTHCARE

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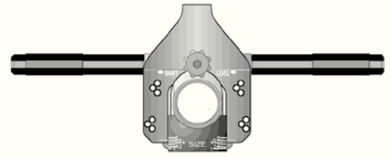

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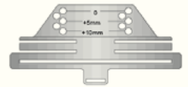

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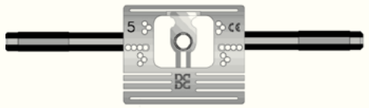

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Surgical Concepts

In pathology where there is grossly deficient bone stock the Buechel - Pappas Knee Replacement System contains modular revision components which provide stem fixation to augment the usual compressive surface fixation, or a hinge which provides stability. A stem may also be used to traverse shaft fractures. The stems used are those of the B-P Hip replacement system and are available in diameters ranging from 10 through 20mm in 1mm increments, and lengths of 25 to 200mm in 25m increments. The connection is reliable, convenient and free of micro-motion.

The surgical technique may be employed, where there is insufficient bone to support compressive load transfer through the prosthesis-bone interface directly. One is the use of a screw supported bone graft for cement less fixation. For cemented fixation, if there is an insufficient proximal tibial bone stock, screws are implanted in the available bone such that their heads will support the tibial component at a position maintaining the joint line.

The other, which is presented here, is the use of metallic augments to compensate for bone loss. A series of such augments is provided for both femoral and tibial augmentation. To minimize the risk of metal to metal rubbing these augments are intended only for use only with cement which acts to separate the metallic elements.

The additional instrumentation required to implant the Hinge components is minimal, consisting only of a box osteotome for each femoral size to prepare the cavity for the hinge pin.

Minimal additional instrumentation is associated with the implantation of the B-P revision components. This simplicity of instrumentation reduces cost and complexity of revision and salvage surgery, a situation where such reduction is badly needed.

System Description

Basic Implants Concepts

1. Duplication of tibio femoral and patella femoral motion patterns.
2. Maximal area contact of metal to polyethylene bearings to decrease contact stresses and improve wear properties.

Revision Component Description

1. Modular Tricompartmental and Hinge Femoral Components (Left And Right)
The Femoral Component and Hinge Femoral Component are designed to replace the complex geometry of the femoral articular surface while maintaining an anatomical valgus angle. The radii of curvature decrease from anterior to posterior in a coordinated fashion to provide full flexion while maintaining excellent bearing congruity with either tibial component. Its geometry also congruently accommodates varus-valgus and rotary motions. It accepts a large variety of diameters and lengths of extension stems.This component accepts the modular stems of the B-P Hip System.

2. Patellar Component
The Patellar Component consists of a patella bearing, mounted on a metallic anchoring plate. The bearing congruently matches the spherical anterior flange segments and sulcus of the femoral component. This component provides axial rotation to allow for variations in anatomical rotation as well as surgical misalignment. The metallic, three peg, anchoring plate is used to protect the prosthesis-cement and prosthesis-bone interfaces. It also functions as a substrate for porous-coating.

3. UHMWPe Patellar Component
This component provides fully congruent contact on its lateral facet except near full extension where contact pressures are low. The medial facet, which sees much lower loading, is in line contact with the femoral component. Thus, stresses in this device are similar to those of the rotating bearing patellar component.

4. Tibial Bearing
This component is used in the absence of viable cruciate ligaments to provide functional stability by use of proper tension control of the surrounding soft tissues of the knee. Limited axial rotation with excellent bearing congruity and superior dislocation resistance is provided. With the exception of the

Hinge Bearng these bearings come in a variety of thicknesses to allow flexibility in bone resection of the tibia, to correct gross deformities, and can be extremely useful in revision arthroplasties.

5. Modular Tibial Component

This tibial component accepts the same extension stems that are used with the *Modular Tricompartmental Femoral Component*. This plateau has an axial rotation stop and is intended to limit bearing rotation. In cases where there are insufficiencies of the soft tissue structures, this stop provides resistance against spinout subluxation. This stop does not engage the bearing unless spinout is induced. If this occurs, spin is limited so that normal compression of the joint results in self reduction of the bearing to a normal orientation.

6. Modular Stems

The stems used are those of the B-P Hip replacement system and are available in diameters ranging from 10 through 20mm in 1mm increments and lengths of 25 to 200mm in 25mm increments. The connection uses a Morse taper and clamping screw which is reliable, convenient and free of micro-motion.

7. Augments

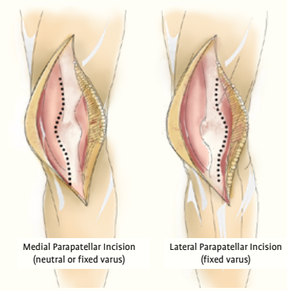
Tibial augments are available in six sizes to match the tibial components and three thicknesses (5, 10, and 15 mm). Distal and posterior femoral augments are also available in six sizes with three thicknesses of posterior augments and two thicknesses of distal augments of 5 and 10 mm.

8. Instrumentation And Trials

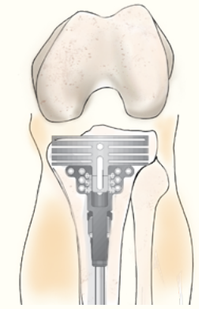
The primary instruments and trials as well as available hip stem reamers in one mm increments are used in the implantation of the revision components. There are a few specialized revision instruments.

Summary of Procedure

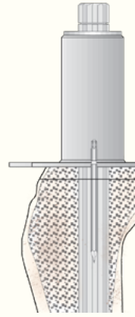
This procedure is written for a surgeon experienced in the use of the Primary B-P knee system and instrumentation. Such experience is important in the successful use of the B-P revision components and instruments.



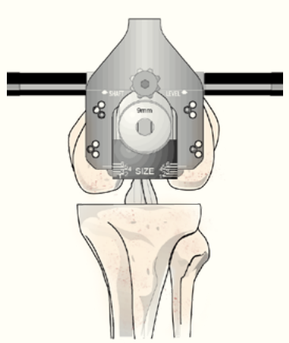
1. *Exposure and Releases*
2. *Evaluation and Removal of failed components*



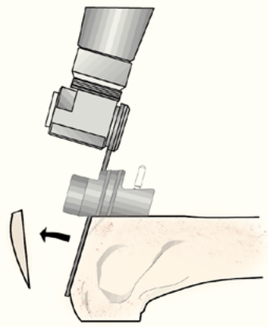
3. *Tibial Resection*



4. *Tibial Preparation*



5. *Femoral Preparation*



8. *Distal Femoral Resection*

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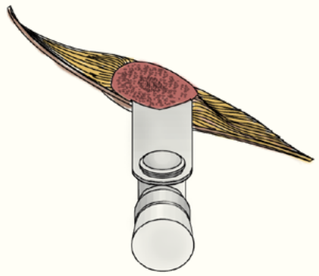


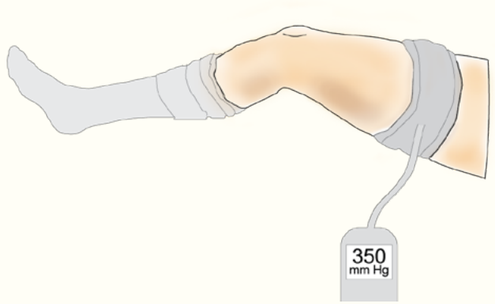
10. *Patellar Preparation*

11. *Trial Reduction*

12. *Final Component Implantation*

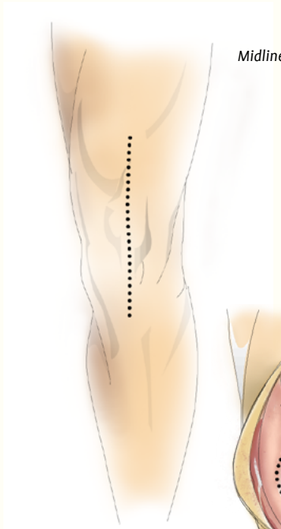
1.Exposure & Releases

Preparation and Draping



Place the patient in a supine position on the operating table. Prep and drape the knee in a sterile fashion. Apply a sterile non-permeable stockinette to allow for palpation of the anterior tibial and malleolar contours.Elevate the leg for one minute to allow for venous runoff and then inflate a previously applied tourniquet, or avoid tourniquet, if preferred.

Incisions



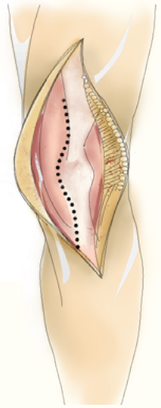
Midline Skin Incision

Skin Incisions

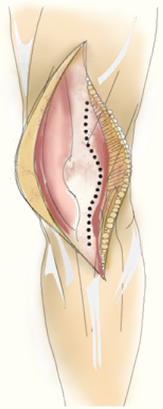
Use a midline skin incision unless previous incisions have been used in which case use
the previous incision that allows proper visualization.

Deep Incisions

Use a deep median parapatellar incision for medial compartment arthritis to expose the joint. Perform a medial soft tissue release from the proximal medial tibia if the varus deformity is fixed. In lateral compartment disease and in fixed valgus deformities use a lateral parapatellar incision to gain entrance to the lateral compartment and perform a release of the ilio-tibial tract subperiosteally from the proximal lateral tibia. Should this fail to give complete release of the valgus deformity, proceed to a proximally-based, subperiosteal elevation of the lateral collateral ligament and the popliteus tendon from the distal lateral femur. These sequential approaches for fixed varus or valgus knees should allow the correction of knee alignment to resume that of the mechanical axis.



Medial Parapatellar Incision (Neutral or fixed varus)



Lateral Parapatellar Incision (Fixed valgus)

2. Evaluation and Removal of Failed Components

Evaluation of Failed Components

Inspect all knee replacement components for deformation, malalignment, wear or loosening. Be sure to obtain neutral alignment by necessary soft tissue releases before removing any failed components. These components provide leverage for applying varus or valgus stress to the knee in extension during the soft tissue balancing part of the procedure. Remove any loose, worn or malaligned component and retain any component that remains stable, properly aligned and without signs of wear or infection.

Technique of Removal

Femoral Component

Use an osteotome under the anterior, middle and posterior flanges of the femoral component to loosen the bone cement interface, or in the case of cementless fixation, the bone-prosthesis interface. Impact the lateral margins of the femoral component alternately until the component becomes dislodged.

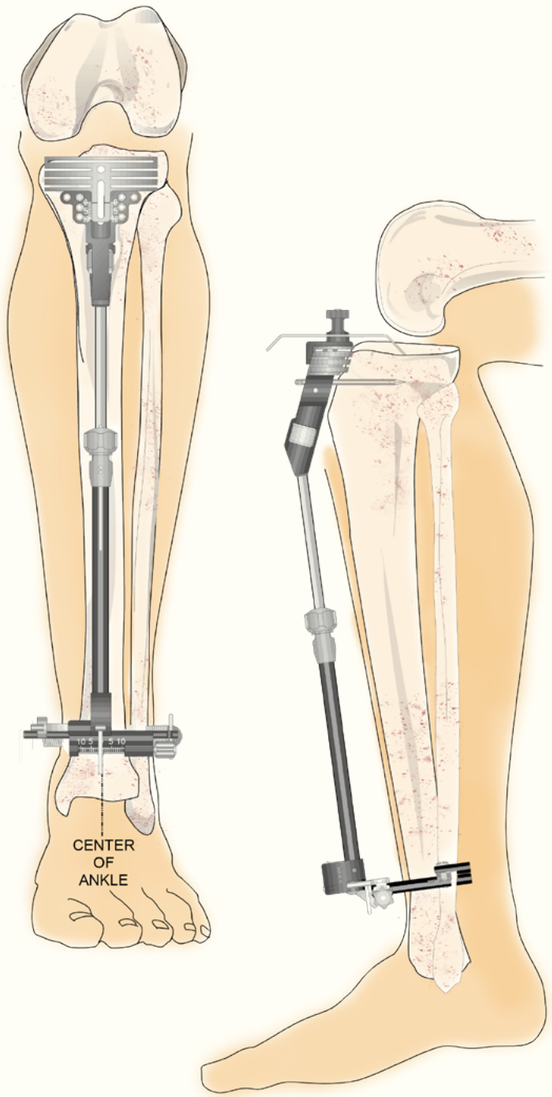
Tibial Component

Drive two osteotomes under the flat fixation plate of the tibial component to assess its stability in the cement mantle or the bone if a cementless device is used. If the component surface lifts free from the tibia and the central fixation stem (if available) becomes grossly loose, then gradually increase the osteotome thickness under the fixation plate until complete loosening is achieved.

If the tibial component remains well-fixed, consider making a 2cm x 3cm cortical window in the proximal medial tibia,under the medial soft tissue sleeve, to allow access to the short metaphyseal stem. Use a curved osteotome to remove cement or interrupt the bone prosthesis interface, so that the tibial component may be driven upward with an impactor until completely removed. The cortical window should be replaced after a new tibial stem is inserted.The medial soft tissue sleeve will maintain stability of the bony window. In lateral approaches, the cortical window can be centered on Gerdys tubercle. The closure of the anterior compartment fascia will maintain lateral stability of the bony window after it is replaced over the new tibial stem.

3.Tibial Resection

Tibial Resection Guide Orientation



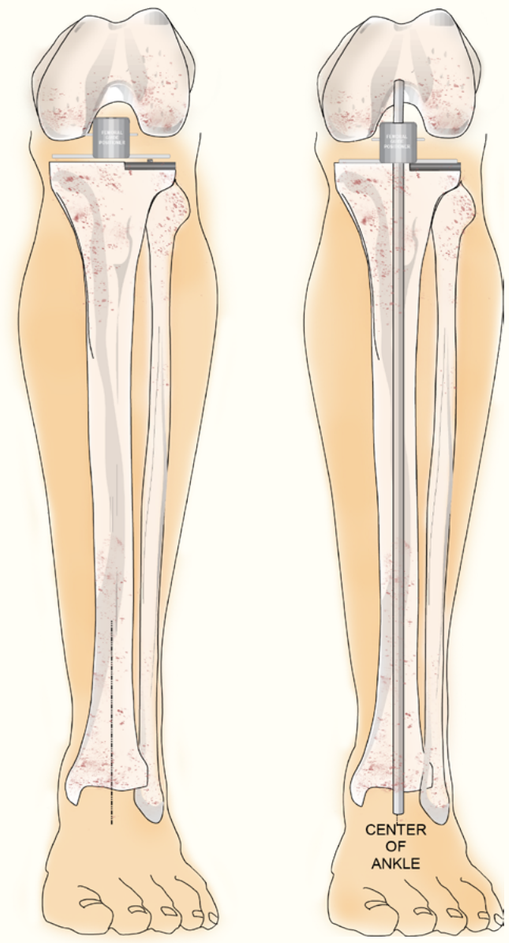
Where metallic Tibial Augments are to be used an Augment Tibial Resection Guide is employed.

a) With the **Tibial Resectioning Guide (TRG)** set at “0” place the Ankle Clamp on the TRG.
b) Place the **Ankle Clamp** on the ankle.
c) Loosen the **Collet** on the TRG Tube and slide the TRG to an approximate level of resection.
d) Position the **Head** of the **Adjustable Tibial Resection Guide** for proper medial-lateral orientation by centering it in the frontal plane, at the medial edge of the tibial tubercle, and placing it at the approximate level of resection. Place a Pin, centerd in the central slot in the TRG, using a Fixation Pin with the Pin Driver to stabilize the TRG.
e) Insert the “2 mm” **Stylus tip**, onto the side with the least pathology, used to determine resection level, and move the tip of the **Probe** to the lowest point. Tighten the Collet.
f) Adjust the Ankle Clamp to place the distal end of the shaft of the TRG in the medial-lateral direction over the extensor hallucis longus tendon, which approximates the ankle joint center (5-8mm medial to the transmalleolar axis).
g) Adjust the resection angle by lifting or depressing the end of the Tube of the TRG to obtain the desired angle.

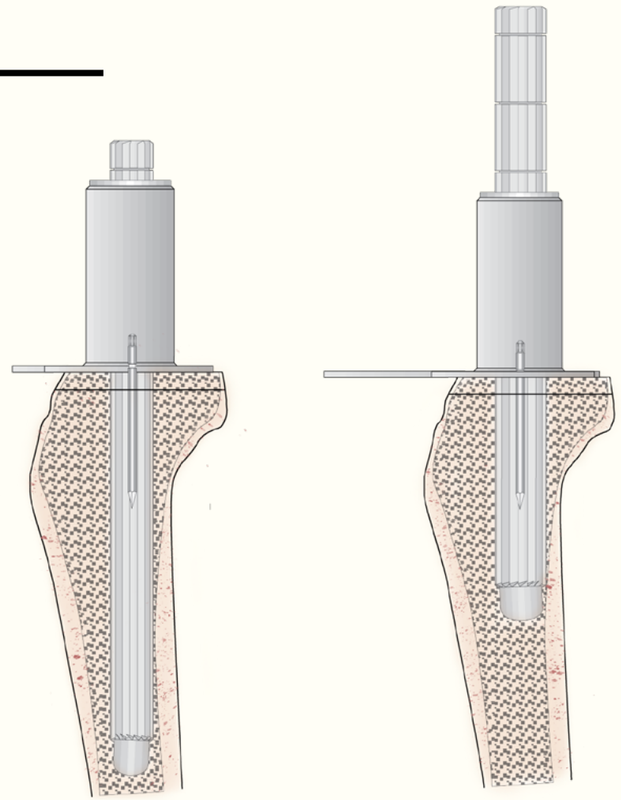
Place the shaft end in the anterior-posterior direction, so as to provide the proper physiologic posterior inclination cut in the lateral plane. The **Crab Claw Visualizer** can be used to aid in establishing the desired posterior inclination angle. This angle should approximate the anatomical angle of tibial inclination. Tighten the **Wing Nut**.
h) Pin the TRG in place using two Fixation Pins with the Pin Driver.
i) Perform the appropriate resection as described in the “Buechel-Pappas Tricompartmental Knee System Surgical Procedure”.

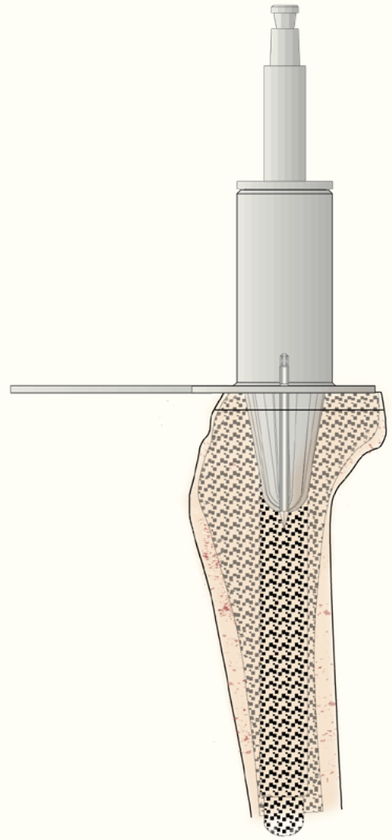
Attach the appropriate **Tibial Augment Trial(s)** onto the **Revision Femoral Guide Positioner**, the notched resection screw head down. Then place them on the resected tibial plateau.

Check the tibial resection using the long **Alignment Rod** inserted into the Femoral Guide Positioner.Correct the tibial resection if necessary before proceeding.



4.Tibial Preparation





The **Conical Reamer** is then passed through the Reamer Guide to fashion the hole for the tapered cone of the Modular Tibial Platform. Often the Reamer will not touch any bone in severe proximal deficiencies.

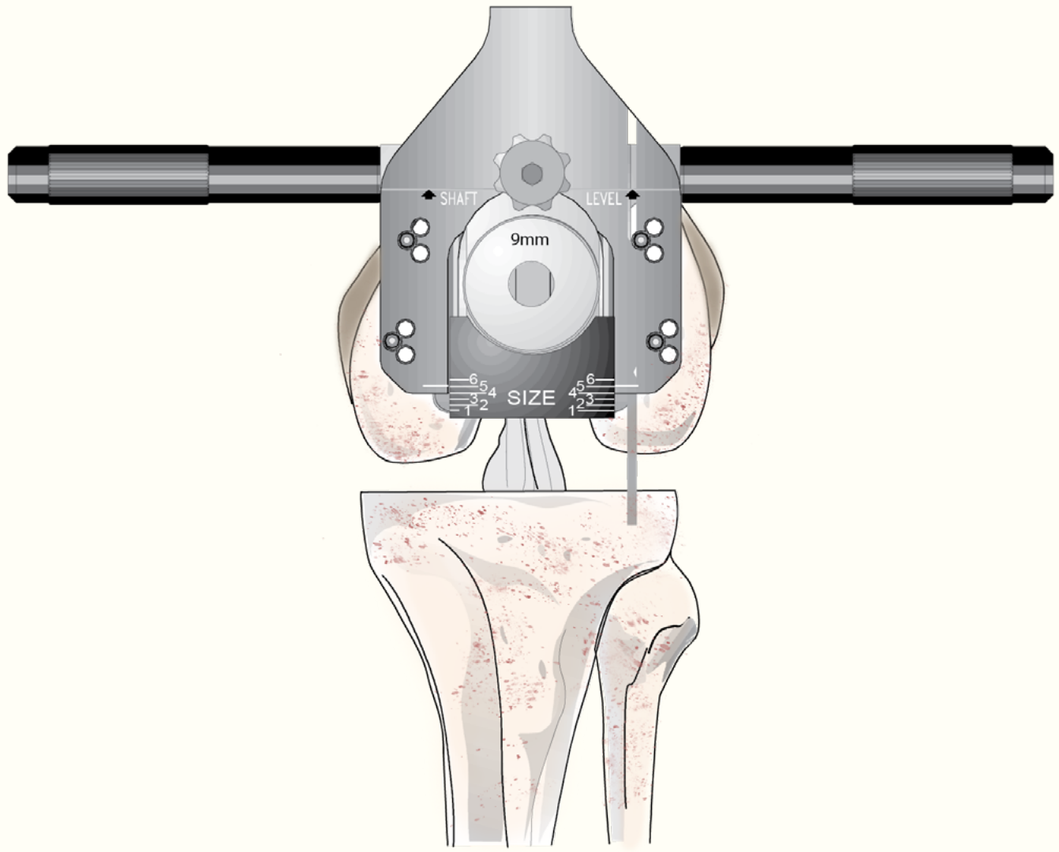
Ream the intramedully hole through the **Reamer Guide** which is pinned into place after it is centered in the A-P and M-L plane to obtain the best coverage without overhang. Sequential, blunt-tipped, straight reamers are passed through the cylinder portion of the Reamer Guide using sequential centering sleeves. The depth of reaming should bypass any proximal cortical defects by at least two tibial shaft diameters. Minor A-P or M-L adjustment of the Tibial Template position may be necessary to remain centered on the tibial canal in cases of severe bony deficiency or malalignment.

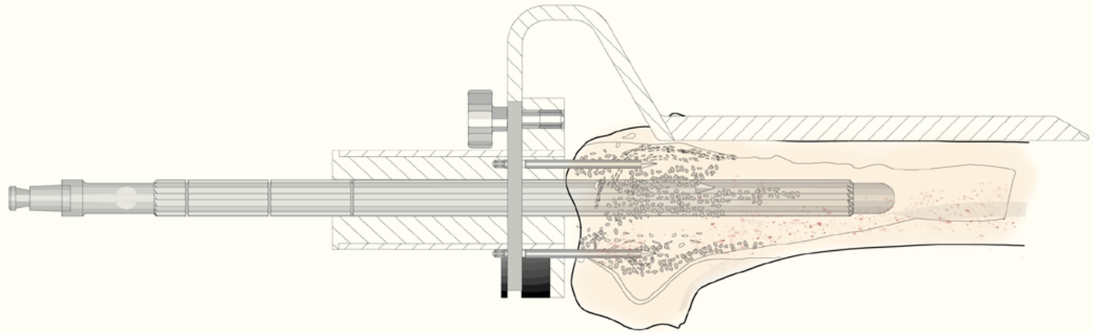
During this process the Template may be moved, or even decreased in size, to obtain the best combination of inclination and tibial plate fit.

If the reamer used is less than 13mm in diameter enlarge the reamed hole to a depth of 60mm from the inferior surface of the template using a 13mm reamer to accommodate the distal end of the Modular Tibial Component.
Remove the Sleeve and Reamer noting the total depth of the reamed hole from the inferior surface of the Tibial Template.

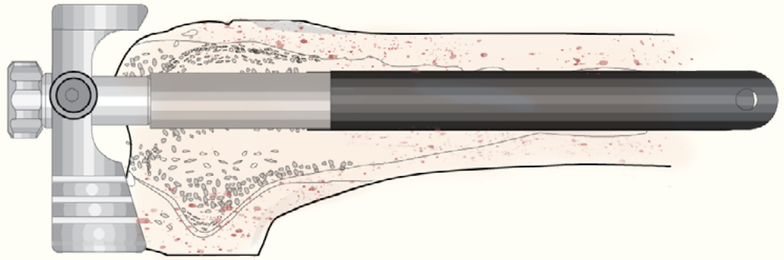
5. Femoral Preparation

Place the **Femoral Shaft Reaming Guide** with a 9mm I.D. **Reamer Guide** in the **Reamer Guide Tube**. Use bone pins to stabilize the femoral Shaft Reaming Guide if needed.





Ream holes of increasing size while maintaining a constant position for the Reamer Guide without migrating anteriorly. Use the straight, blunt-tipped reamers to engage the endosteal cortex and prepare a length of at least 2 femoral shaft diameters above the most proximal femoral defect. Once completed remove this Guide and Pins.



Assemble and insert the A/P Femoral Resection Guide with the appropriate diameter and length Trial Stem Extension.

6. A-P Femoral Resection

Check the tibial resection using the long Alignment Rod inserted into the Femoral Guide Positioner with the appropriate Tibial Augment Trial attached into the lower slot in the A/P Femoral Resection Guide. Correct the tibial resection if necessary before proceeding.

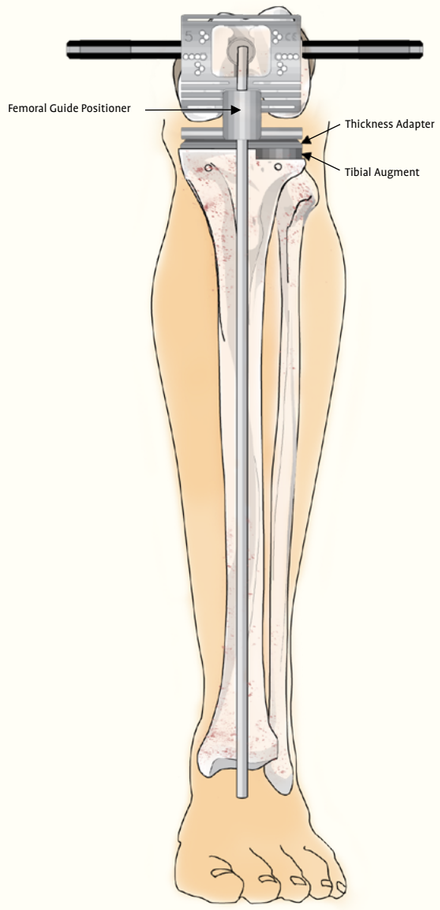
The Alignment Rod is also useful for rocking the Femoral Guide Positioner to determine flexion tension in each compartment.

If the tibial resection is correct, and balanced ligament tension is achieved, pin the A-P Femoral Resection Guide using two Fixation Pins, and remove the Positioner and Alignment Rod.

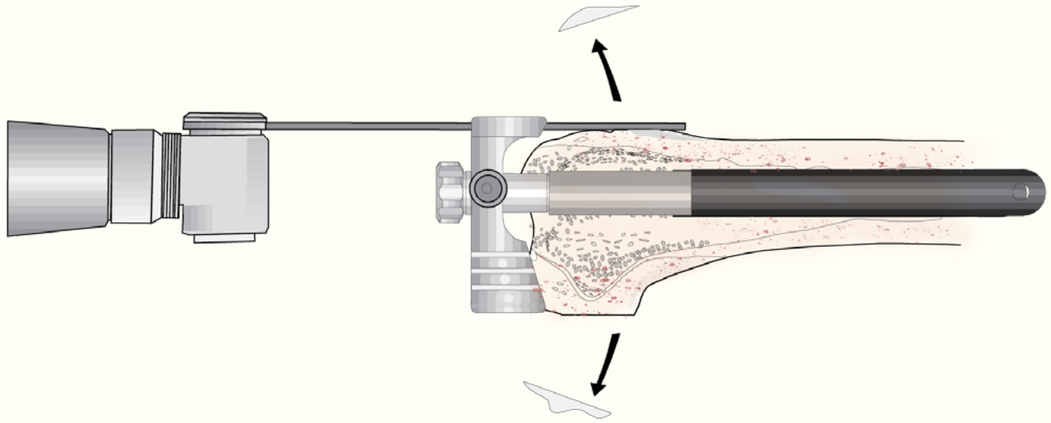
If the ligament tension is too tight or the Femoral Guide Positioner cannot be inserted, the tibia must be resected at a lower level.

If the tension is too loose add an appropriate Thickness Adapter to the inferior surface of the Femoral Guide Positioner and attach the appropriate Tibial Augment Trial to the **Thickness adapter** to obtain proper ligament tension.

If there is sufficient bone stock, first perform the anterior femoral resection. Check that the resection is flat and at the level of the anterior aspect of the femoral shaft. If the anterior resection is too high,remove the I/M Rod and lower the A-P Femoral Resection Guide. Do this by selecting a new set of holes into which the Fixation Pins are engaged so that the new resection will be approximately at the shaft level. This resection adjustment condition will affect the flexion gap and will require a similar amount of resection adjustment of the proximal tibia.

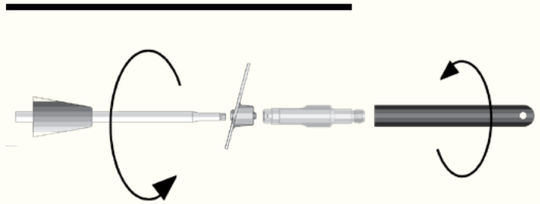


Note: Where there is sufficient anterior resection take care that it is flat. The anterior resection surface is a basic reference surface for the primary procedure and if this surface is viable it may be used to orient the Distal Femoral Resection Guide.

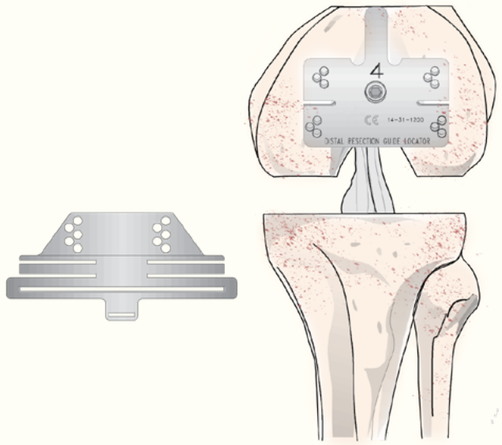


After making a proper anterior resection resect the posterior femoral condyles if there is sufficient bone stock at the desired levels.

7. Distal Femoral Resection



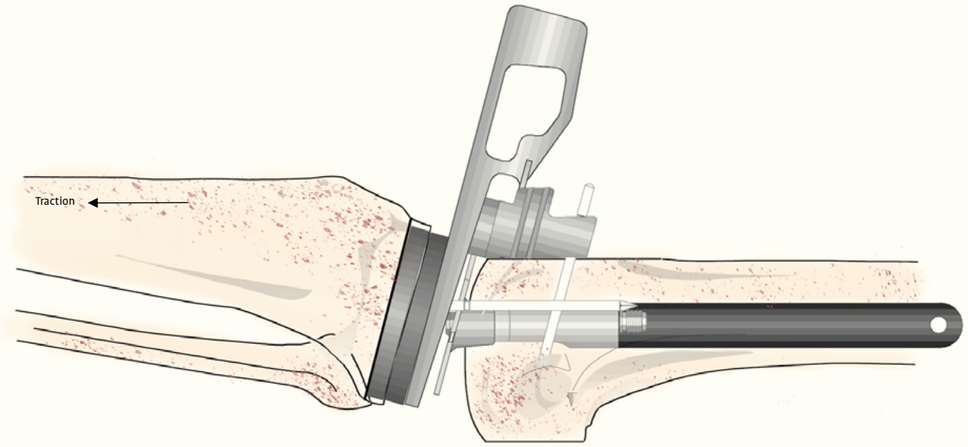
Assemble the Revision Distal Femoral Resection Guide (RDFRG) Positioner with the **Revision Distal Femoral Resection Guide Positioner Adapter** oriented for Left or Right resection as desired with the Appropriate Trial Extension.



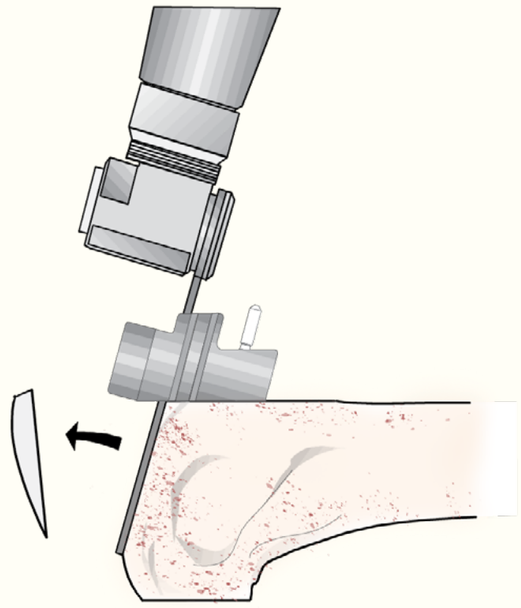
Insert the Assembly into the reamed hole in the femur and place the Bone Pin Hole(s) of the Plate of the Distal Femoral Resection Guide Positioner onto the same Pins that were used in the correponding holes to align the A-P Femoral Resection Guide in step 6 of the procedure. Impact the pin(s) so that they will not engage the tibia on extension of the joint.

Slide the most distal slot of the **Distal Femoral Resection Guide** onto the **Tang** on the **Plate** ofthe Distal Femoral Guide Positioner.

Fully extend the knee and apply traction to the leg. Insert the Tang of the A-P Femoral Resection Guide (with the same Thickness Adapter used earlier) into the distal Resection Slot of the Distal Femoral Resection Guide and the inferior surface of the assembly onto the tibial resection plane. This establishes the correct positioning of the Distal Femoral Resection Guide.



Fix this position with Bone Pins through the Anterior Bone Pin Holes in the Distal Femoral Resection Guide.



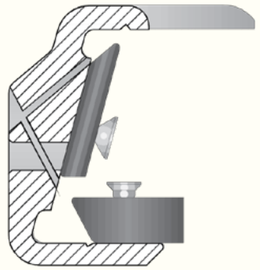
Check alignment of the angular position of the Distal Femoral Resection Guide using the long Alignment Rod as done previously. Adjust if needed and re-pin using an alternate set of pin holes.

Remove the distal pin(s) and Guide Positioner. Perform the distal femoral resection using the appropraiate slot, or slots, in the Distal Femoral Resection Guide.

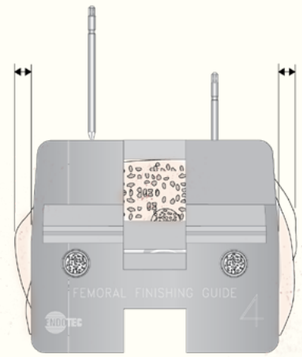
Note: Make sure that these resections are flat. Errors in these cuts will generate errors in the subsequent femoral resections.

Remove the anterior Pin(s) and the distal Femoral Resection Guide.

8. Femoral Finishing Resections

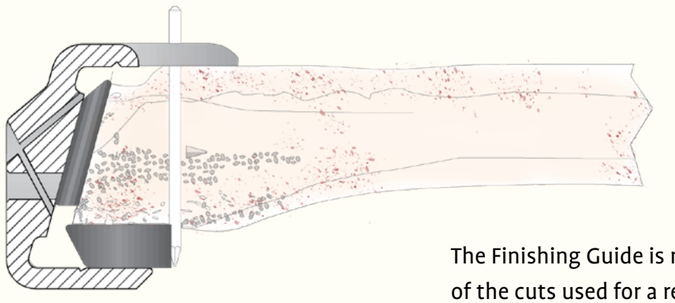


Assemble the appropriate **Trial Femoral Augments** onto the **Finishing Guide**. The same Trial Augments will be used with the Femoral Trial.



For revision cases, where there is insufficient anterior and posterior bone stock to support and position the Finishing Guide,the Guide is manually postioned such that the intramedulary femoral hole is centered on the edge of the oblique anterior recessing guide surface.

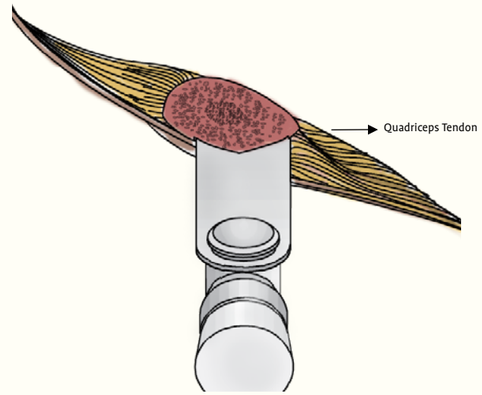
Pins are then placed in the Anterior Pin Holes to support the Guide.



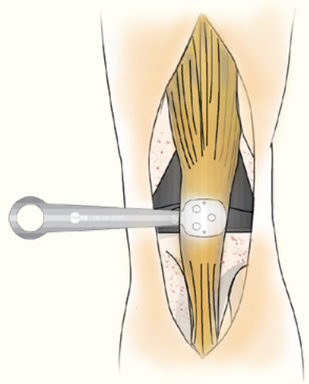
The Finishing Guide is now ready for use in making any of the cuts used for a revision knee where bone is present for cutting. Often there will be no bone available for making these cuts in revision cases and thus the Finishing Guide is often not used.

9. Patella Preparation

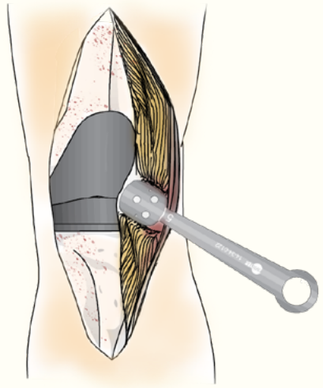
If this is an LCS or B-P knee revision and if the **Rotating-Bearing Anchoring Plate** is well-aligned and well-fixed but the **Patella Bearing** shows signs of wear, insert a 6mm osteotome between the bearing and the anchoring plate and twist the osteotome to dislodge the bearing from the trunion cone. Snap-on a new Bearing by digital pressure or use of the **Patella Clamp**.



If the Rotating-Bearing Anchoring Plate or another type of patella device has been removed, be sure that the bony cut is parallel to and at the level of the quadriceps tendon insertion to give equal amounts of bone medially-laterally and superiorly-inferiorly.

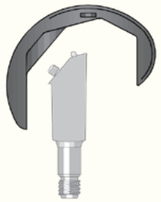


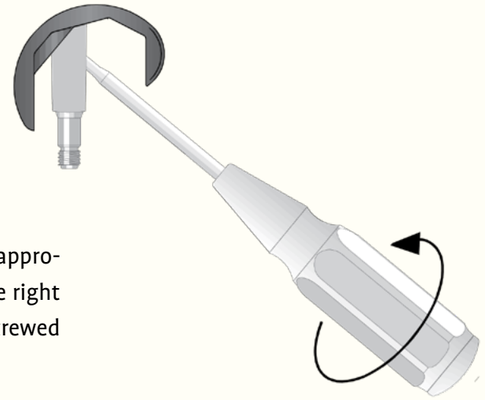
If ample bone stock exists after the facing cut has been completed, place the appropriate **Patellar Template** onto the resected bony surface of the patella with the patella reduced into its normal anatomical position. The Template should be oriented perpendicular to the patellar tendon and the tibial shaft in this position.



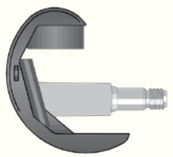
Evert the patella and maintain the patellar template orientation which is usually downward by approximately 30 degrees. Center the template on the patella at this angle and proceed to mark the three fixturing holes with a Marking Pen. If poor bone stock exists after removing the patellar component, consider trimming and contouring the patella remnant into a resection arthroplasty or augment the deficient patella with bone graft and a synovial flap if possible. Replace the patella remnant into the femoral groove and perform a lateral release if necessary to establish central tracking with no tendency to sublux.

10. Assembly of Trial Components

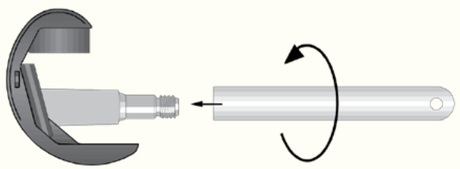




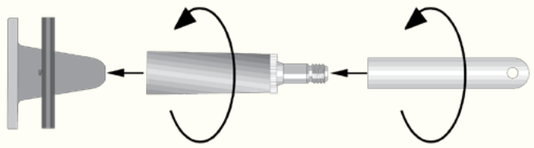
After unscrewing the two **fixation pegs** on the appropriate size **Modular Femoral Trial**, an appropriate right or left **Femoral Trial Modular Shaft Adapter** is screwed onto the Femoral Trial.



Assemble the appropriate **Trial Femoral Augments** to the Modular Femoral Trial.



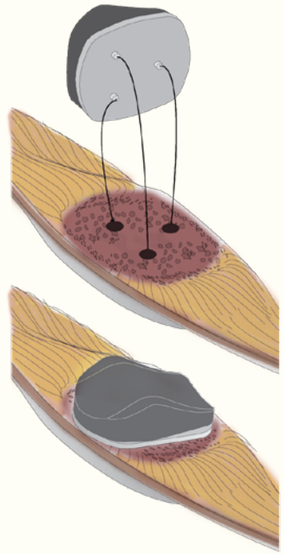
The selected length and diameter **Stem Extension Trial** is then screwed onto the Adapter end.



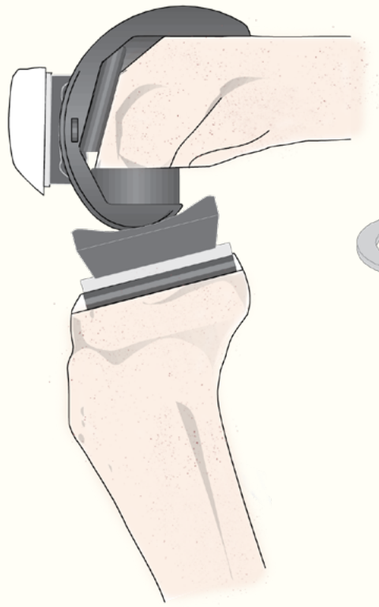
The Modular Tibial Trial is assembled by screwing on the Tibial Trial Modular Shaft Adapter of appropriate size to the Tibial Trial. If a Tibial Augment is to be used a Trial Tbial Augment is attached to the inferior surface of the Tibial Trial. Finally an appropriate Stem Extention is screwed onto the Shaft Adapter.

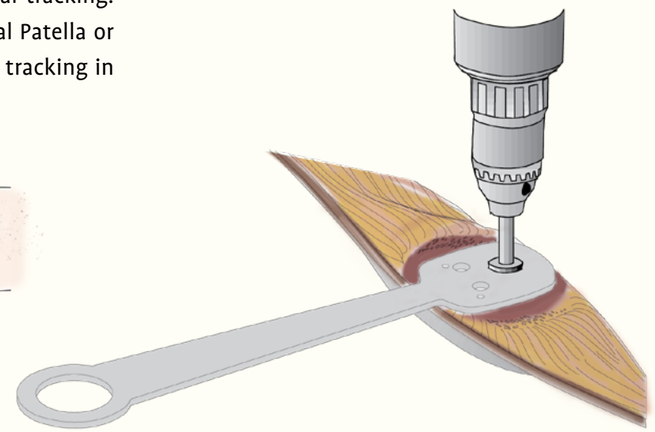
11. Trial Reduction

Press the **Trial Patella** component onto the resected patellar surface with the pins located on the drill hole marks.



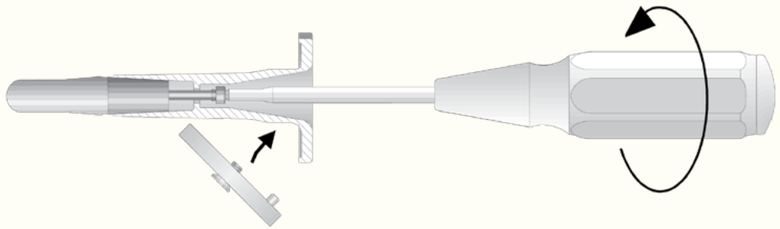
Implant the Assembled Tibial, Bearing and Femoral Trials. Reduce the patella and evaluate the patellar tracking. If necessary adjust the position of the Trial Patella or perform a lateral release to obtain central tracking in the femoral groove.





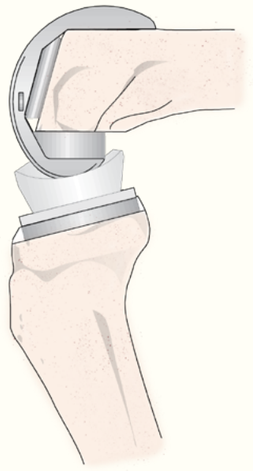
Align the appropriate size and type Patellar Template with the marking on the resected patellar surface representing proper patella placement.Ensure that the Template is flush. Prepare the three holes using the Patella Drill through the holes in theTemplate. Ensure that the holes are sufficiently deep to avoid any “hang up” of the patella component.

12. Component Implantation



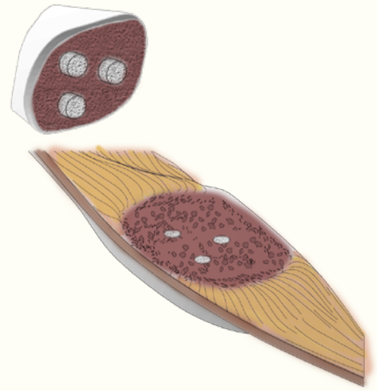
Tibial Component
Assemble the proper size **Tibial Component with the Tibial Augment** by use of cement and the **Augment Screw**. Add the **Modular Stem** by inserting the conical end of the Modular Stem into the distal recess of the Tibial Component and then insert the **Clamping Screw** into the other recess. Tighten the Clamping Screw using the **Torque Screwdriver** until a click indicating proper torque is heard.

Femoral Component
Assemble the proper size **Femoral Component**, Femoral Augments and Modular Stem in the same manner.



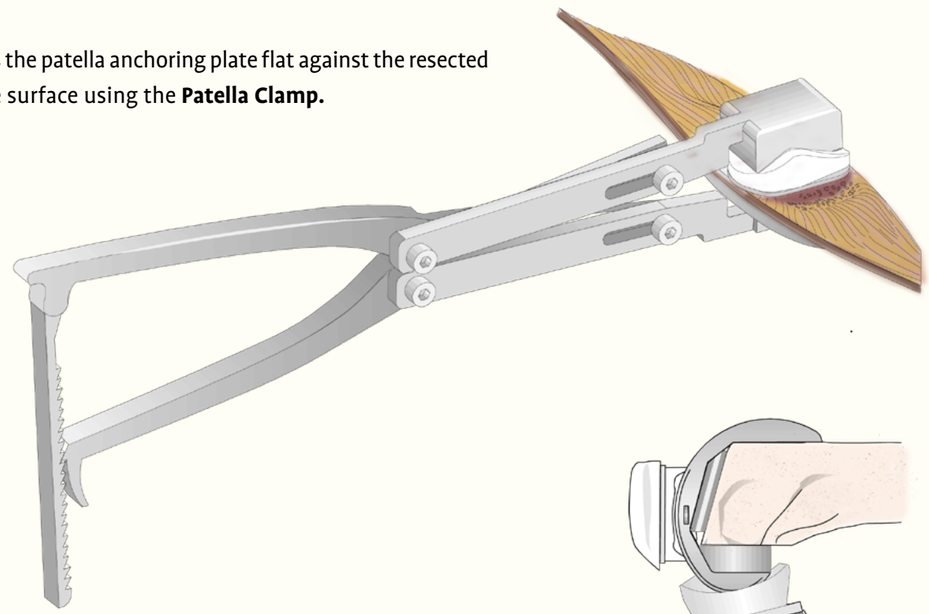
Component Implantation
Flex the knee to 110 degrees and insert the Tibial Modular Stem into the tibial canal and fully seat the Tibial Component. Implant the **Bearing** on the Tibial Platform. Finally, implant the Femoral Component by placing the Femoral Modular Stem in the femoral canal and fully seating the Femoral Component.

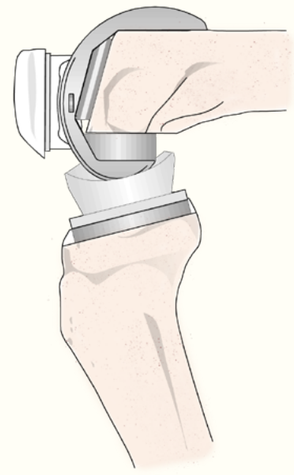
Bring the knee to 80 degrees flexion. Remove excess cement from the edges of the prosthesis. Extend the knee fully and allow the cement to completely set.



Patellar Component
Place bone cement onto the resected patellar surface and with finger pressure outline the peg holes. Press the pegs into the cement mantle and secure final seating with the patellar clamp. Remove excess cement from the edges of the prosthesis.

Press the patella anchoring plate flat against the resected bone surface using the **Patella Clamp.**

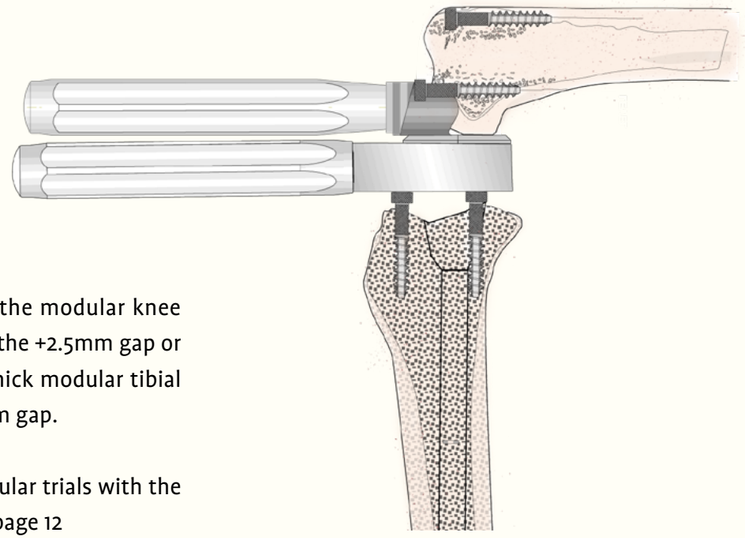




Reduce the patella and evaluate the implants.Ensure that an unrestricted range of motion, free bearing movement and proper patella tracking are present.

Hinge Implantation

Additional femoral resection

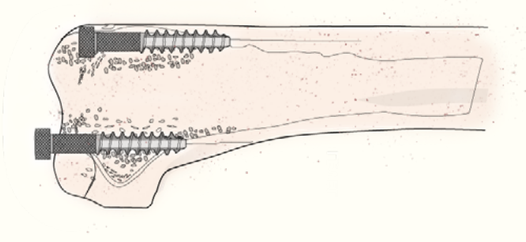


Prepare the femur and tibia as for the modular knee and use the setup of page 17 except the +2.5mm gap or +12.5 mm gap is always used. The thick modular tibial component is used with the +12.5mm gap.

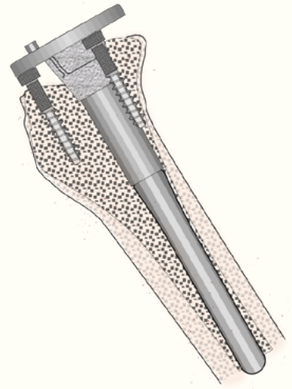
Trial reduce the knee using the modular trials with the +2.5mm thick bearing as shown on page 12

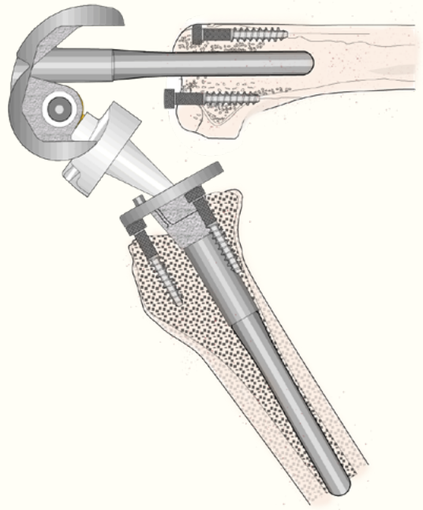
Prepare the box for the hinge by use of the appropriate box osteotome and spacer as shown centered on the femoral intramedullary role.

Hinge component implantation

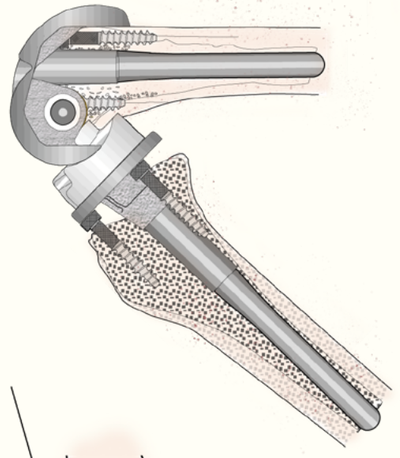


Insert the tibial component

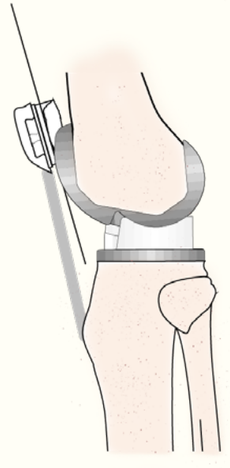




Flex the knee about 120 deg and insert the femoral assembly with the bearing taking care to engage the bearing cone into the hole in the tibial component.

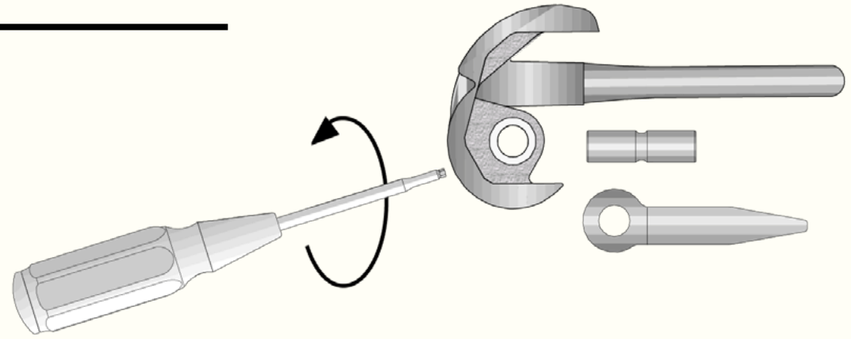


Fully seat the femoral assembly

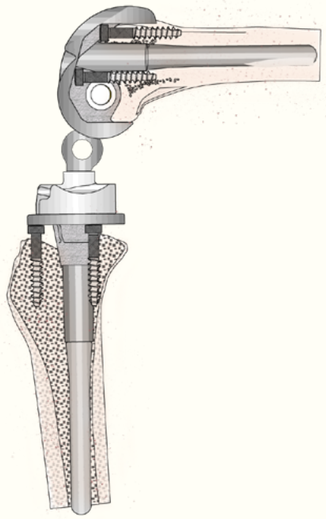


Check the knee for stability and motion

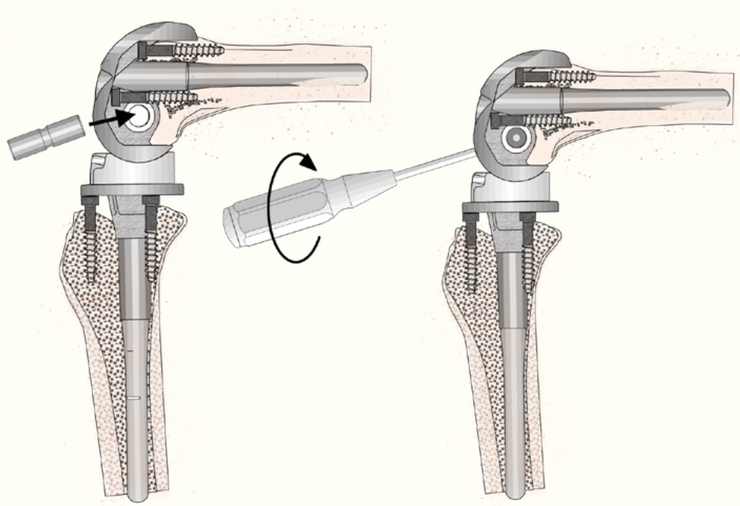
Hinge Component Implantation (Alternate)



Disassemble the hinge knee assembly



Insert the tibial components



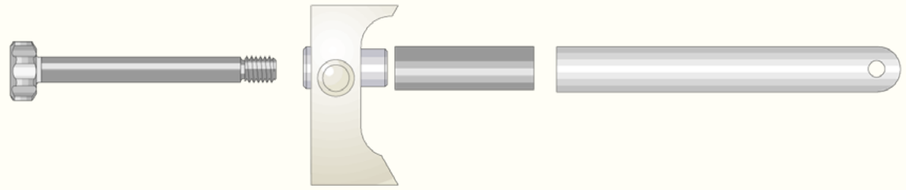
Align the hinge elements and insert the hinge pin

Tighten the setscrew

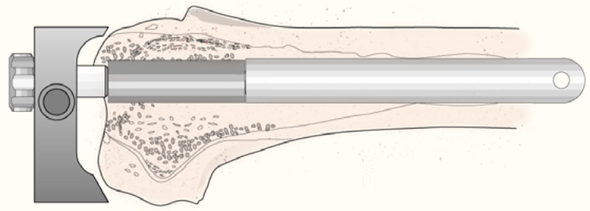
Auxiliary Steps

4a.A-P Femoral Resection

The degree of femoral resection depends upon the bone stock remaining after failed component removal. Some resections called for may not be possible .Others may only be partial. Rebar Screws are used in such cases to obtain necessary component support rather than resected bone.

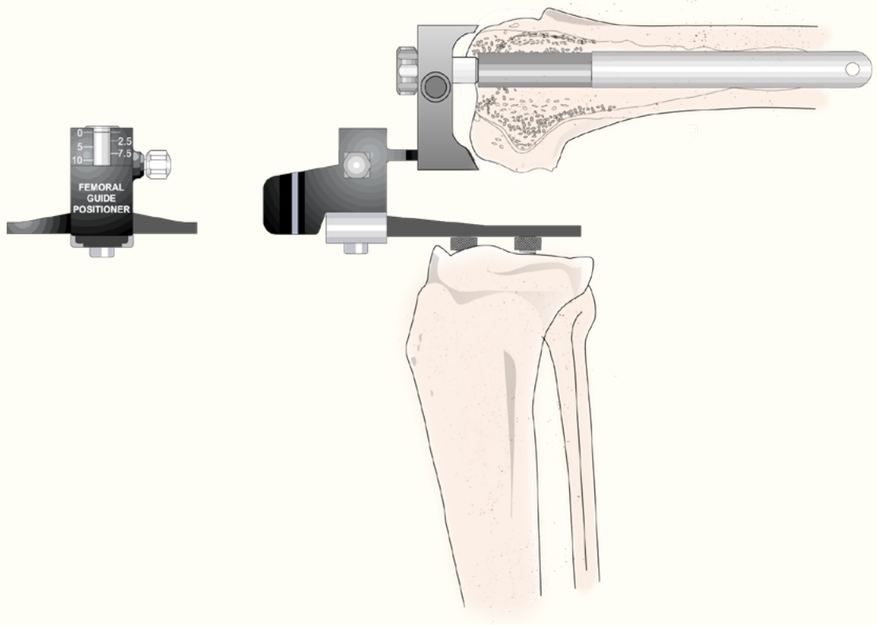


Assemble the A-P Femoral Resection Guide to the appropriate length and diameter Trial Stem Extension by use of the A-P Extension Shaft and Bolt.



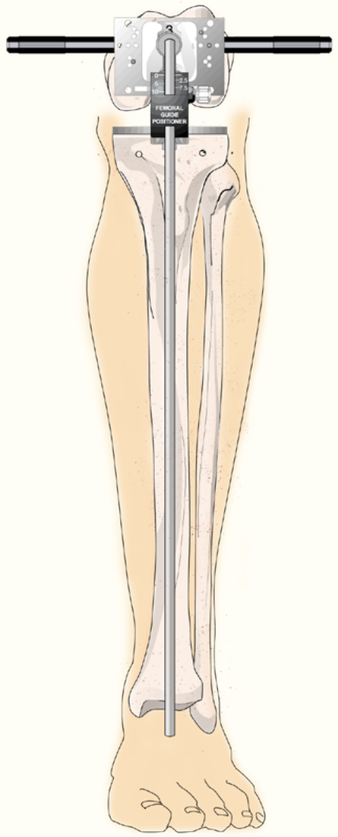
Insert the assembly into the prepared femoral hole.

Note: If there is insufficient distal tibial bone stock, which even when augmented with Rebar Screws, to provide a stable Proximal Tibial Reference Plane so as to support the Femoral Guide Positioner then the Tibial Platform Trial may be installed and its superior surface used as this reference. In this event the thickness of the Trial Tibial Plate of about 5mm or 15mm must be taken into account.



Insert the Full Gap Spacer into the Channel in the Femoral Guide Positioner .Insert the Tang of the Femoral Guide Positioner into the Positioning Slot of the Femoral Resection Guide and onto the resected surface of the tibia.
The function of the Positioner is to reproduce the flexion gap and balanced medial and lateral ligamentous tension. This will axially position the A-P Femoral Resection Guide so as to produce balanced flexion tension and proper axial plane alignment.

If the Positioner is too tight, the tibial resection is too high. In this case drop the Tibial Resection Guide to the next set of holes to engage the Fixation Pins at a lower level and redo the tibial resection plane.
If the joint is loose in flexion move the Carriage of the Positioner to a “thicker” position by loosening the lateral knob just enough to allow the Carriage to drop to the next position. Further slow loosening of the knob will allow the Carriage drop to yet thicker positions. Select the thickness that provides the best approximation to normal flexion tension of the ligaments. The final position of the Carriage producing the proper ligament tension will most likely indicate the thickness of the bearing that will be used.

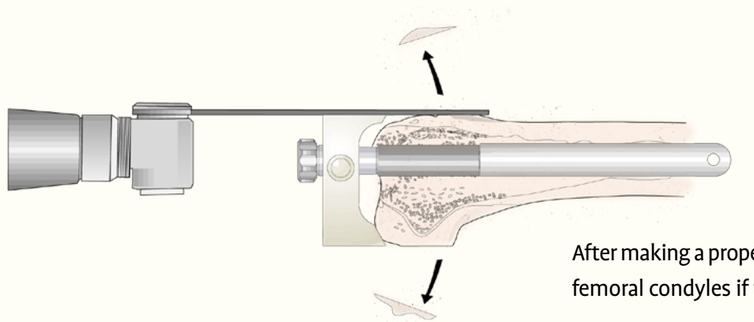


Check the tibial resection using the long **Alignment Rod** inserted into the Femoral Guide Positioner. Correct the tibial resection if necessary before proceeding.

The Alignment Rod is also useful for rocking the Femoral Guide Positioner to determine flexion tension in each compartment. If the tibial resection is correct, and balanced ligament tension is achieved , pin the A-P Femoral Resection Guide using two Fixation pins and remove the Positioner and Alignment Rod.

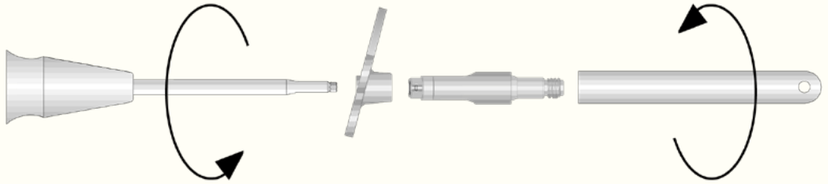
If there is sufficient bone stock, first perform the anterior femoral resection. The **Saw Capture** may be used to help guide the blade if desired. Check that the resection is flat and at the level of the anterior aspect of the femoral shaft. If the anterior resection is too high, remove the I/M Rod and lower the A-P Femoral Resection Guide. Do this by selecting a new set of holes into which the Fixation Pins are engaged so that the new resection will be approximately at the shaft level. This resection adjustment condition will affect the flexion gap and will require a similar amount of resection adjustment of the proximal tibia.

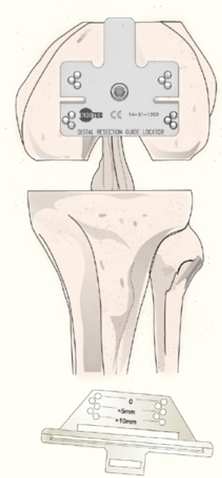
Note: Where there is sufficient anterior resection take care that it is flat. The anterior resection surface is a basic reference surface for the primary procedure and if this surface is viable it may be used to orient the Distal Femoral Resection Guide.



After making a proper anterior resection resect the posterior femoral condyles if there is sufficient bone stock.

4b. Distal Femoral Resection

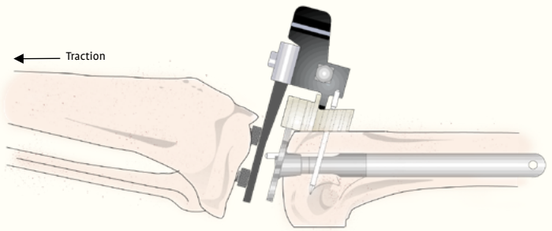




Assemble the **Revision Distal Femoral Resection Guide (RDFRG) Positioner** with the **Revision Distal Femoral Resection Guide Positioner Adapter** oriented for left or right leg resction as desired with the Appropriate Trial Extension.

Insert the Assembly into the reamed hole in the femur and place the Bone Pin Hole(s) of the Plate of the the Distal Femoral Resection Guide Positioner onto the same Pins that were used in the corresponding holes to align the A-P Femoral Resection Guide in step 4 of the procedure. Impact the pin(s) so that they will not engage the tibia on extension of the joint.

Slide the most distal slot of the **Distal Femoral Resection Guide** onto the **Tang** on the **Plate** of the Distal Femoral Guide Positioner.



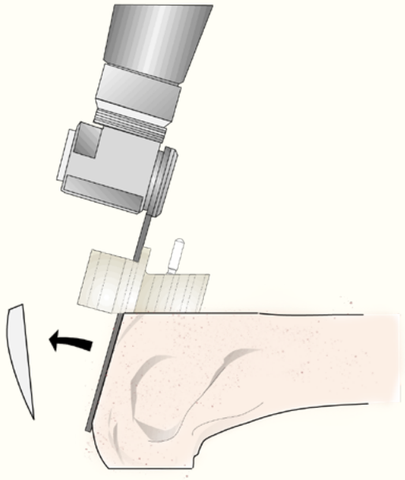
Fully extend the knee and apply traction to the leg. Insert the Tang of the A-P Femoral Resection Guide Positioner (in the same configuration used to position the A-P Femoral Resection Guide) into the Inferior-Superior Positioning Slot of the Distal Femoral Resection Guide and the inferior surface of the Tibial Template onto the tibial resection plane. This establishes the correct positioning of the Distal Femoral Resection Guide.

Fix this position with Bone Pins through the Anterior Bone Pin Holes in the Distal Femoral Resection Guide.

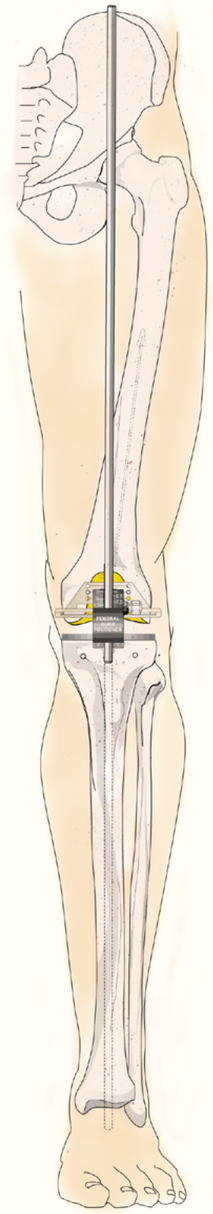
Check alignment of the angular position of the Distal Femoral Resection Guide using the long Alignment Rod. Adjust if needed and re-pin using an alternate set of pin holes.

Remove the distal pin(s) and Guide Positioner. Perform the distal femoral resection using the slot in the Distal Femoral Resection Guide.

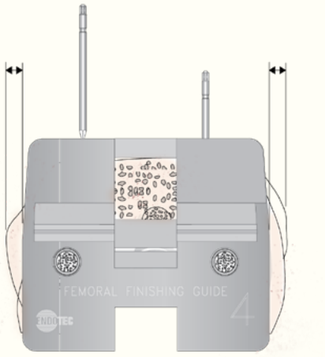
Note: Make sure that this resection is flat. Errors in this cut will generate errors in the subsequent femoral resections.



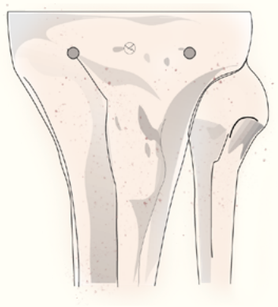
Remove the anterior Pin(s) and the Distal Femoral Resection Guide.



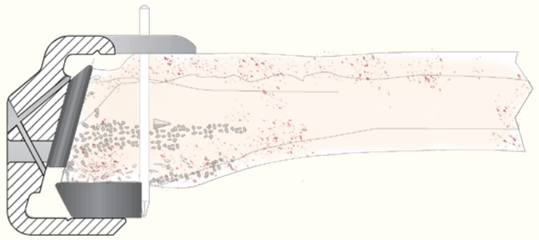
4c.Femoral Finishing Resections



In primary cases the **Finishing Guide** is centered on the distal end of the femur. The chamfer cuts are made through the **Anterior Slots** and **Posterior Slots.** The sulcus recessing cut is made using the **Sulcus Cutting Guide Surfaces**. The posterior recessing cuts are made using the **Posterior Recessing Cutting Guide Surfaces**.



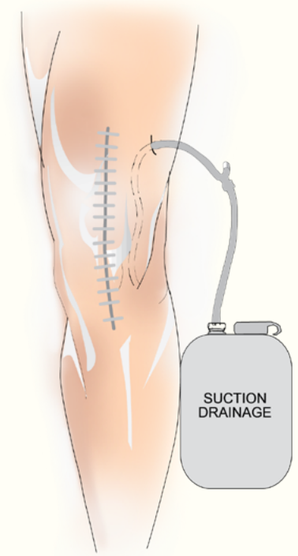
For revision cases, where there is insufficient anterior and posterior bone stock to support and position the Finishing Guide, the Guide is manually positioned such that the intramedulary femoral hole is centered on the edge of the oblique anterior recessing guide surface.



Pins are then placed in the Anterior Pin Holes to support the Guide.

The Finishing Guide is now ready for use in making any of the cuts used for a revision knee where bone is present for cutting. Often there will be no bone available for making these cuts in revision cases and thus the Finishing Guide is often not used.

Closure and Post-Operative Management



Closure

Release the tourniquet, if used, and copiously irrigate the wound with antibiotic saline solution. Check motion with the tourniquet down. Close the deep retinacular tissues using #1 absorbable suture, the subcutaneous tissue with a 2-0 absorbable suture and the skin using staples or a vertical mattress suture. A suction drain may or may not be used. Apply a Robert Jones compression dressing to the extremity followed by a long leg knee immobilizer.

Note: If pressure is needed to gain full extension, apply a well padded long leg cast to hold full extension for 24 hours.

Postoperative Care

Consider the use of continuous nasal oxygen (3L/min) and 10,000 mg of intravenous vitamin C daily for the initial 48 hour post operative period to promote wound healing.

The patient may be out of bed on the first post-operative day and may begin isometric quad setting exercises of at least ten per hour. Remove suction drains, if used, after 48 hours. An anticoagulation protocol should be used. The patient may transfer with weight-bearing to tolerance on the first post-operative day and may begin gravity-assist and active-assistive range of motion. Should wound healing be a problem, then defer flexion until the wound quality appears satisfactory.

Perform physical therapy, consisting of progressive ambulation with weight bearing to tolerance, daily for the first two weeks and then three times weekly over the next four weeks. Knee swelling may persist consistent with the rehabilitation status of the quadriceps mechanism. Post operative swelling with a well functioning quadriceps generally subsides within 6-12 weeks following knee replacement. Isometric quad setting exercises should be continued until knee effusion (swelling) has subsided. Once this effusion has subsided, progressive resistive quadriceps exercises should begin to improve strength and endurance.

References

1. Garvin, K.L., Scuderi, G., Insall, J.N. Evolution of the quadriceps snip. Clin. Orthop. 321: 131-137, 1995.

2. Insall, J.W. Surgical approaches to the knee. Insall JN (ed). Surgery of the Knee. NewYork, Churchhill, Livingston. 4-54, 1984.

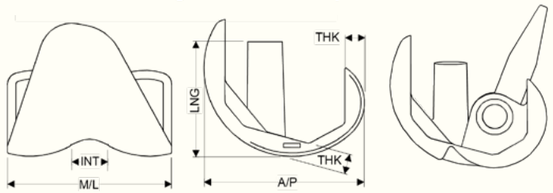
3. Buechel, F.F. A sequential three step lateral release for correcting fixed valgus knee deformities during total knee arthroplasty. Clin. Orthop. 260; 170-175, 1990.

4. Levy, T.E. Curing the Incurable - Vitamin C, Infectious Diseases and Toxins, Livon Books, Las Vegas, 2002.

5. Berend ME, Ritter MA, Keating EM et al. Use of screws and cement in primary TKA with up to 20 years follow-up. JOA 29: 6; 1207-1210, 2014.

System Description - Implant Availability and Sizing

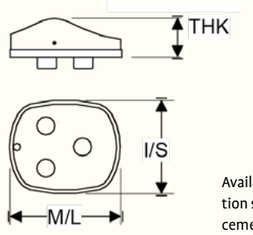
Modular and Hinge Femoral Component



Available in the right handed versions withBiocota® on the metal fixation surfaces.

Size	A/P (mm)	M/L (mm)	INT (mm)	LNG (mm)	THK (mm)
1	53.0	56.8	12.8	41.0	6.5
2	57.0	60.0	13.7	41.4	7.0
3	61.4	64.6	14.8	41.8	7.5
4	66.1	69.6	15.9	42.3	8.1
5	71.2	74.9	17.1	42.8	8.7

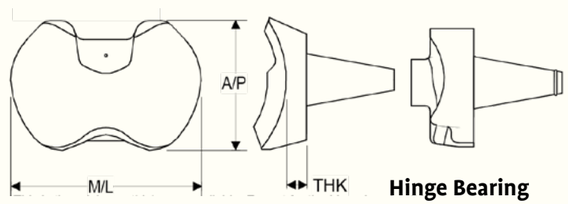
Patellar Component



Available in Biocota® on the metal fixation surfaces and as an all polyethylene cemented version.

Size	I/S (mm)	M/L (mm)	THK (mm)	THK (All Poly)
1	24.0	28.6	10.1	8.4
2	25.9	30.8	10.8	9.0
3	27.8	33.2	11.6	9.7
4	30.0	35.7	12.4	10.4
5	32.3	38.4	13.3	11.2

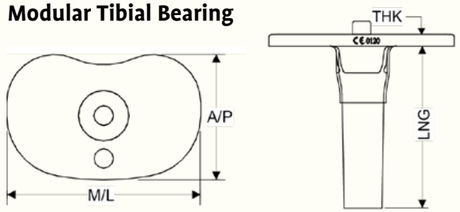
Tibial Bearing



Hinge Bearing

Size	A/P (mm)	M/L (mm)	THK (mm)*
1	33.9	55.1	6.0 (8.5)
2	36.5	59.3	6.3 (8.8)
3	39.3	63.9	6.9 (9.4)
4	42.4	68.7	7.4 (9.9)
5	45.6	74.0	8.1 (10.6)

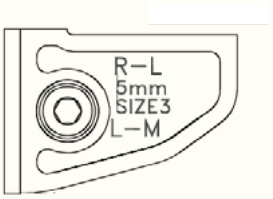
Modular Tibial Bearing



Available in Biocota® on the metal fixation surfaces.
*Components with a 10mm thicker tibial plate are also available.

Size	A/P (mm)	M/L (mm)	THK (mm)*	LNG (mm)
1	38.1	59.2	3.6	56.7
2	41.0	63.7	3.8	56.5
3	44.2	68.6	4.1	56.3
4	47.6	73.8	4.3	56.0
5	51.2	79.5	4.6	55.8

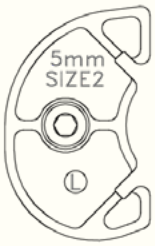
Femoral Augments



Distal augments are available in six sizes, two thicknesses (5 and 10mm).

Posterior augments are available in six sizes, three thicknesses (5, 10, and 15mm).

Tibial Augments



These augments are available in six sizes, three thicknesses (5, 10 and 15mm).