Contraindications

- Patients with inflammatory arthritis
- Patellofemoral symptomatology
- Active history of infection of the knee
- Arthritic changes in other compartments
- Extra-articular alignment deformity
- Anterior cruciate ligament (ACL) deficiency
- A flexion contracture of greater than 10°
- Range of motion less than 90°
- More than 10° of varus or 15° of valgus deformity

Indications

- Patients with isolated symptomatic osteoarthritis of either the medial or lateral compartment
- Osteonecrosis of the medial femoral condyle that is not amenable to cartilage restoration
- Failed nonoperative and operative nonarthroplasty treatment options, including:
  - Nonsteroidal anti-inflammatory drugs
  - Physical therapy
  - Unloader braces
  - Cortisone injections
  - Viscosupplementation injections
  - Arthroscopy/chondroplasty
  - Other cartilage repair and transplant procedures
- Close to ideal body weight
- Willingness to accept activity limitations compatible with longevity of the prosthesis

Examination/Imaging

- Patients with isolated unicompartmental osteoarthritis should have a thorough physical examination to assess for tenderness in other parts of the knee joint and ligamentous stability.
- A hip examination should be performed to rule out hip pathology.
- Radiographs
  - Weight-bearing anteroposterior (AP), 45° flexion weight-bearing posteroanterior, lateral, and patellar views and a mechanical axis should be obtained to accurately template the prosthesis and to confirm that the arthritis is unicompartmental.
  - Ensure that there is not a substantial amount of tibiofemoral subluxation as this is difficult to correct intraoperatively and can lead to maltracking of the femoral component on the tibial tray, with early failure secondary to edge loading of the polyethylene.
  - The AP view is used to template the size and level of tibial resection (Fig. 1).
    - The tibial resection should be minimal (2–4 mm) and just enough to at least accommodate the thinnest available tibial tray.
    - Position the template to achieve a tibial resection 90° to the long axis of the tibia.
  - The lateral view is used to template the size of the femoral prosthesis and the tibial slope (Fig. 2).
Position the template on the distal femur, placing the keel parallel to the long axis of the femur.

The template should be about 2 mm larger than the bony margin of the femur to make up for the lost cartilage.

Use the lateral radiograph to measure the tibial slope. Reproducing the tibial slope will prevent tightness in flexion.
Positioning

- The patient is positioned in the supine position on a standard operating room table.
- If obtaining intraoperative radiographs is desired, a radiolucent extension may need to be added. For medial unilateral knee arthroplasty (UKA), the final alignment should be either neutral or slightly varus. Intraoperative radiographs may help in achieving that alignment.
- A gel bump is placed under the ipsilateral buttock to internally rotate the leg.
- A number of commercial foot holders can be used if only one assistant is available. They allow the surgeon to place and lock the knee in different degrees of flexion. Alternatively, place a footrest on the bed so that the foot rests on it with the knee flexed 90° (Fig. 3).
- A tourniquet is applied as proximal as possible on the thigh.
- The patient is prepped and draped in the usual fashion, the extremity is exsanguinated, and the tourniquet is inflated.
Portals/Exposure

- Flex the knee to 90° and mark the skin incision centered over the medial third of the patella.
- Dissection is made down to the fascia, and medial and lateral skin flaps are elevated.
- A midvastus arthrotomy is performed next, and the vastus medialis obliquus is split bluntly parallel to its fibers. Alternatively, a medial parapatellar arthrotomy is performed.
- A subperiosteal medial release is performed and extended posteriorly to obtain appropriate exposure.
- A small amount of fat pad tissue is removed to view the lateral condyle and patellofemoral joint to ensure the arthritis is isolated to the medial compartment. A Z-retractor can be used to expose the lateral compartment. Furthermore, it is important to check the integrity of the ACL. If grade 3 or 4 arthritic changes are seen in the lateral or patellofemoral compartment, it is advisable to convert to a total knee arthroplasty.
- Using a rongeur or a curved osteotome, osteophytes over the medial femoral condyle, tibial plateau, and medial notch are resected.

Procedure

- There are a number of unicondylar knee implant manufacturers. Most have similar designs and require similar steps for implantation. The following steps specifically pertain to the DePuy Preservation Unicompartmental Knee system (DePuy, Inc., Warsaw, IN). The readers are encouraged to review their manufacturers’ surgical guide for more information.

Step 1: Tibial Cut

- The knee is flexed to 90°. Z-retractors are placed on both sides of the femoral condyle.
- Using the template as a guide, an oscillating saw is used to make a vertical cut in the tibia plateau under the lateral edge of medial femoral condyle. Care is taken not to make the cut too deep or at an oblique angle. Be sure the cut is just on the medial edge of the ACL insertion on the tibia. This step can alternatively be done after making the transverse tibial cut.
- The tibial cutting jig is first attached to the ankle above the malleoli.
Unicondyilar Knee Arthroplasty

**PEARLS**

- A surgical clamp can be used to distract the resected bone anteriorly, and a small knife is used to cut the posterior attachments to the medial meniscus.

- It is very important to reproduce the patient’s native tibial slope when making the tibial cut.

- Take care to not place too many pins in the proximal tibia as plateau fractures can result.

- When checking for flexion and extension gaps, it is ideal to have about 2–3 mm of gap in both flexion and extension.

- The jig should be rotated to position the vertical bar over the tibial crest and in line with the second metatarsal.

- The tibial cutting block is raised to the level of the joint line (Fig. 4).

- Loosen up both clamps on the ankle side of the jig and adjust the varus/valgus angle and the posterior slope according to the template. The goal is to place the cut perpendicular to the mechanical axis of the tibia. Every 5 mm of distal translation of the vertical bar will increase the tibial slope by about 1° (Fig. 5).

- The vertical slot in the rod is now pinned, and the upper clamp is loosened to raise or lower the cutting block. A tibial stylus is placed through the cutting slot to measure the depth of the tibial resection (Fig. 6).

- The upper knob is now tightened and another pin is placed through one of the inferior holes in the cutting block (Fig. 7A and 7B).
FIGURE 6

FIGURE 7

A

B
A sagittal saw is used to make the horizontal tibial cut to meet the previously made vertical cut (Fig. 8). A small straight osteotome is used to link the two cuts, and a broader osteotome is used to lever the resected bone and remove it. The resected bone is measured. If it is too shallow, the cutting block is lowered by replacing it through a higher hole in the cutting block, and the cut is redone.

Due to tibial cartilage wear, a minimum cut of 2–4 mm is usually sufficient. The goal is to have 7 mm of space for an all-polyethylene bearing and 10 mm if a metal-backed bearing is needed.

A trial tibial block is inserted and the flexion gap is evaluated (Fig. 9).
• If the flexion gap is tight, recut the tibia and increase the tibial slope.
• If the flexion gap is loose, increase the thickness of the tibial trial.

The knee is now extended and the extension gap is evaluated.
• If the extension gap is loose, a 2-mm femoral defect shim can be added to the distal femoral cutting block to compensate for the lost cartilage on the distal femur.

The extramedullary alignment rod is placed on the distal femoral cutting block, which is inserted into the gap under the distal femur (Fig. 10).
• In flexion, the rod should pass through the center of the foot.
• In extension, the rod should parallel the femur from a lateral view to avoid placing the femoral component too flexed or extended. Flex or extend the knee until this is achieved.
Step 2: Distal Femoral Cut
- The distal femoral cutting block is secured to the femur using two pins (Fig. 11).
- If the previous tibial cut left the extension gap loose, place the 2-mm femoral shim on the cutting block to move the femoral cut distally.
- A sagittal saw is used to make the distal femoral cut.
- The resected bone is removed, and the posterior horn of the medial meniscus is now excised.

Step 3: Femoral Sizing
- Place the knee in 90° of flexion.
- The tibial tray trial is placed back into the flexion gap.
- Using a marking pen or a Bovie electrocautery, mark the distal femur and proximal tibia along the center line in the tibial trial to establish the center point of the femoral condyle (Fig. 12).
- Using the preoperative template, the appropriate femoral rotation and sizing guide is placed against the distal femur. Move the guide so that it does not overhang superiorly to prevent patellar clunk. If it does, choose a smaller guide. Mallet the center pin to stabilize the medial/lateral position. The marked position on the distal femur is a good starting point (Fig. 13).
■ Rotate the sizing guide until it articulates best with the tibial trial in different degrees of knee flexion. The guide can be rotated a maximum of 10° in each direction.
■ Using a 1/8th-inch drill, mark the two superior holes through the guide to set its rotation (Fig. 14).
■ Use a curved gouge to remove a small piece of the anterior femur to mark the anterior extent of the femoral prosthesis (Fig. 15).
■ Remove the guide.
**PEARLS**

- To stabilize the three-in-one cutting guide, a handle can be placed on the guide and stabilized by an assistant while the cuts are being made.

**STEP 4: FEMORAL CUTS**

- The three-in-one corresponding-size femoral guide is now placed on the distal femur and tapped flush with the bone (Fig. 16).
- The posterior femoral cut is made first (Fig. 17A and 17B). The anterior chamfer cut is made next to remove a small piece of the previously gouged bone.
- The posterior chamfer cut is done last. The resected femoral pieces are removed.
**STEP 5: TRIAL REDUCTION**

- Place a femoral trial prosthesis in the center of the medial femoral condyle. Move it medially or laterally to allow it to best articulate with the tibial trial prosthesis (Fig. 18A and 18B).
- Assess joint stability and rotational alignment.
  - If the trial is tight both in flexion and extension, resect more tibia.
  - If the trial is tight in flexion only, choose a smaller femoral prosthesis.
  - If the trial is tight in extension, cut 2 more millimeters of distal femur.
  - If the trial is loose in both flexion and extension, choose the thicker tibial trial.

**FIGURE 18**
**Pearls**

- Be sure not to lever against the femoral drill guide to avoid placing the drill hole anteriorly, thereby flexing the femoral prosthesis.
- If the keel does not fit easily, remove it and use a curette or burr to deepen the slot. This will prevent an iatrogenic femur fracture later.

**Step 6: Final Femoral Preparation**

- Place the knee in 90° of flexion to expose the distal femur.
- Using a saw blade, make a vertical shallow cut through the open slot in the femoral trial (Fig. 19).
- Place the femoral drill guide through the center circle in the slot and drill a hole for the peg (Fig. 20).
- Apply and tap the keel punch flush with the trial (Fig. 21).
- The femoral and tibial trials are now removed.

**Pearls**

- If resistance is encountered while cutting the keel groove, a burr should be used first. This will prevent fracturing the posterior tibia.

**Step 7: Final Tibia Preparation**

- The knee is hyperflexed to expose the tibia.
- The tibial finishing guide is placed flush with the proximal tibia, aligned with the previously marked point at the center of the tibia (Fig. 22).
- Use a pin to stabilize the guide.
- Cut a keel groove through the slot in the guide using the appropriately angled osteotome (Fig. 23). Use a curette to remove the cut bone.
- The tibial keel trial is now inserted. Be sure it is flush with the finishing guide.

![FIGURE 19](image1)

![FIGURE 20](image2)
**Step 8: Final Prosthesis Implantation**

- All the trial prostheses are removed and the joint is irrigated with saline to remove all the blood in the bone. The bony surfaces are dried thoroughly.
- The real implants are opened and placed on a clean towel.
- Two bags of cement are mixed.
- Place a sponge around the rim of the tibia to help remove the excess cement.
- Coat the undersurface of the tibial prosthesis with cement and apply a small amount into the keel groove.
- The tibial polyethylene component is inserted into its groove and pushed in place using the appropriate C impactor.
- The sponge is removed and a curved curette is used to remove the excess cement.
- Precoat the femoral prosthesis with cement. Apply a thin layer to the femoral surface.
- Tap the femoral prosthesis in place and remove the excess cement.

**Step 9: Closure**

- A final range of motion and stability check is performed. All excess cement is removed.
- The tourniquet is deflated and all miscellaneous bleeder are cauterized. The knee is irrigated with saline.
- A drain is used if desired.
- The capsule is injected with bupivacaine prior to closure.
- The capsule is closed with #1 Vicryl.
- The skin is closed in layers.
- AP and lateral radiographs are taken in the recovery room (Fig. 24).
- Similar steps are taken for a lateral UKA (Fig. 25).

**Postoperative Care and Expected Outcomes**

- The patient is admitted overnight for pain control.
- A continuous passive motion (CPM) machine is started in the recovery room and the angle is increased as tolerated.
- The patient is allowed to bear weight as tolerated.
- A CPM machine should ideally be used at home.
Anticoagulation with enoxaparin or warfarin is instituted for 4 weeks.
Formal physical therapy is started when the sutures are removed in 2 weeks.
Return to full activities is expected in 3 months.
Evidence


This study evaluated the effects of having a previous UKA on the outcomes of revisions to total knee arthroplasty (TKA). Twenty-eight patients (group A) had a previous UKA converted to TKA, and 28 patients (group B) had a primary TKA. Both groups were matched based on age, sex, weight, and height. The average follow-up was about 55 months. On follow-up using the Knee Society Score, group A scored 71.8 and group B scored 80.4. Using the WOMAC score, group A scored 56.1 and group B scored 64.1. Group B patients had better postoperative subjective scores and range of motion. The authors concluded that revision from UKA to TKA showed inferior objective and subjective functional results. However, they were still satisfied with their revision results.


The authors studied 411 medial UKAs from 1994 to 1998. Most prostheses were fixed bearing and cemented with a metal backing. Patient average age was 67. Younger patients and those with a thinner polyethylene component had a higher rate of failure and revision. Weight and gender did not affect revisions. Survival rates at 9 years were better when the polyethylene component was thicker than 7 mm and when the shelf life was under 1 year.


Ninety-one metal-backed UKAs were evaluated at 1, 3, and 5 years. At 1 year, using the Insall and Scott Clinical Rating System, the patients' knee score improved from 57.6 to 94.8. Three cases had to be revised during the study period.


A prospective randomized study was used to compare tibial fixation in UKA with or without metal backing. Forty-five patients were randomized to two groups, one received an all-polyethylene tibial component and the other received a metal-backed tibial component. The authors used radiostereometric analysis to measure micromotion of the tibial component for 2 years after surgery. No significant difference was seen between the two groups, and therefore the authors recommended using an all-polyethylene component because of its lower cost, excellent biomechanical strength, and lack of modularity.


Between 1985 and 2003, 1819 patients entered in the Finnish Arthroplasty Register were studied for prosthesis survival using Kaplan-Meier analysis. Overall, 73% of UKAs had a 10-year survival rate. The mean age of the patients was 65. Younger patients had a 1.5-fold increase in failure rates.


Fifty-six knees in 48 patients were randomized to undergo UKA using either a fixed or mobile bearing design. Two year follow-up included clinical exam and radiographs. While progression of osteoarthritis was similar in both groups, the mobile bearing group had a lower incidence of lucency on radiograph. No differences were noted in the clinical evaluation or knee scores.