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Appendix 1.

LATERAL UNICOMPARTMENTAL KNEE ARTHROPLASTY (UKA) SURGICAL TECHNIQUE

Incision and Arthrotomy

Operative set up, skin preparation, and draping for a non-robotically assisted, fixed-baring lateral UKA using an intramedullary (IM) femoral and extramedullary (EM) tibial technique was utilized.[16]

The incision length is dictated by patient size and is made with the knee flexed to 45° from the top of the patella traversing 8-10-cm inferiorly over the lateral compartment towards Gerdy's tubercle. A lateral parapatellar incision allows for adequate visualization that minimizes damage to medial structures, avoids the necessity for patellar eversion, and provides direct access to the lateral compartment. Dissection should occur in a single plane through the skin, subcutaneous fat, and deep to Scarpa's fascia. Special care should be taken due to the thin nature of the skin on the lateral aspect of the knee to avoid postoperative wound complications.

A lateral parapatellar arthrotomy is performed moving distally to ensure bisecting the lateral meniscus. The arthrotomy continues towards Gerdy's tubercle and releases the iliotibial band. Proximally, the vastus lateralis obliquus is incised in line with its fibers and released accordingly to allow for adequate visualization. The distal lateral capsule is elevated

subperiosteally off the lateral aspect of the tibial plateau with a knife or key elevator to allow for safe placement of a Z retractor.

The knee is placed in a figure of four position to improve visualization as needed. The lateral meniscus is carefully excised with removal of Hoffa's fat pad. A circumferential patelloplasty is performed to remove the patellar osteophytes with a small rongeur. The edges of the patella are smoothed with a nasal rasp always avoiding damage to the patella cartilage surface. Osteophytes on the femur and tibia are not removed unless the cutting guides cannot sit flush against the bone. Verification of the integrity of the anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) is performed. Osteophytes are removed from the intercondylar notch to avoid ACL impingement.

Bone Cuts

The bone cuts are performed in a systematic fashion. The distal femur is cut first, followed by the proximal tibial cut, and then the posterior femoral and chamfer cuts using a gap-balancing technique.

Distal Femur Cut

The knee is flexed to 30° and secured at the ankle. A small pilot hole is drilled approximately 1-cm superior to the femoral insertion of the PCL and in line with the apex of the intercondylar notch and central axis of the femoral shaft. The pilot drill is axially loaded through the articular cartilage until it engages with the subchondral bone and opens the entry to the femoral canal. The IM guide rod is inserted and a side-specific lateral distal femoral cutting

block is placed and adjusted according to the preoperative alignment and templating to yield an appropriate valgus-aligned knee. The cutting guide is placed flush with the distal femoral condyle avoiding soft tissue impingement. The distal femoral cutting block is secured in place. The appropriate saw blade is utilized to perform the distal femoral cut. An angel wing is used to verify the distal femoral cut prior to using the saw blade. The IM guide is removed and the distal femoral cut is inspected to ensure the cut is flat and rasped if necessary. A self-retaining IM patellar retractor is placed and the knee flexed to 90°.

Proximal Tibial Cut

An extramedullary guide is positioned in line with the long axis of the tibia with ankle clamps, lateral to the tibial crest to ensure proper alignment. The posterior slope should mirror the patient's native anatomy (5-7°) as determined preoperatively. The cutting block is placed centrally over the lateral tibial surface, taking care to protect the patellar tendon. A 4-mm slotted stylus is used to measure the appropriate amount of resection of the cartilage-deficient proximal tibial plateau. The proximal tibial cutting block is secured. A Z-retractor is used to protect vital structures. The minimal proximal lateral tibial plateau cut is completed to ultimately meet the vertical plateau cut. The sagittal saw blade is used to make the vertical tibial plateau cut. This cut is in line with the medial border of the lateral femoral condyle slightly internally rotated to account for the rotational relationship between the femur and the tibia in full extension as a result of the 'screw home' mechanism. Utilization of this sagittal saw must be mindful to avoid injury to the ACL. This completed bone cut can then be used to determine the tibial tray implant size.

Flexion and extension gaps using the 8-mm or 10-mm spacer guides ensure appropriate gap balance.

Posterior Femoral and Chamfer Cuts

The knee is maintained in 90° of flexion and the appropriately-sized two in one posterior femoral and chamfer cut guide is placed. The guide is purposefully aligned as medial as possible on the lateral femoral condyle. This guide must meet the flat cut surface of the tibia to avoid any edge loading of this fixed-bearing implant. Pull the foot of the guide anteriorly until it contacts the cartilage/bone of the posterior condyle. There should be 2-3-mm of exposed bone above the anterior edge of the guide. Ensure that the proper sized implant is selected. Always select the smaller-sized implant to prevent the patella from impinging on the prosthesis. The guide is pinned in place. The appropriate peg holes are completed prior to cutting the posterior femoral and chamfer cuts. The posterior femoral cut is performed prior to the chamfer cuts. Any fragments of bone are removed and a laminar spreader is placed. A curved osteotome and curved curette are utilized to remove any posterior osteophytes posteriorly to achieve maximum flexion. Any remaining lateral meniscus is excised and the posterior aspect of the joint is inspected for any loose bodies.

Final Tibial Preparation & Trialing of Components

The femoral trial component is placed. The cut tibial surface is measured. The keel punch cutting and sizing guide is utilized. Two, 20° posterior-angled tibial drill holes are completed. A trial polyethylene component is inserted to meet the femoral trial component.

The knee is placed through a full range of motion to evaluate tracking of the femoral and tibial components and noting the range of motion. The knee is placed in 90° of flexion and a 2-mm tension gauge is inserted. The tension gauge should move in and out of the joint using two fingers and slight resistance without movement of the tibial trial. The knee is placed in full extension and the same maneuver with the 2-mm tension gauge is performed. Once again, the tension gauge should move in and out with two fingers and slight resistance. Varus and valgus stability are tested to ensure that the lateral collateral ligament has attained appropriate tension. Adjustments are made with the thickness of the polyethylene as needed to perform fine-tuning as necessary. Upon successful completion of trial implants, all parts are removed and a thorough irrigation is performed with antibiotic irrigation.

Final Preparation & Cementing the Prosthesis Components

The joint surfaces are dried and a surgical sponge is placed posteriorly to assist in the removal of any excess cement. A new Z retractor is placed. A small amount of cement is placed on the back of the tibia. The real tibial implant is inserted after cement is placed on the tibial plateau. Appropriate instrumentation is used to remove any excess cement and the surgical sponge is removed. Cement is placed on the femur. The real femoral prothesis is impacted. A 1-mm upsized polyethylene is placed to aid in compression. The knee is held in extension until the cement is cured. The knee inspected. A small 1/8-inch osteotome may be used to remove any cured overlying cement. The real polyethylene liner is snapped in place. A full ROM of the knee is completed and confirmed along with stability. The wound is closed in routine fashion with sutures. A soft tissue bulky dressing is placed and removed to a smaller dressing the following

day in the office beginning range of motion and full weightbearing with any assistive device as necessary.