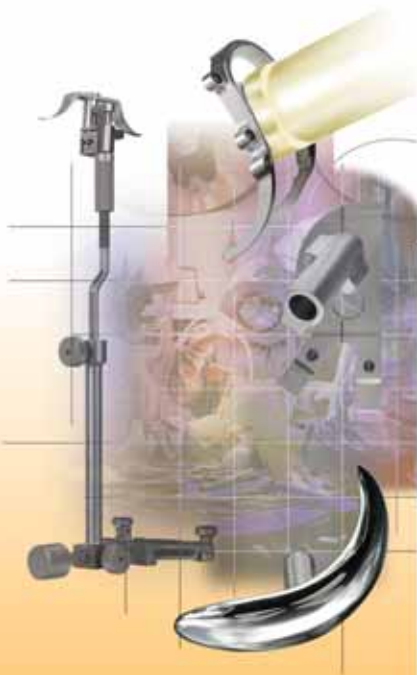


ADVANCE[®]

UNICOMPARTMENTAL KNEE SYSTEM

SURGICAL TECHNIQUE



ADVANCE[®]

unicompartmental
KNEE SYSTEM

was designed in conjunction with
the following surgeons:

UNITED STATES

RICHARD A. ROSA, MD, FACS
Attending Orthopedic Surgeon
Saint Barnabas Medical Center
Livingston, New Jersey

JACK M. BERT, MD, FACS
Clinical Professor
University of Minnesota Medical School
Summit Orthopedics, LTD
Saint Paul, Minnesota

JOHN C. GARRETT, MD
Atlanta, Georgia

INTERNATIONAL

MICHAEL GROSS, MD, FRCS (C & LOND)
Professor of Orthopedics
Dalhousie University
Attending Orthopedic Surgeon
QEII Health Sciences Centre
Halifax, Nova Scotia, Canada

JEAN-PAUL BARTHELEMY, MD
Clinique Saint Gatien
8 place de la Cathédrale
37000 TOURS
France

GHERARDO GIARETTA, MD
Casa di Cura "Città di Brescia"
Via Gualla, 15
25128 BRESCIA
Italy

ANDRÉ HERVE, MD
Clinique Sainte Elisabeth
Rue de Naimeux 15
4802 HEUSY
Belgium

BARRY L. HINVES, MD, FRCS
Consultant Orthopaedic Surgeon
Conquest Hospital
The Ridge
St Leonards on Sea
East Sussex
TN37 7RD
United Kingdom

JOHN A. N. SHEPPERD, MD, FRCS
Consultant Orthopaedic Surgeon
Conquest Hospital
The Ridge
St Leonards on Sea
East Sussex
TN37 7RD
United Kingdom

PATRICK VIALE, MD
Chef de Clinique des Hopitaux de Paris
Clinique Guillaume de Varye
210 route de Vaugeron
18230 SAINT DOULCHARD
France

PROF. CLAUDIO ZORZI
Divisione Ortopedia e Traumatologia
Ospedale "Sacro Cuore"
37024 Negrar (VR)
Italy

ADVANCE[®]
unicompartmental
KNEE SYSTEM

a conservative incision
with consistent precision

ADVANCE

unicompartmental
KNEE SYSTEM

as described by Richard Rosa, MD

conservative incision with CONSISTENT PRECISION



A one-piece posterior resection guide and distal resurfacing guide provide consistent alignment.



The precision distal resurfacing guide may be utilized with a revolutionary end-mill or low-profile power rasp to prepare the femur and provide unprecedented implant fit.



Low profile tibial guide and stylus are easily applied in small incision surgery.



Angled drill guides allow for posterior tibial peg preparation within the confines of a minimal incision.

Unicompartmental knee systems designed for minimal exposure have historically provided either limited instrumentation, making reproducible alignment difficult, or bulky instrumentation which requires more intrusive surgery.

The goal of the ADVANCE® Unicompartmental Knee System was to provide instruments which could be effectively used in a minimal incision procedure while still offering the surgeon the alignment guides needed for consistent results. Reproducible outcomes are possible within a minimal incision when we put the right tools in the surgeon's hands.

NOTE | Two styles of all-polyethylene tibial components are available for the ADVANCE® Unicompartmental Knee; the conforming component, and the Universal Component (UC). The conforming tibial base was designed to replicate the anatomy of the medial tibial plateau, and is therefore only recommended for use in the medial compartment. The Universal Component may be employed in both the medial and lateral compartments.



removing the guesswork WITHOUT REMOVING QUALITY BONE

With the increased prevalence of unicompartmental knee arthroplasty (UKA), a system which provides a conservative approach in terms of both instrumentation and implant design is critically important.

To address this, the ADVANCE® Unicompartmental Knee System was designed with bone conserving femoral and tibial components that provide reproducible results within a minimal incision. This was accomplished with the following three system design requirements:

CONSERVATION

The resurfacing femoral implant conserves 20% more quality bone stock compared to contemporary full resection femoral implants.¹ An all-poly tibial base design conserves bone while providing proven outcomes based on cortical bone support in place of inlay techniques.²

SIMPLICITY

State-of-the-art instrumentation allows precision resurfacing while remaining versatile and straight-forward. Through the use of guides at every step of the procedure, interoperative simplicity is assured while surgeon confidence is maintained.

CONSISTENCY

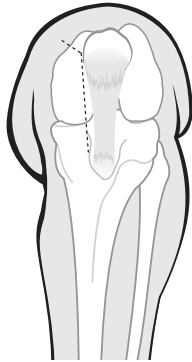
Consistent alignment and reproducible clinical results are obtained through an instrumented minimal incision technique. Increased tibial implant fixation and more consistent clinical outcomes are provided with a dual peg tibial base design.⁵

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. Prior to surgery, a thorough radiographic analysis is recommended; including standing weight bearing A/P and lateral films to determine the projected component size and alignment goals.

NOTE | The instrumentation for the ADVANCE® Unicompartmental Knee System has been marked for medial compartment replacement. If preparing the lateral condyle, the instrumentation (and implants) for the opposite leg should be utilized. For example, if preparing the left lateral condyle, the right femoral guide should be utilized.

surgical EXPOSURE



The medial compartment is approached through a 3 to 5 inch medial parapatellar incision. With the knee flexed to 90°, the incision begins at the medial border of the patella and is carried distally to the level of the tibial tubercle. The incision may be extended distally and proximally as needed to gain adequate exposure. The proximal portion of the retinacular incision is then extended proximally and medially in a "hockey-stick" fashion to, or just splitting the distal fibers of the vastus medialis. If present, the medial patellar osteophyte should be removed. Additionally, the medial border of the patella can be removed to facilitate the exposure. In performing the medial meniscectomy, it may be helpful to excise the anterior horn of the meniscus and complete the meniscectomy following the proximal tibial resection and distal femoral preparation.

NOTE | If preparing the lateral tibial plateau, utilize the tibial cutting guide of the opposite side. (For example, if preparing the lateral left plateau, utilize the right tibial guide.)

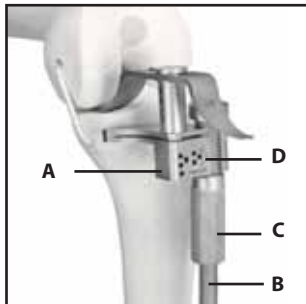


FIGURE 1 |

Flex the knee to 90° and attach the appropriate "right" or "left" tibial cutting guide | **FIGURE 1A** to the extramedullary (EM) tibial alignment guide | **FIGURE 1B** by lowering the alignment guide thumbscrew | **FIGURE 1C** to allow attachment of the tibial cutting guide. With the tibial cutting guide applied, raise the alignment guide thumbscrew until the tibial cutting guide rests at the top of the proximal alignment guide. | **FIGURE 1D**

Place the assembled extramedullary (EM) tibial alignment guide onto the tibia by first applying the ankle portion with the clamp positioned at the midpoint of the medial and lateral malleoli. | **FIGURE 2A** Ensure the EM tibial alignment guide is placed parallel to the long axis of the tibial shaft and positioned proximally at the medial third of the tibial tubercle or another appropriate landmark for correct tibial rotation.

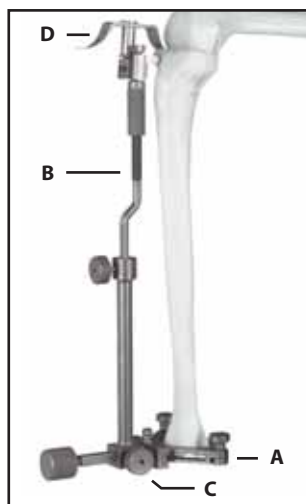


FIGURE 2 |

Placing the EM tibial alignment guide parallel in the sagittal plane with long axis of the tibia will provide a 5° posteriorly sloped resection. | **FIGURE 2B**

Moving the alignment rod away from the ankle increases posterior slope while moving the rod towards the joint reduces the posterior slope. | **FIGURE 2C** It is desirable to match the anatomic slope as closely as possible while avoiding excessive posterior angulation.

If desired, attach the 4mm/6mm-tibial stylus to the tibial cutting guide. | **FIGURE 2D**

A 4mm tibial resection is recommended to conserve bone. After the initial cut, if more bone resection is desired, the tibial resection guide can be repositioned at a lower level and more bone can be removed.

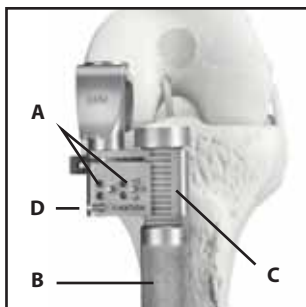


FIGURE 3 |

Ensure proper tibial rotation is maintained, and insert a .125" (3.2mm) headless fixation pin in the tibial cutting guide through the "0mm" holes.

| **FIGURE 3A** In hard or sclerotic bone, quick disconnect .125" (3.2mm) drill bits may be necessary prior to applying fixation pins.

The proximal tibial resection may be performed with or without the EM tibial alignment guide in place. To remove the alignment portion, turn the thumbscrew counter-clockwise to lower the screw | **FIGURE 3B** and slide the alignment guide proximally until the guide can be removed through the track in the tibial cutting guide. | **FIGURE 3C**

Prior to performing the proximal tibial resection, the tibial cutting guide depth may be further adjusted by moving the cutting guide over the fixation pins at the +2mm or -2mm position. For additional fixation, a divergent headless fixation pin may be applied. | **FIGURE 3D** With the tibial cutting guide positioned correctly, remove the tibial stylus and initiate a proximal resection with a 1/2" wide (.050"/1.3mm thick) oscillating sawblade through the proximal resection slot.

The proximal tibial resection is completed by performing a sagittal resection along the lateral border of the medial condyle with a reciprocating sawblade, taking care to avoid the anterior and posterior cruciate ligaments. The alignment of the sagittal resection should be perpendicular to the frontal plane of the tibia.

NOTE | An alternative technique involves making the sagittal resection first while leaving the reciprocating sawblade in the proximal tibia. This now acts as landmark for making the horizontal resection of the proximal tibia.

femoral SIZING

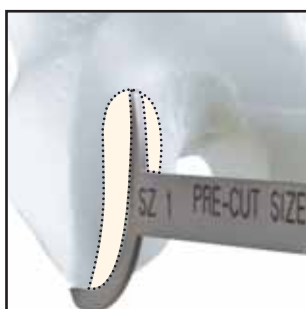


FIGURE 4 |

Following complete exposure and appropriate soft tissue release, preliminary sizing for the femoral component is determined with pre-cut femoral sizers; which are available for both the lateral and medial condyles. To size the femur, align the anterior tip of a selected pre-cut sizer with the anterior "tide mark" on the distal femur while ensuring the handle of the sizer is parallel to the femoral shaft. By placing the sizers in this orientation, it may be determined which one most closely approximates the curvature of the femur. | **FIGURE 4** If sizing the lateral condyle, see the Preparation of the Lateral Condyle section before proceeding. After sizing, the femur may be marked with methylene blue to indicate the central weight-bearing line.

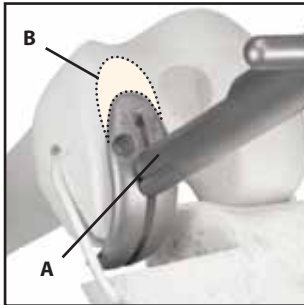


FIGURE 5 |

extramedullary ALIGNMENT

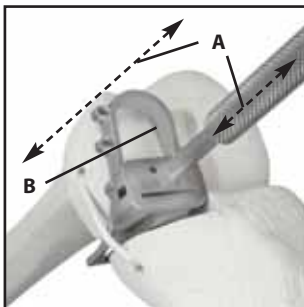


FIGURE 6 |



FIGURE 7A |



FIGURE 7B |

As a secondary measure, the slotted femoral trials may be utilized to determine femoral size. If sizing the lateral femoral condyle, utilize the femoral trial of the opposite side. (For example, if sizing the lateral left condyle, utilize right femoral trials.) To size the femur, first attach the femoral trial handle to the appropriate size (based on pre-operative templating) slotted femoral trial. | **FIGURE 5A** Place the assembled trial onto the femur and assess the medial-lateral component width and anterior-posterior fit.

NOTE | Because a posterior femoral resection has not yet been completed, the anterior location of the trial will not represent the final location of the femoral implant. Following the posterior resection, the implant will be positioned approximately 7mm superior to its position during trialing. | **FIGURE 5B** Ultimately, the anterior portion of the component should be positioned at the tidemark between the degenerative weight-bearing surface and the healthier articular cartilage.

Final sizing is determined with the femoral rasp guide/posterior resection guide assembly. Attach the appropriately sized (size 1, 2, 3, 4) "right" or "left" rasp guide to the correct size posterior resection guide (size 1-2 or 3-4) and apply the assembly to the unprepared medial-femoral condyle. If desired, a threaded handle | **FIGURE 6A** or the external alignment rod guide | **FIGURE 6A** can be attached to the posterior resection guide to aid in positioning the rasp guide assembly

The assembled rasp guide is positioned and aligned on the femoral component using the following steps:

- ONE** With the knee flexed to 90°, the rasp guide handle is positioned parallel to the femur and perpendicular to the tibia when viewed from the lateral or medial side | **FIGURE 6A** The flat resected tibia may also be used to confirm correct positioning of the guide .
- TWO** Position the femoral rasp assembly in the correct medial-lateral and rotational position (along the distal weight bearing surface) to obtain maximum femoral coverage. The inner rim of the rasp assembly replicates the outer medial-lateral geometry of the femoral implant. | **FIGURE 6B**
- THREE** Ensure the assembled rasp guide is rotated correctly for femoral alignment. The femoral implant provides a 7° anatomic angle, between the distal and posterior surfaces, which should closely replicate the geometry of the anatomic femur.
- FOUR** Confirm the femoral rasp guide is parallel to the tibial resection with the tibial shims. To do so, place the appropriate thickness of shim between the tibial resection and the posterior paddle of the femoral guide **FIGURE 7A**. Proper varus/valgus positioning of the femoral guide may be determined by utilizing the external alignment rod to ensure the rasp guide is perpendicular to the long axis of the tibia. | **FIGURE 7B**

intramedullary ALIGNMENT (OPTIONAL TECHNIQUE)

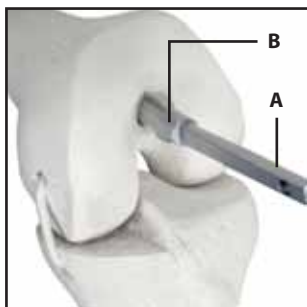


FIGURE 8 |

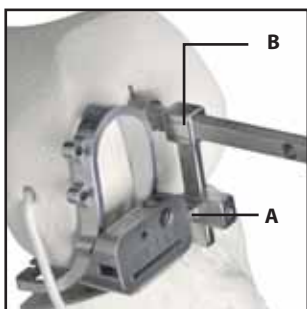


FIGURE 9 |

Initiate an opening in the femoral canal with a 3/8" (9.5mm) diameter drill bit. Routine irrigation and aspiration should be performed to reduce the possibility of fat emboli. Choose the appropriate 3°, 5° or 7° valgus rod with the surface marked "left" facing up for a left knee and "right" facing up for a right knee. | **FIGURE 8A** A valgus rod is placed into the femoral intramedullary canal without seating the valgus rod fins into the bone. | **FIGURE 8B**

The femoral rasp assembly is now connected to the appropriate size (short or long) IM linking instrument with the linking bar connecting to the lateral slot in the femoral rasp assembly for a medial unicompartmental knee or the medial slot for a lateral compartmental knee | **FIGURE 9A** The entire construct is placed onto the femoral condyle with the vertical linking bar connected to the valgus rod. | **FIGURE 9B** Position and align the assembled rasp guide utilizing the techniques listed in the EM ALIGNMENT section. Finalize femoral alignment by impacting against the valgus rod cap, fully seating the anterior and posterior fins.

posterior RESECTION

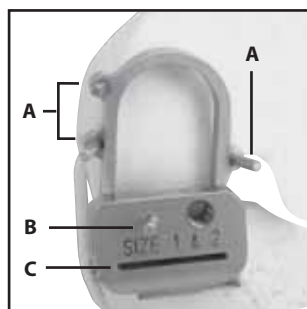


FIGURE 10 |

With the rasp assembly correctly positioned, ensure the posterior resection paddle is flush against the posterior condyle and pin the guide in place with .125" (3.2mm) headless fixation pins through both the medial and lateral eyelets. | **FIGURE 10A** An additional pin is placed in the divergent hole provided in the posterior resection guide to ensure it remains stable during resection of the posterior condyle. | **FIGURE 10B** For hard or sclerotic bone, it may be necessary to pre-drill the holes with the .125" (3.2mm) quick disconnect drill bits. With a 1/2" wide sagittal sawblade (.050"/1.3mm thick), resect the posterior condyle through the posterior resection slot in the guide. | **FIGURE 10C** The posterior resection slot will remove 7mm (combined thickness of bone *and* sawblade) from the most prominent point of the posterior condyle when positioned correctly. With the posterior resection complete, remove the divergent fixation pin and remove the posterior resection guide leaving the rasp guide in place.



FIGURE 11 |



FIGURE 12 |

distal RESURFACING

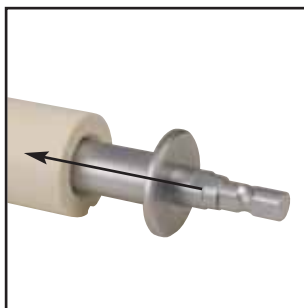


FIGURE 13 |



FIGURE 14 |

FOR PREPARATION OF THE LATERAL CONDYLE ONLY

NOTE | Instrumentation is marked according to the medial condyle. For example, when preparing for a left lateral femur, the right femoral instrumentation must be used.

To prepare the lateral femoral condyle, utilize the same surgical technique as is used for the medial condyle. However, two posterior resection guides are available for the lateral condyle: the standard (7mm resection) and the lateral (4mm resection). In some cases, use of the standard 7mm resection guide on the lateral condyle will allow the femoral implant to sit too proximally; possibly leading to patellar impingement as the patella tracks along the lateral condyle. The lateral posterior resection guide may be recognized by the blue dot on its face. | **FIGURE 11** To gauge which posterior resection guide should be employed, the pre-cut femoral sizing templates may be utilized. The standard sizing template is 3mm longer anteriorly than the lateral template | **FIGURE 12** to indicate the anterior position where the femoral component would rest with a 7mm posterior resection. If the lateral pre-cut sizer offers the better fit, the lateral posterior resection guide should be used.

FEMORAL END-MILL

After the posterior resection has been made, remove the posterior resection guide. Additional stabilization pins may be placed in the holes left vacant by the guide. Next, assemble the femoral end-mill that matches the size of the femoral rasp guide.

NOTE | End-mill cutting blades and handles are size-specific, and are available in sizes 1-4.

End-mill assembly begins by first feeding the reamer shaft through the appropriate end-mill handle. | **FIGURE 13** Next, the appropriate size cutting blade is screwed into the threads of the reamer shaft. | **FIGURE 14**

Final tightening of the blades is accomplished by placing the prongs of the assembly tool into the appropriate holes of the blades and turning. | **FIGURE 15**



FIGURE 15 |



FIGURE 16 |



FIGURE 17 |



FIGURE 18 |

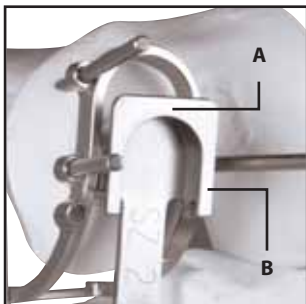


FIGURE 19 |

After loading the end-mill into a standard reamer, the cutting portion of the assembly is placed into the femoral rasp guide; ensuring the anti-rotation flats of the end-mill rest posteriorly in relation to the end-mill position.

| **FIGURE 16A** Reamer power should be started prior to plunging the end-mill into the bone to avoid chipping and gouging. After initial bone engagement, the end-mill is plunged into the bone three to four times down the length of the guide. The end-mill is then used in a sweeping motion to clear our remaining bone (end-mill blades are both side-cutting and end-cutting). The guide will automatically stop the progress of the end-mill when it reaches the appropriate depth. In some cases, it may be difficult to prepare the transition between the distal and posterior condyles due to impingement of the end-mill on the tibia. In this case, the femoral power rasp, or a standard burr may be utilized to prepare this transition area. | **FIGURE 17** If using the power rasp, it should be drawn posterior to anterior to avoid damaging the tibial surface

POWER RASP

When using the Power Rasp technique to prepare the distal/anterior surface of the femur for the femoral implant, attach the appropriate size power rasp to the reciprocating power saw | **FIGURE 18A** Place the power rasp within the rails of the rasp guide and against the most prominent cartilage surface of the femur | **FIGURE 18B** Utilize the power rasp to remove the necessary cartilage or articular bone in preparation for the femoral implant.

NOTE | It may be necessary to utilize a high speed burr prior to rasping to remove the hard layer of sclerotic bone.

The power rasp may be directed from either an anterior or posterior direction.

NOTE | The power rasp must be positioned with the rounded end directed anteriorly to complete resurfacing of the bone at the anterior portion of the rasp guide. | **FIGURE 19A**

The appropriate level of preparation is complete when the power rasp depth stop comes into contact with the outer surface of the rasp guide along its entire path of travel. | **FIGURE 19B** It is critical that this is completed along the entire surface of the rasp guide in order for the implant to fit properly.



FIGURE 20 |

femoral AND TIBIAL TRIALING



FIGURE 21 |



FIGURE 22 |

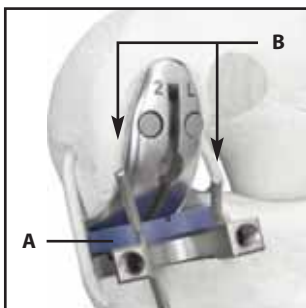


FIGURE 23 |

FEMORAL RASP HANDLE

To fine-tune the femoral resurfacing, the femoral rasp handle may be utilized. | **FIGURE 20** To insert a femoral rasp into the handle, first unscrew the back of the handle until the threads disengage. A locking screw prevents the back end of the handle from completely separating. Next, insert the connecting hub of the appropriate femoral rasp into the cavity of the rasp handle and screw the back of the handle into place until it secures the rasp rigidly. Once assembled, the rasp may be utilized with the femoral guide in the normal fashion for femoral resurfacing.

The bone surface may be checked and implant fit assessed using either the slotted femoral trial or the appropriate size femoral shaping template prior to removal of the guide. | **FIGURE 21** At this step, it is helpful to mark the fixation pin holes or anterior rim of the femoral trial for later reference to ensure proper anterior/posterior placement of the femoral trial after the rasp guide has been removed.

After completing the distal resurfacing, remove the rasp guide and apply the appropriate size "left" or "right" slotted femoral trial. It may be necessary to clean up the edges of the femoral surface with a rongeur or hand rasp where the femoral rasp guide was seated. This will allow adjustment of medial-lateral femoral position.

NOTE | When trialing for the lateral compartment, utilize the trial for the opposite side. For example: when trialing for a left lateral compartment, utilize the right femoral and tibial trials.

With the femoral trial in the appropriate position (the femoral trial may be held in place with thumb pressure), introduce the proposed trial tibial base and insert onto the proximal tibia. Placement and size of the tibial component may be determined using one of the two following methods:

METHOD ONE

Determine the tibial component size that maximizes tibial coverage and confirm the appropriate medial-lateral and rotational alignment by placing the knee through a range of motion with a free floating tibial trial base and insert. A line is etched in the center of the insert trial to assess proper tibiofemoral tracking. | **FIGURE 22** With the trial insert/base in place, pin the trial base through the two anterior fixation pin eyelets. | **FIGURE 22**

METHOD TWO

Determine the tibial component size that maximizes tibial coverage and pin the trial base through the two anterior fixation pin eyelets with a .125" (3.2mm) headless fixation pin. | **FIGURE 23** Attach the correct size tibial insert and run the knee through a range of motion to confirm desired implant tracking and component positioning. Adjust tibial trial positioning, if needed.

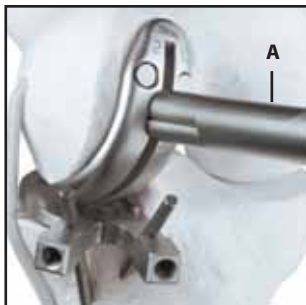


FIGURE 24 |

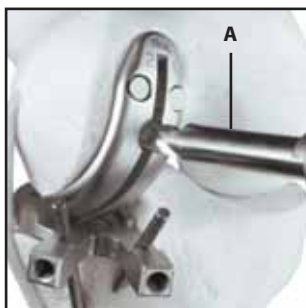


FIGURE 25 |



FIGURE 26 |



FIGURE 27 |

Attach the femoral trial to the trial handle | **FIGURE 24A** and position the femoral trial flush against the flat posterior resection while ensuring correct medial-lateral implant placement before pinning the trial in place. | **FIGURE 24**

A trial range of motion may be completed prior to preparation of the central femoral peg / fin, to ensure correct implant tracking. Femoral preparation is completed by first preparing for the central peg with the appropriate size (1-2 or 3-4) femoral peg drill. | **FIGURE 25A** The drill bit should be positioned perpendicular to the distal femoral surface and reamed until the depth stop contacts the femoral trial. To prevent splitting of the femur, initial preparation for the central femoral fin is performed through the slot provided in the trial using an oscillating or podiatry saw. | **FIGURE 26** Care should be taken not to over-resect bone in the central portion of the femur.

Preparation is completed with the appropriate size (1,2,3,4) fin punch. The punch is placed into the slot and lightly tapped until it rests flush against the anterior portion of the femoral trial. | **FIGURE 27** With the peg and fin prepared, remove the fin punch.

NOTE | Any size ADVANCE® Unicompartmental femoral component is compatible with any size tibial base.

tibial peg PREPARATION

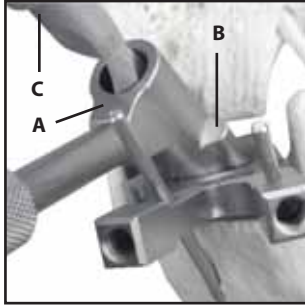


FIGURE 28 |

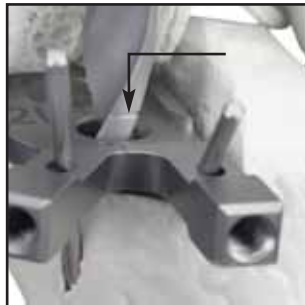


FIGURE 29 |

final trial reduction and COMPONENT IMPLANTATION



FIGURE 30 |

all poly tibia APPLICATION

Remove the femoral fixation pins and femoral trial. Assemble the tibial peg drill guide and threaded handle. | **FIGURE 28A** Maximally flex and externally rotate the tibia to more easily position the drill guide. Apply the drill guide to the pinned trial tibial base by engaging the two pins on the undersurface of the drill guide into the two angled holes in the trial base. | **FIGURE 28B** While holding the drill guide firmly, utilize the tibial peg drill to prepare for the posterior tibial peg. The drill guide and drill are at a 50° angle and a drill stop is provided for proper drill depth | **FIGURE 28C** Remove the drill guide, keeping the femur flexed with the tibia externally rotated and prepare the straight anterior peg by reaming only to the depth line marked on the tibial peg drill. | **FIGURE 29** Remove the anterior fixation pins and tibial trial base.

NOTE | When trialing for the lateral condyle, utilize the trial for the opposite side. For example: when trialing for a left lateral condyle, utilize the right femoral and tibial trials.

Apply the appropriate size pegged tibial trial and trial insert to confirm size, tracking and ease of insertion. If any difficulty is encountered during insertion of the pegged tibial trial, it may be necessary to chamfer the posterior peg hole with a round burr. Place the correct size monolithic femoral trial. Perform standard range of motion and stability testing to confirm final implant alignment and to determine the appropriate tibial insert thickness. | **FIGURE 30** With component sizes confirmed, remove all trial components and prepare the femur and tibia for cement application. If desired, burr or drill multiple holes in the femur and tibia. Thoroughly pulse lavage and dry both the femur and tibia prior to applying cement.

First apply a dry sterile twisted gauze along the posterior border of the tibia before applying cement to the component. Apply the tibial base first, while limiting the amount of un-needed cement posteriorly. Position the tibial base by aligning both the anterior and posterior pegs in the prepared holes in the proximal tibia and pressurize the tibial component. Remove the cloth and all excess cement from behind the tibial base once the implant is in place.

femoral APPLICATION



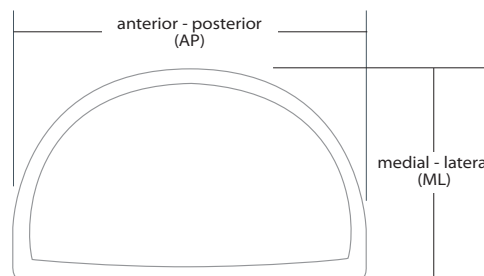
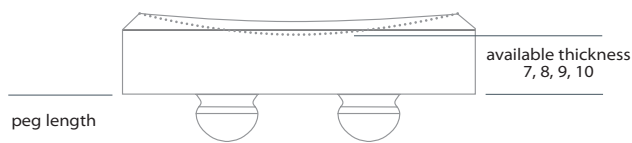
FIGURE 31 |

NOTE | When selecting a femoral implant for the lateral condyle, utilize the opposite side implant. For example: the appropriate implant for a left lateral condyle is a right femoral implant.

Apply cement to the prepared femoral surface while avoiding extrusion of cement posteriorly. Apply the femoral implant by aligning the femoral peg and central fin. Utilize the femoral implant impactor to fully seat the femoral component | **FIGURE 31** and remove all excess cement. Maintain the knee in full extension while the femoral cement is drying. Irrigate the components thoroughly and perform routine closure and wound management.

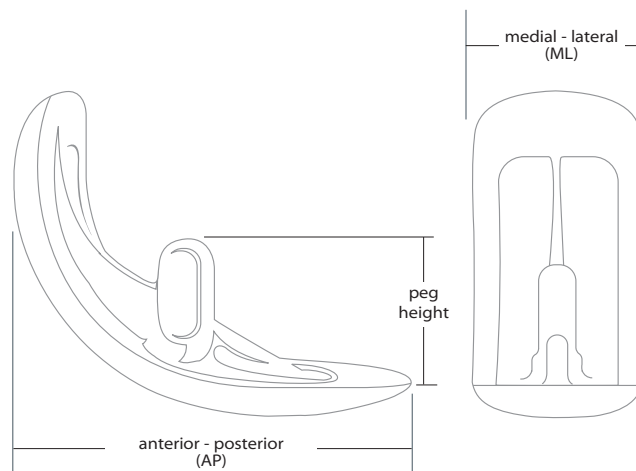
all-poly tibial component

size	ML width	AP length	peg length
1	24 mm	40 mm	6 mm
2	26 mm	44 mm	6 mm
3	29 mm	49 mm	6 mm
4	33 mm	54 mm	6 mm



uni femoral component

size	ML width	AP length	peg height
1	19 mm	39 mm	13.3 mm
2	20 mm	43 mm	14.0 mm
3	21 mm	48 mm	14.6 mm
4	22 mm	53 mm	15.3 mm



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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