

OPTETRAK[®]

A COMPREHENSIVE KNEE SYSTEM

LPI[®]

LOW PROFILE INSTRUMENTATION
DISTAL FIRST TECHNIQUE

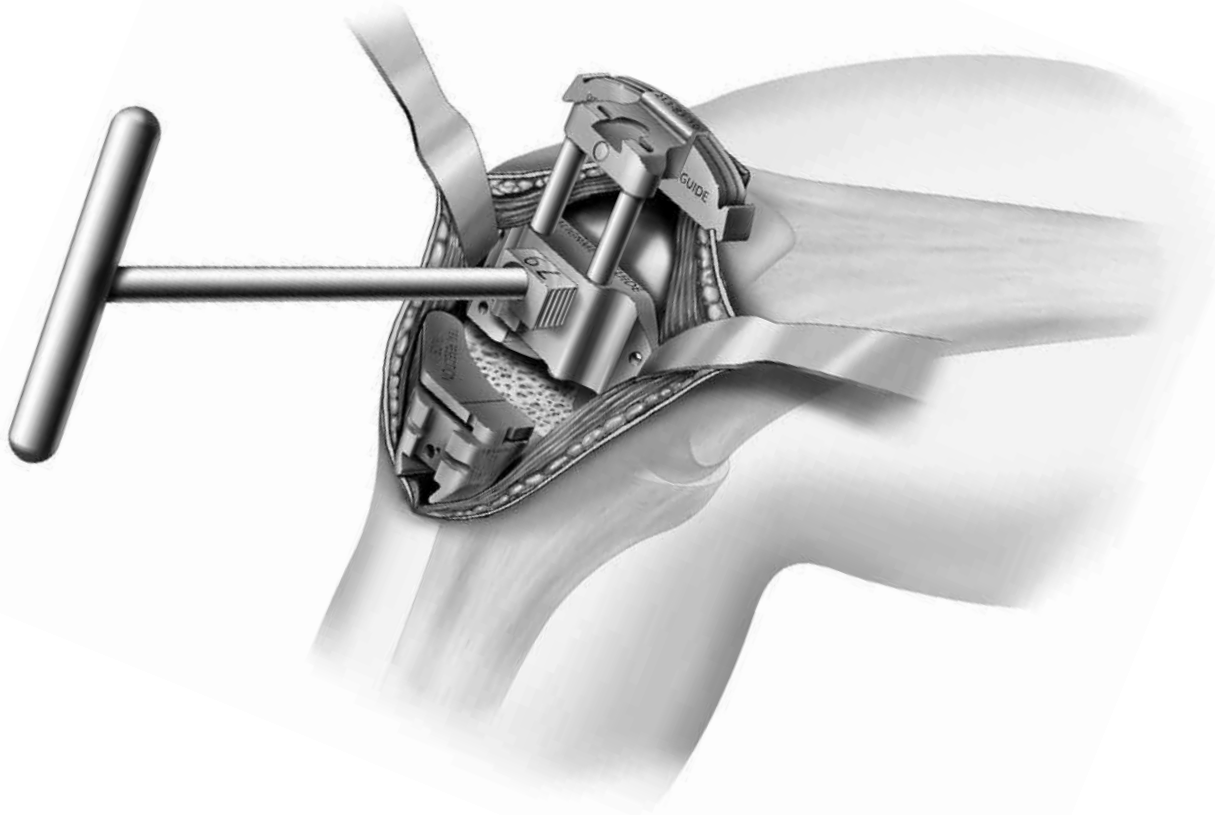


TABLE OF CONTENTS

INTRODUCTION	1
PRE-OPERATIVE PLANNING	1
OPERATIVE TECHNIQUE OVERVIEW	2
DETAILED OPERATIVE TECHNIQUE	4
APPROACH AND EXPOSURE	4
PREPARATION OF THE TIBIA.....	6
PREPARATION OF THE FEMUR.....	7
Step 1: Opening the Intra-medullary Canal	7
Step 2: Femoral Alignment Assembly	8
Step 3: Distal Femoral Resection	8
Step 4: Sizing of Femoral Component.....	10
Step 5: Rotation of Femoral Component.....	10
Step 6: Resection of Anterior, Posterior and Chamfer Femoral Bone.....	11
POSTERIOR STABILIZED FEMORAL PREPARATION	11
PATELLAR PREPARATION	12
FINAL TIBIAL PREPARATION.....	12
IMPLANTATION OF FINAL COMPONENTS	14
Step 1: Final Bone Preparation.....	14
Step 2: Implantation of Tibial Prosthesis	14
Step 3: Implantation of Femoral Component	16
Step 4: Implantation of Patellar Component.....	16
Step 5: Polymerization of Cement	17
Step 6: Installation of Tibial Polyethylene Insert (modular tibial component only)	17
FINAL CHECK AND CLOSURE	17
INSTRUMENT LISTING	18

THE OPTETRAK DISTAL FIRST LOW PROFILE INSTRUMENTATION TECHNIQUE WAS DEVELOPED IN CONSULTATION WITH:

William Balcom, MD
Boston, MA

David J. Covall, MD
Atlanta, GA

Wayne Moody, MD
Auburn, ME

William J. Bose III, MD
Mobile, AL

Sam Delgado, ST III
New York, NY

Geoffrey H. Westrich, MD
New York, NY

Michel Brax, MD
Haguenau, France

Dan Gallagher, MD
New Orleans, LA

Ajoy K. Sinha, MD
Flushing, NY

Kyle C. Swanson, MD
Mankato, MN

INTRODUCTION

Total knee replacement surgery has been one of the most successful orthopaedic procedures during the past two decades. Advanced surgical techniques and design improvements on the implants have been two of the factors responsible for that success. Exactech[®], Inc., developed Low Profile Instrumentation (LPI[®]) taking into account the experience of our surgical design team, providing user-friendly instruments that achieve reproducible bone preparation and limb alignment, allowing for superior visualization and accessibility while keeping soft tissue disruption to a minimum.

Exactech's LPI instrumentation is not a radical departure from the classic Optetrak[®] instrumentation; it is, rather, an optimized system of instruments that can be used in total knee replacement surgery, regardless the size of the incision or the surgeon's preferred method of handling soft tissues.

PRE-OPERATIVE PLANNING

The mechanical goal of the surgery is to effectively restore the normal alignment of the affected limb. Normal alignment implies that the mechanical axis, from the center of the hip to the center of the ankle, passes through the center of the knee joint. The implant should be positioned perpendicular to that line. Correct positioning is usually accomplished by performing the tibial cut perpendicular in the frontal plane, usually with some degree of posterior slope and by cutting the distal femur between 5-7 degrees of valgus from the anatomic axis (*Figure 1*).

Templating is done in both the anterior/posterior and lateral planes to estimate the implant size for both the femur and tibia.

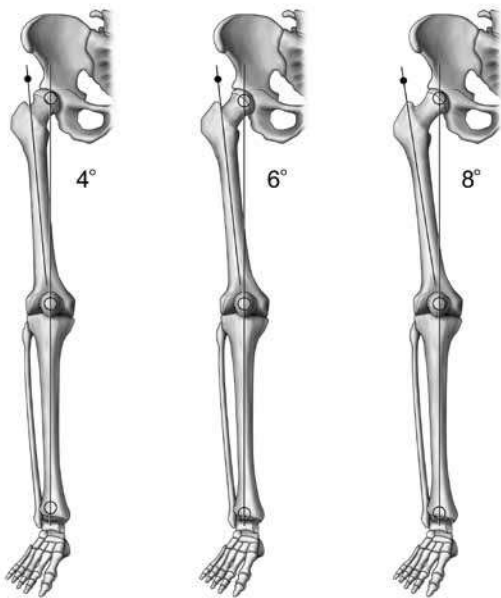
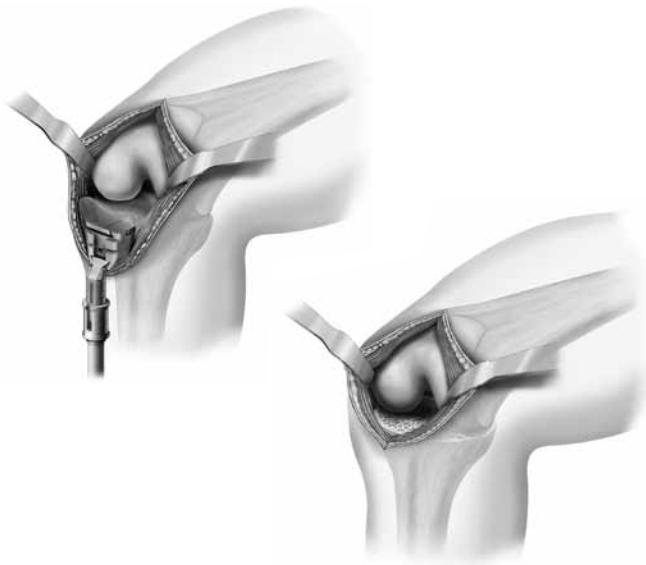
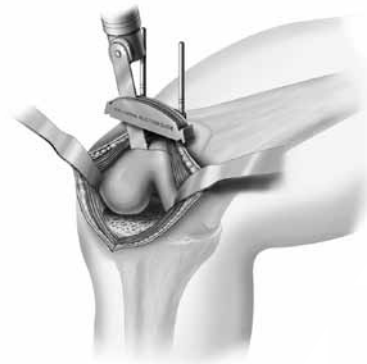


Figure 1
Different Alignment Angles of the
Mechanical Axis of the Lower Limb

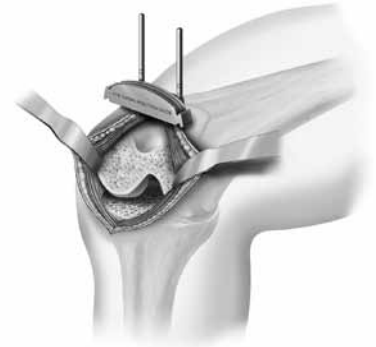
OPERATIVE TECHNIQUE OVERVIEW



1
**Tibial Resection Guide on
 Tibia and Proximal Tibia
 Resected**



2a
**Distal Femoral
 Resection Guide
 Positioned for
 Resection**



2b
**Distal Femur
 Resected**



7a
**Tibial Base
 Plate Pinned**

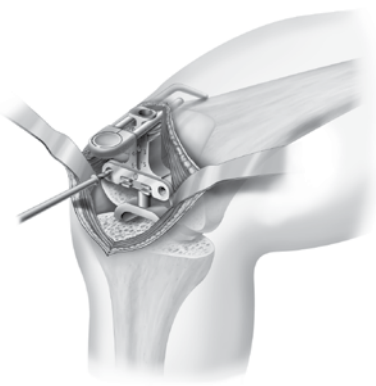
7b
**Proximal Tibia
 Perforated Using
 the IM Pilot Drill**



8a
**Tibial Tamp
 Inserted**



8b
**Tibial Tamp
 Removed**



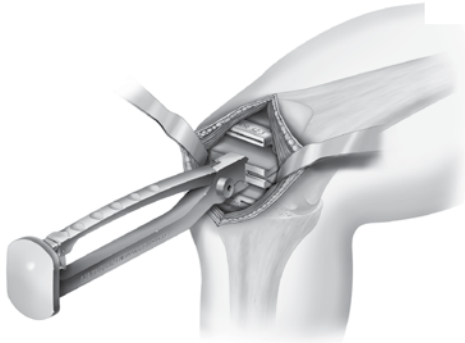
3

Femoral Sizing and Drilling Rotational Alignment Holes



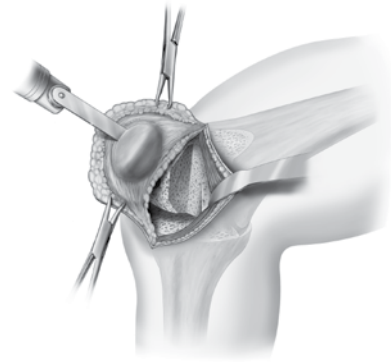
5

Positioned PS Notch Guide



4

Positioned Femoral Finishing Guide



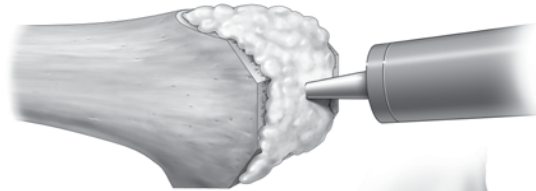
6

Patella Resected Using a "Free-hand" Technique



9a

Retractors Placed



10

Cementation



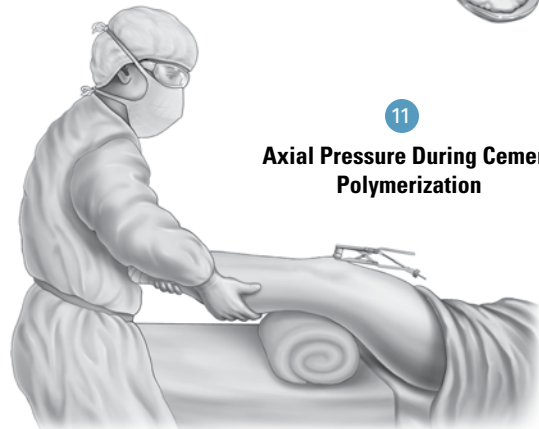
11

Axial Pressure During Cement Polymerization



9b

Tibial Component Impacted



DETAILED OPERATIVE TECHNIQUE

APPROACH AND EXPOSURE

Setup is important, and because the degree of flexion and extension of the knee must be adjusted and optimized for each step of the procedure, an adjustable foot holder, an extra assistant or placement of multiple bolsters on the surgical table is helpful. Although a great deal of traditional arthroplasty is performed with the knee in a flexed or hyperflexed position, minimally invasive total knee arthroplasty is often facilitated by placing the knee in a more extended position, thereby relaxing the anterior soft tissue envelope. The landmarks shown in this procedure performed with the Optetrak Low Profile Instrumentation are the same ones used during standard-incision total knee replacement surgery: the shape of the patella, the anterior tibial tuberosity and the joint line (*Figure 2*).

An 8-10cm incision is made, beginning at or 1cm above the superior pole of the patella and extending 2cm distal of the joint line. Fascia adhesions of the quadriceps muscle to the subcutaneous tissues are freed with blunt and sharp dissection, which facilitates subsequent soft tissue and patellar mobilization.

The joint is then entered through one of three approaches. When doing a *subvastus* approach, the arthrotomy is capsular only, preserving the entire extensor mechanism insertion onto the patella. A fascia rim is preserved bordering the vastus medialis obliquus (VMO) to assure retractors are placed against this rim and not directly on the muscle over the quadriceps itself. The reflected retinaculum contains the medial patellofemoral ligament and must be tagged, retracted and protected. The medial capsular reflection under the VMO is released, allowing the quadriceps to be displaced laterally. In the *midvastus* approach, an incision is made between the vastus medialis and the vastus medialis obliquus, beginning at the superior and medial corner of the patella. The muscle is split bluntly in line with its fibers, while the underlying fascia is split sharply by pushing scissors in a similar direction.

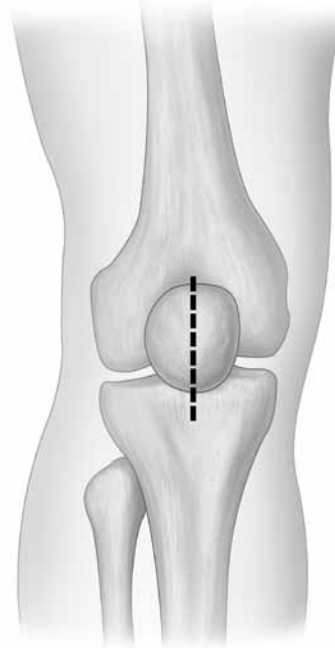


Figure 2
Skin Incision. Bony Landmarks
Can Be Recognized Underneath the Skin.



Rectus femoris split



Mini-midvastus



Subvastus

Figure 3
Joint Can Be Entered
Through One of
These Three
Approaches

This 2cm split can be safely extended for 3-4cm, although this is rarely necessary. The *rectus femoris split* approach is simply a shortened conventional arthrotomy. Of course, all approaches can and are being used successfully. To optimize the ease and efficiency of the procedure in patients with increased obesity, increased thigh muscularity, increased distal femoral dimension, patella baja, a more horizontal VMO insertion, a decreased extensor mechanism mobility, or in any case, when difficult exposure is anticipated, it is recommended to move away from the subvastus towards either the midvastus, or on occasion, the rectus split approach (Figure 3).

The exposure is expanded medially using an angled narrow and sharpened Hohmann Retractor. A second Hohmann Retractor is used to push the patella laterally. The patella is not everted. Initially exposure is limited to the central and medial compartments, however, with some extension the entire joint can be delivered into the wound. An interesting paradox exists with regard to both the number of retractors and the force of retraction: less is more. Retraction for exposure in one area will result in a proportionate and obligate reduction of exposure in another. Using fewer and narrower angled retractors and pulling reciprocally rather than forcefully is recommended. The retractor and leg position must be constantly adjusted and optimized for each step of the procedure. Exposure during the remainder of the procedure is achieved by moving the soft tissue window. The anterior collateral ligament (ACL) and the anterior horns of both menisci are resected. The superficial layers of the medial collateral ligament (MCL) are subperiosteally elevated and a meticulous resection of osteophytes is performed. This not only helps to mobilize the unresected patella into the lateral gutter of the knee, but also relieves tension off the lateral and medial collateral ligaments.

A very important precaution in every small incision procedure is to keep the suprapatellar pouch as intact as possible; this decreases the incidence of short-term post-operative pain and long-term scar formation and limited flexion.

PREPARATION OF THE TIBIA

There are some benefits, particularly with minimally invasive approaches, to resecting the tibia first. With a “distal femoral” first approach, achieving proper rotational positioning of the **LPI Beta Femoral A/P Sizer** can be challenging because of the lateral soft tissues and the unresected proximal tibia both conspiring to push the cutting block into an internally rotated position. In addition, two of the three commonly used femoral reference points are obscured by minimally invasive approaches. The lateral epicondyle is poorly visualized and not readily palpable and the posterior condyles are not easily accessed. By performing the tibial cut first, the lateral soft tissues are relaxed and the offending proximal tibia is removed, allowing for the desired external rotation of the position guide. With regard to the femoral rotational reference points, resecting the tibia improves access to the posterior condyles and adds the resected tibia as a useful reference point. If the Optetrak Ligament Balancing System (LBS II™) will be used, the tibial platform is the most important rotational reference point. The Optetrak **LPI Beta Tibial Resection Guide** is assembled on the Optetrak Classic **Extra-medullary Tibial Alignment Guide**. The Tibial Resection Guide is attached by sliding it onto the dovetail of the **Tibial Ankle Clamp** shaft and then sliding the shaft into the **Adjustable Tibial Resector**. The shaft must be rotated 180 degrees within the Tibial Resector in order to slide into position. The EM Alignment Guide assembly should be placed on the front of the tibia and secured by placing the spring-loaded arms around the ankle in the supramalleolar position. The EM Alignment Guide should be centered over the ankle joint. This center is located in the depression between the Extensor Hallucis Longus and the Extensor Digitorum Longus tendons. The EM Alignment Guide may be adjusted by loosening the anterior knob on the Ankle Clamp. In most instances, the guide will read 2-5mm medial to “0” when properly centered (*Figure 4*).

In the sagittal plane, the EM Alignment Rod should be aligned parallel to a line extending from the center of the knee joint to the center of the ankle joint. If the surgeon prefers, a posterior tilt may be added at this point by sliding the vertical bar slightly more anteriorly or by sliding the adjustable arm into the desired degree of posterior slope (*Figure 5*).

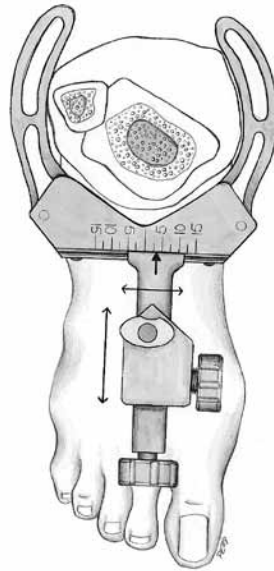


Figure 4
Setting Medial/
Lateral Alignment
at Ankle

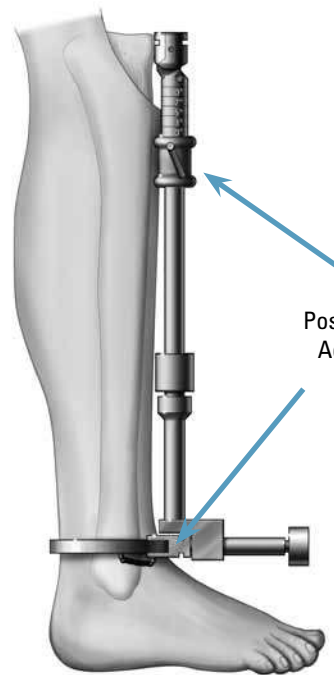


Figure 5
Posterior Slope Adjustment Using
Adjustable Arm or at the Ankle



Figure 6a
Tibial Resection Guide
on Tibia



Figure 6b
Proximal Tibia Resected



Figure 7
The Intra-medullary Canal is Entered
with the IM Pilot Drill

The **Fixed Tibial Stylus** should be placed in the cutting slot of the Tibial Resection Guide so that either the side marked “most normal” or the side marked “most defective” extends over the tibial plateau (*Figure 6a*). Since the incision is smaller and the arthrotomy is medial, access to the lateral compartment is difficult. Determination of the resection depth in the medial compartment is therefore routinely used. Alternatively, the surgeon can determine the tibial resection level using the **Cut Line Predictor** inserted through the slot of the Tibial Resection Guide, more or less 1–2mm below the level of the deepest point of the medial tibial plateau.

This cut is made at about 70-80 degrees of flexion. Further flexion tends to inadvertently reduce the patella. Complete anterior subluxation is difficult and is not required at this time. The tibia cut is begun, but not yet completed. A sagittal cut is often made in the intercondylar area at this point and the medial half of the tibia bone is removed to allow better visualization of the lateral aspect. The bone margins of the initial osteotomy plane are now used as a guide to complete the resection. As a double-check, a small provisional tray and anterior referencing rod are assembled on a proper coronal resection plane. Being satisfied with the tibial resection plane is important, because the remainder of the reconstruction is built on this tibial platform.

Two different Tibial Resection Guides are provided in the set (213-73-17: left and 213-73-18: right) (*Figure 6b*).

PREPARATION OF THE FEMUR

Step 1: Opening the Intra-medullary Canal

The **Intra-medullary Pilot Drill** should be used to drill a hole in the distal femur coaxially with the femoral endosteal canal. The entry point for this drill is located in the intercondylar groove 5-10mm anterior to the intercondylar notch. This entry point may be more accurately located by one of two methods:

1. palpating the femur in the cephalad portion of the exposure, or
2. by opening the cortex anterior to the femoral notch with a rongeur, osteotome or gouge (*Figure 7*).

The intra-medullary canal can then be probed with a small curette prior to drilling. It may be beneficial to enlarge the hole in the distal femur so that a slightly malpositioned entrance point does not affect the **T-Handle Intra-medullary Rod**. After the canal has been opened with the IM Pilot Drill, the T-Handle IM Rod should be inserted into the femoral canal to be sure it passes easily. Then, the T-Handle IM Rod should be removed from the canal.

Step 2: Femoral Alignment Assembly

Assemble the **LPI Beta Intra-medullary Alignment Guide** using the T-Handle IM Rod, the **LPI Beta Distal Femoral Resection Guide**, the **LPI Beta Intra-medullary Alignment Guide Bushing** determined during pre-operative planning (2-, 5-, 6 and 7-degree options) and the **LPI Beta Distal Link** (*Figure 8*). To set the distal femoral valgus alignment of the femoral cut, insert the IM Alignment Guide Bushing into the IM Alignment Guide with the proper side (left or right) facing anteriorly. The release button underneath the rectangular hole in the IM Alignment Guide is pressed and the Alignment Guide Bushing is slid into it (*Figure 9*).

Step 3: Distal Femoral Resection

The IM Alignment Guide can be aligned parallel to the transepicondylar axis or the resected surface of the proximal tibia although alignment is not crucial at this point (*Figure 10*).

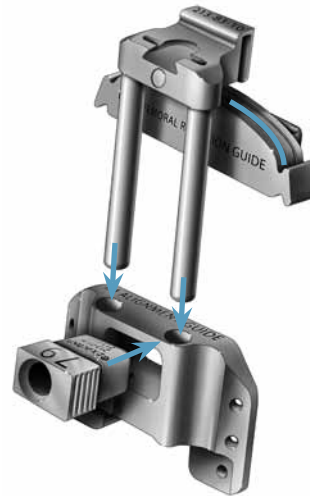


Figure 8
Femoral Alignment Assembly
(IM Alignment Guide, Distal
Femoral Resection Guide,
Bushing and Distal Link)

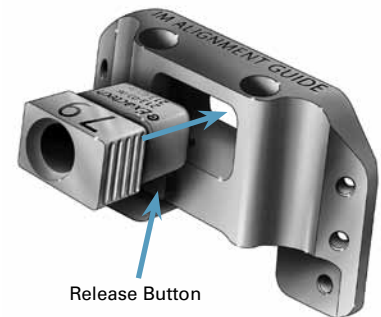


Figure 9
Assemble the IM Alignment Guide and
IM Alignment Guide Bushing.
Setup for a 6-degree Distal Femoral Cut in a
Left Knee.

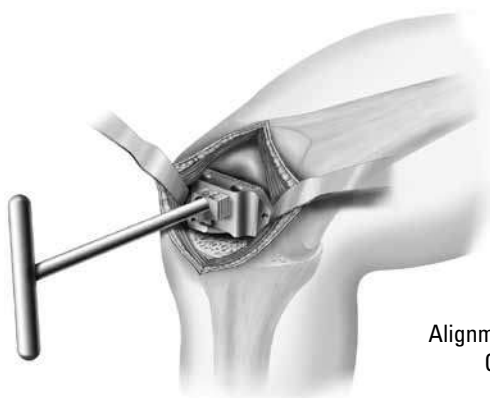


Figure 10
Alignment of the Distal Femoral
Cutting Instruments

Figure 11
 Assembly of Distal Femoral
 Resection Guide to Distal Link

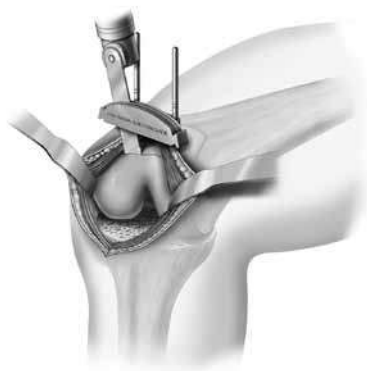


Figure 12a
 Distal Femoral Resection Guide Positioned
 for Resection

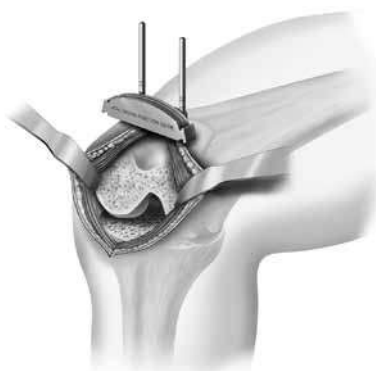


Figure 12b
 Distal Femur Resected

The Distal Femoral Resection Guide is not affixed to the Distal Link; this makes the placement of the block underneath the soft tissues easier (Figure 11).

The distal femoral resection will be influenced by the degree of flexion contracture documented during pre-operative examination. Adjusting the depth of distal femoral resection to the degree of flexion contracture is important so as to ease balancing the flexion and extension spaces. The Distal Femoral Resection Guide features different pinholes that allow for adjustment of the resection depth in 2mm increments. The preferred position for the pins is in the holes marked with a "0". It also features two slots. Performing the distal femoral cut through the standard slot resects 10mm from the distal femur; the alternative slot resects 3mm more (13mm). The Distal Femoral Resection Guide also features two extra holes for cross pins that enhance the fixation of the Resection Guide to the bone and make it more stable during the resection. The quadriceps and skin must be retracted proximally and the knee slightly extended before performing the distal femoral resection (Figure 12). A **Mauldin Multi-Tool** can be used with an **Extra-medullary Alignment Rod/Coupler** pointing toward the pre-operatively marked femoral head to verify the alignment.

The distal femoral resection is performed, always protecting the medial and lateral collateral ligaments, stopping just before the posterior femoral condyles are totally resected in order to prevent damage to the previously resected proximal tibia (Figure 12a). The medial condyle is resected first, the surgical window is mobilized to the lateral compartment of the knee and the lateral condylar resection is performed (Figure 12b). The Distal Femoral Resection Guide is removed and the distal femoral resection is completed using a "free-hand" technique. Bone remnants may now be resected with a rongeur, a saw or a bone file. To be sure that the resected surfaces of the medial and lateral femoral condyles are coplanar, a flat cutting block may be used to check the cuts.

Figure 13
A/P Femoral Sizer Placed
on Distal Femur



Step 4: Sizing of Femoral Component

The following step is the determination of the dimension of the femoral component. Templating is essential in small incision procedures, since the surgeon has a limited view of the anterior aspect of the distal femur. The A/P Femoral Sizer is placed flush against the resected distal surface of the femur. An **LPI Beta Offset A/P Sizer Handle** is provided to facilitate insertion and manipulation of the sizing guide (*Figure 13*).

At this stage, the **LPI Beta ARC Stylus Pointer** has not been assembled on the Femoral A/P Femoral Sizer yet. The posterior flanges of the Sizer should be put against the posterior femoral condyles. If a posterior condylar defect is present, the **LPI Beta Femoral A/P Sizer Drill Guide** should be rotated to a position that accommodates the defect. Due to the size of the incision and the medial arthrotomy, the A/P Sizer Drill Guide could be placed slightly medial on the femoral bone. The Femoral A/P Sizer is adjusted to the templated femoral size. The Stylus Pointer is then placed on the Femoral A/P Sizer, trying to slide its tip underneath the quadriceps and into the suprapatellar pouch. The Stylus Pointer is then rotated until it snaps onto the Femoral A/P Sizer. The surgeon palpates the position of the tip of the Stylus Pointer, trying to make it rest in the mid-portion of the femoral metaphysis. It is advisable to choose a smaller femoral size if the A/P Sizer Drill Guide is measuring between sizes. The surgeon must correlate the templated size with the size given by the Femoral A/P Sizer.

Step 5: Rotation of Femoral Component

External femoral rotation is determined by inserting a Bushing into the Femoral A/P Sizer. The LPI instruments feature three different rotation bushings: 0 and 3 degrees, right and left. An Offset A/P Sizer Handle is provided to facilitate insertion and manipulation of the A/P Sizer Drill Guide; this handle does not interfere with the drill bit that is used to determine the external rotation (*Figure 14*). Due to the size of the incision and the medial arthrotomy, the A/P Sizer Drill Guide could be placed slightly medial on the distal femur.



Figure 14
Drilling Rotational
Alignment Holes

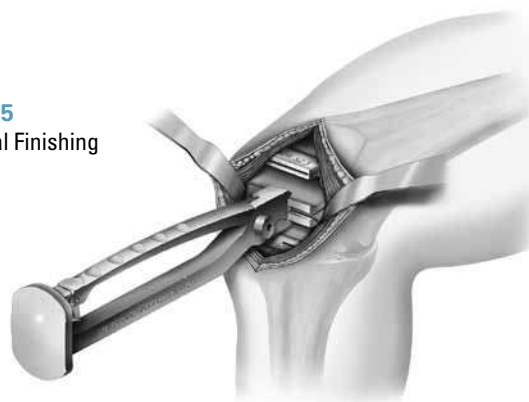


Figure 15
Positioned Femoral Finishing
Guide



Figure 16
Positioned PS Notch
Guide



Figure 17
Distal Femur Prepared for
an Optetrak PS Femoral
Component



Figure 18
Limb Alignment Check with Trials
in Place

Two 4mm holes should be drilled with the corresponding step drill and the A/P Sizer Drill Guide is then removed. The femur is now ready for anterior/posterior and chamfer bone resection.

Step 6: Resection of Anterior, Posterior and Chamfer Femoral Bone

The **LPI Beta Femoral Finishing Guide** is placed using the **LPI Beta Finishing Guide Impaction/Extraction Handle** (Figure 15).

The size of the Femoral Finishing Guide (A/P and chamfer cut guide) has been determined during the previous stage. The Femoral Finishing Guide has two pegs that fit into the pre-drilled holes. It also features extra holes for additional fixation on both the medial and lateral sides as well as in the center (cross pins) for patients with osteoporotic bone. Once the cuts on the distal femur are completed, the Femoral Finishing Guide is removed and the resected bone is excised. The knee could need to be mobilized from flexion to extension, depending on which bone remnants need to be taken out. If an Optetrak Cruciate-Retaining implant will be used, the femoral preparation has been completed.

POSTERIOR STABILIZED FEMORAL PREPARATION

After the anterior, posterior and chamfer femoral resections have been completed, the following steps should be taken to prepare the femur for the posterior stabilized femoral component. The **LPI Beta PS Notch Guide** should be placed on the resected anterior surface of the femur and carefully centered on the condyles (Figure 16).

The PS Notch Guide should be held in place with fixation pins in the anterior and medial/lateral pin locations. A narrow oscillating saw should be used to make the cuts necessary to accommodate the box of the posterior stabilized femoral implant (Figure 17). Preparation for the posterior stabilized femoral component is now complete.

The **Femoral** and **Tibial Trials** are impacted in place. With provisional reduction, the knee is allowed to have full passive range of motion. The collateral ligament stability is assessed, and the rotational position of the tray that optimizes congruency with the femoral component is marked with the cautery on the periosteum (Figure 18).

PATELLAR PREPARATION

An advantage of resecting the patella until this stage is that it is protected against any inadvertent damage by the lateral retractor had it been osteotomized earlier in the procedure. The articular surface of the patella may be resected with or without the use of the Patellar Resection Guide, depending on the surgeon's preference. Resection in small incision procedures is usually done with the knee extended, trying not to totally evert the patella to avoid damage to the quadriceps mechanism; it is typically tilted 90 degrees. For patellar resection performed without the guide ("free hand"), the patella should be stabilized with large towel clips or similar instruments. Either of two landmarks should be used:

1. from edge of medial articular surface to edge of lateral articular surface, or
2. beginning just posterior to the patellar tendon origin at the inferior pole of the patella and cutting superiorly, parallel to the plane of the patella.

The posterior patellar surface should be resected with an oscillating saw (*Figure 19*).

When patellar resection is complete, final determination of size and hole preparation should be performed using the patellar template. The template should be placed on the resected patellar surface, providing a size check for all sizes of patella. It also provides guide holes for the drill for three-peg or single-peg component. Holes should be drilled through the patellar template in either the three-hole or single-hole configuration. The appropriate size of trial prosthesis should be placed on the patella.

FINAL TIBIAL PREPARATION

When all checks have been completed, pins may be drilled or driven into the medial and lateral outrigger holes on the Tibial Base Plate. Sometimes it is difficult to place the lateral pin in patients with a large or tight patellar tendon until the knee is flexed and the Femoral Trial prosthesis and Tibial Insert Trial are removed. If this is the case, the surgeon should place the medial pin, hold the proper rotation of the Tibial Base Plate while these other Trial components are removed, and then place the lateral pin. Once the Tibial Insert Trial is removed, the surgeon will have access to additional pin fixation holes in the bottom of the base plate, should these be needed. At this point, the patellar trial prosthesis should be removed. The **Tibial Pilot Drill Guide** should be assembled to the **Tibial Tray Trial** and the IM Pilot Drill is drilled to the depth that matches the tray size (*Figures 20 and 21*).

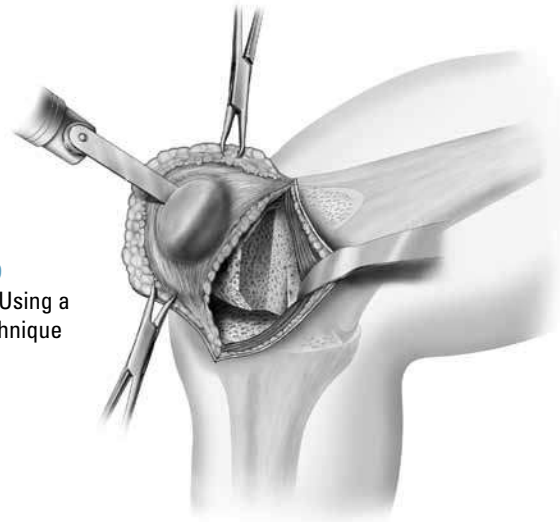


Figure 19
Patella Resected Using a
"Free-hand" Technique



Figure 20
Tibial Base Plate
Pinned

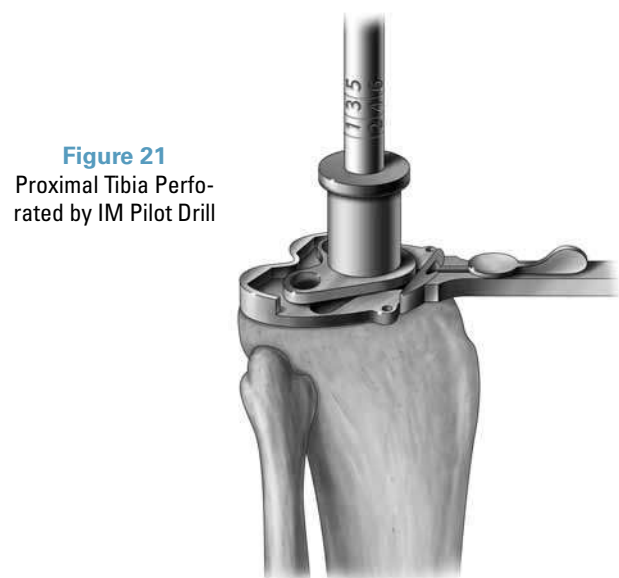


Figure 21
Proximal Tibia Perforated by IM Pilot Drill

Figure 22
Tibial Tamp Assembly and Setting of
Tamp for Selected Tray Size

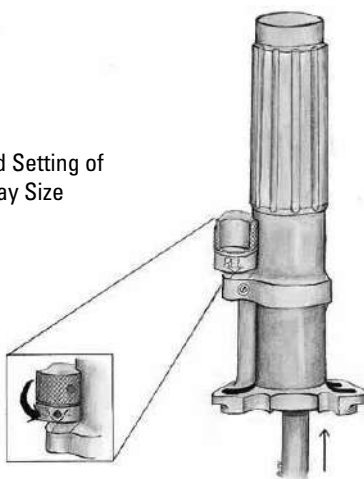


Figure 23a
Tibial Tamp Inserted and
Removed



Figure 23b
Tibial Tamp Removed



The same technique for preparation is followed whether the finned or trapezoidal tibial component is used. The different shapes are created by selecting the appropriate shape of tamp. The selected tamp is assembled to the **Tibial Tamp Guide** by dialing REL (release) on the tray size adjustment knob. Then, the tamp is inserted into the Tamp Guide. After assembly, the Tamp Guide should be set for the tibial tray size being used by dialing the proper number on the tray size adjustment knob. This accomplishes three things:

1. secures the tamp to the Tamp Guide,
2. assures proper bone penetration for the tamp, and
3. sets the Tamp Guide so that it will seat properly on the Tibial Tray Trial.

If the correct size is not set for the tray being used, the Tamp Guide will not seat properly on the tray. This is a safety check to be certain tamping is correct for the selected tibial tray (*Figure 22*).

The Tamp Guide should be seated on the Trial Tibial Tray and the tamp driven into the tibia until the stop is reached. The appropriate size is marked by a line at the top of the Tamp Guide; this serves as an additional check to indicate when the tamp is fully seated (*Figure 23a*).

The tamp should be removed by inserting the small stud on the end of the Mauldin Multi-Tool into the hole in the handle of the Tibial Tamp, then rotating the Mauldin Multi-Tool to loosen the Tibial Tamp. If needed, a threaded hole is available for attachment of a slap hammer to remove the tamp. However, it is usually easily removed after loosening with the Mauldin Multi-Tool. The tamp and Tibial Tray Guide may be removed (*Figure 23b*). At this point, the fixation pins and base plate trial should be removed. Next, the component will be implanted.

IMPLANTATION OF FINAL COMPONENTS

Surgeons have different preferences in regard to the sequences used to place the prosthesis components. A standard, successful technique sequence is described here. If the surgeon prefers another sequence, the Optetrak Knee System provides sufficient flexibility to accommodate adjustments in the implantation technique.

Step 1: Final Bone Preparation

Retractors should be placed to expose the proximal tibia (Figure 24).

All tissue debris should be removed from resected bone surfaces. The bone trabeculae should be thoroughly cleansed with pulsed lavage.

Step 2: Implantation of Tibial Prosthesis

Bone cement should be applied to the prosthesis and prepared bone surfaces when the cement has a viscosity low enough to promote good penetration into the trabecular bone.

Apply bone cement to the proximal tibia and the distal surface of the tibial tray component, including the stem, using either a cement gun or by manually pressurizing the cement. Assure that both the bone and the bone-side of the prosthesis are thoroughly coated with cement. When using the finned tray components, ensure that cement is pressed into the cement pockets (undercuts) (Figures 25, 26 and 27). Care should be taken to limit the amount of cement placed on the posterior lateral corner of the implant to limit cement cleanup in the posterior capsule.

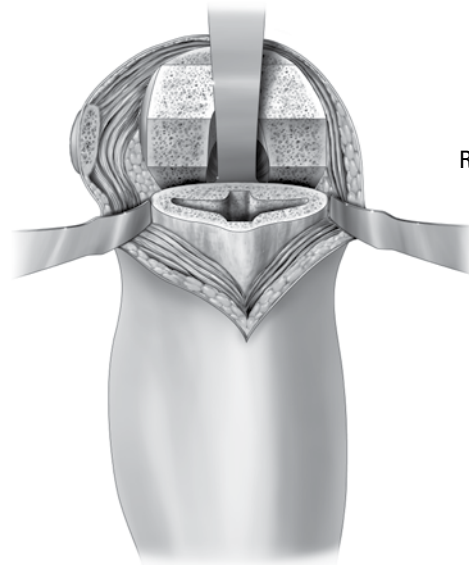


Figure 24
Retractors Placed

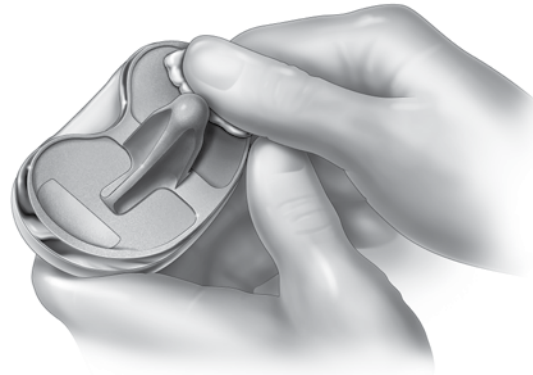


Figure 25
Cement Pressed Into
Cement Pockets

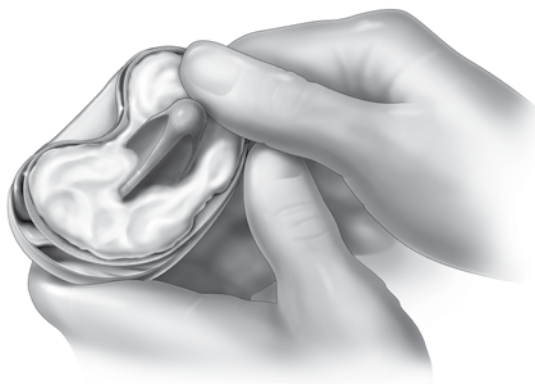


Figure 26
Tray Thoroughly Coated
with Cement

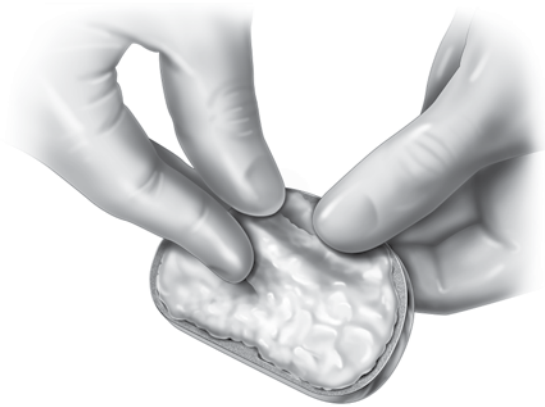


Figure 27
Stem Thoroughly Coated
with Cement

Figure 28
Tibial Component
Impacted



Introduce the tibial tray component onto the prepared tibial surface using the **Locking Tibial Tray Impactor**, applying a constant downward force (*Figure 28*). Alternately, the polyethylene insert may be assembled to the tibial tray prior to implantation. In this case, the **Tibial Insert Driver** should be used to insert the pre-assembled components (*Figure 29*). A mallet can be used for final impaction of the tibial component. All extraneous cement must be removed from the borders of the tibial component, starting posteriorly and working around to the sides and front. All cement must be removed from the posterior capsular area of the knee.

A Tibial Insert Trial should be used when pressurizing the cement during polymerization unless the polyethylene insert was pre-assembled to the tray before implantation. It is recommended to install the final insert implant after the cement has polymerized. The all-polyethylene or metal-backed tibial component may be used instead of a modular component, in which case the implantation technique is similar to the pre-assembled modular tibial component (*Figure 30*).



Figure 29
Installation of
Polyethylene Insert



Figure 30
Insertion of Pre-Assembled
or All-Polyethylene Tibial
Component

Figure 31
Cement Placement on
Femoral Component

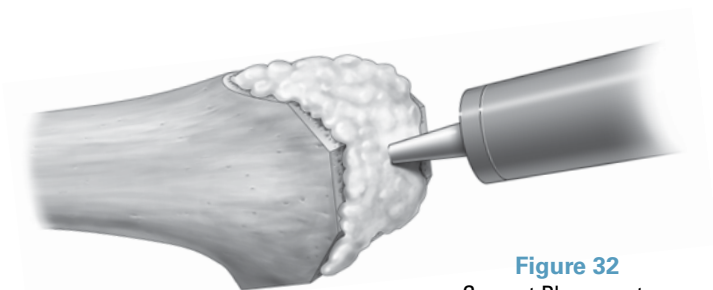
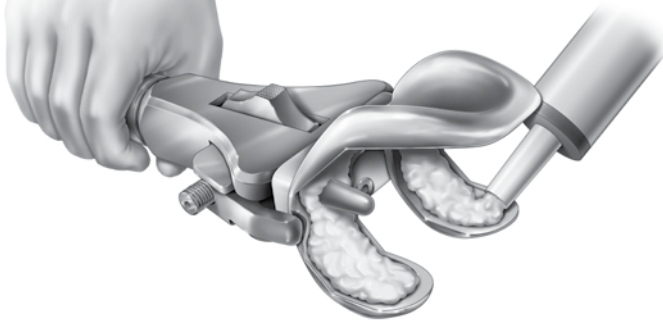


Figure 32
Cement Placement on
Distal Femur

Step 3: Implantation of Femoral Component

It is important to apply bone cement to both the resected femoral bone surface and the bone mating surface of the femoral component. Take care to apply only a thin layer of cement on the posterior surface of the prosthesis in order to avoid excessive cement extrusion posteriorly where it could be difficult to remove (*Figure 31*). Apply bone cement to the anterior, chamfer and distal surfaces of the prepared femur. Avoid placing cement on the posterior bone surface to prevent excessive cement extrusion posteriorly (*Figure 32*).

The femoral component should be positioned onto the distal femur by using the Locking Femoral Impactor. Slight upward pressure should be applied to the Impactor handle as the component is being impacted to prevent it from rotating into flexion. The **Non-Locking Femoral Impactor** can be used for final impaction of the femoral prosthesis (*Figure 33*). All cement must be removed from the posterior capsular area of the knee.

Step 4: Implantation of Patellar Component

The patellar surface should be coated with cement and the patellar component implanted. The surgeon should take care to align the peg(s) with the previously drilled peg hole(s) (*Figure 34*).

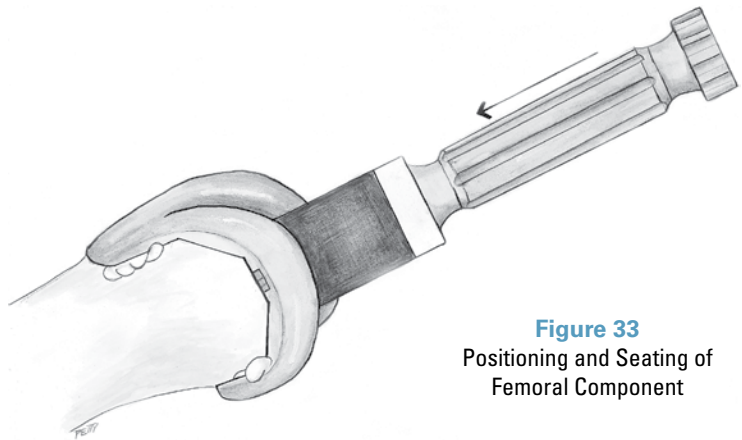


Figure 33
Positioning and Seating of
Femoral Component

Figure 34
Implantation of
Patellar Prosthesis

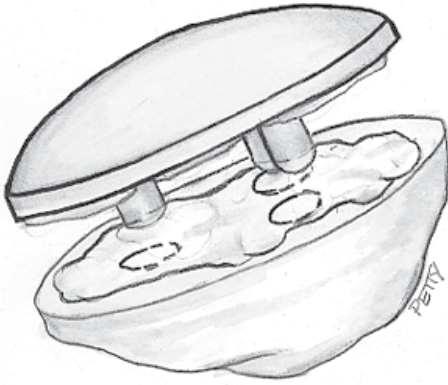


Figure 35
Three-pegged Patellar Component and
Patellar Cement Clamp

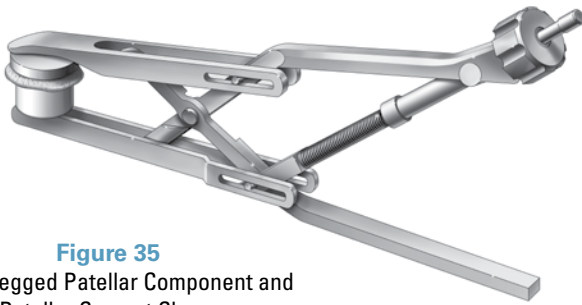
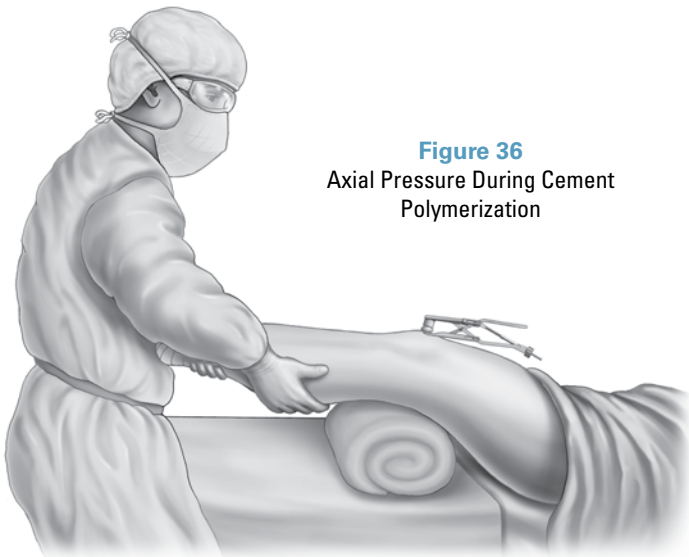


Figure 36
Axial Pressure During Cement
Polymerization



The patella should be held securely with the Patellar Cement Clamp (*Figure 35*). The surgeon should avoid excessive pressure with the Patellar Cement Clamp as it may damage the patella, especially when the bone is soft. Remove excess cement.

Step 5: Polymerization of Cement

Hold axial pressure across the joint during cement polymerization, avoiding either hyperextension or flexion which may tip the prosthesis into either flexion or extension (*Figure 36*). This is important in every case, but especially in osteopenic bone. Avoid any movement of the prosthesis until the bone cement has completely polymerized.

Step 6: Installation of Tibial Polyethylene Insert (modular tibial component only)

After the cement has completely polymerized, the tibial polyethylene insert should be directed posteriorly so that the posterior portion slides under the rail of the metal tibial tray. Using the **Tibial Component Impactor**, the polyethylene insert should be impacted with a sharp blow from a mallet. The surgeon should check to be certain that the insert is fully seated in the metal tibial tray.

FINAL CHECK AND CLOSURE

Final check includes the following:

1. Removal of any remaining extruded cement
2. Final assessment of:
 - ALIGNMENT,
 - STABILITY,
 - MOTION and
 - PATELLAR TRACKING

Closure:

A standard closure technique preferred by the surgeon may be used.

INSTRUMENT LISTING

Catalog Number Part Description

213-03-00 LPI Beta Femoral Intra-medullary Alignment Guide



213-03-02 LPI Beta Intra-medullary Alignment Guide Bushing, 2 Degrees, 8mm

213-03-05 LPI Beta Intra-medullary Alignment Guide Bushing, 5 Degrees, 8mm

213-03-06 LPI Beta Intra-medullary Alignment Guide Bushing, 6 Degrees, 8mm

213-03-07 LPI Beta Intra-medullary Alignment Guide Bushing, 7 Degrees, 8mm



213-37-00 LPI Beta Femoral A/P Sizer



213-41-06 LPI A/P Sizer Stylus Pointer



213-44-00 LPI Beta Offset A/P Sizer Handle



Catalog Number	Part Description
213-48-00	LPI Beta 0-Degree Femoral A/P Sizer Drill Guide
213-48-01	LPI Beta 3-Degree Femoral A/P Sizer Drill Guide, Right
213-48-02	LPI Beta 3-Degree Femoral A/P Sizer Drill Guide, Left



213-49-00	LPI Beta A/P Sizer Collar Drill, 4mm
-----------	--------------------------------------



213-50-10	LPI Beta Femoral Finishing Guide, Size 0†
213-50-11	LPI Beta Femoral Finishing Guide, Size 1
213-50-12	LPI Beta Femoral Finishing Guide, Size 2
213-50-13	LPI Beta Femoral Finishing Guide, Size 3
213-50-14	LPI Beta Femoral Finishing Guide, Size 4
213-50-15	LPI Beta Femoral Finishing Guide, Size 5
213-50-16	LPI Beta Femoral Finishing Guide, Size 6†



213-52-10	LPI Beta Finishing Guide Impaction/Extraction Handle
-----------	--



213-53-00	LPI Beta PS Notch Guide, Size 0†
213-53-01	LPI Beta PS Notch Guide, Size 1
213-53-02	LPI Beta PS Notch Guide, Size 2
213-53-03	LPI Beta PS Notch Guide, Size 3
213-53-04	LPI Beta PS Notch Guide, Size 4
213-53-05	LPI Beta PS Notch Guide, Size 5
213-53-06	LPI Beta PS Notch Guide, Size 6†



INSTRUMENT LISTING

Catalog Number **Part Description**

213-64-01 LPI Locking Femoral Impactor



213-73-17 LPI Beta Tibial Resection Guide, Left
213-73-18 LPI Beta Tibial Resection Guide, Right



213-77-00 LPI Cut Line Predictor



213-83-00 LPI Beta Distal Femoral Resection Guide



213-83-10 LPI Beta Distal Link



Catalog Number Part Description

201-40-00 Intra-medullary Pilot Drill, Hudson



201-41-00 T-Handle Intra-medullary Rod



201-44-00 Mauldin Multi-Tool



201-46-00 Holding Pins



EXTRA-MEDULLARY ALIGNMENT GUIDE:

201-52-00 Tibial Ankle Clamp



201-52-02 Adjustable Tibial Resector Shaft, Extra-medullary



INSTRUMENT LISTING

Catalog Number	Part Description
----------------	------------------

201-53-00	Tibial Stylus, Fixed
-----------	----------------------



201-58-01	Extra-medullary Tibial Alignment Guide
-----------	--



201-58-02	Extra-medullary Alignment Rod
-----------	-------------------------------



201-62-00	Patellar Cement Clamp
-----------	-----------------------



201-64-00	Femoral Impactor, Non-Locking
-----------	-------------------------------



201-65-00	Tibial Tray Impactor, Locking
-----------	-------------------------------



Catalog Number Part Description

201-71-00 Tibial Pilot Drill Guide



201-72-00 Tibial Finned Tamp, Net-Shape



201-74-00 Tibial Tamp Guide



201-90-00 Tibial Component Impactor



201-90-01 Tibial Insert Driver



INSTRUMENT LISTING

Catalog Number	Part Description
201-01-00*	Femoral Trial, CR, Size 0 [†]
201-01-01*	Femoral Trial, CR, Size 1
201-01-02*	Femoral Trial, CR, Size 2
201-01-03*	Femoral Trial, CR, Size 3
201-01-04*	Femoral Trial, CR, Size 4
201-01-05*	Femoral Trial, CR, Size 5
201-01-06*	Femoral Trial, CR, Size 6 [†]
205-01-10*	Femoral Trial, PS, Size 0 [†]
205-01-11*	Femoral Trial, PS, Size 1
205-01-12*	Femoral Trial, PS, Size 2
205-01-13*	Femoral Trial, PS, Size 3
205-01-14*	Femoral Trial, PS, Size 4
205-01-15*	Femoral Trial, PS, Size 5
205-01-16*	Femoral Trial, PS, Size 6 [†]
201-02-26	Three-Peg Patella Trial, Size 26
201-02-29	Three-Peg Patella Trial, Size 29
201-02-32	Three-Peg Patella Trial, Size 32
201-02-35	Three-Peg Patella Trial, Size 35
201-02-38	Three-Peg Patella Trial, Size 38
201-02-41	Three-Peg Patella Trial, Size 41
201-80-09	Tibial Trial, Modular Insert, Size 0, 9mm [†]
201-80-11	Tibial Trial, Modular Insert, Size 0, 11mm [†]
201-80-13	Tibial Trial, Modular Insert, Size 0, 13mm [†]
201-80-15	Tibial Trial, Modular Insert, Size 0, 15mm [†]
201-80-18	Tibial Trial, Modular Insert, Size 0, 18mm [†]
201-21-09	Tibial Trial, Modular Insert, Size 1, 9mm
201-21-11	Tibial Trial, Modular Insert, Size 1, 11mm
201-21-13	Tibial Trial, Modular Insert, Size 1, 13mm
201-21-15	Tibial Trial, Modular Insert, Size 1, 15mm
201-21-18	Tibial Trial, Modular Insert, Size 1, 18mm
201-21-22	Tibial Trial, Modular Insert, Size 1, 22mm [†]
201-22-09	Tibial Trial, Modular Insert, Size 2, 9mm
201-22-11	Tibial Trial, Modular Insert, Size 2, 11mm
201-22-13	Tibial Trial, Modular Insert, Size 2, 13mm
201-22-15	Tibial Trial, Modular Insert, Size 2, 15mm
201-22-18	Tibial Trial, Modular Insert, Size 2, 18mm
201-22-22	Tibial Trial, Modular Insert, Size 2, 22mm [†]
201-22-26	Tibial Trial, Modular Insert, Size 2, 26mm [†]
201-22-30	Tibial Trial, Modular Insert, Size 2, 30mm [†]



Catalog Number	Part Description
201-23-09	Tibial Trial, Modular Insert, Size 3, 9mm
201-23-11	Tibial Trial, Modular Insert, Size 3, 11mm
201-23-13	Tibial Trial, Modular Insert, Size 3, 13mm
201-23-15	Tibial Trial, Modular Insert, Size 3, 15mm
201-23-18	Tibial Trial, Modular Insert, Size 3, 18mm
201-23-22	Tibial Trial, Modular Insert, Size 3, 22mm [†]
201-23-26	Tibial Trial, Modular Insert, Size 3, 26mm [†]
201-23-30	Tibial Trial, Modular Insert, Size 3, 30mm [†]

201-24-09	Tibial Trial, Modular Insert, Size 4, 9mm
201-24-11	Tibial Trial, Modular Insert, Size 4, 11mm
201-24-13	Tibial Trial, Modular Insert, Size 4, 13mm
201-24-15	Tibial Trial, Modular Insert, Size 4, 15mm
201-24-18	Tibial Trial, Modular Insert, Size 4, 18mm
201-24-22	Tibial Trial, Modular Insert, Size 4, 22mm [†]
201-24-26	Tibial Trial, Modular Insert, Size 4, 26mm [†]
201-24-30	Tibial Trial, Modular Insert, Size 4, 30mm [†]

201-25-09	Tibial Trial, Modular Insert, Size 5, 9mm
201-25-11	Tibial Trial, Modular Insert, Size 5, 11mm
201-25-13	Tibial Trial, Modular Insert, Size 5, 13mm
201-25-15	Tibial Trial, Modular Insert, Size 5, 15mm
201-25-18	Tibial Trial, Modular Insert, Size 5, 18mm
201-25-22	Tibial Trial, Modular Insert, Size 5, 22mm [†]
201-25-26	Tibial Trial, Modular Insert, Size 5, 26mm [†]
201-25-30	Tibial Trial, Modular Insert, Size 5, 30mm [†]

201-26-11	Tibial Trial, Modular Insert, Size 6, 11mm [†]
201-26-13	Tibial Trial, Modular Insert, Size 6, 13mm [†]
201-26-15	Tibial Trial, Modular Insert, Size 6, 15mm [†]
201-26-18	Tibial Trial, Modular Insert, Size 6, 18mm [†]
201-26-22	Tibial Trial, Modular Insert, Size 6, 22mm [†]
201-26-26	Tibial Trial, Modular Insert, Size 6, 26mm [†]
201-26-30	Tibial Trial, Modular Insert, Size 6, 30mm [†]

213-70-00	LPI Tibial Tray Trial, Size 0 [†]
213-70-10	LPI Tibial Tray Trial, Size 1
213-70-20	LPI Tibial Tray Trial, Size 2
213-70-30	LPI Tibial Tray Trial, Size 3
213-70-40	LPI Tibial Tray Trial, Size 4
213-70-50	LPI Tibial Tray Trial, Size 5
213-70-60	LPI Tibial Tray Trial, Size 6 [†]

205-52-00	Tibial Trial, PS Spine, Size 0 [†]
205-52-01	Tibial Trial, PS Spine, Size 1
205-52-02	Tibial Trial, PS Spine, Size 2
205-52-03	Tibial Trial, PS Spine, Size 3
205-52-04	Tibial Trial, PS Spine, Size 4
205-52-05	Tibial Trial, PS Spine, Size 5
205-52-06 [†]	Tibial Trial, PS Spine, Size 6 [†]



[†] Special order

For additional device information, refer to the Exactech Optetrak® Comprehensive Knee System – Instructions for Use.

For further product information, please contact Customer Service, Exactech, Inc. 2320 NW 66th Court, Gainesville, Florida 32653-1630, USA. (352) 377-1140, (800) 392-2832 or FAX (352) 378-2617.

Authorized European Representative

MediMark® Europe
11, rue Emile Zola B.P. 2332
38033 Grenoble Cedex 2
France

US Patents 5,732,992; 5,688,281; 5,910,143; 6,193,723B1; 5,725,580; 4,298,992; 5,702,458.
Other US and foreign patents pending.

Exactech is proud to have offices and distributors around the globe.
For more information about Exactech products available in your country, please visit www.exac.com

©2010 Exactech, Inc. • ISO 13485 Certified

352-377-1140
1-800-EXACTECH
www.exac.com

The logo features a stylized blue 'C' icon to the left of the word 'Exactech' in a bold, italicized, black sans-serif font.

712-20-30 Rev. D
LPI Operative Technique 1010



A Great Day in the O.R.™