



SURGICAL TECHNIQUE

- Alignment options in 3°, 5°, or 7° valgus
- Intramedullary or extramedullary tibial instrumentation
- Recessed or onlay patellar instrumentation



ADVANCE[®] Knee
Distal Cut First

The ADVANCE® Knee System was developed in conjunction with:

J. David Blaha, MD

Clinical Professor
Department of Orthopaedic Surgery
University of Michigan
Ann Arbor, Michigan

Dan Daluga, MD

Orthopaedic Surgeon
Arnett Clinic, Lafayette Home Hospital
St. Elizabeth Medical Center
Lafayette, Indiana

M.A.R. Freeman, MD., FRCS

Honorary Consultant Orthopaedic Surgeon
Royal London Hospital
London, U.K.

William Maloney, MD

Elsbach-Richards Professor and Chairman
Department of Orthopaedic Surgery
Stanford University School of Medicine
Stanford, California

Brad Penenberg, MD

Attending Orthopaedic Surgeon
Cedars Sinai Medical Center
Midway Hospital Medical Center
Los Angeles, California

Kent Samuelson, MD

Attending Orthopaedic Surgeon
LDS Hospital
Salt Lake City, Utah

Robert Schmidt, MD

Orthopaedic Surgeon
The Texas Hip and Knee Center
Fort Worth, Texas

Steven Stuchin, MD

Associate Professor, Clinical Orthopaedics
Director of Orthopaedic Surgery
Hospital for Joint Diseases
Orthopaedic Institute
New York University Medical Center
New York, New York

The Hospital for Special Surgery

New York, New York



ADVANCE®
knee system
DISTAL CUT FIRST

surgical technique

ADVANCE®

knee system

DISTAL CUT FIRST

instrument design CRITERIA

- Precise instrument tolerancing and manufacturing processes ensure accurate bone resections.
- Resection blocks produced from wear resistant stainless steel minimize wear debris from the saw blade and cutting block.
- Highly visible laser etching and secondary sizing information increase operating room efficiency.
- Screws are "captured", ensuring they cannot be lost or dropped from the sterile field during the procedure.
- Quick disconnect attachments allow for rapid exchange of equipment, reduce operating room time and provide a user friendly system for the surgeon and hospital staff.

distal cut first TECHNIQUE

- Alignment options in 3°, 5° and 7° are available to meet specific patient anatomy.
- Standard and + 4mm resection slots along with adjustable pin holes provide multiple distal resection options.
- Femoral implant sizing and external rotation is performed with one instrument.
- Femoral external rotation is established from either the transepicondylar axis, posterior femoral condyles.
- The anterior-lateral surface of the sulcus resection guides mimic the femoral implant shape and size aiding in accurate medial-lateral positioning of the implant.

tibial OPTIONS

- Extramedullary instruments provide a fine-tune adjustment for more precise positioning of the tibial crosshead resection depth.
- Medial-lateral adjustment at the ankle ensures proper anatomic alignment.
- Tibial guides are available in both left and right crossheads to prevent interference with the patellar tendon.
- A secondary external alignment guide ensures proper anatomic positioning of the intramedullary guide.
- Recut block provides easy correction of varus/valgus malalignment.

patellar OPTIONS

- Recessing instrumentation allows exact depth positioning of the implant and complete preparation in a single reaming process.
- Patented dual fulcrum technology provides accurate and consistent preparation of an onlay patellar component.

overview

FEMORAL PREPARATION

Opening the femoral canal | **STEP 1**

Distal femoral alignment and resection | **STEP 2**

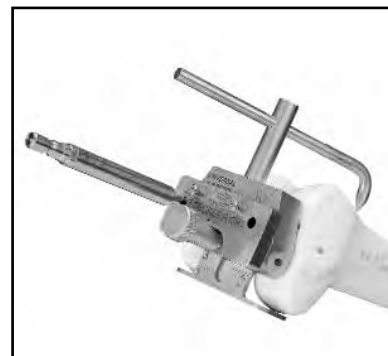
Femoral sizing and external rotation | **STEP 3**

Anterior/Posterior femoral resections | **STEP 4**

Trochlear groove resection | **STEP 5**



STEP 1



STEP 3



STEP 2



STEP 4



STEP 5

TIBIAL PREPARATION

Extramedullary alignment and proximal tibial resection | **STEP 1 (OPTION A)**

Intramedullary alignment and proximal tibial resection | **STEP 1 (OPTION B)**

Tibial sizing and alignment | **STEP 2**

Tibial base keel preparation | **STEP 3**



STEP 1 (OPTION A)



STEP 2



STEP 1 (OPTION B)

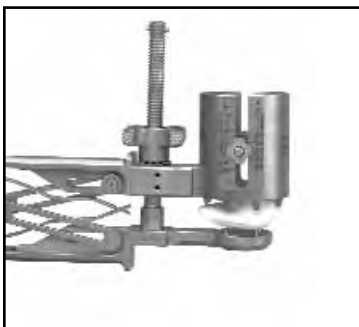


STEP 3

PATELLA PREPARATION

Recessed patella preparation with central-peg endmill reamer | **OPTION A**

Onlay patella preparation | **OPTION B**



OPTION A



OPTION B

preoperative PLANNING

Proper surgical techniques are necessarily the responsibility of the medical professional. The following guidelines are furnished only as recommended techniques. Each surgeon must evaluate the appropriateness of the techniques based on his or her own medical training and experience.

preparation of DISTAL FEMUR

Tibial and femoral resections are made independently; therefore, the order in which they are made is left to the discretion of the orthopaedic surgeon.



FIGURE 1

STARTER HOLE PREPARATION

Initiate an opening in the femoral canal with the 3/8" (9.5mm) diameter drill bit. The hole is placed medial and anterior to the anteromedial corner of the intercondylar notch | **FIGURE 1**.



FIGURE 2

ALIGNMENT ROD INSERTION

Insert the fluted IM reamer/rod into the femoral canal, being sure to irrigate and aspirate several times to reduce the chance of fat emboli. Turn the reamer during insertion with the T-handle | **FIGURE 2**. Remove the T-handle leaving the rod in the intramedullary canal.

DISTAL FEMORAL ALIGNMENT/EXTERNAL ROTATION

Set the desired valgus angled (i.e. 3°, 5°, or 7°) prior to attaching the valgus angle alignment guide to the IM reamer/rod. Lock the valgus angle by tightening the small screw | **A IN FIGURE 3**. Slide the femoral valgus alignment guide over the IM reamer/rod until the paddle rests against the unresected prominent distal condyle | **FIGURE 3**. Lock the guide to the IM reamer/rod by tightening the large thumbscrew | **B IN FIGURE 3**.

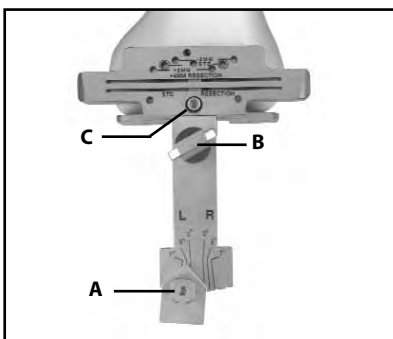


FIGURE 3

The distal resection crosshead may be locked onto the valgus alignment guide by tightening the locking screw | **C IN FIGURE 3** with a standard 3.5mm hex head screwdriver.



FIGURE 4

The alignment may be checked by referencing the femoral head with the external alignment guide and rod | **FIGURE 4**. Fix the crosshead to the anterior femur by placing 1/8" (3.2mm) headless pins or drill bits into the zero-holes.

DISTAL FEMORAL RESECTION

NOTE | All ADVANCE® femoral resection slots are designed for use with a .050" (1.3mm) thick saw blade.



FIGURE 5

The distal femoral resection may be performed with or without the IM rod and alignment guide in place. Remove the valgus angle alignment guide and IM reamer/rod as an assembly with the T-handle. It is not necessary to loosen the thumbscrew for this step. Resect the distal femur using either the standard resection slot which provides a 9mm resection from the prominent distal condyle or the +4mm resection slot which provides a 13mm resection | **FIGURE 5**. If headless pins or drill bits are used, the crosshead can be adjusted 2mm proximally or distally. The crosshead can be pinned to the anterior femur through the divergent pin hole for additional stability.

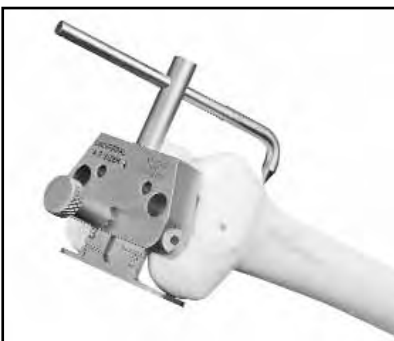


FIGURE 6

FEMORAL SIZING

Place the A-P femoral sizer flush against the resected distal femur and adjust the sizer so the feet rest against the posterior condyles and the stylus (T-bar or single point) touches the most prominent aspect of the anterior cortex just proximal to the anterior condyles | **FIGURE 6**. The estimated size is indicated on the distal surface of the sizing caliper. If between sizes, use the smaller of the two sizes.

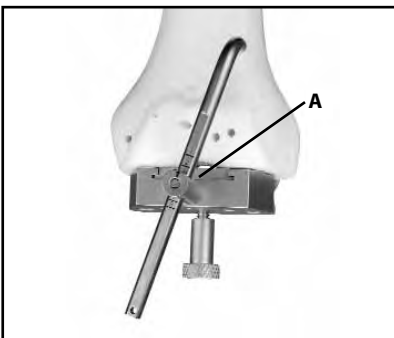


FIGURE 7

Markings on the stylus correspond to the length of the anterior flange of the femoral component and can be used to locate the exit point of the saw blade | **A IN FIGURE 7**.

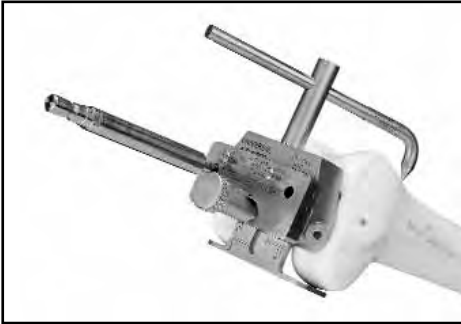


FIGURE 8A

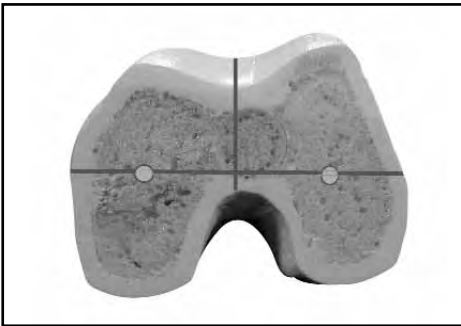


FIGURE 8B

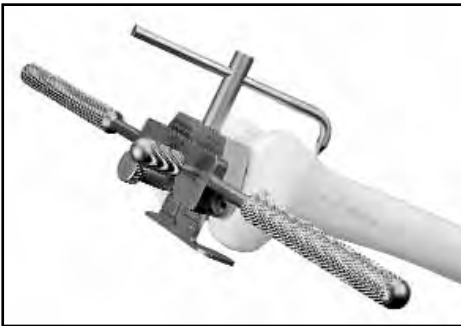


FIGURE 9



FIGURE 10

Pin the sizer to the distal femur using 1/8" (3.2mm) diameter headed pins. After the appropriate size is determined, the 3/16" drill bit and the 3° drill guide is used to prepare holes in the distal femur for the fixation pegs on the femoral resection block | **FIGURE 8A**. The surface marked "left" should be facing the surgeon for a left knee ("right" for a right knee).

NOTE | The M-L position of implant is set during this step.

The position of these holes will set external rotation at 3° relative to the posterior condyles | **FIGURE 8B**.

NOTE | In cases with significant wear or severe deformation of the posterior condyles, the 0° guide can be used with a tommy pin to set rotation manually using the A-P or epicondylar axes | **FIGURE 9**. The tommy pin should be inserted in the lateral hole so rotation will not cause notching of the lateral anterior cortex.

ANTERIOR AND POSTERIOR RESECTIONS

Select the femoral resection block corresponding to the size indicated by the femoral sizing caliper. Place the femoral resection block into the prepared holes and flush to the distal femur | **FIGURE 10**. Stabilize the block using 1/8" (3.2mm) diameter headed pins on the medial and lateral sides of the block. The fixation pin holes are predrilled with a 1/8" diameter drill bit. The recommended order for femoral resections is posterior to anterior.

If using a posterior stabilized femoral component, the anterior and posterior chamfer resections may be prepared using either the femoral resection block or the housing resection guide.



FIGURE 11

NOTE | The femoral resection block can be used to double check sizing | **FIGURE 11**. The thickness of the metal below the posterior resection slot approximates the posterior condyle thickness of the femoral implant. The lateral posterior femoral condyle should be even with the posterior edge of the guide with approximately 2mm of posterior condyle visible under the medial side of the guide. However, referencing the posterior condyles may be an unreliable landmark if there is degenerative wear. Two laser marks on the surface of the block indicate the M-L width of the posterior stabilized femoral component, which is 5mm narrower than the primary femoral component.

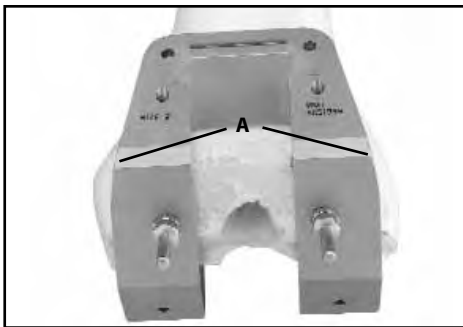


FIGURE 12

PRIMARY TROCHLEAR GROOVE RESECTION

At this time, it is necessary to perform the final femoral resection of the trochlear groove. Two styles of primary sulcus resection guide are available: standard blade and power burr. Both should be placed on the femur using fixation pins and/or handles. When using the standard blade guide | **FIGURE 12**, the trochlear groove should be resected by using a ½ inch saw blade on the angled surface.

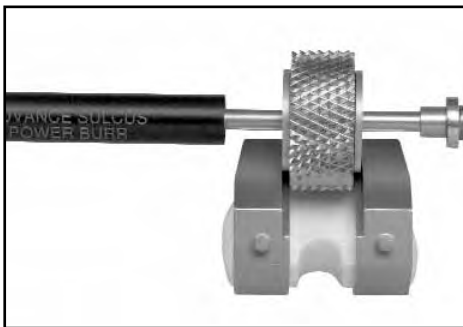


FIGURE 13

When using the power burr guide | **FIGURE 13**, the power burr is connected to a standard power reamer. The power burr is then placed into the sulcus resection guide and repeatedly drawn over the track (proximal to distal) until reaming is complete. The depth of the groove may be evaluated with the flat end of the dual function reference gauge | **FIGURE 14**. The gauge should be able to move smoothly across the tracks of the guide without engaging bone.

NOTE | Both sulcus resection guides are the same size (M-L) as the final implant | **A IN FIGURE 12**.

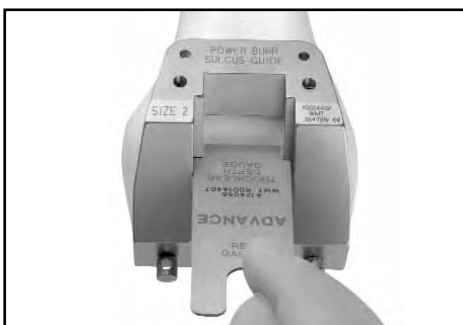


FIGURE 14

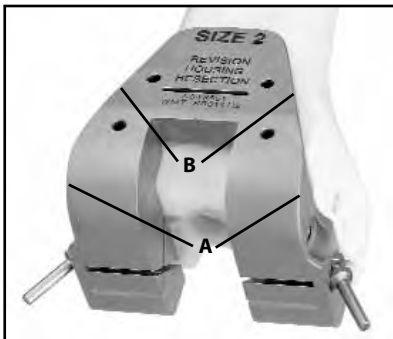


FIGURE 15

CHAMFER AND POSTERIOR STABILIZED FEMORAL HOUSING RESECTIONS

If preparing for a posterior stabilized femoral component, a housing resection block is utilized at this point instead of a sulcus resection guide | **FIGURE 15**. Place the appropriate size femoral housing resection block flush against the anterior and distal bone surfaces. Position the block mediolaterally using the width and anterior face of the block as positioning guides.

The width of the resection block is equal to the femoral implant width | **A IN FIGURE 15** and the anterior face has the same profile as the anterior surface of the femoral implant | **B IN FIGURE 15**.

Pin the guide to the femoral bone or stabilize with handles. If not previously performed, resect the anterior and posterior chamfers. Resect the intercondylar notch using a narrow ½" saw blade on the angled surface. It is recommended that the proximal notch surface be prepared before the sides of the notch.

NOTE | The proximal notch resection surface is angled at 8° to match the 8° posteriorly angled housing on the implant. The blade should pass straight anterior to posterior to prevent undercutting the condyle.

The medial and lateral surfaces are resected only to a depth equal to the proximal notch resection.

tibial PREPARATION

The ADVANCE® Medial-Pivot insert is recommended for use in posterior cruciate sacrificing techniques. However, if the PCL is retained, a careful assessment of PCL tension is essential. Excess PCL tension could detrimentally affect range of motion and long term success.

Adequate posterior tibial slope is an important factor in proper tensioning of the PCL. When retaining the PCL, it is recommended to use a minimum slope of 3° (to match the tibial base slope) or match the anatomic slope (3°-10°). However, use of a stem extension is contraindicated with a slope greater than 3°.

NOTE | The ADVANCE® tibial resection guides are designed for use with a .050" (1.3mm) thick saw blade.



FIGURE 16



FIGURE 17



FIGURE 18



FIGURE 19

ADVANCE® EXTRAMEDULLARY TIBIAL RESECTION

Position the ankle yoke against the lower leg just proximal to the malleoli and wrap the spring around the leg | **FIGURE 16**. Raise the bar holding the appropriate (left, right, or universal) resection crosshead and pin the bar to the upper tibia when the crosshead is centered on the proximal tibia | **FIGURE 17**. The resection slot should be located a few millimeters below the lowest articular surface.

Use the medial/lateral adjustment screw at the ankle to align the resection guide. The long axis of the tibial resection guide should be parallel to the tibia. Attach the stylus to the crosshead and turn the crosshead adjustment knob to raise or lower the crosshead until the stylus indicates the desired level of resection | **FIGURE 18**. Pin the crosshead to the proximal tibia. If the crosshead is detached from the guide, the crosshead can be moved proximally or distally 3mm if headless pins are used. An alignment guide and rod can be used to check alignment to the ankle | **FIGURE 19**. The crosshead can be pinned to the tibia through the divergent pin holes for additional stability.

NOTE | The top surface of the crosshead can be used to resect the tibia and is 4mm proximal to the distal surface of the captured slot.

If the initial resection is in varus or valgus, used the 3° varus/valgus resection block to recut the tibia for correct alignment | **FIGURE 20**.

ADVANCE® INTRAMEDULLARY TIBIAL RESECTION

A 3/8" (9.5mm) drill bit is used to penetrate the proximal tibia just posterior to the anterior cruciate ligament tibial attachment. Insert the fluted IM reamer/rod into the tibial canal constantly turning the T-handle | **FIGURE 21**.



FIGURE 20



FIGURE 21

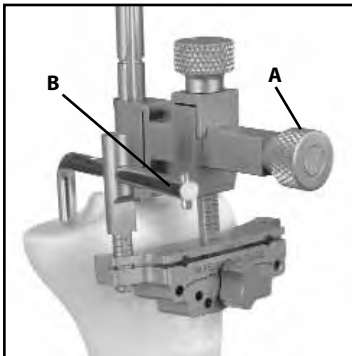


FIGURE 22



FIGURE 23

Irrigate and aspirate several times to reduce the chance of a fat embolus. The reamer/rod should be inserted to at least the mid isthmus. Disconnect the T-handle and slide the tibial alignment guide onto the IM reamer/rod until the bottom surface of the guide rests against the tibial surface | **FIGURE 22**. Turn the locking screw to lock the guide to the IM reamer/rod | **A IN FIGURE 22**. A stylus can be used to set the proximal/distal position of the crosshead to the desired level of tibial resection | **B IN FIGURE 22**. Pin the crosshead to the proximal tibia.

If the crosshead is detached from the guide, the block can be moved proximally or distally 3mm if headless pins are used. The tibial resection can be performed with or without the IM reamer/rod in place. Varus/valgus angulation can be checked to the ankle using the external alignment guide and rod | **FIGURE 23**.

If the resection is in varus or valgus, a 3° varus/valgus resection block may be used to recut the tibia. | **FIGURE 20**.

tibial sizing, keel preparation, and TRIAL REDUCTION

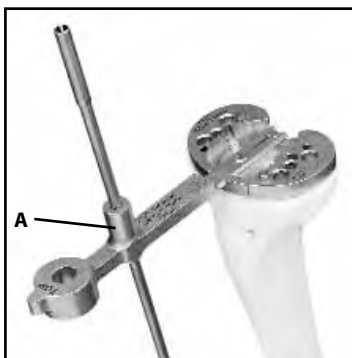


FIGURE 24

Assemble the trial tibial base equal in size to the femoral implant with the trial base handle and place against the proximal tibial surface | **FIGURE 24**. An alignment rod can be inserted through the handle to check alignment to the ankle | **A IN FIGURE 24**.

If the size is appropriate, align the base and pin it to the tibia using short headed anchoring pins. If the tibial size is too small, a "plus size" will provide additional tibial coverage.

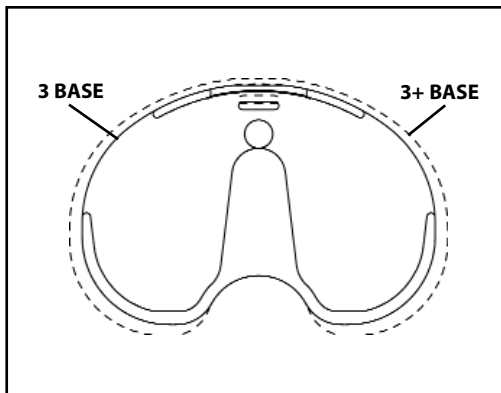


FIGURE 25

NOTE | In all ADVANCE® total knees, with the exception of the ADVANCE® Double-High Knee, the tibial insert size must match the femoral implant size. There are two tibial base sizes that can be used with any one size femoral component. For example a size 3 femoral implant can be used with either a size 3 or 3+ tibial base | **FIGURE 25**. When using the ADVANCE® Double-High insert, a femoral component one size greater than the tibial insert may be utilized. For example, a size 3 ADVANCE® Double-High insert may be used with a size 3 or 4 femur and a size 3 or 3+ tibial base.

Attach the keel punch guide to the keel punch handle and secure it to the trial base by turning the knurled handle | **FIGURE 26**. Prepare the entry hole for the tibial stem using the ½" drill guide and reamer (press-fit or oversize) | **FIGURE 27**.



FIGURE 26

Ream to the first line | **FIGURE 27** for a size 1, 1+, or 2 base, to the second line for a 2+, 3, 3+, or 4 base, and to the third line for a 4+, 5+, or 6 base.

Using the threaded punch handle and appropriate keel punch, slide the punch through the guide until the punch is fully seated | **FIGURE 28**.

NOTE | The rim of the punch is designed to engage the trial base, keeping it from being inserted too deep. The threaded handle has a mark indicating the depth that the punch should be impacted | **A IN FIGURE 28**.

Once the punch is seated, remove the punch handle by turning counter-clockwise until it is disengaged from the punch and remove the punch guide leaving the trial base and stem in place for a trial reduction.



FIGURE 27

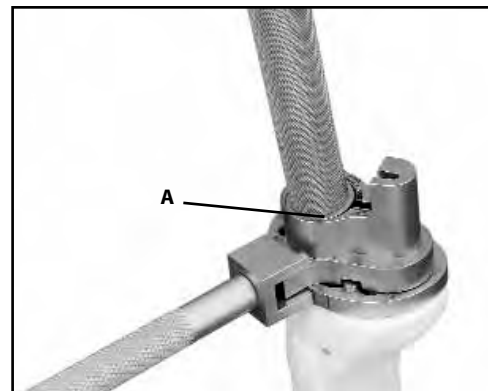


FIGURE 28

patella PREPARATION

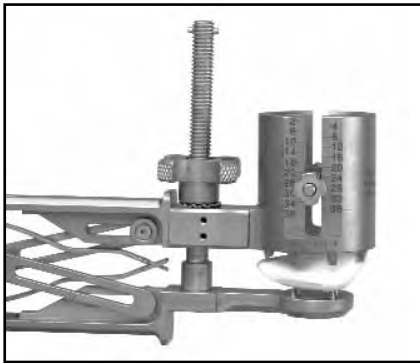


FIGURE 29

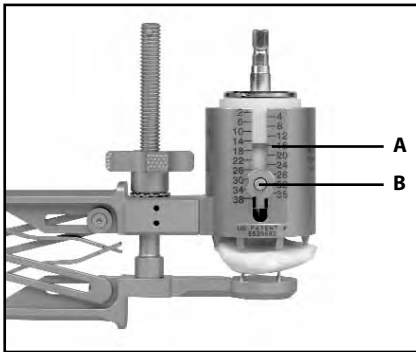


FIGURE 30



FIGURE 31

PATELLA RECESSING INSTRUMENTATION

Attach the patellar reamer guide to the parallel patellar clamp. Center the guide over the apex of the patellar articular surface | **FIGURE 29**, and clamp the patella. Slightly loosen the two thumbscrews on the depth regulator | **B IN FIGURE 30** until it sits at the bottom of the patellar reamer guide. Insert the appropriate patellar reamer into the guide until it rests on the apex of the patellar articular surface. Note the reamer depth by referencing the bottom of the reamer collar | **A IN FIGURE 30** to the scale on the side of the reamer guide. Set the top edge of the depth regulator to 14mm below the patellar reamer collar for a high dome patellar implant, and 12mm below the reamer collar for a low dome. Ream until the depth regulator stops the patellar reamer.

NOTE | The reamer is a "one step" instrument that resects bone for the patellar body and peg simultaneously.

ONLAY PATELLA INSTRUMENTATION

The onlay patellar resection guide can be used with or without resection depth gauges or minimum thickness gauges. When used without gauges, the resection guide is positioned at the desired level of resection. Securely clamp the jaws into the patella and resect the patellar bone.

For a calibrated resection, the appropriate resection depth gauge corresponding to the implant thickness should be attached to the top of the resection guide with the lock screw | **FIGURE 31**.

Position the resection guide jaws parallel to the articular margin and securely clamp the guide to the bone assuring the gauge is contacting the apex of the articular surface. The gauge can be removed to increase visibility.

Minimum thickness retention gauges are available for preservation of 10mm or 15mm bone stock. Use of the minimum bone thickness gauge is based on intraoperative assessment of bone quality and thickness.

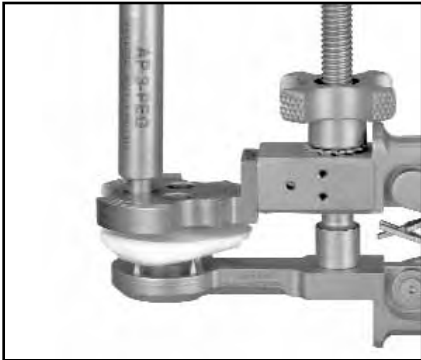


FIGURE 32

The appropriate drill guide (tri-peg or single peg) is used to size the patella and prepare holes in the bone for the implant peg(s). Attach the drill guide to the patellar clamp. The drill guides have grooves on their surfaces indicating the patellar diameter options. The appropriate tri-peg or central peg reamer is used to prepare the peg hole(s) | **FIGURE 32**.

NOTE | The tri-peg patellae have the same peg patterns between sizes and can be easily changed during trial reduction.

trial reduction IMPLANT INSERTION

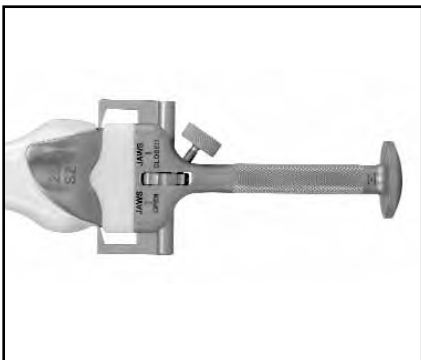


FIGURE 33

With the knee flexed, place the appropriate size femoral trial on the distal femur using the femoral impactor or femoral holder/driver | **FIGURE 33**. Insert the trial tibial insert of equal size and appropriate thickness onto the trial base and complete the trial reduction.

If necessary; drill for the femoral implant fixation peg through the femoral trial implant using the 3/16" drill bit. After the trial reduction is complete, remove the femoral trial with the femoral extractor and remove the short headed tibial fixation pins with the pin puller or slap hammer pin extractor.

The recommended order for implantation is left to the discretion of the orthopaedic surgeon. Insert the femoral implant with the femoral impactor or femoral holder/driver | **FIGURE 33**. The metal tibial base is inserted with the tibial base impactor | **FIGURE 34**.



FIGURE 34

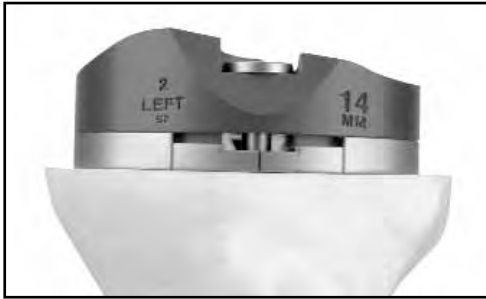


FIGURE 35

After the metal base has been inserted, the appropriate trial tibial insert can be used to recheck ligament and soft tissue balancing | **FIGURE 35**. An additional trial insert pin may be placed through the trial insert and tibial base implant to provide a secure construct during final assessment of joint stability.

NOTE | The trial insert only engages the central locking detail and a gap will be present along the anterior periphery of the insert | **FIGURE 35**.

The patellar implant can be held in place while the cement cures using the parallel patellar recessing clamp and plastic seater | **FIGURE 36**.

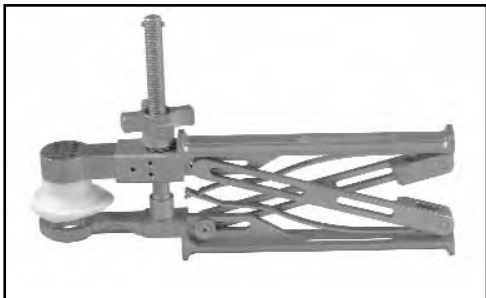


FIGURE 36

TIBIAL INSERT SEATING

Once the cement surrounding the tibial base has cured, the appropriate tibial insert may be locked into place. Initial seating is accomplished by pushing the insert as far posterior as possible with hand pressure, paying special attention to engage the central dovetail and posterior captures of the tibial base.

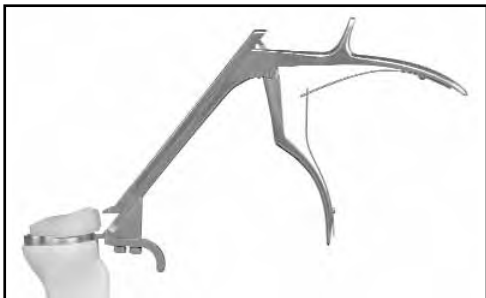


FIGURE 37

For final seating of the insert, two options are available. An insert assembly gun may be utilized by placing the lower jaw in the anterior slot of the tibial base | **FIGURE 37**. With the bottom jaw inserted, slide the locking shim completely forward to assure proper gun position | **A** IN **FIGURE 38**. To seat the insert, squeeze the handle until the top jaw pushes the insert fully posterior and flush against the surface of the tibial base | **FIGURE 40**. Withdraw the locking shim to loosen the assembly gun.

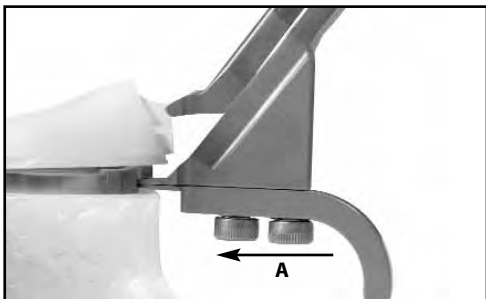


FIGURE 38



FIGURE 39

A second option, the 45° insert impactor, may be utilized by placing the impactor tip in the anterior slot of the tibial insert | **FIGURE 39**. While maintaining a 45° angle relative to the tibial base, apply several strong mallet blows until the insert face is flush against the surface of the tibial base | **FIGURE 40**.



FIGURE 40

appendix

DISTAL FEMORAL RECUT (IF NECESSARY)

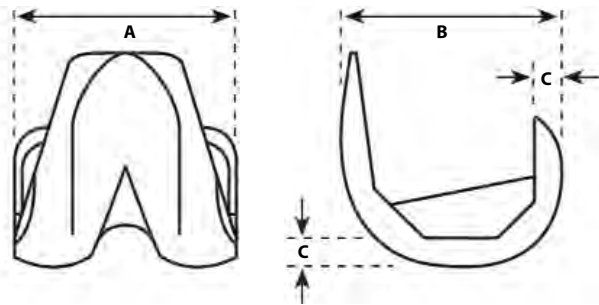
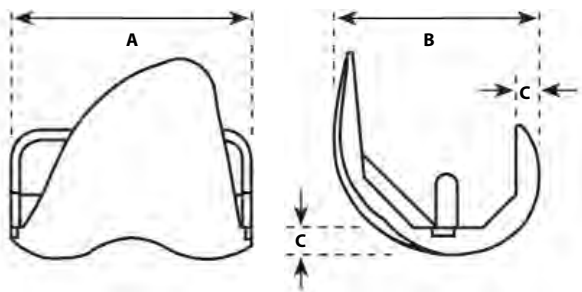
If it is necessary to recut the distal femur, attach the 5mm spacer block to the paddles on the valgus angle alignment guide and attach the resection block to the guide with the recut surface visible | **FIGURE 41**.



FIGURE 41

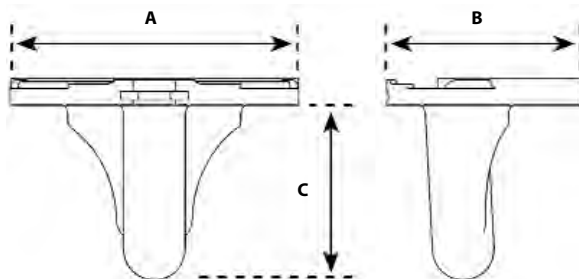
Place the paddles flush to the distal femur, fix the distal resection block to the anterior cortex in the 0mm holes and remove the valgus angle alignment guide. The recut surface has 4 and 8mm recut slots. When combined with the fixation pin holes the distal femur may be recut in 2mm incremental thicknesses.

IMPLANT DIMENSIONS (mm)

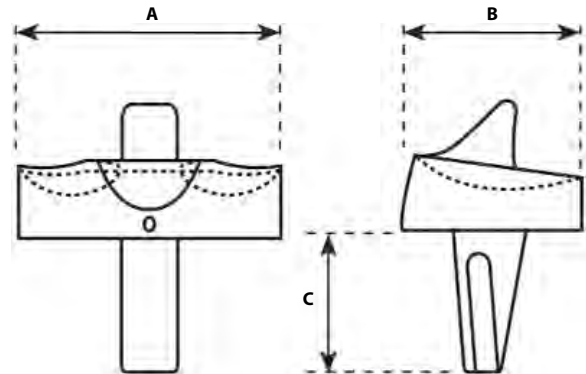
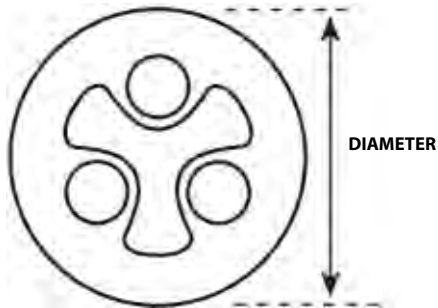


SIZE	A	B	C
1	60	52	8
2	65	57	8
3	70	62	8
4	75	66	8
5	80	71	8
6	85	76	9

SIZE	A	B	C
1	55	53	8
2	60	58	8
3	65	62	8
4	70	67	8
5	75	72	8
6	80	76	9



TRAY SIZE	A	B	C	INSERT SIZE
1	60	41	35	1
1+	65	44	35	
2	65	44	35	2
2+	70	48	43	
3	70	48	43	3
3+	75	51	43	
4	75	51	43	4
4+	80	54	50	
5	80	54	50	5
5+	85	58	50	
6	85	58	50	6

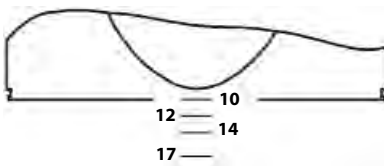


SIZE (DIAMETER)	SINGLE PEG	TRIEG	THICKNESS (mm)
25	•	N/A	7 or 9
26	N/A	•	8
28	•	N/A	7 or 9
29	N/A	•	8
32	•	•	8
35	•	•	8
38	•	•	10
41	•	•	11

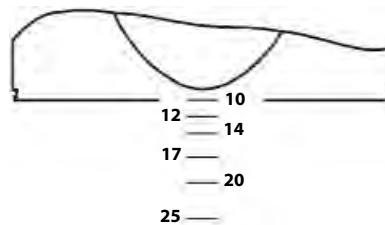
SIZE	A	B	C
1	60	41	29
2	65	44	29
3	70	48	29
4	75	51	39
5	80	54	39
6	85	58	39

INSERT THICKNESS (mm)

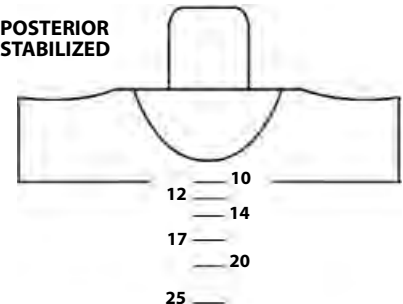
DOUBLE-HIGH



MEDIAL-PIVOT



POSTERIOR STABILIZED





Wright Medical Technology, Inc.

5677 Airline Road
Arlington, TN 38002
901.867.9971 phone
800.238.7188 toll-free
www.wmt.com

Wright Cremascoli Ortho SA

Zone Industrielle la Farlecle
Rue Pasteur BP 222
83089 Toulon Cedex 09
France
011.33.49.408.7788 phone

ADVANCE® is a registered trademark of Wright Medical Technology, Inc.

The ADVANCE® Knee is covered by one or more of the following patents:

U.S. Patents: 4,298,992; 4,718,413; 5,219,362; 5,662,656; 5,672,178; 5,702,458; 6,013,103

© 2002 Wright Medical Technology, Inc. All rights reserved.

MK 674-1097
(Rev. 1-05)