A Modified Lateral Approach for Total Knee Replacement in Type 2 Valgus Deformity

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Case Report

abstract

Total knee replacement for patients with osteoarthritis and valgus deformity remains challenging, with soft tissue balance often difficult to achieve. Most orthopedic surgeons use the medial parapatellar approach for total knee replacement. However, the lateral approach described in this case allows direct access to the pathology. The valgus deformity is corrected by using a modified lateral parapatellar arthrotomy with a staged and gradual release of the contracted lateral capsuloligamentous structures and the iliotibial tract. A Z-shaped dissection of the lateral retinaculum and careful dissection and preservation of the infrapatellar fat pad is performed. The creation of this laterally based vascularized flap provides the necessary tissue to cover the soft tissue gap resulting on the lateral aspect of the knee after valgus correction. The lateral approach has advantages, including ligament balancing and preservation of the medial retinaculum and the medial neurovascular structures for the supply of the patella. However, this approach should be used with caution by experienced surgeons. [Orthopedics. 2017; 40(5):313-316.]

osteoarthritis (OA) combined with a valgus deformity of the knee is characterized by bony changes in the lateral aspect of the joint and a shortening of the iliotibial band and the posterolateral capsuloligamentous structures. Frequently, there is also an external rotation of the tibia, a laterализation of the tibial tuberosity, and an internal rotation of the femur. Total knee replacement has poorer results in these cases.1

There are 3 types of valgus deformity based on clinical and radiological criteria.2 In type 1, valgus can be corrected passively. Medial soft tissue stabilizers are intact. In type 2, medial stabilizers are lax, and the deformity is passively not correctable. Lateral soft tissue contracture exists. The anatomical femorotibial valgus angle is greater than 10°. In type 3, there is severe osseous deformity after prior osteotomy with an incompetent medial soft tissue sleeve.

Valgus OA occurs less frequently than varus OA. Thus, most surgeons have less experience with the former. The medial parapatellar arthrotomy is the standard approach for total knee replacement surgery. However, the correction of a valgus deformity by controlled, gradual loosening (release) of the soft tissue structures on the lateral side of the knee joint via a standard medial arthrotomy is associated with complications.3,4 Poor results have been reported for total knee arthroplasty in valgus-deformed knees using a conventional medial approach.1,5,6 In addition, vascular compromise has been reported after total knee arthroplasty by a medial approach with lateral retinacular release.3,7,8 Therefore, the lateral approach has been developed, which allows direct access to the pa-
Case Report

A 62-year-old patient presented with a posttraumatic valgus OA of the right knee following an intra-articular fracture of the proximal tibia 16 years earlier. A standing, weight-bearing anteroposterior radiograph showed a mechanical femorotibial angle of 15.7°. Digital planning software (mediCAD; Hectec GmbH, Germany) was used preoperatively (Figure 1A). The mechanical femorotibial angle (mechanical femur axis [mFA]–mechanical tibia axis [mTA]) was 15.7°. Virtual correction is shown (B). Postoperative standing, weight-bearing anteroposterior radiograph showing the correction of the valgus deformity (C). Abbreviations: AMA, anatomical mechanical angle; FSA, femoral shaft axis; JLCA, joint line conversion angle; KBL, knee base line; MAD, mechanical axis deviation; mFA, mechanical femur angle; mLDFA, mechanical lateral distal femur angle; mLDTA, mechanical lateral distal tibia angle; mLPFA, mechanical lateral proximal femur angle; mMPTA, mechanical medial proximal tibia angle; TL, traglinie (mechanical axis of the leg).

Patient Positioning

After general anesthesia was administered, the patient was positioned supine on the operating table. A tourniquet was placed high on the thigh, and the knee was shaved. A lateral thigh post, positioned at the level of the tourniquet, can help to stabilize the knee when it is placed in flexion with the aid of a bolster placed under the foot and taped securely to the table (Figure 2A).

Approach and Exposure

A straight midline incision was made starting approximately 8 cm proximal to the superior pole of the patella and continuing distally to the level of the tibial tuberosity. The incision was carried down to the deep fascial layer to expose the quadriceps tendon, the patella, the lateral capsule and retinaculum, and the patellar tendon (Figure 2B). Stepwise division of the lateral patellar retinaculum and of the aponeurosis of the vastus lateralis was performed. The arthroscopy started approximately 5 cm proximal to the patella at the lateral edge of the quadriceps tendon. Approximately 1 cm proximal to the patella, the incision was turned laterally, with the aponeurosis of the vastus lateralis muscle and the lateral transverse patellar retinaculum being dissected. After superficial vertical incision, the fibrous tissue was split tangentially approximately 2 cm in a proximal direction before the incision was turned perpendicular to the fibrous direction in a Z-shaped manner. This dissection allowed an extension of the aponeurosis of the vastus lateralis muscle and the lateral retinaculum in wound closure and a realignment of the traction of the vastus lateralis muscle. The lateral longitudinal patellar retinaculum was then dissected down to the fascia cruris but without incision of the infrapatellar fat pad (Figure 2C).

The infrapatellar fat pad was mobilized as a laterally based vascularized flap. After detachment from the patellar ligament, it was dissected posteriorly in the sagittal direction at the level of the transition from the anterior horn of the medial meniscus to the transverse ligament. The fat pad was then shifted laterally along with a 2- to 3-mm–wide base of the lateral meniscus. Thereafter, the tibialis anterior muscle and the capsuloligamentous structures from the tibia and the iliotibial band were detached subperiosteally from Gerdy’s tubercle. With a sufficiently long patellar ligament, a small Q-angle, and a well-moving knee, the patella is easily dislocated medially. However, the tibial tuberosity should be protected with a K-wire to protect the extensor mechanism (Figure 2D).

Reattachment and Closure of the Lateral Retinaculum

After all of the components of the knee replacement system were inserted, the carefully dissected structures of the lateral
retinaculum were reattached so that the joint capsule could be closed. As a result of the correction of the valgus deformity, there was a significant gap of the dissected lateral joint capsule (Figure 3A). First, the infrapatellar fat pad was attached laterally of its point of separation behind the patellar ligament with 2 rows of U-stitches and moderate tension, thereby closing the gap distally (Figure 3B). Second, the dissected deep layer of the lateral parapatellar retinaculum was liberated (Figure 3C) and attached with its lateral edge to the medial edge of the superficial layer using several sutures, thereby closing the soft tissue gap proximally (Figure 3D).

Postoperative Management
The patient was evaluated closely for signs of peroneal nerve compromise. If signs of nerve compromise were to develop, the knee would be placed in flexion. If the compromise did not improve, the bandage would then be loosened. Physical therapy and continuous passive motion were initiated on the first postoperative day, after the drain was removed. The patient progressed to weight bearing as tolerated and was discharged on day 7.

DISCUSSION
This lateral approach is a modification of the technique described by Buechel and Keblish. The correction of the valgus and of the often associated external rotation of the tibia are achieved by a gradual release of the contracted lateral soft tissue structures, before the bone resections are performed. This includes dissection of the lateral retinaculum in the sense of a Z-plasty and lengthening and realignment of the insertion of the vastus lateralis muscle. For ad-
equate representation of the medial femorotibial compartment and better assessment of the ligament tension in the flexed knee, an osteotomy of the tibial tuberosity may be necessary in a short patellar tendon. The overview of the entire joint is particularly important in valgus OA because of overcorrection following high tibial osteotomy for early medial OA. In this situation, deep structures of the medial collateral ligament must be released subperiosteally from the tibia to achieve a balanced knee.

Type 2 valgus OA and femoropatellar OA with lateral subluxation of the patella can be treated using this technique. Previous high tibial osteotomy for medial OA less than 6 months earlier, osteotomy of the tibial tuberosity (especially with atrophic and thin skin coverage), and severe osteoporosis are contraindications.

Advantages of this technique include performing the arthrotomy and the release of contracted lateral soft tissue structures in one surgical step, preserving the continuity of all lateral soft tissue structures, simultaneously removing valgus and external rotation deformity of the tibia, eliminating dislocation or subluxation of the patella, not additionally attenuating the often overstretched medial retinaculum, and not interrupting the medial neurovascular structures to the patella.

However, there are also some disadvantages to this technique. Most surgeons are more familiar with the medial parapatellar approach. There is a higher risk for injury to the knee extensor mechanism, especially the patellar tendon or the tibial tuberosity. Therefore, osteotomy of the tibial tuberosity is often necessary for better assessment of the medial compartment and the ligament and soft tissue tension in knee flexion, and there is a risk of insufficiency of the refixed tibial tuberosity. Also, the peroneal nerve is at risk because of overstretching or a subcapital osteotomy of the fibula.

**CONCLUSION**

The authors have described a modified parapatellar arthrotomy for valgus OA. Although this lateral approach to total knee replacement offers some advantages over the medial approach, it should be performed with caution by experienced surgeons.

**REFERENCES**