



Total Resurfacing Unicompartamental Knee Replacement

“ Design By Reason ”

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Technique:

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Rationale of Design

The **BioPro** unicompartamental knee replacement ensemble has been anatomically designed to provide a non-constrained, full resurfacing unicompartamental arthroplasty. The implants are made available in five evenly graded sizes and the femoral component is contoured to simulate the normal polycentric configuration of the femoral condyles. The wide size selection of anatomically contoured implants assures maximum supportive contact with the remodeled bone and accurate placement of the femoral surface contour in relation to the synchronized, stabilizing position of the ligaments, irrespective of the size of the operated knee. The restored anatomic articular relationship between the femoral and tibial components allows a normal range of motion, including non-constrained rotary and antero-posterior gliding excursion, thus reducing the potential for implant loosening.

The utilization of a full resurfacing femoral component, i.e., by the addition of an anterior trochlear flange, not only provides a smooth, uninterrupted articulation for the patella but also finalizes the stability of the implant by completing the mechanical square. The modular tibial component consists of a metal tray and a snap-fitted, interchangeable polyethylene insert that is made available in variable dimensions of thickness to accommodate varying degrees of tibial plateau deficiency. The metal tray has been designed with screw holes to accept cancellous screws for compression fixation of the implant.

Indications

The indications for unicompartamental replacement include knees with non-inflammatory degenerative arthritis in the middle or older age group of patients with severely advanced unicompartamental disease associated with a varus or valgus angular deformity and with reasonably limited pathology on the contralateral side. The procedure is contraindicated for inflammatory diseases such as rheumatoid or gouty arthritis.

Surgical Approach

The knee is exposed through a slightly curved antero-medial incision. The deep structures are divided at the musculotendonous juncture of the quadriceps above and in close proximity to the medial margin of the patella and patellar tendon below. The proximal portion of the patellar tendon insertion is released by sharp, subperiosteal dissection along its medial border to an adequate extent distally to allow lateral displacement of the patella. The capsular and ligamentous attachments to the tibia on the involved side of the joint are elevated subperiosteally in a similar manner without disturbing the insertion and stabilizing function of the collateral structures.

Femoral Preparation

With the patella displaced laterally and the knee flexed to a right angle the femoral modeling commences by resecting the anterior surface of the condyle.

The medial margin of the resection is delineated with a saw cut that is aligned parallel to the trochlear cavity anteriorly and the inner margin of the condyle distally (Figure 1). The anterior resection is completed with the *anterior cutter*, maintaining the resection plane at the angle and level of the anterior surface of the femoral shaft and parallel to the transverse plane of the femoral condyles and knee joint (Figure 2). Only enough bone is removed to accommodate the thickness and width of the anterior flange of the implant. (Figure 3).

Sizing of the femur is completed using the *anterior sizing guide* (Figure 4). Resection of the posterior portion of the condyle is accomplished by guiding a *saw* along the bottom flange of the *chamfer/posterior marker* (Figure 5). Parallelism should be maintained between the anterior and posterior surfaces. Distal resection is completed by guiding the *saw* through the slot provided in the *distal cutter*. The cut must be made at a 90 degree angle to the anterior and posterior cuts (Figure 6).

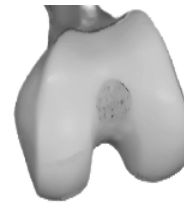


Figure 1



Figure 2

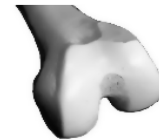


Figure 3



Figure 4

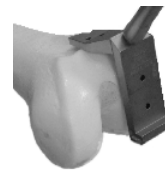


Figure 5



Figure 6

Using the *chamfer/posterior marker* as a guide, holes are drilled in the distal portion of the condyle to accommodate the pegs of the *chamfer guide* (Figure 7). The anterior and posterior corners of the condyle are chamfered, removing only enough bone to allow complete seating of the distal surface of the implant (Figure 8). The *template trial component* is impacted into position and the osteotomized bone surfaces are altered as necessary to provide an accurate fit at the bone-prosthetic interface and a stable, anatomically positioned implant (Figure 9).

The chamfered areas at the anterior and posterior corners must be resected sufficiently to allow total, flush contact distally at the major weight-bearing surface of the remodeled condyle. Although full contact at the chamfered interfaces is not essential, there should be no visible space remaining between the distal resection plane of the condyle and the opposing distal surface of the implant. With the *trial component* maintained in the desired anatomical position, the inner margin of the condyle is resected and squared with an *end-on power saw* to a sufficient depth to accommodate the medial flange of the implant (Figure 10). At this point, a *punch* is inserted into the hole in the *trial component* to accommodate and position the stabilizing nail on the implanted component (Figure 11). The *template trial* is removed and the *final trial component* is inserted, utilizing the *implant holder* to maintain the component in the proper position (Figure 12). The holder is removed. After the *trial implant* has been completely seated by end-on impaction, peripheral condylar osteophytes are trimmed down to the level of the outer margins of the implant.



Figure 7



Figure 8



Figure 9



Figure 10



Figure 11



Figure 12

Tibial Preparation

With the femoral trial component in position, the knee is flexed to a right angle in preparation for the tibial resection. With the tibia held in the normal rotated position in relation to the femur, the plateau resection is delineated by an anteroposterior cut with a *reciprocating “stab” saw* that is aligned parallel to the inner margin of the femoral component and the longitudinal axis of the tibial shaft. The depth of the cut should be limited to only the amount necessary to accommodate the thickness of the tibial implant (Figure 13).



Figure 13

Excessive intrusion into the tibial cortex will compromise the strength of the supporting bone and will introduce the potential for a postoperative stress fracture of the tibial plateau. The *femoral trial component* is removed and the plateau resection is completed with an *end-on oscillating saw*, removing only enough bone initially to level the surface of the plateau to a common flat plane (Figure 14). The resection should be maintained at a 90 degree angle to the axis of the tibial shaft in the transverse plane and at approximately four to eight degrees of posterior declination from front to back in the saggital plane. The thinnest *tibial trial component* is inserted and with both *trial components* in position (Figure 15) the knee is evaluated for alignment with the plumb line. The joint is normally aligned when the plumb line transverses the midpoint of the knee joint when it is extended in a straight line between the anterior superior iliac spine and the center of the ankle. If the resspacing provided by the initial use of the thin *tibial trial component* is inadequate to correct the angular deformity within a degree or so of normal alignment, a thicker *trial implant* is utilized. On the other hand, if the angular deformity has been over-corrected, additional bone is resected from the tibial plateau until anatomical alignment has been obtained. However, if excessive resection of bone is required, it should be removed from the femoral side to avoid inordinate weakening of the tibial plateau. After it has been determined that the joint and the implants have been properly sized and aligned, the *trial components* are removed in preparation for the final implantation.

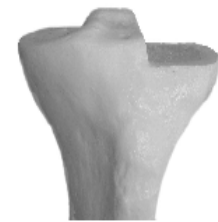


Figure 14



Figure 15

Final Component Implantation

An anteroposterior slot is made with an *osteotome* into the tibial surface a millimeter or so from the osteotomized margin of the tubercle eminence to accommodate the flange of the metal tibial tray. The slot should be centered anteroposteriorly at the approximate anticipated position of the flange and should be no longer than necessary to accept the flange in a press fit (Figure 16). With the tray appropriately aligned anteroposteriorly, the flange is driven into the prepared slot and the component is impacted firmly into position until its undersurface is in complete flush contact with the supporting bone in all areas of the interface. Centered “starter” holes are punched or drilled into the bone through the openings in the tray and cancellous screws of the appropriate length are utilized to augment the fixation (Figure 17). The screws must be inserted at an angle of no greater than 10 degrees so that the heads will be sufficiently countersunk below the level of the implant surface to allow unobstructed seating of the polyethylene insert (if the posterior screw cannot be positioned properly, it should not be used). The polyethylene insert of the appropriate size and trial-tested thickness is inserted by first fitting the posterior end into the tray and then sliding the component posteriorly into the snap-lock position (Figure 18). With the knee flexed to a right angle, the femoral component is implanted in the appropriate, trial- tested position with the assistance of the *implant holder*. The implant is positioned with the stabilizing nail localized in the preformed punch hole and with the squared inner margin of the condyle. The three major surfaces of the implant must be maintained parallel to the interfacing surfaces of the remodeled condyle (Figure 19).



Figure 16



Figure 17



Figure 18



Figure 19

After proper placement has been assured, the *holder* is removed and the insertion is completed by utilizing the *impactor* to compress the implant into a full seated position at the distal interface (Figure 20). With the implantation completed, the patella is everted to expose the articular surface. Marginal osteophytes are excised down to the level of the articular surface and a chondrectomy is performed in the routine fashion as necessary. The knee is extended and is examined for collateral tension on the contracted side of the joint. If the ligaments are inordinately tight (verified by the inability to separate the joint a trifle), osteophytic projections that extend beyond the outer margins of the implants are excised. If this does not provide adequate relief of the tension, a limited release of the collateral structures is performed as necessary.



Figure 20

Cementing Technique

When the implants are cemented, the resected bone surfaces are debrided and washed free of blood clots, loose bone fragments, soft tissue debris, etc. Small one-eighth inch anchoring holes are punched into the bone surfaces and semisoft cement is compressed firmly into the interfacing surfaces of the bone and the implants and the components are implanted as previously described.

Postoperative Management

A hemovac drain is left in place during the closure. The patient leaves the operating room in a full length compression dressing that extends from the upper thigh to the ankle. The drainage tube is removed when it is no longer productive, usually 24 to 48 hours postoperative. The patient is mobilized and is allowed to bear weight on the operated extremity within limits of pain toleration with the use of a walker, crutches, or a cane as necessary on the first postoperative day. The bulky compression dressing is removed on the second postoperative day and the patient is placed on a formal regime of active and passive exercises, which is continued until the patient has regained motion to ninety degrees. The patient is discharged from the hospital on the eighth to tenth postoperative day and is instructed to continue self-motivated exercises at home.

POROUS COATED COBALT CHROME UNI FEMORAL COMPONENT

DESCRIPTION	ITEM#
SMALL LL/RM	10295
MEDIUM LL/RM	10296
LARGE LL/RM	10297
X-LARGE LL/RM	10298
XX-LARGE LL/RM	10299
SMALL LM/RL	10300
MEDIUM LM/RL	10301
LARGE LM/RL	10302
X-LARGE LM/RL	10303
XX-LARGE LM/RL	10304

POROUS COATED TITANIUM UNI TIBIAL TRAY

DESCRIPTION	ITEM #
SMALL	14146
MEDIUM	14147
LARGE	14148
X-LARGE	14149

UNI POLY INSERT

DESCRIPTION	ITEM #
SM 8.5mm	14134
SM 10.0mm	14135
SM 11.5mm	14136
MD 8.5mm	14137
MD 10.0mm	14138
MD 11.5mm	14139
LG 8.5mm	14140
LG 10.0mm	14141
LG 11.5mm	14142
XL 8.5mm	14143
XL 10.0mm	14144
XL 11.5mm	14145

UNI TIBIAL TRIALS

DESCRIPTION	ITEM #
SM 8.5mm	14176
SM 10.0mm	14177
SM 11.5mm	14175
MD 8.5mm	14179
MD 10.0mm	14180
MD 11.5mm	14178
LG 8.5mm	14182
LG 10.0mm	14183
LG 11.5mm	14181
XL 8.5mm	14185
XL 10.0mm	14186
XL 11.5mm	14184

UNI FEMORAL TRIALS

DESCRIPTION	ITEM #
SM LL/RM TRIAL W/MESIAL FLANGE	10627
MD LL/RM TRIAL W/MESIAL FLANGE	10628
LG LL/RM TRIAL W/MESIAL FLANGE	10629
XL LL/RM TRIAL W/MESIAL FLANGE	10630
XXL LL/RM TRIAL W/MESIAL FLANGE	10631
SM LM/RL TRIAL W/MESIAL FLANGE	10637
MD LM/RL TRIAL W/MESIAL FLANGE	10638
LG LM/RL TRIAL W/MESIAL FLANGE	10639
XL LM/RL TRIAL W/MESIAL FLANGE	10640
XXL LM/RL TRIAL W/MESIAL FLANGE	10641
SM LL/RM TRIAL WITHOUT FLANGE	10642
MD LL/RM TRIAL WITHOUT FLANGE	10643
LG LL/RM TRIAL WITHOUT FLANGE	10644
XL LL/RM TRIAL WITHOUT FLANGE	10645
XXL LL/RM TRIAL WITHOUT FLANGE	10636
SM LM/RL TRIAL WITHOUT FLANGE	10632
MD LM/RL TRIAL WITHOUT FLANGE	10633
LG LM/RL TRIAL WITHOUT FLANGE	10634
XL LM/RL TRIAL WITHOUT FLANGE	10635
XXL LM/RL TRIAL WITHOUT FLANGE	10646

UNICOMPARTMENTAL INSTRUMENTATION

DESCRIPTION	ITEM #
UNI TRIAL HOLDER	10621
REPLACEMENT TIP FOR HOLDER	11530
T-SQUARE	10670
LL/RM ANTERIOR SIZING GUIDE	11465
LM/RL ANTERIOR SIZING GUIDE	11468
LL/RM ANTERIOR CUTTER	10647
LM/RL ANTERIOR CUTTER	10654
SM RL/LM CHAMFER/POSTERIOR MARKER	11371
MD RL/LM CHAMFER/POSTERIOR MARKER	11372
LG RL/LM CHAMFER/POSTERIOR MARKER	11373
XL RL/LM CHAMFER/POSTERIOR MARKER	11374
XXL RL/LM CHAMFER/POSTERIOR MARKER	11375
SM RM/LL CHAMFER/POSTERIOR MARKER	13257
MD RM/LL CHAMFER/POSTERIOR MARKER	13258
LG RM/LL CHAMFER/POSTERIOR MARKER	13259
XL RM/LL CHAMFER/POSTERIOR MARKER	13260
XXL RM/LL CHAMFER/POSTERIOR MARKER	13261
SM UNI DISTAL CUTTER	11470
MD UNI DISTAL CUTTER	11471
LG UNI DISTAL CUTTER	11472
XL UNI DISTAL CUTTER	11427
XXL UNI DISTAL CUTTER	11428
SM CHAMFER GUIDE	10655
MD CHAMFER GUIDE	10648
LG CHAMFER GUIDE	10622
XL CHAMFER GUIDE	10660
XXL CHAMFER GUIDE	10665

TOTAL RESURFACING UNICOMPARTMENTAL KNEE REPLACEMENT

"Design By Reason"

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