

MICRO-MILL[®]
INSTRUMENT
SURGICAL
TECHNIQUE

For Mobile
Bearing
Knees



INTRODUCTION

The *MICRO-MILL*® Instrumentation System has been designed to provide a simple, precise and reproducible technique with a number of options that offer the surgeon more choices and greater flexibility. In resecting the femoral and tibial surfaces to accept the prosthetic components, the surgeon can choose between the Milling Technique or the 5-in-1 Saw Blade Technique.

Both the milling and 5-in-1 saw blade procedures are designed to create smooth, accurate resected surfaces and precise knee alignment. The Milling Templates and the 5-in-1 Saw Guides attach to the same Femoral Mounting Bases, providing an accurate, reproducible reference for all femoral precision cuts. This helps avoid the inaccuracies that can be associated with multiple instrument setups and referencing resected surfaces. The result is more accurate and reproducible femoral resection, leading to improved femoral fit and more precise joint alignment.

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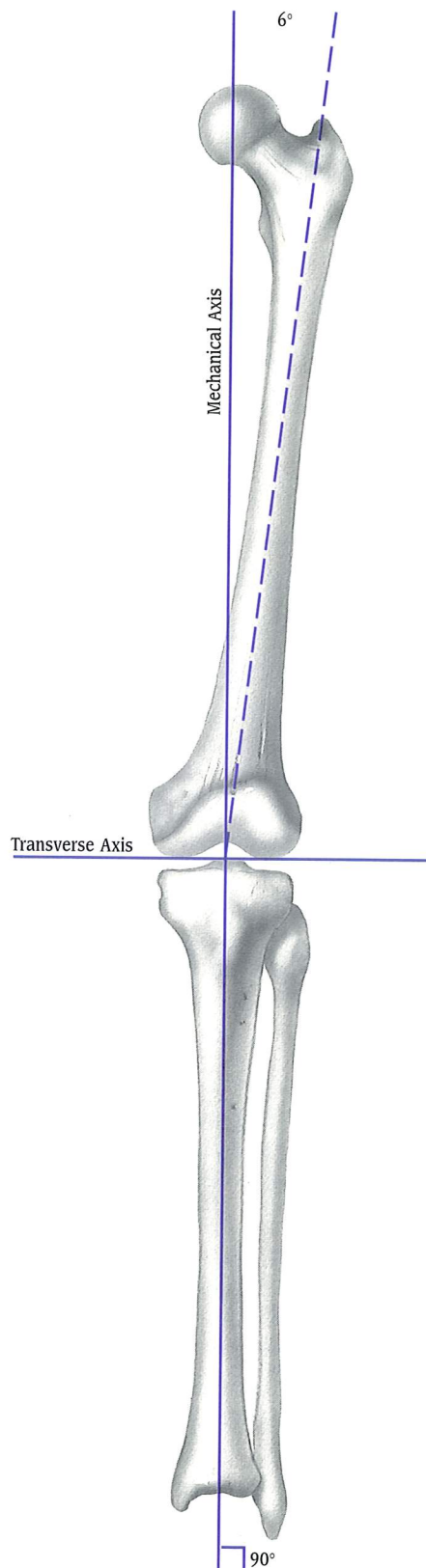
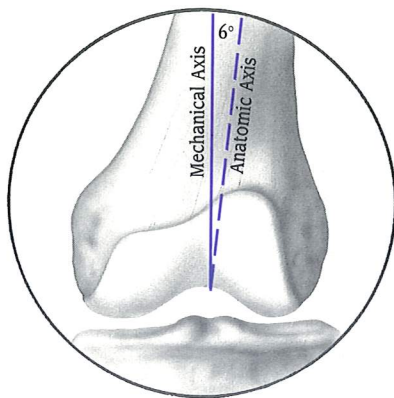
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PREOPERATIVE PLANNING

Use the template overlay (available through your Zimmer representative) to determine the angle between the anatomic axis and the mechanical axis. This angle will be reproduced intra-operatively. 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.



STEP ONE

ALIGN THE TIBIA

In this step, the tibial cut is aligned, ensuring proper posterior slope and rotation and that the resection is perpendicular to the mechanical axis.

Retract the tibia anteriorly by using the tibial retractor. Adjust the length of the Extramedullary Tibial Alignment Guide to fit the patient's tibia. Attach the Proximal Tibial Reference Guide to the proximal end of the alignment guide (Fig. 1). Do not fully seat the reference arm. Leave 1-2 lines visible.

Center the foot of the alignment guide at the ankle and tighten the ankle strap (Fig. 2). The

true center of the ankle is about 5-10mm medial to the mid-point between the medial and lateral malleoli. Position the proximal portion of the alignment guide superior to the tibial tubercle and center it mediolaterally. Use the Tibial Depth Resection Gauge in the depth resection slot on the reference guide (Fig. 3) to ensure that the proximal portion is not positioned too far superiorly. This will show the maximum tibial resection when the milling base is inserted to the same depth as the reference guide. If there is not enough resection possible, move the alignment guide distally. Also observe the wings of the Proximal Tibial Reference Guide to ensure that proper rotation has been achieved (Fig. 1 Inset).



Fig. 1

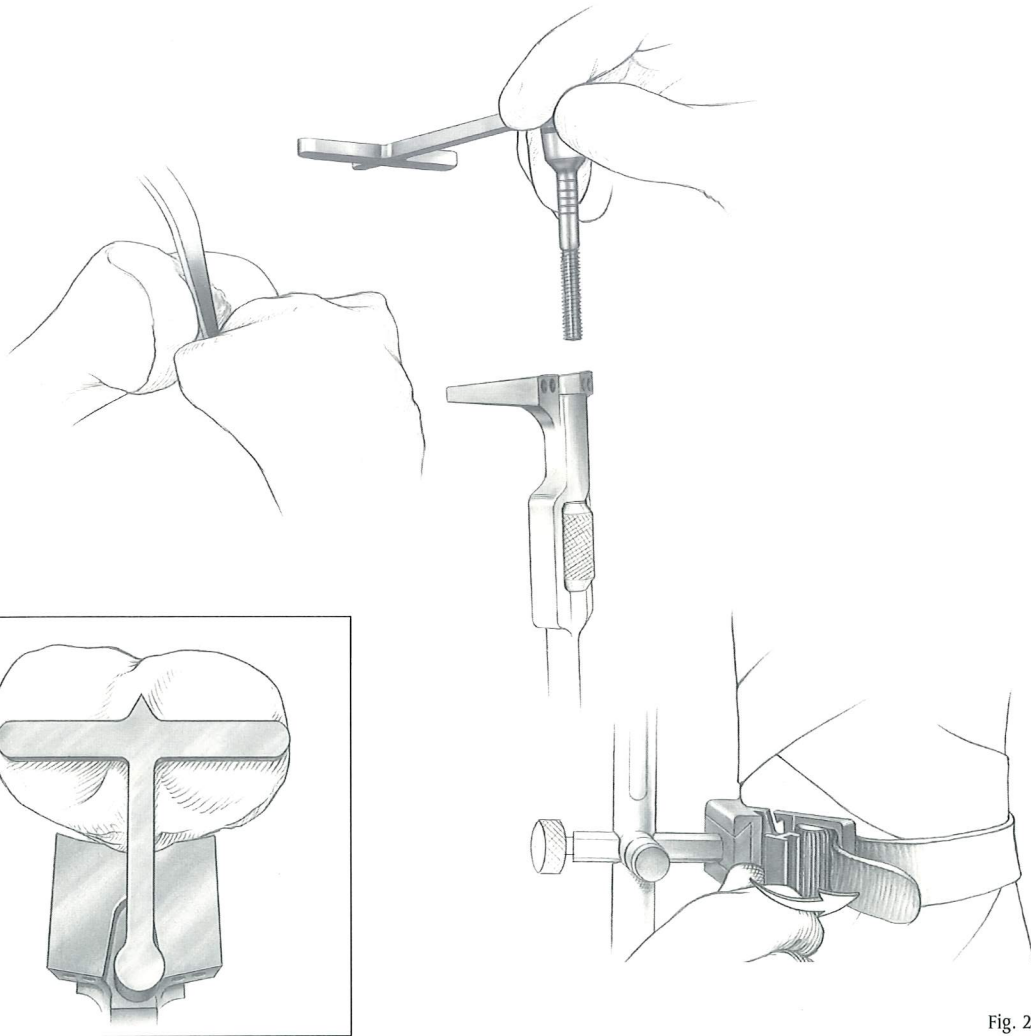


Fig. 2



Ensure that the alignment guide is parallel to the mechanical axis in the sagittal plane. If it is not, adjust the guide in or out at the ankle until it is parallel (Fig. 3). Observe the Proximal Tibial Reference Guide to check the 7° posterior slope and rotation. When the position is set, pin the guide with one pin on the lateral side. Adjust the distal ankle portion in the mediolateral plane so the guide follows the anterior tibial crest and is

slightly closer to the medial malleolus than the lateral malleolus (Fig. 4). This will ensure that the resected surface will be 90° to the mechanical axis. Observe the Proximal Tibial Reference Guide to ensure that the resection will have the appropriate varus/valgus angle. If desired, insert a second pin after ensuring that alignment is correct.

Remove the Proximal Tibial Reference Guide.

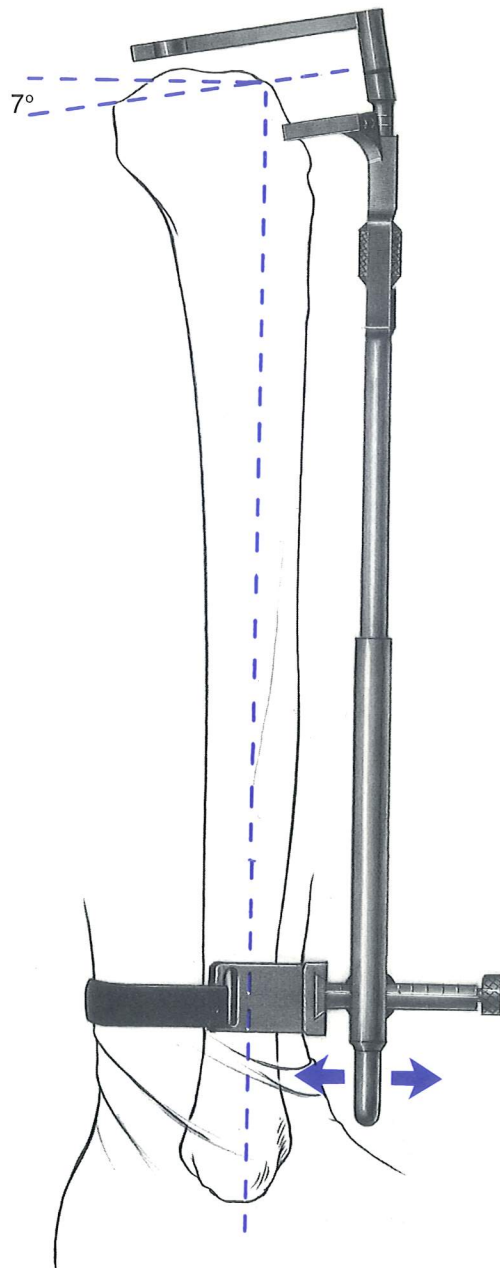


Fig. 3

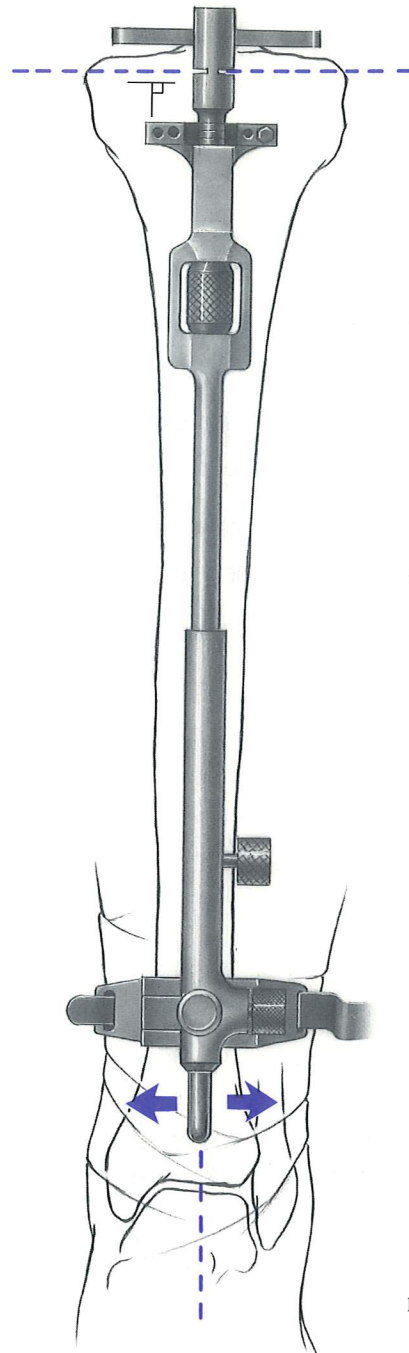


Fig. 4

MICRO-MILL® ASSEMBLY AND USAGE*:

1. With the air hose detached, disengage the shield lock and retract the shield/plunge guide to expose the collet.
2. Turn the mill Collet to the "OPEN" position.
3. Insert the cutter onto the mill until it is fully seated (Fig. 5).
4. Turn the collet to the "CLOSED" position.
5. Slide the shield/plunge guide over the cutter.
6. Place the Milling Drape over the end of the shield/plunge guide. The hole in the center of the drape fits over the base of the safety shield (Fig. 6).
7. When the drape is in place, attach the air hose to the mill.
8. Ensure that the operating pressure is set at 100 PSI plus 10 PSI for each 10 feet of hose between the mill and regulator.
9. The safety is disengaged when the surgeon places a finger under the safety lever (Fig. 7).

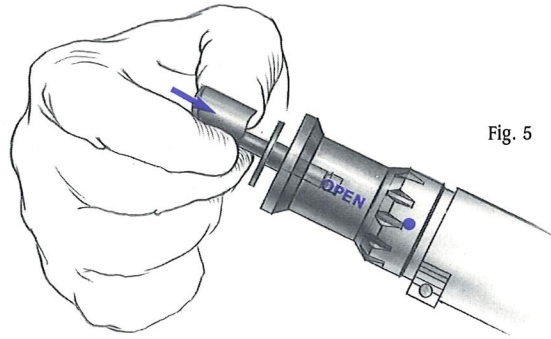


Fig. 5

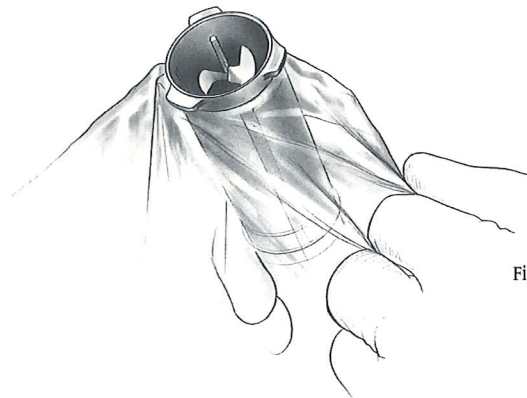


Fig. 6

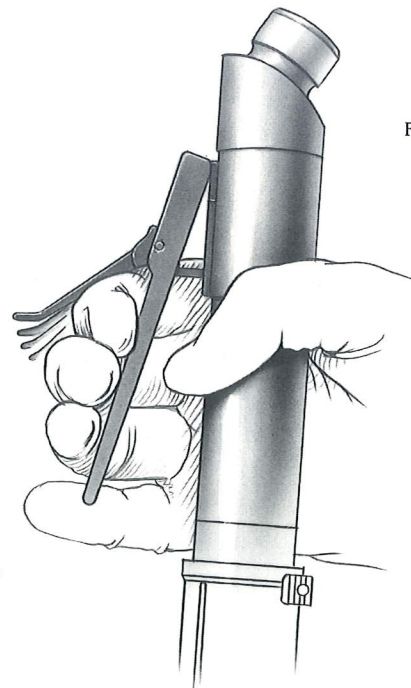
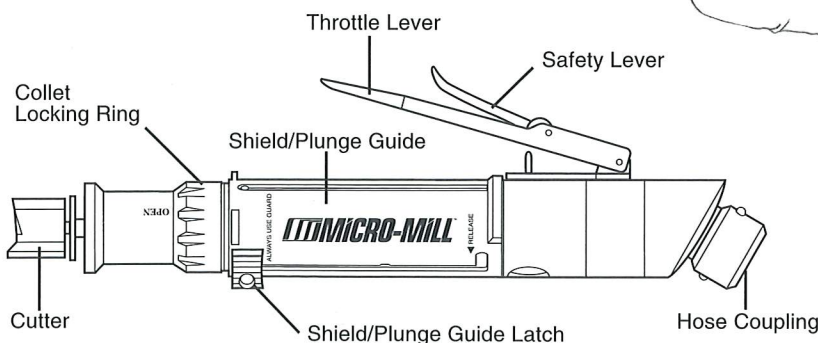


Fig. 7





STEP TWO (MILLING)

RESECT THE TIBIA

Attach the Tibial Milling Base to the Extra-medullary Tibial Alignment Guide by placing it into the guide and engaging the threads by turning the adjustment knob (Fig. 8). Choose the appropriate Tibial Milling Template by placing them one at a time over the tibia until one provides the desired tibial coverage for bone removal (Fig. 9). **This does not dictate the final size selection for the tibial base plate.** The outer edge of the template corresponds to the cutting edge of the mill. Attach the selected template to the Tibial Milling Base by compressing the two plungers on each side of the base (Fig. 10). If the template contacts the femur, flex the knee further and retract the tibia more anteriorly.

When exposure for the lateral compartment becomes tight, a small portion of the distal lateral femoral condyle can be removed to aid in placement of the template.

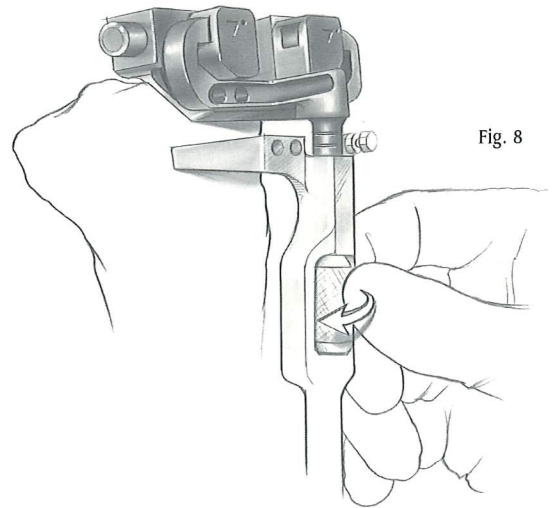


Fig. 8

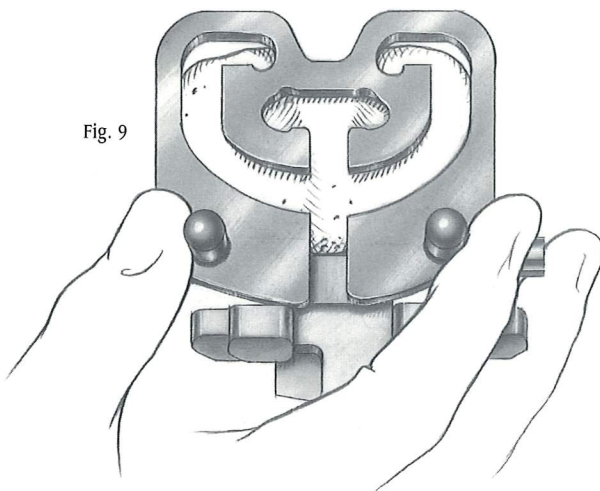


Fig. 9

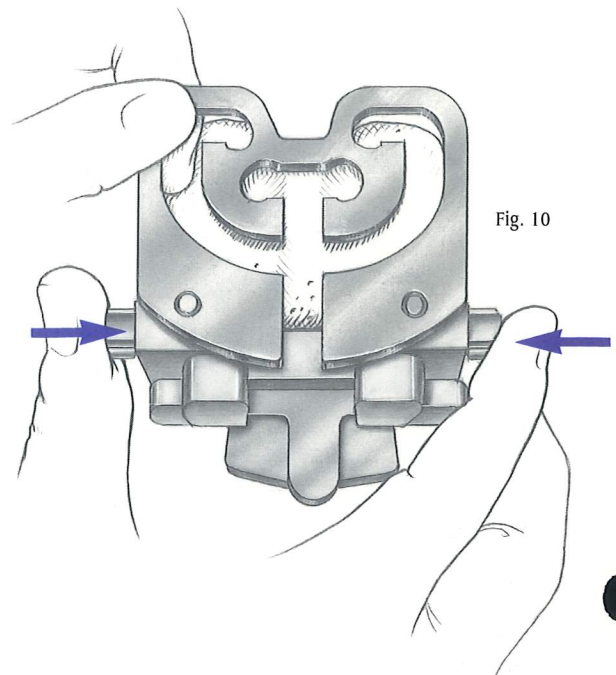


Fig. 10

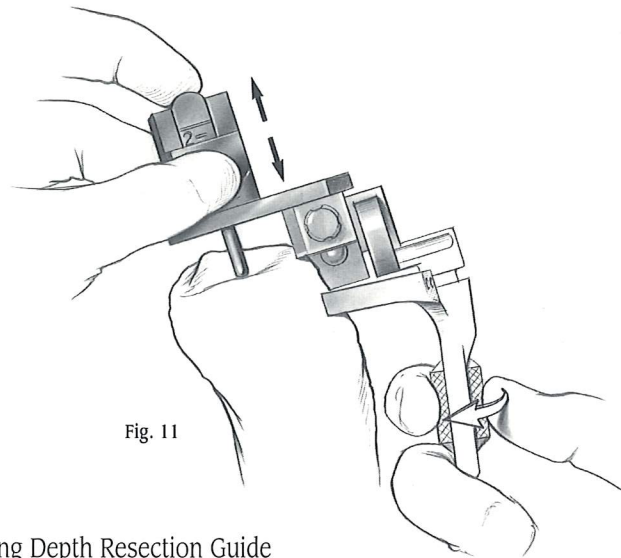


Fig. 11

Place the Tibial Milling Depth Resection Guide onto the template. Adjust the Tibial Milling Base to the proper level (Fig. 11). Keep a finger on the plunger to ensure that the probe stays in contact with bone. The depth resection guide should read 10mm on the intact condyle for an anatomic cut, or 2mm on the defective condyle for a minimal cut. These two points of resection will usually not coincide. The surgeon must decide between an anatomic and minimal resection based on patient age, bone quality and type of prosthetic implant planned. After the depth is set, move the template mediolaterally until it is centered over the PCL attachment site. When positioned properly, use the Pin Driver to pin the milling base in place with two gold Tibial Milling Spring Pins (Fig. 12).

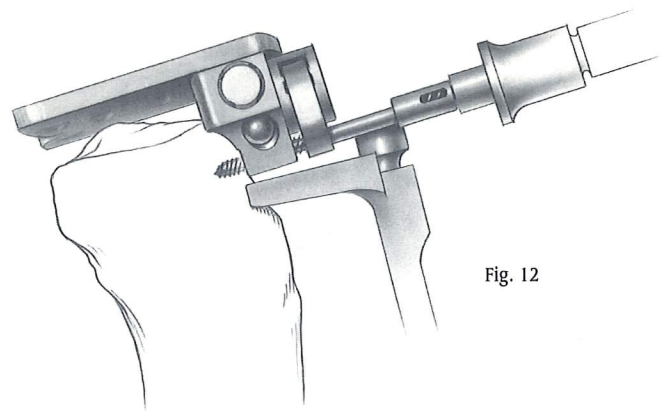


Fig. 12

Check to ensure that all soft tissue is retracted from under the template and there is adequate clearance of the posterior femoral condyles. The patella tendon retractor is recommended to assist. Be sure that retractors are located between all soft tissues and the mill cutter.

With the milling drape over the assembled mill and the operative sight, retract the shield and engage the mill into the anterior opening of the template (Fig. 13).

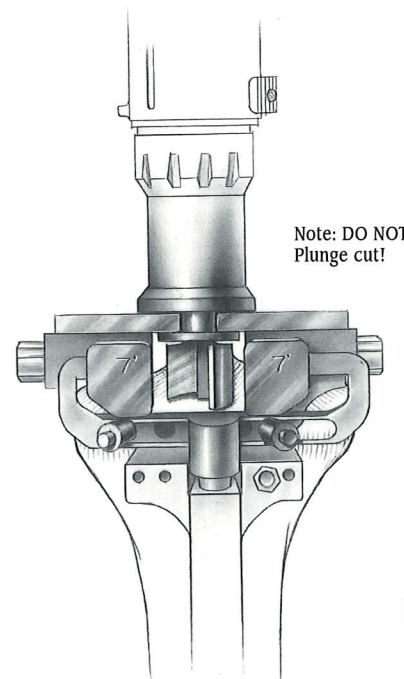


Fig. 13



Disengage the safety and start the mill with the cutter slightly off the bone. Mill the tibia by following the tracks on the template in a clockwise direction. Keep the mill against the outside edge of the track. Depending on the level of resection, the template may contact the tibial crest and prevent milling. If this occurs, the crest should be removed with a rongeur or oscillating saw to allow the mill to cut properly.

When milling is complete, turn off and remove the mill. Pull the shield back over the cutter. Remove the Tibial Milling Template and check the proximal tibial surface resection (Fig. 14). If bone remains around the edges of the proximal tibia, attach the next larger template and remill. If osteophytes are present, remove them with a rongeur.

When complete, use the Female Hex Driver to remove the two tibial milling spring pins.

Place the Female Hex Driver over the spring pin and apply a downward force on the driver sleeve

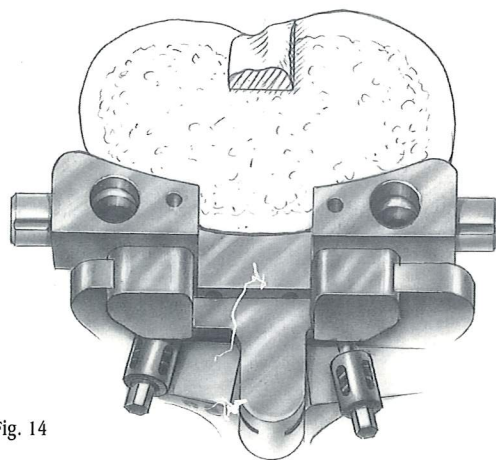


Fig. 14

(Fig. 15). Start the drill/reamer slowly until the driver hex engages the hex head of the pin. Continue until the spring pin disengages bone.

Remove the Tibial Milling Template, the Tibial Milling Base, and the Tibial Extramedullary Alignment Guide. Then use a reciprocating or oscillating saw to remove the island of bone at the PCL attachment.

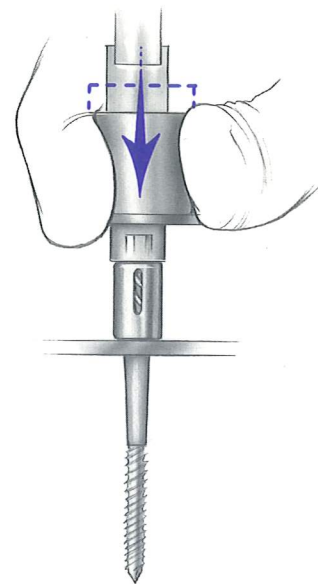
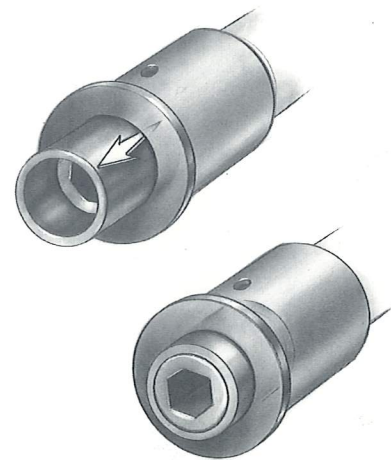


Fig. 15



Check the varus/valgus alignment of the tibial cut by placing a Spacer/Alignment Guide on the resected surface of the tibia with the arm extending over the tibial tubercle. Insert the Alignment Rod with Coupler into the hole on the arm and flex the knee so the rod hangs freely and parallel with the anatomic axis of the tibia in the A/P plane. Note the position of the distal end of the rod. It should be near the center, but slightly closer to the medial malleolus of the ankle (Fig. 16).

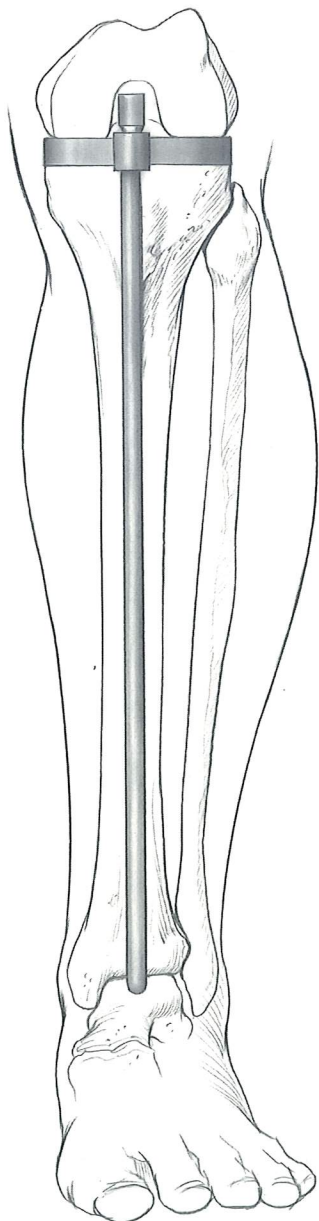


Fig. 16

STEP TWO (SAW)

RESECT THE TIBIA

Insert the Tibial Cutting Head into the Extra-medullary Tibial Alignment Guide (Fig. 17). Insert the 10mm tab of the Tibial Depth Resection Guide into the cutting slot of the cutting guide and adjust the platform until the arm of the gauge rests on the cartilage of the good condyle (Fig. 18).

Note: IM tibial resection instrumentation is also available for the tibial saw blade technique.

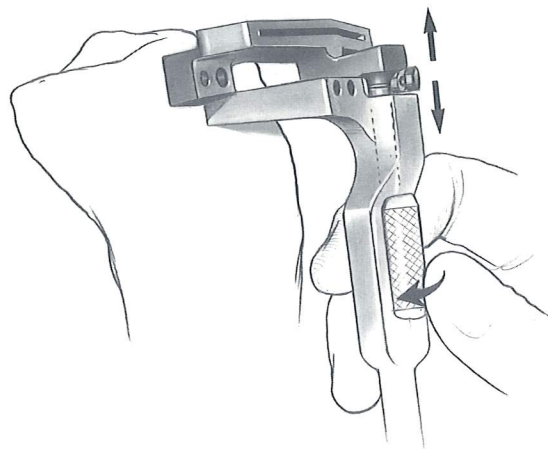


Fig. 17

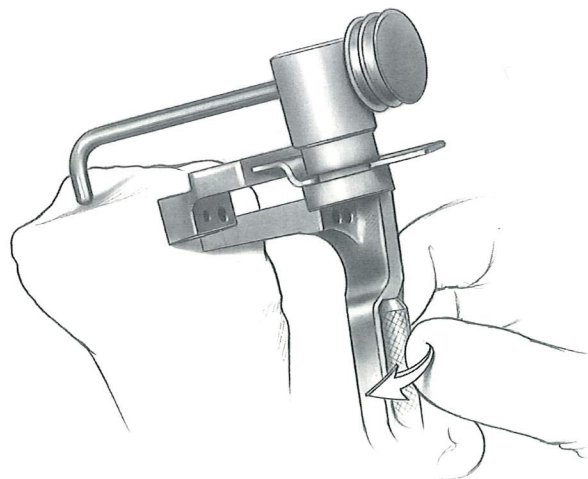


Fig. 18





Be sure that the mark on the arm of the gauge is lined up with the mark on the base of the gauge. This will ensure that the arm is properly rotated within its base and that the proper resection depth is made. This positions the cutting slot to remove the same amount of bone that the thinnest tibial component would replace to give an anatomic fit. The resection guide can also be used to visualize where the cut will exit the posterior tibia (Fig. 19).

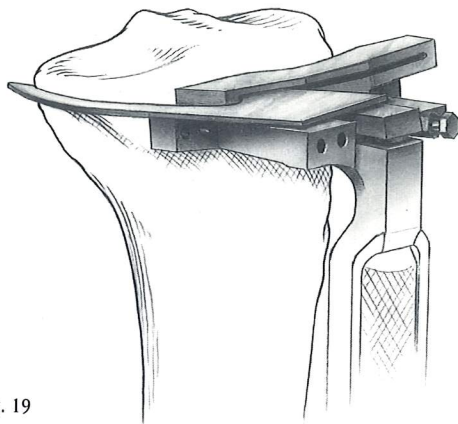


Fig. 19

Optionally, the 2mm tab can be placed into the cutting slot. The arm of the gauge should rest on the defective condyle to be resected. This will allow the removal of two millimeters of bone below the tip of the gauge and provide a minimal resection. These 2mm and 10mm points of resection will usually not coincide. The surgeon must decide between an anatomic and minimal resection based on patient age, bone quality and the type of prosthetic implant planned.

Remove the depth guide and secure the cutting guide with two silver spring pins using the Female Hex Driver. Do not use gold sleeved pins*. (Two standard 1/8-inch pins can also be used to secure the guide.) Use the appropriate thickness blade (1.27mm/.050") and an oscillating saw to cut the proximal tibia (Fig. 20). A bone island at the PCL attachment cannot be left. It will restrict the rotation of the articular surface.

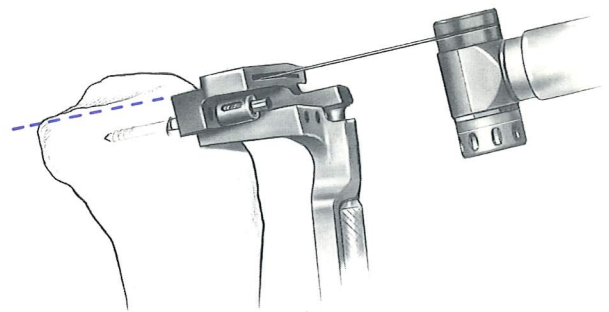


Fig. 20

*Gold pins are for tibial milling only.

STEP THREE

SIZE THE FEMUR

Drill a hole in the center of the patellar sulcus of the distal femur (Fig. 21), 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 drill is a step drill and can be used to enlarge the entrance hole on the femur to 12mm in diameter if desired. This will help to further reduce IM pressure from placement of subsequent IM guides.

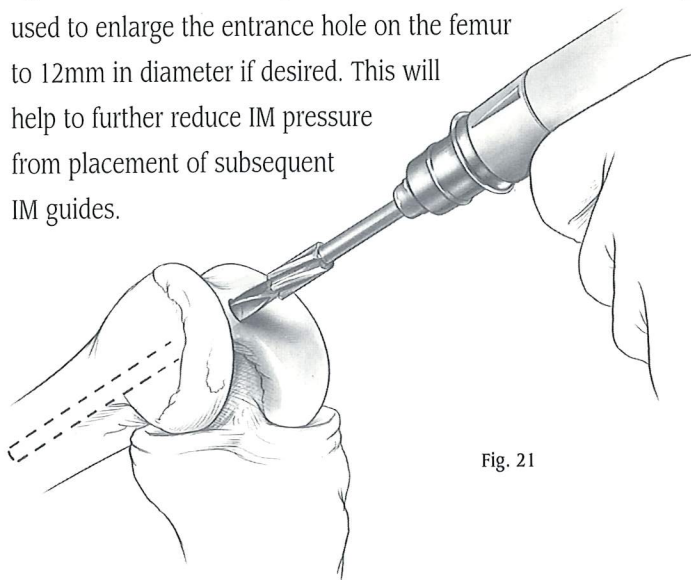


Fig. 21

Insert the IM Femoral AP 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.

Read the femoral size directly from the guide (Fig. 22). If the indicator is between two sizes, choose the smaller size. This size indicates the proper size of the Femoral AP Positioning Guide, the Femoral Milling Template or 5-in-1 Femoral Cutting Guide, and the Femoral Finishing Guide

(milling or 5-in-1), and the femoral component. The sizing should be confirmed at the alignment stage.

The IM Femoral AP 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 (Fig. 23). These holes will be used in conjunction with the IM Alignment Guide to set rotation.

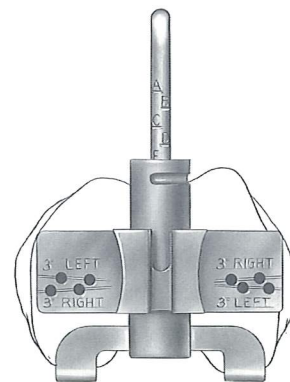


Fig. 22

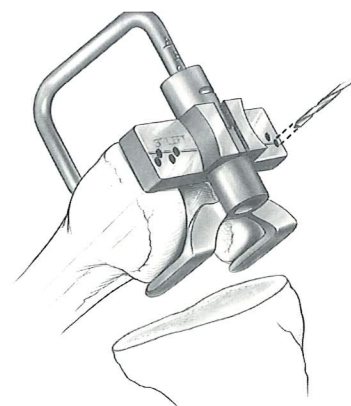
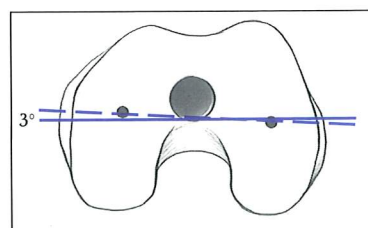


Fig. 23





STEP FOUR

ESTABLISH FEMORAL ALIGNMENT

In this step, the valgus angle, depth of distal femoral resection, and rotation are set.

First, set the IM Alignment Guide to the proper valgus angle as determined by preoperative radiographs. Check to ensure that the proper "Right" or "Left" indication is used and engage the lock mechanism (Fig. 24). **The Plus 1 Cut Block must be attached to the IM Alignment Guide for A Standard MBK distal femoral resection.** The plate should be tightened on the guide prior to use and the screw should be loosened for sterilization. If a large flexion contracture exists or, for other reasons, 2mm of additional distal femoral bone needs to be resected, remove the cutting block (Fig. 25).

Insert the guide into the IM hole on the distal femur.

Optional Technique:

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

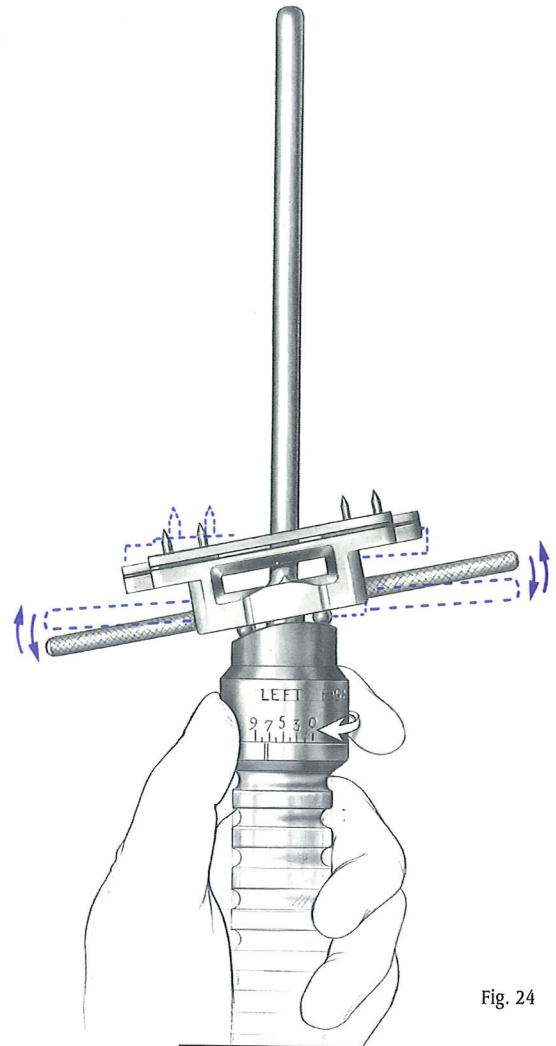


Fig. 24

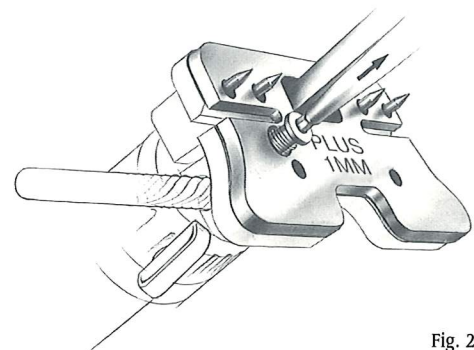
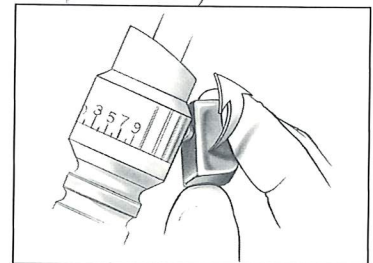


Fig. 25



To achieve 3° of femoral component external rotation, use the alignment holes made when sizing. Line the holes up with the alignment slots on the IM guide (Fig. 26). If needed, use 1/8" pins to aid alignment with the pin going through the alignment slot on the IM guide and into the alignment holes.

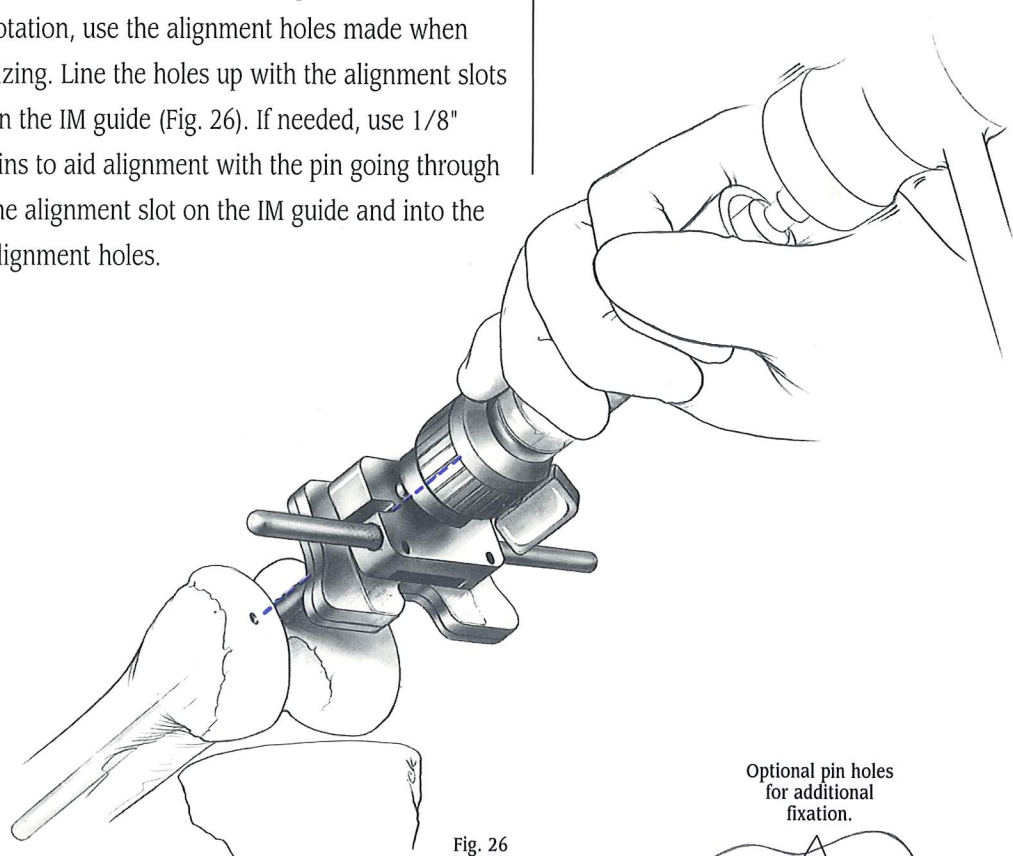


Fig. 26

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

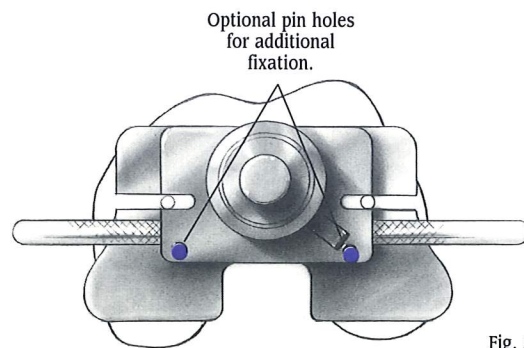


Fig. 27

Optional Techniques:

The external rotation can also be set by positioning the handles of the guide relative to the epicondyles, or by using the posterior condyles and referencing the posterior aspect of the IM guide (Fig 27). A Rotational Alignment Guide is available for easier referencing of the posterior condyles in large knees.

If the tibial resection is completed first, the external rotation can also be set by positioning the handles of the IM guide parallel to the cut surface of the tibia after balancing the collateral ligaments.



STEP FIVE

SET AP POSITION OF THE FEMUR

While the IM Alignment Guide is being inserted by the surgeon, the scrub nurse should attach the two Standard Femoral Mounting Bases (Micro sizes require separate bases) to the correct size Femoral AP Positioning Guide as determined in the sizing stage. Tighten the thumb screws. The bases are right/left specific with "R" and "L" indications and can only be assembled in the correct orientation (Fig. 28).

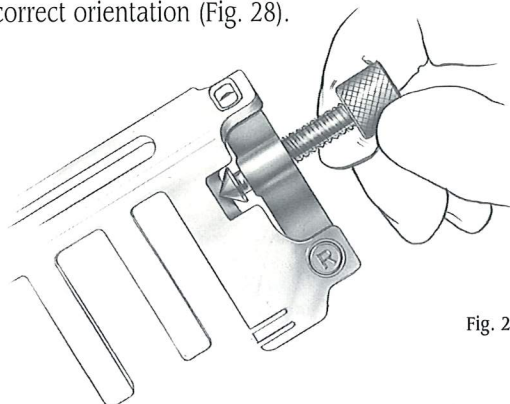


Fig. 28

Insert the AP Positioning Guide with bases attached into the IM Alignment Guide (Fig. 29) until the boom contacts the anterior femoral cortex.

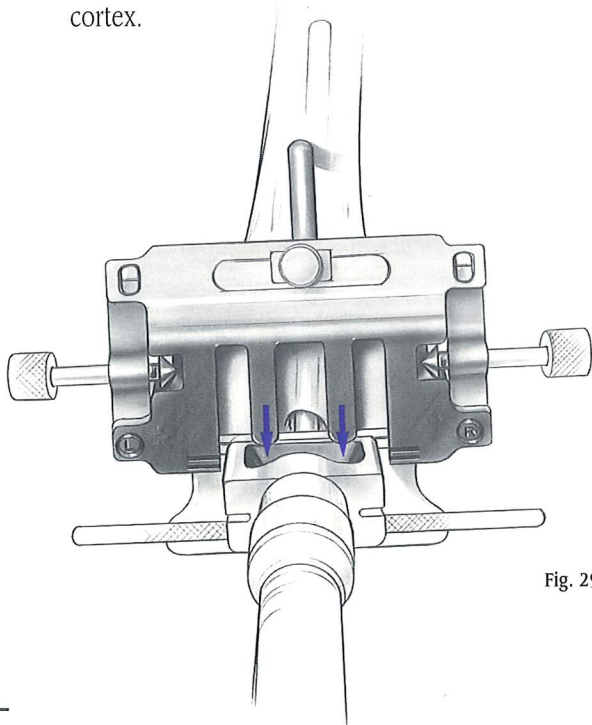


Fig. 29

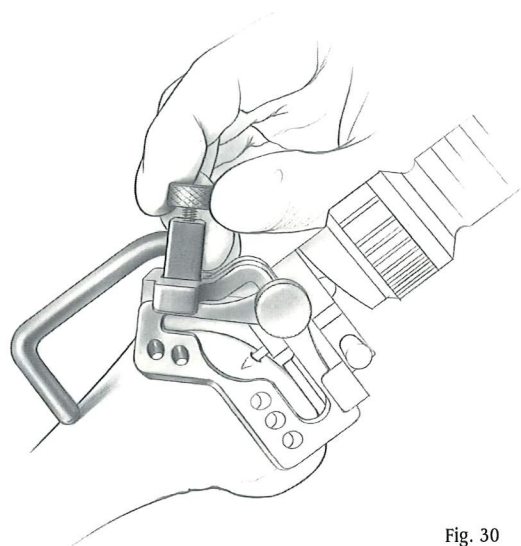


Fig. 30

The boom indicates where the anterior cut will exit the femur. To prevent notching of the femur, center the boom over the IM canal. Be sure that the boom is not on an unusually high or low spot. If it is, adjust the boom to a more appropriate position. When the boom position is set, tighten the boom thumbscrew (Fig. 30).

The two slots on the posterior aspect of the AP Positioning Guide correspond to the posterior femoral resection of the two femoral sizes covered by the guide. Check this resection level by placing the resection guide through the slots (Fig. 31). External rotation results in removal of more bone on the medial posterior condyle.

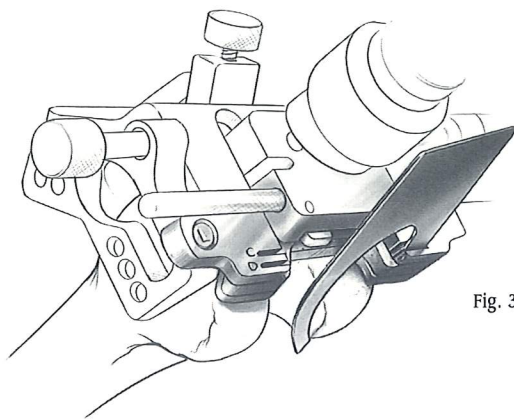


Fig. 31

If neither of the posterior resection levels are satisfactory, reevaluate the sizing steps.

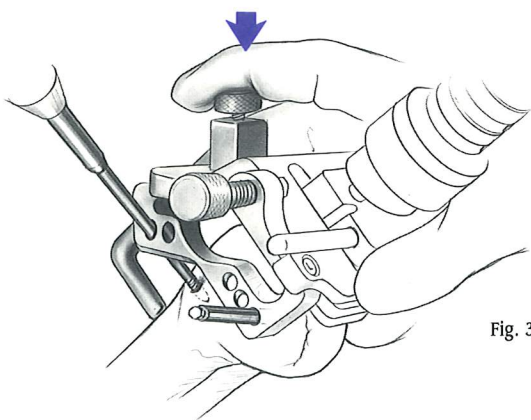


Fig. 32

STEP SIX

SECURE FEMORAL MOUNTING BASES

By hand, insert two femoral fixation pins into each of the two Femoral Mounting Bases. (**Do not use spring pins.**) Use the holes that are farthest apart (Fig. 32) and do not impinge soft tissue. Then, while holding the positioning guide boom to ensure that it is still touching the anterior femoral cortex (Fig. 33), drive each pin into the bone with the Female Hex Driver and drill reamer. The drill reamer should be set to the "Screw" position. To prevent damage while screwing a pin in, ensure that the pin remains parallel to the hole. Do not completely bury the threaded portion within the bone. Leave one or two threads visible (Fig. 34).

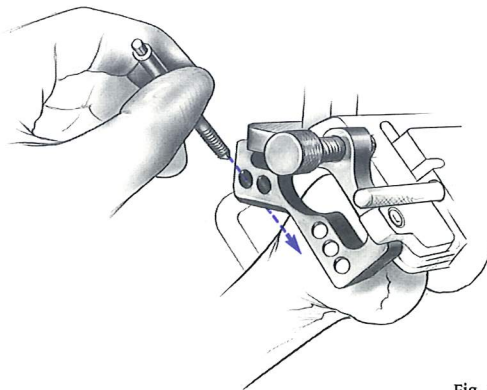


Fig. 33



Fig. 34





Loosen the thumb screw that holds the boom of the AP Positioning Guide in position and slide the boom to the medial side. Then loosen the two mounting base thumb screws to disassemble the AP Positioning Guide from the mounting bases. The thumb screws must be completely free of the AP Positioning Guide (Fig. 35).

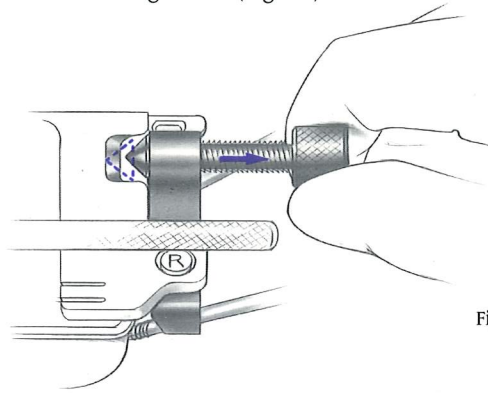


Fig. 35

Remove the AP Positioning Guide and IM Alignment Guide with the Slaphammer Extractor (Fig. 36).

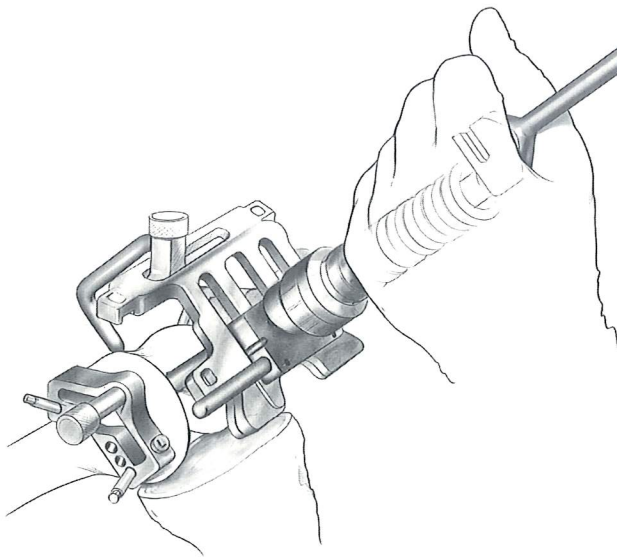
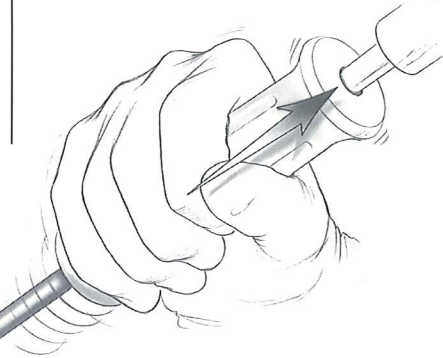


Fig. 36

At this point, sizing and alignment are complete. All femoral precision cuts will reference off these mounting bases, preventing inaccuracies due to multiple instrument usage and referencing resected surfaces.

Optional 4" IM Alignment Guide Technique:

If the femoral anatomy is altered, as in a femur with a long-stem hip prosthesis or with a femoral fracture malunion, then the optional 4-inch IM Alignment Guide should be used. To use the 4-inch guide, pull the sleeve down and rotate the plate to the proper setting "Right" or "Left." Reference the indication closest to the handle (Fig. 37). This sets the guide to a 6° valgus angle. The Extramedullary Alignment Arch and Alignment Rods must be used to ensure proper valgus alignment since the shorter rod is not as stable in the medullary canal.



The handle of the guide should be viewed from the side to ensure the component is not rotated anteriorly or posteriorly. The handle of the guide should be parallel to the medullary canal. If it is not, adjust the guide and pin it in place. Once satisfied with the alignment, proceed with the rest of the alignment procedure.

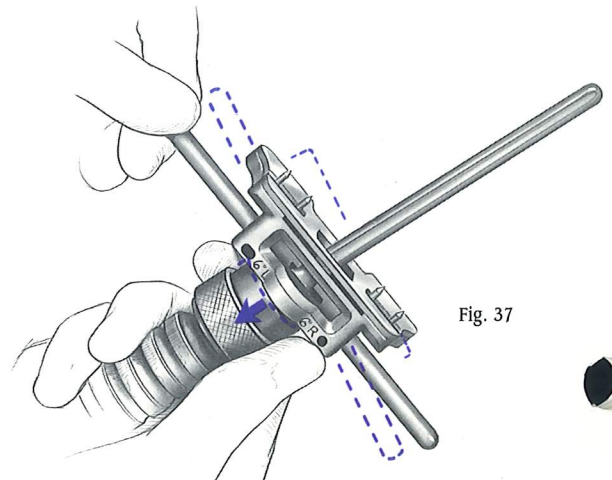


Fig. 37

STEP SEVEN (MILLING)

RESECT THE FEMUR

Attach the proper size Femoral Milling Template onto the two Femoral Mounting Bases. If the template contacts the tibia, flex the knee further. Secure the template into position by turning the thumb screws on the two bases until they lock on the template (Fig. 38). To further stabilize the template, turn the anterior screw by hand until it contacts the anterior femoral cortex (Fig. 39). Do not overtighten. Check to ensure that there is no soft tissue in the area below the template. **The quadriceps muscle and tendon, as well as the patella, must be protected.**

Note: The Milling Depth Resection Guide can be used at this time to verify that the template is correctly positioned for the proper depth of resection (11mm distally).

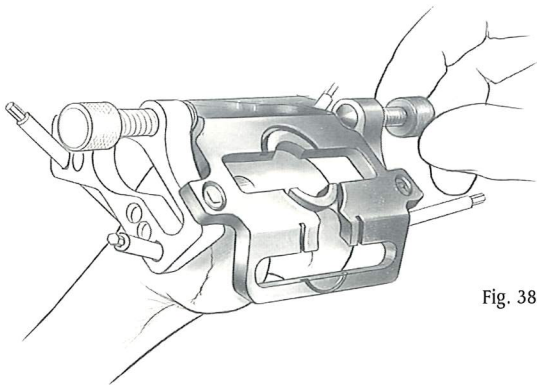


Fig. 38

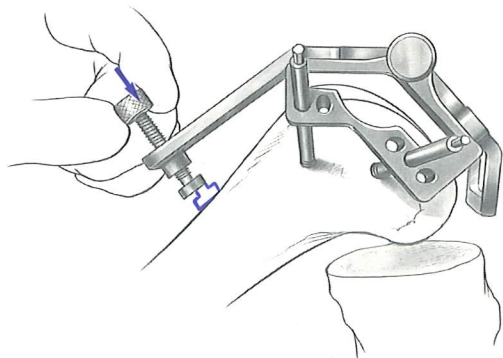


Fig. 39

With the shield/plunge guide over the cutter, spread the drape over the operative site and insert the mill shield/plunge guide into the anterior recessed ring on the template (Fig. 40).

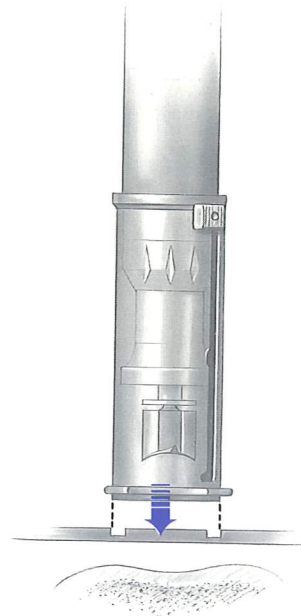


Fig. 40

Disengage the shield lock and advance the cutter to the bone (Fig. 41).

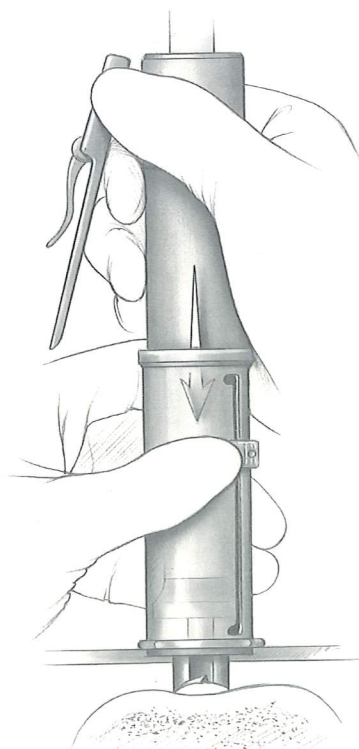


Fig. 41



Turn the *MICRO-MILL* safety off by placing at least one finger under the safety lever. Raise the cutter slightly off the bone by moving the mill only, and leaving the shield/plunge guide engaged in the template. Then, holding the mill firmly with both hands, start the mill by pressing the throttle lever and plunge the the cutter into the bone until the nose of the mill rests on the milling template (Fig. 42). Keeping downward pressure on the mill, retract the shield and move

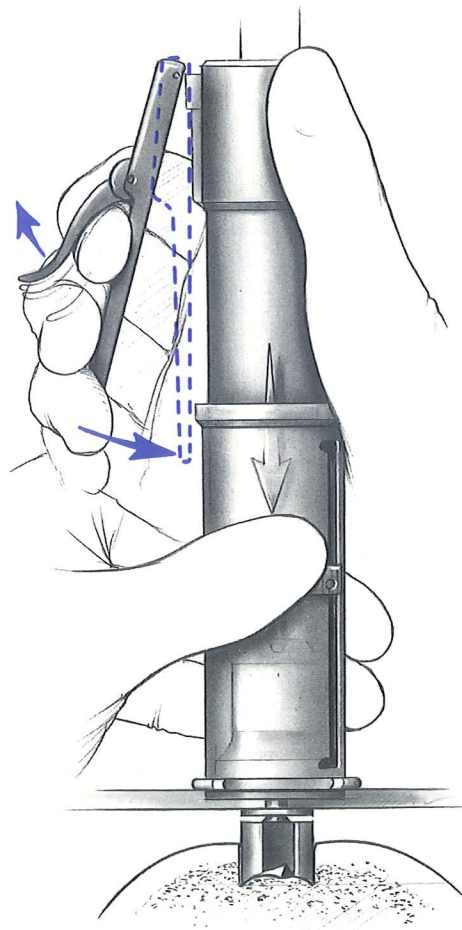


Fig. 42

the mill through the track of the template in a clockwise direction. Keep the mill against the outside edge of the track (Fig. 43).

DO NOT FORCE THE MILL. USE THE LOWER HAND TO DIRECT THE MILL MOVEMENT. DO NOT HOLD THE MILLING TEMPLATE WHILE MILLING. KEEP BOTH HANDS ON THE MILL, AND DO NOT ALLOW ANY HANDS UNDER THE DRAPE. ALSO, ENSURE THAT NO SOFT TISSUE IS BELOW THE TEMPLATE.

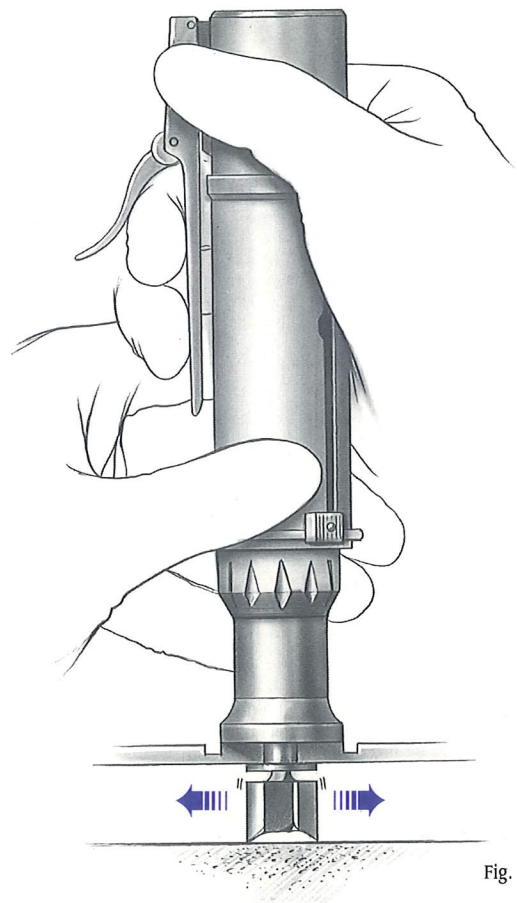
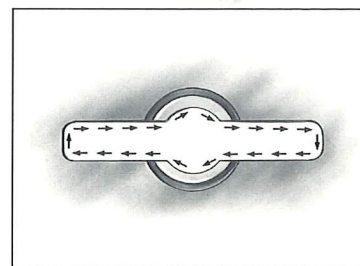


Fig. 43



When each section is complete, turn off the mill and remove it from the track. Pull the shield/plunge guide down to cover the cutter. Repeat the above procedure for each of the template tracks, moving from anterior to posterior. The milling procedure can be stopped at any time. The mill and template can be removed to provide a clear view of the milled surface, then reattached to complete the milling without loss of accuracy.

The posterior chamfer region is the most difficult section to mill. This region does not fully support the shield/plunge guide, so care must be taken to ensure that the mill is perpendicular to the template when inserting the mill into the template and when milling (Fig. 44). Often, one will not need to use the shield/plunge guide. The mill can engage the template centrally without contacting the bone.

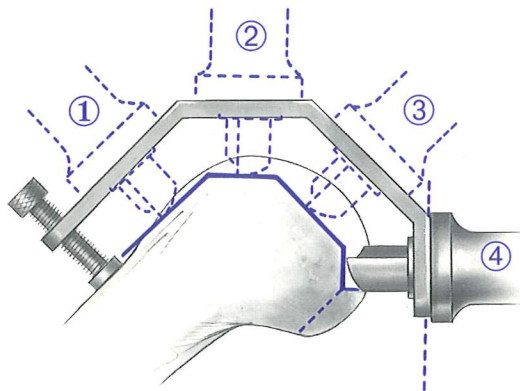


Fig. 44

When all four sections have been milled, remove the mill and template. Check the surfaces of the milled bone (Fig. 45). If milling is complete, proceed to Step Eight. If any areas are unmilled, reattach the milling template and remill the unfinished sections. In some cases, there may be a small step on the anterior cortex since the mill is contained in the template, preventing the cut from extending up the femur. If so, blend it into the anterior cortex with a saw or file.

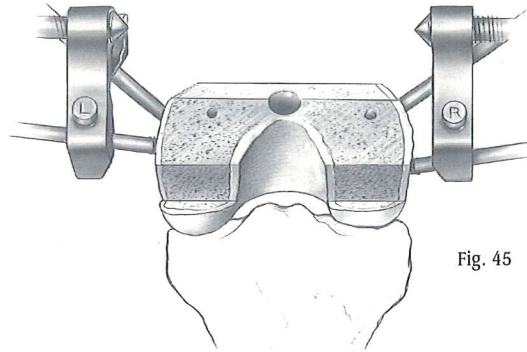


Fig. 45





STEP EIGHT (MILLING)

FINISH THE FEMUR

Place the appropriate size Femoral Finishing Guide onto the Femoral Mounting Bases. Center the guide mediolaterally on the distal femur. Use the mounting base thumbscrews for final mediolateral adjustment and to secure the guide (Fig. 46).

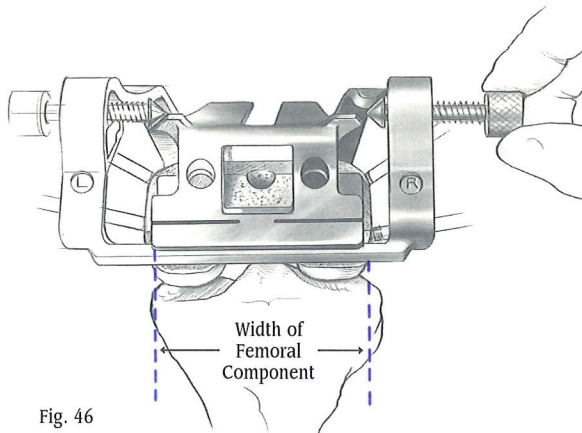


Fig. 46

The position of the guide will determine the position of the implant. Ensuring that the guide does not move, secure the guide to the mounting bases by tightening both thumb screws.

With the Milling Drape in place and the shield/plunge guide retracted (plunge cut not required), engage the mill into the anterior track of the guide keeping the mill perpendicular to the track (Fig. 47). Disengage the mill safety and start the mill with the cutter slightly off the bone. Then, holding the mill firmly with both hands and perpendicular to the track, mill the trochlear recess. Move the mill clockwise within the track, keeping the mill pressed against the outside edge (Fig. 48). Remove the mill and pull the shield back over the cutter.

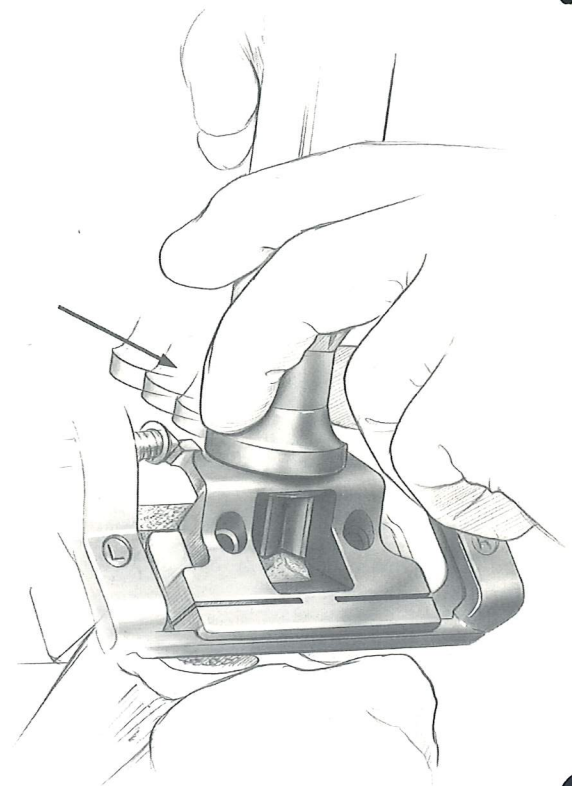


Fig. 47

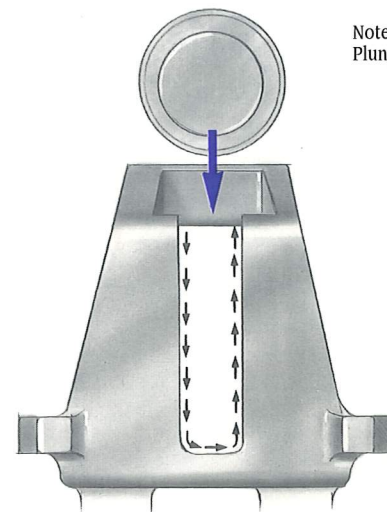


Fig. 48

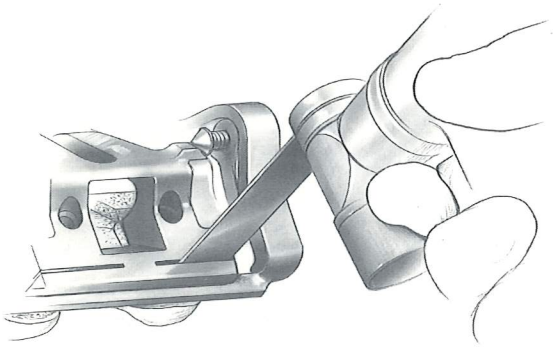


Fig. 49

Use the appropriate thickness (.050"/1.27mm) blade and an oscillating saw to cut the posterior condyles (Fig. 49). Ensure that the proper thickness blade is used to yield the optimum cut and implant fit. Drill the two femoral post holes (Fig. 50). Remove the Femoral Finishing Guide. Ensure that all cuts are complete, before removing the two mounting bases (Fig. 51).

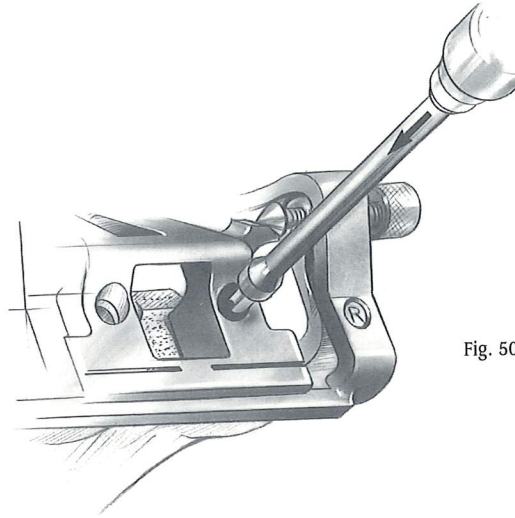


Fig. 50

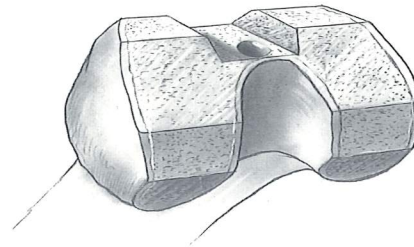


Fig. 51



STEP SEVEN (SAW BLADE)

RESECT THE FEMUR

Attach the proper size 5-in-1 Femoral Saw Guide onto the two Femoral Mounting Bases. If the guide does not seat, check for and remove any osteophytes or bone that is causing interference. Lock the template into position by firmly turning the thumb screws on the two bases (Fig. 52). Check to be sure that there is no soft tissue in the area below the guide.

Note: If the template is not firmly locked into position, vibration can loosen the thumb screws.

For the most accurate cuts, perform the femoral cuts through the slots in the order indicated on the guide (Fig. 53).

1. Anterior
2. Posterior
3. Posterior Chamfer
4. Anterior Chamfer
5. Distal

The guide can be removed at any time to check the cuts and be reattached to the bases to finish the cuts without loss of accuracy. For precision cuts, one must use the appropriate thickness (1.27mm/.050") saw blade. When all cuts are complete, remove the 5-in-1 Femoral Cutting Guide and the Femoral Mounting Bases.

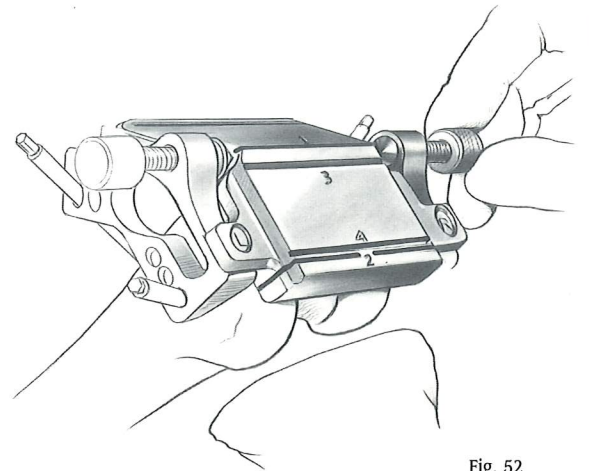


Fig. 52

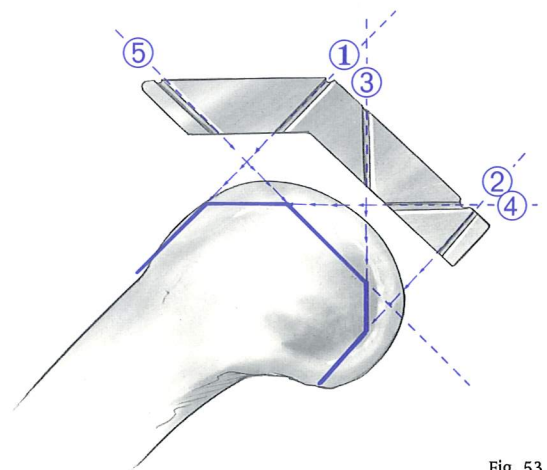


Fig. 53

STEP EIGHT (SAW BLADE)

FINISH THE FEMUR

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. Center the guide mediolaterally on the distal femur (Fig. 54). This will determine the position of the femoral component.

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.

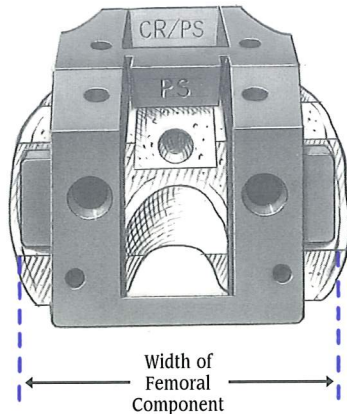


Fig. 54

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 first cut the base and then the sides of the trochlear recess. The engraved lines on the inside of the guide show the depth of the trochlear recess (Fig. 55). Cut only the trochlear recess for the MBK component.

Drill the two femoral post holes (Fig. 56).

Remove the Femoral Finishing Guide.

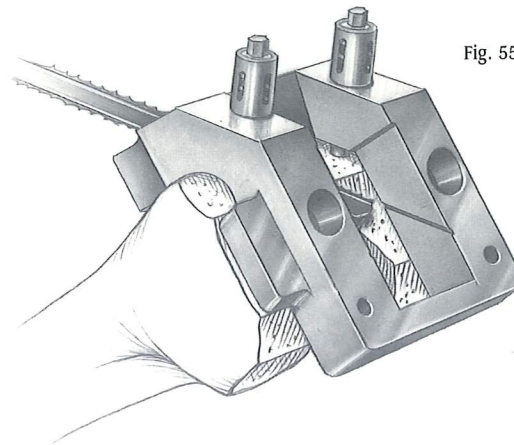


Fig. 55

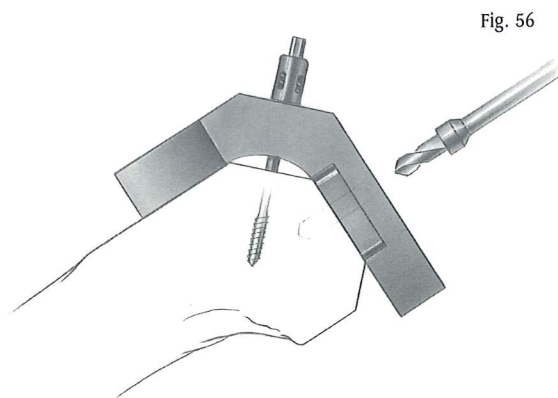


Fig. 56

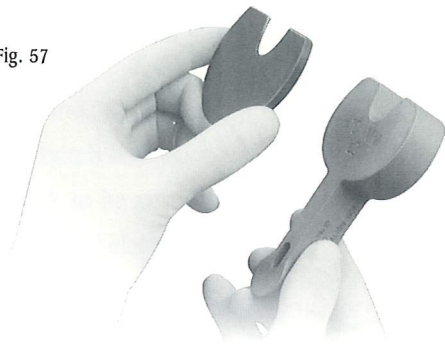




SPACER/ALIGNMENT GUIDE TECHNIQUE

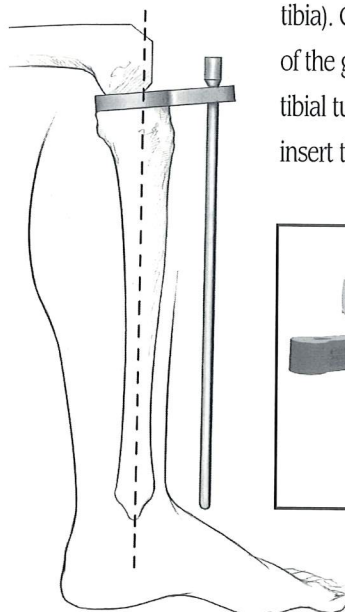
Check the thickness and alignment of the femoral cuts in both flexion and extension. Select the 9mm Spacer/Alignment Guide and assemble the MBK Spacer Adaptor (Fig 57).

Fig. 57



This adaptor increases the spacer thickness by 2mm. (2mm is the thickness difference between NexGen and MBK components.) With the adaptor in place, the 9mm spacer will be representative of the MBK with a 9mm articular surface. With the knee flexed, insert the 9mm Spacer/Alignment Guide with MBK Spacer Adaptor between the resected surfaces of the femur and tibia. Insert progressively thicker Spacer/Alignment Guides with an MBK Spacer Adaptor until the proper soft tissue tension is obtained, (this is defined as very limited A/P motion when pushing

Fig. 57a



and pulling on the tibia). Center the arm of the guide over the tibial tubercle and insert the Alignment

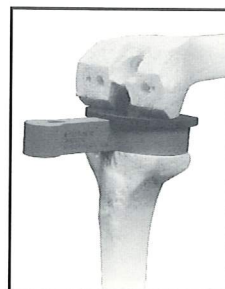


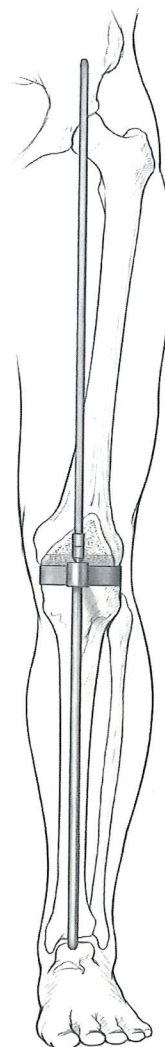
Fig. 57b

Rod with Coupler through the hole in the arm.

The rod should be parallel to the anatomic axis of the tibia (Fig.57a), 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 MBK Spacer Adaptor and extend the knee. Reinsert the spacer with adaptor 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 over the center of the hip joint (Fig. 58).

Fig. 58



If the knee is too tight in flexion and extension with the 9mm spacer and adaptor, the proximal tibia should be recut. If the knee is tight only in extension, the distal femur should be recut. If the knee is tight only in flexion, the femoral component should be downsized.

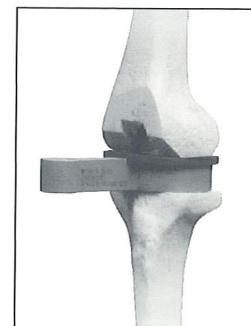


Fig. 58a

STEP NINE

FINISH THE TIBIA

Select the proper size of Tibial Sizing/Positioning Plate. Ensure that the plate chosen provides the desired tibial coverage and is one of the three tibial plate sizes designated on the anterior flange of the femoral provisional. Attach the MBK Tibial Holding Clamp to the selected sizing plate by placing the cut-out of the clamp over the anterior rail of the plate. Secure it by tightening the thumb screw (Fig. 59).

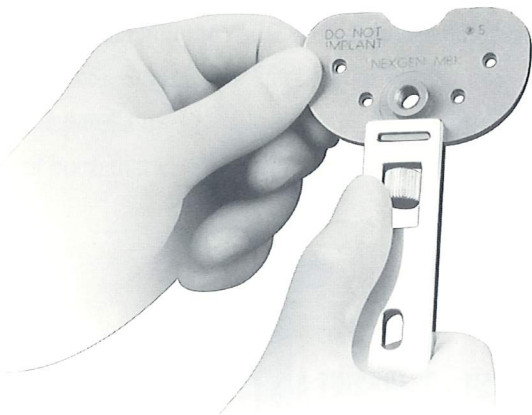
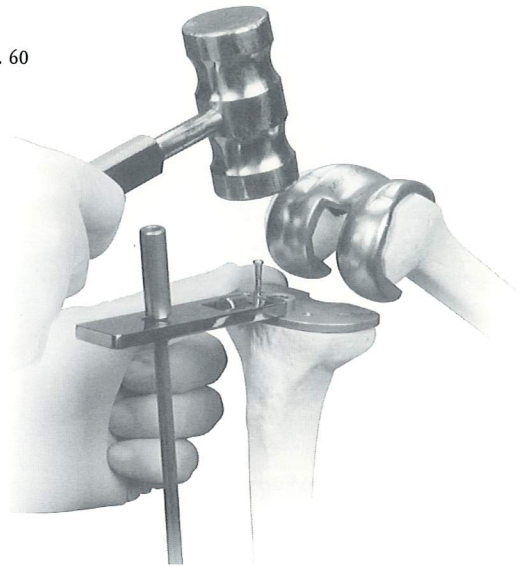


Fig. 59

Then use the Alignment Rod to aid in confirming varus valgus alignment and posterior slope. Rotate the plate so the handle of the holding clamp points at, or slightly medial to, the midpoint of the tibial tubercle. Pin the plate in place with two small head holding pins and impact so the head of the pin is recessed below the surface of the plate (Fig. 60).

Insert the proper provisional femur. Select the letter of the articular surface that is the same as the letter of the femoral provisional and position it on the tibial plate. Flex and extend the knee with the provisionals in place (Fig. 61). The tibial component should be positioned such that the anterior rail does not impede the rotation of the articular surface provisional. Ensure that soft tissue balance

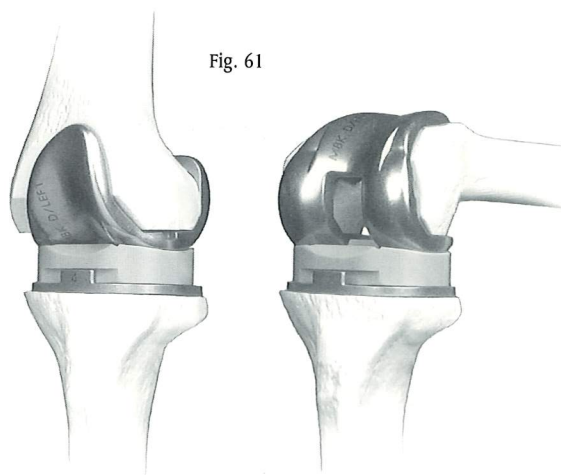
Fig. 60



is appropriate. If the articular surface provisional lifts off anteriorly during flexion the PCL should be recessed, or can be sacrificed, as necessary. In deep flexion the articular surface provisional should exhibit approximately 5 to 7mm of rollback on the lateral side and slightly less on the medial side. If stability is not achieved, conversion to the *NexGen® Legacy® LPS* should be considered.

With the plate position appropriately selected, the articular surface provisional and sizing/positioning plate can be removed from the tibial surface. The same size Fluted Stem Sizing Plate can then be placed onto the proximal tibial surface. Pin the plate

Fig. 61



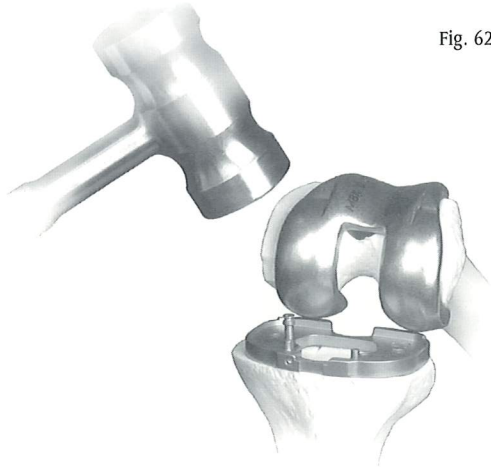


Fig. 62

with short head holding pins (Fig. 62). Use the pin holes created by the small head pins used to secure the tibial sizing/positioning tray. This will ensure that the position of the plate does not change.

Place the Tibial Drill Guide on sizing the plate and drill for the stem with the 15mm Drill (Fig. 63). Drill until the first engraved line on the drill is in line with the top of the drill sleeve.

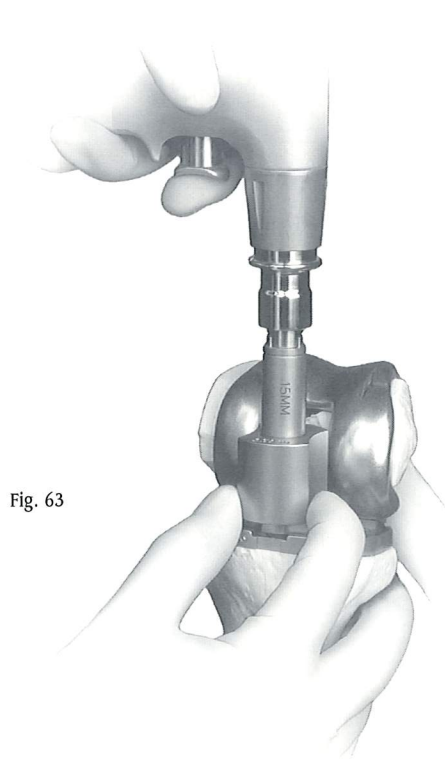


Fig. 63

Assemble the proper size Fluted Stem Tibial Broach to the Broach Impactor. 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 over-impacted (Fig. 64).

Remove the impactor assembly using the built-in slaphammer, then remove the sizing plate.

Use the correct size trial tibia to ensure proper fit before implanting the final components.

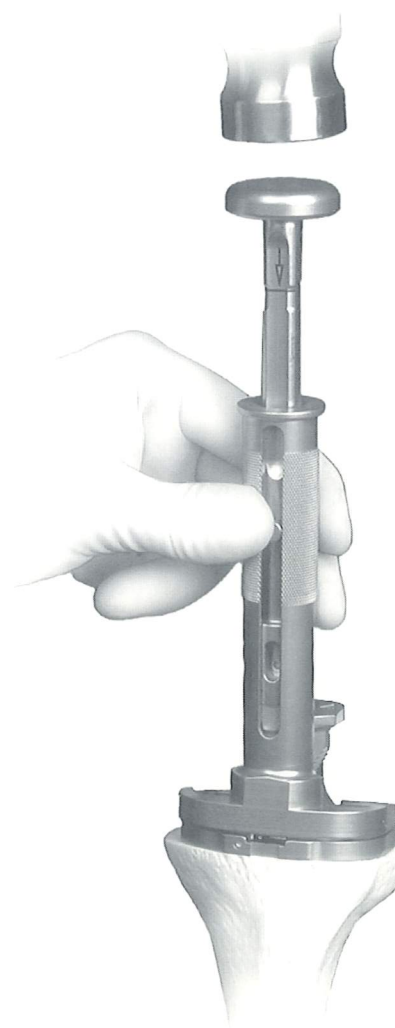


Fig. 64

STEP TEN

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 (Fig. 65). Subtract the implant thickness from the patella thickness to determine the amount of bone that should remain after resection.

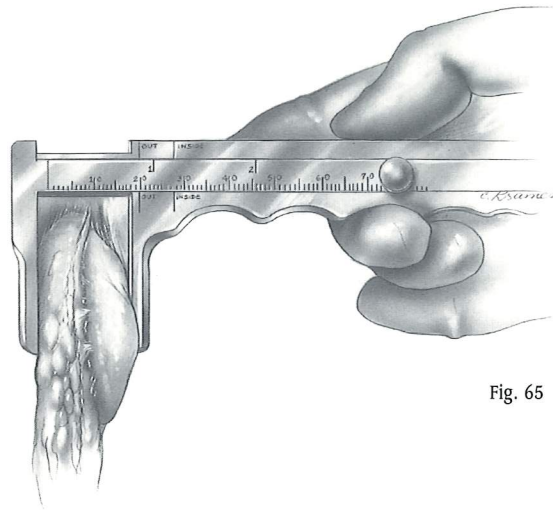


Fig. 65

PATELLA THICKNESS - IMPLANT THICKNESS = BONE REMAINING

NexGen ALL-POLY IMPLANT THICKNESSES

	<u>Standard</u>
26mm*†	7.5mm
29mm*	8.0mm
32mm*	8.5mm
35mm	9.0mm
38mm	9.5mm
41mm	10.0mm

* Do not use 26mm, 29mm and 32mm patellas with MBK size G and H Femoral Components.

† 26mm patella for inset only.

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



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 (Fig. 66). 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 (Fig. 67). Turn the locking screw until tight.



Fig. 66

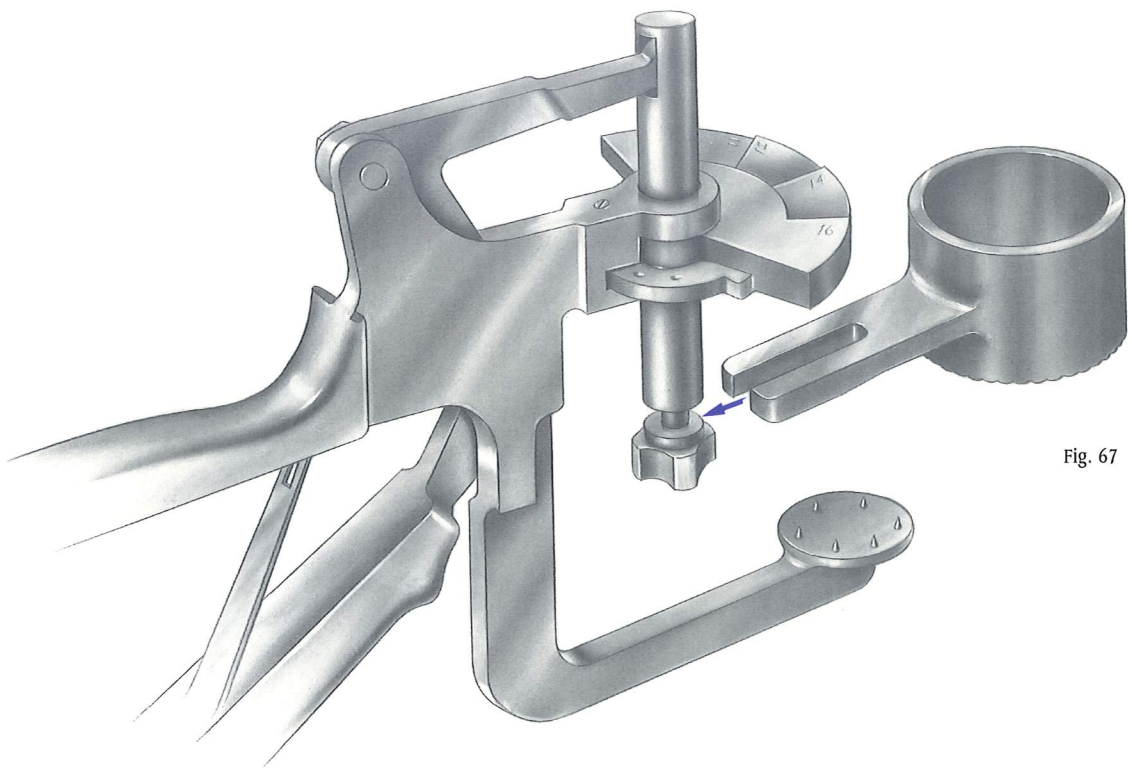


Fig. 67

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 (Fig. 68). Turn the clamp screw to hold the instrument in place. The anterior surface must fully seat upon the pins and contact the fixation plate.

Turn the clamp wing to the proper indication for the correct amount of bone that is to remain after reaming (Fig. 69).

Attach the appropriate size Patella Reamer Blade to the appropriate size Patella Reamer Shaft (Fig. 70). Use only moderate hand pressure to tighten the blade. Do not overtighten the blade. 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.



Fig. 68

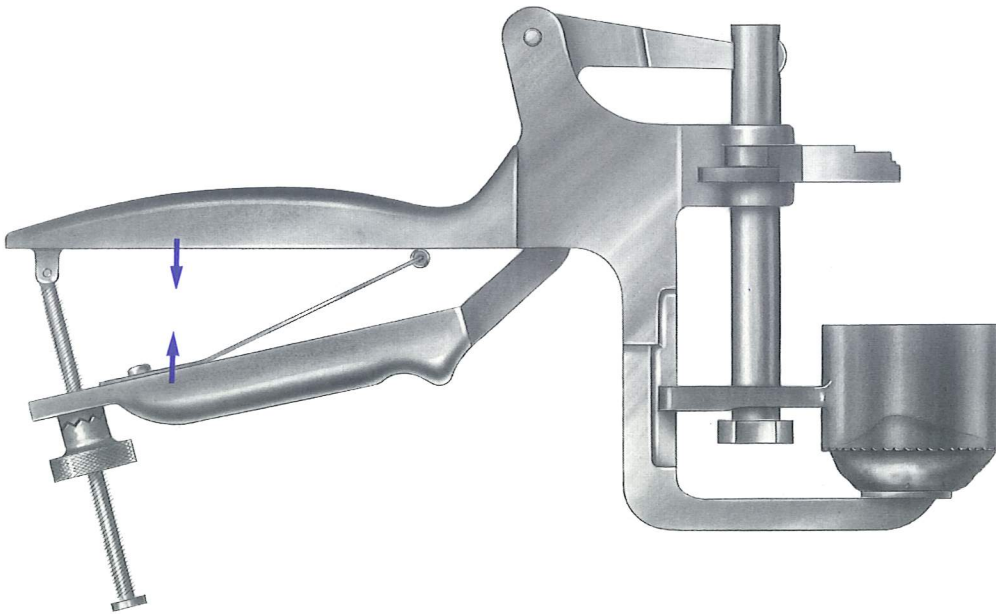


Fig. 69

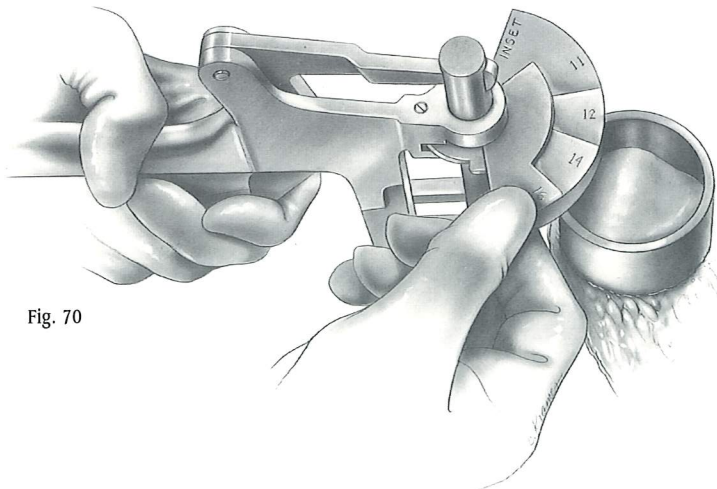
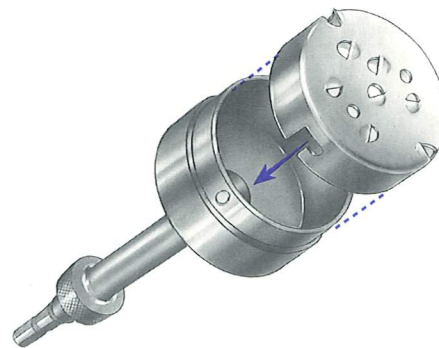


Fig. 70





INSETTING PROCEDURE

Use the Patella Reamer Insetting Guides as templates to determine the appropriate size guide and reamer. Choose the guide which will allow approximately 2mm between the superior edge of the patella and the outer diameter of the guide (Fig. 71).

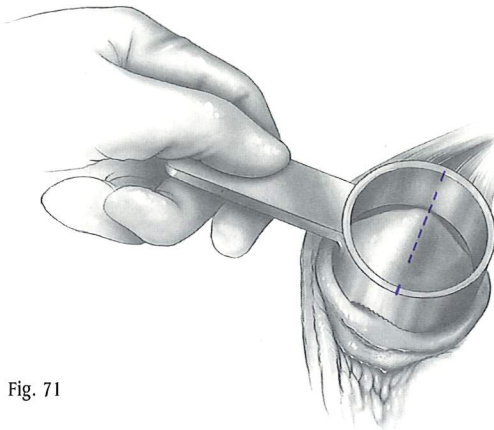


Fig. 71



Insert the appropriate size Patella Reamer Insetting 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 Insetting 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 contact 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 (Fig. 72).

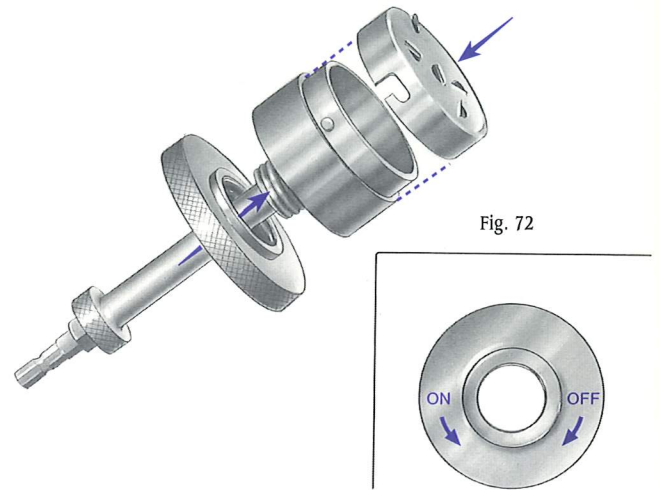


Fig. 72

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 Insetting 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.

Note: See your local Zimmer representative for a detailed surgical technique on the Zimmer Patella Reamer System.

UNIVERSAL SAW GUIDE TECHNIQUE

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

The amount to be resected across the top of the saw guide jaws should be approximately the same on all sides. Check to be sure that the 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 (Fig. 73).

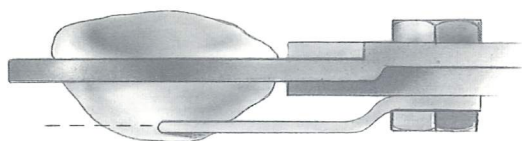


Fig. 73

Cut the patella flat so that a smooth surface remains (Fig. 74).

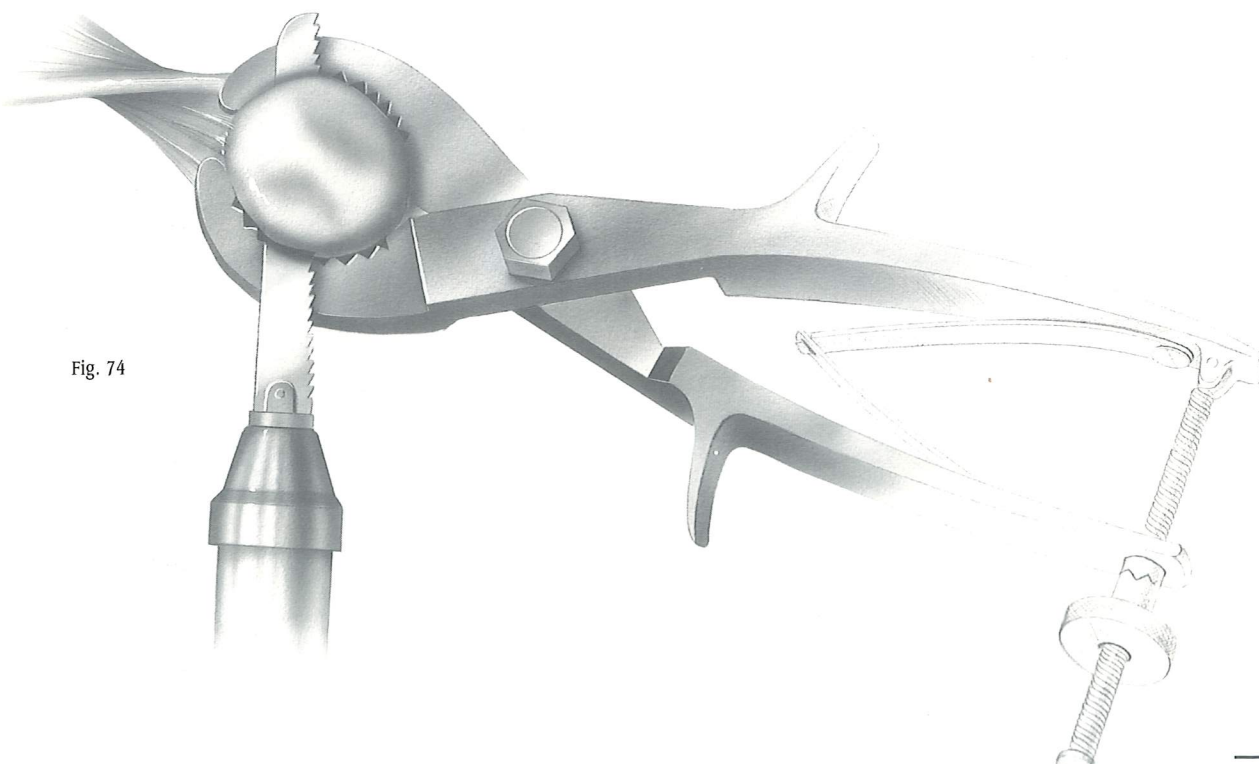


Fig. 74

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 (Fig. 75).

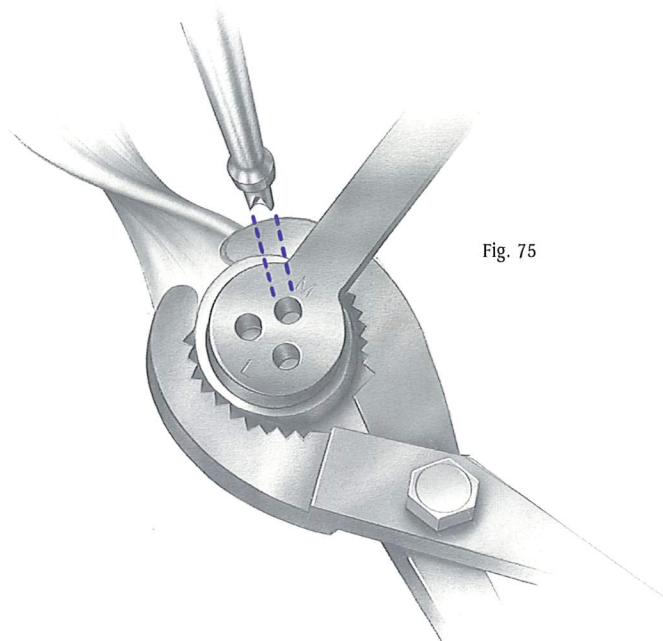


Fig. 75





TRIAL REDUCTION

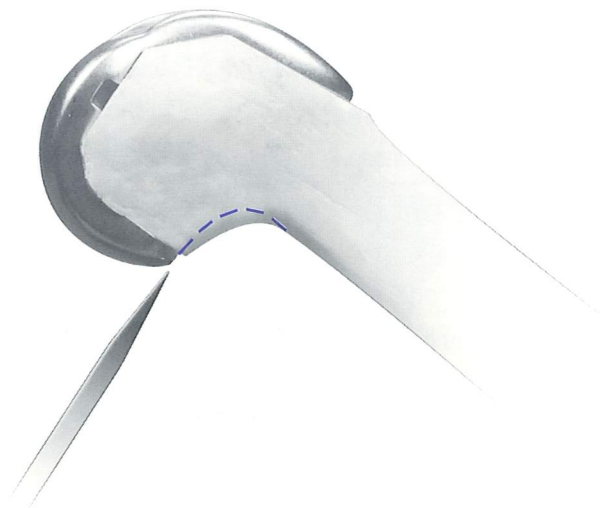
Insert the femoral and patellar provisional components and the correct size tibial provisional. Remember that the tibial component selected should match one of the three tibial sizes designated on the anterior flange of the femoral provisional. Similarly, the femoral component selected should match one of the three femoral sizes designated on the proximal surface of the tibial provisional. Insert the proper height and size articular surface provisional and check the range of motion and ligament stability. The articular surface provisional size must match the femoral provisional size exactly. If the articular surface provisional lifts off anteriorly during flexion the PCL should be recessed, or can be sacrificed, as necessary. Perform any necessary soft tissue releases. If stability is not achieved, conversion to the *NexGen Legacy LPS* should be considered. The Femoral Extractor can be used to remove the femoral provisional.

COMPONENT IMPLANTATION

After the implants have been chosen, make one last check to ensure that the femoral, tibial and articular surface components match. The femoral letter must match the articular surface letter and must be one of the three letters indicated on the tibial carton. The tibial number must match one of the three numbers indicated on the articular surface carton.

It may be necessary to remove femoral bone or osteophytes proximal to the posterior condyles. The bone must be removed to avoid impingement with the articular surface in deep flexion. Remove bone, as necessary, with an osteotome (Fig. 76).

Fig. 76



ARTICULAR SURFACE INSERTION

The articular surface implant is assembled by hand onto the D-shaped mushroom on the tibial plate proximal surface. Slide the articular surface between the femoral and tibial components and rotate it internally approximately 15 degrees (Fig. 77). The indent along the anterior flat of the articular surface can be used to orient the articular surface in relation to the anterior rail of the tibial plate. Once properly aligned, the articular surface will snap onto the plate.

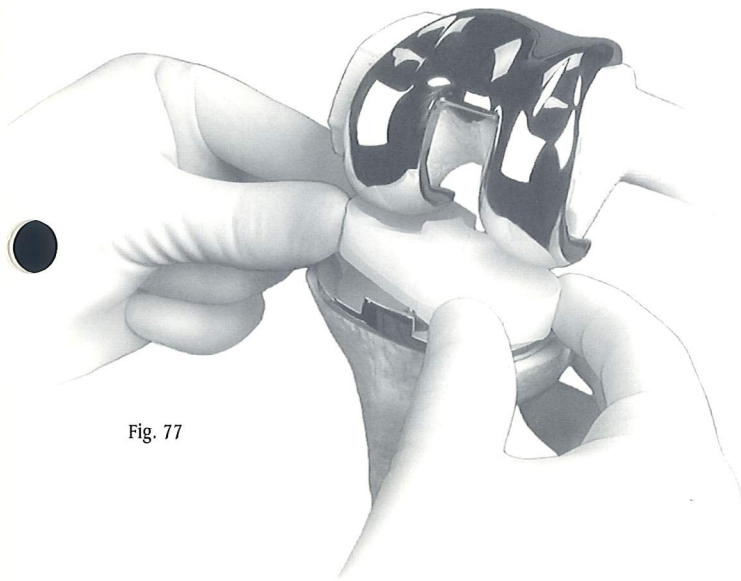


Fig. 77

Fig. 77a

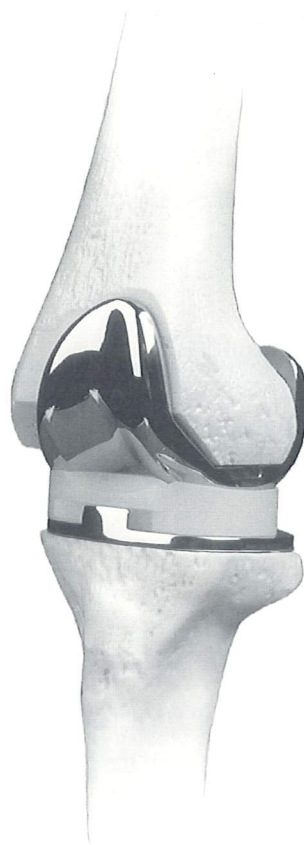
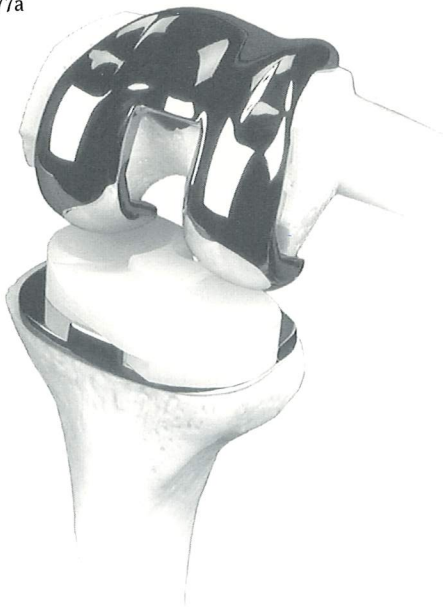


Fig. 77b



Fig. 77c

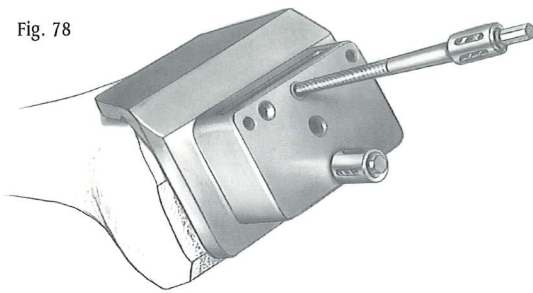




FEMORAL RECUTTING/DOWNSIZING TECHNIQUE

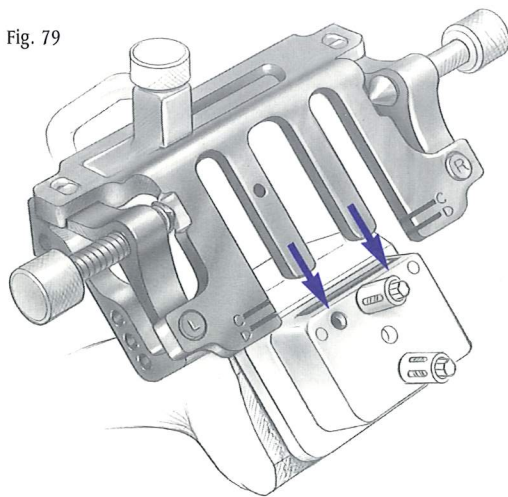
If one needs to resect more distal bone or downsize the femur to correct flexion/extension spaces, the proper recutting or downsizing block is selected and pinned to the distal femur with two silver spring pins (Fig. 78).

Fig. 78



Ensure the guide is seated on the distal and anterior femur. Using the proper AP Positioning Guide with mounting bases attached, insert the guide into the block until the hole on the guide lines up with the hole on the block (Fig. 79).

Fig. 79



With the two holes lined up, insert a fixation pin through the positioning hole in the block and into the hole in the AP Guide (Fig. 80). (The boom on the A/P Placement Guide is not used when recutting the distal femur, and will not contact the femoral cortex.)

Drive two fixation pins into each of the two Femoral Mounting Bases. Remove the fixation pin and the silver spring pins from the Recutting Block and remove the block and the A/P Placement Guide.

Attach the proper size Femoral Milling Template onto the two Femoral Mounting Bases. **Check to ensure that there is not soft tissue in the area below the template.**

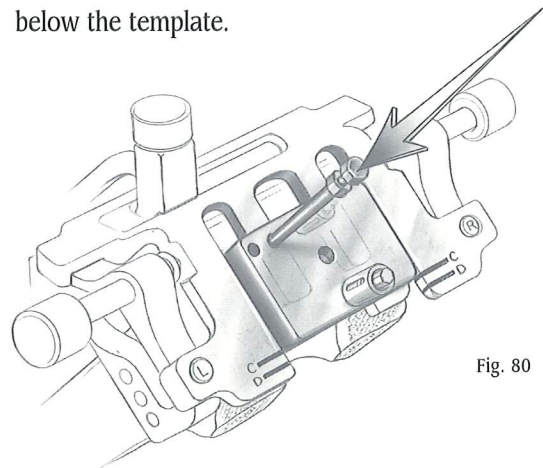


Fig. 80

Note: The Milling Depth Resection Guide can be used at this time to verify that the template is correctly positioned for the proper depth of resection.

Remill the anterior cortex, anterior chamfer, distal femur, the posterior chamfer, and the posterior condyles in the same manner as before.

Reattach the appropriate size Femoral Finishing Guide and remill the trochlear recess.

Remove the Femoral Finishing Guide and the Femoral Mounting Bases, and recheck the alignment and flexion/extension gaps using the Spacer/Alignment Guide with MBK Spacer Adaptor and Alignment Rod.

