Robert C. Schweigel, MD, FRCSC

Partial knee replacement

The last decade has seen renewed interest in unicondylar knee arthroplasty and patellafemoral arthroplasty for patients with osteoarthritis affecting one compartment of the knee.

ABSTRACT: Partial knee replacements have come into and out of favor over the past 60 years. There has been renewed interest in partial knee replacements in the armamentarium for arthritic knees due to increasingly good results. Partial knee replacements include the unicondylar knee replacement and the patellofemoral arthroplasty. These partial knee replacements are indicated for specific, isolated arthritic portions of the knee joint—specifically the medial, lateral, or patellofemoral portion of the joint. In carefully selected patients outcomes are comparable to the results of total knee replacements. Patient selection and meticulous surgical technique are likely the key to a good result in a partial knee replacement.

Partial knee replacements are a form of knee arthroplasty that doesn't replace the entire knee (the femoral condyles, tibial plateau, and patella). These surgical interventions include the patellofemoral arthroplasty and the more common unicondylar knee arthroplasty. Both procedures have been available since the 1950s and may be options for patients who have osteoarthritis in one compartment of the knee, do not have specific contraindications for these more conservative procedures, and who have failed to benefit from nonoperative management of their osteoarthritis.

Unicondylar knee arthroplasty

In the past, unicondylar knee replacements fell out of favor primarily because of the surgical technique of the time, which made conversion to a full knee replacement difficult. However, with the advent of minimally invasive approaches for unicondylar knee replacement, there has been renewed interest in this procedure over the past decade.

A unicondylar knee replacement (**Figure 1**) consists of a metal component that goes on the femoral condyle, and another component that goes on the tibial side. The tibial component can be metal-backed with a fixed-bearing or mobile-bearing polyethylene bearing surface, or it can be an all-polyethylene fixed-bearing cemented component. There is no evidence that one approach is better than another.

The rationale for considering a unicondylar knee arthroplasty is that it is a more conservative operation with faster recovery, less resection of bone, conservation of the cruciate ligaments, and potentially better function. In addition, conversion to a total knee replacement down the road is simple using modern techniques, with outcomes similar to a primary knee replacement. When appropriate, partial knee arthroplasty can be thought of as a time-buying operation.

In addition, a unicondylar knee replacement is an alternative to other invasive procedures such as a high tibial osteotomy or a total knee replacement.

Dr Schweigel is a clinical instructor in the Department of Orthopaedics at the University of British Columbia.

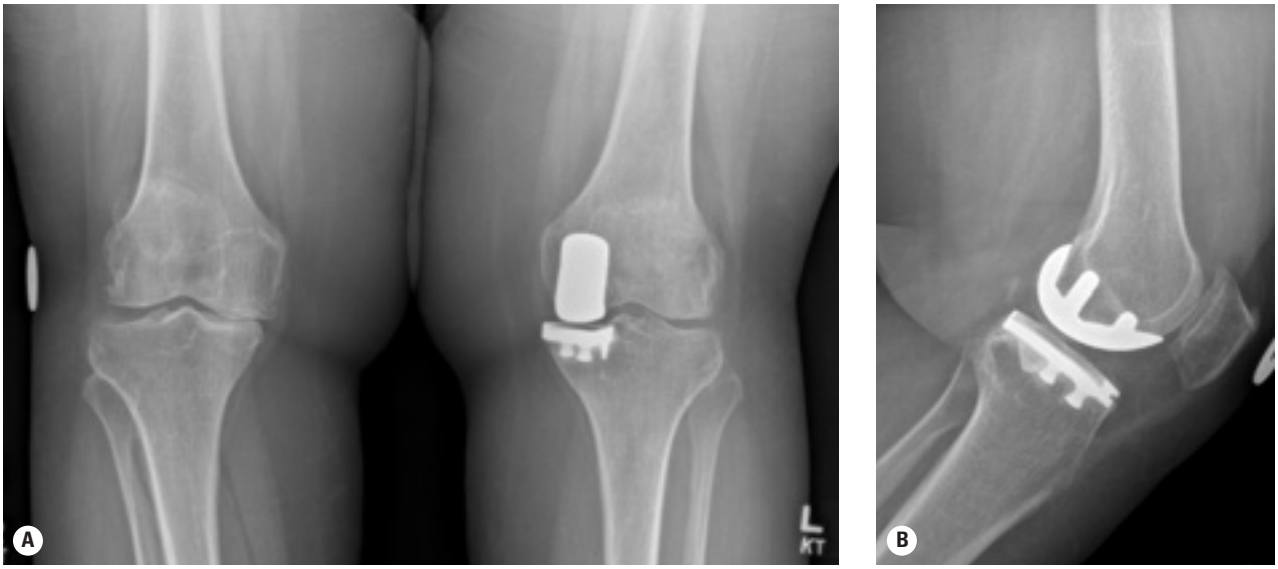

Figure 1. (A) Anteroposterior radiograph showing a medial unicondylar knee replacement. (B) Lateral radiograph showing a medial unicondylar knee replacement. *Radiographs courtesy of Dr Bas Masri.*

Patient selection

Careful patient selection is needed to get the best possible results. This requires a thorough history and physical examination.

The history should include specific questions about the knee to determine whether there was a gradual onset of pain or whether there was a specific incident (i.e., trauma) that caused the problem. This is particularly important because anterior cruciate ligament deficiency is a contraindication for a unicondylar knee replacement. When considering a unicondylar knee replacement, the location of the pain is very important. It must be localized to only one compartment of the knee. For a medial unicondylar knee replacement, the pain has to be medial and the patient has to be able to point to the medial side of the knee as the site of the pain. For a lateral unicondylar knee replacement, which is much less common as the results are less predictable than a medial unicondylar knee replacement, the pain has to be lateral. For either a lateral or medial unicondylar knee replacement, the presence of substantial patellofemoral pain is a contraindication. In addition, the pain has to be of sufficient magnitude and to interfere with activities of daily living to warrant surgical intervention. It is important to ensure that all reasonable attempts at medical management have been exhausted before considering any surgical procedure.

Indications

Kozinn and Scott have outlined several classic indications and contraindications for unicondylar knee replacement.[1] Indications include the diagnosis of unicondylar osteoarthritis or osteonecrosis in either the medial or lateral compartment of the knee. Initially, Kozinn and Scott stipulated that patient age had to be greater than 60 years and weight had to be less than 82 kg. There had to be minimal pain at rest and low demand of activity. The ideal range of motion was an arc of flexion of 90 degrees with a contracture of less than 5 degrees. The angular deformity had to be less than 15 degrees and be passively correctible to neutral at the time of operation.

Specific contraindications to a unicondylar knee arthroplasty identified by Kozinn and Scott included the diagnosis of an inflammatory arthritis, age younger than 60 years, high patient activity level, pain at rest (which may indicate an inflammatory component), and patellofemoral pain or exposed bone in the patellofemoral or opposite compartment at the time of the surgery. Asymptomatic chondromalacia in the patellofemoral joint was not necessarily a contraindication.

More recently, some of these indications have been expanded. Various authors have reported good results in patients younger than 60 years[2] and in obese patients with BMIs over 30.[3]

Generally it is felt that both of the cruciate ligaments have to be intact to perform a unicondylar knee arthroplasty. Again however, studies have suggested that a medial compartment unicondylar arthroplasty is possible in an ACL-deficient knee in certain

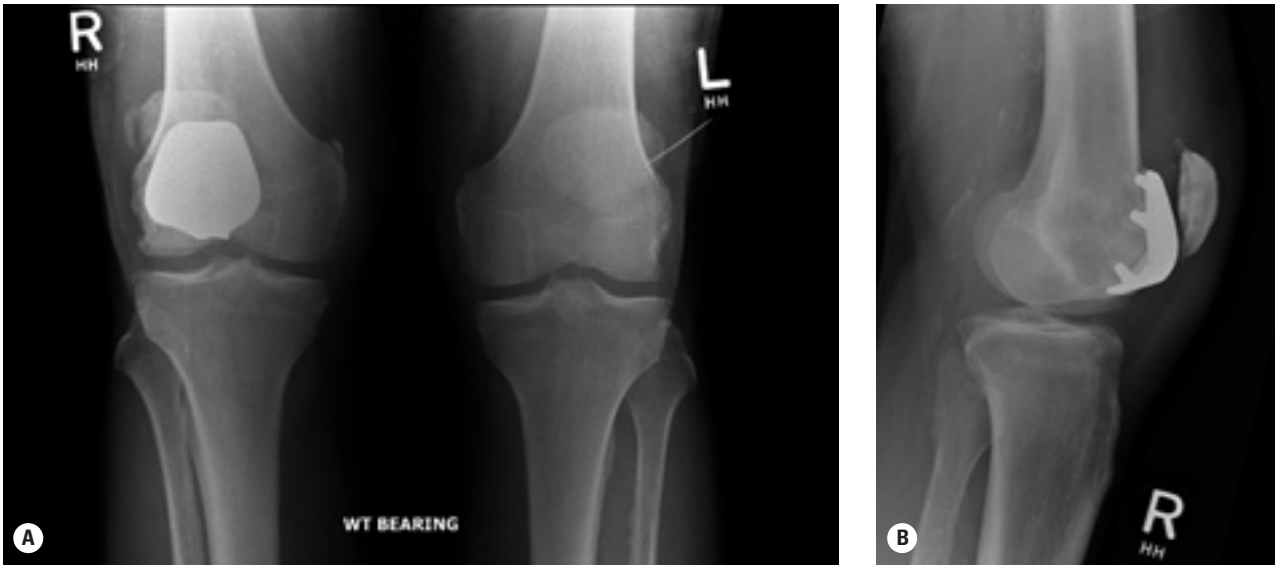

Figure 2: (A) Anteroposterior radiograph showing a patellofemoral replacement. (B) Lateral radiograph showing a patellofemoral replacement. *Radiographs courtesy of Dr Bas Masri.*

circumstances;[4] still, most surgeons will not perform a unicondylar knee replacement on a patient with a history of torn ACL, and the presence of a torn ACL should be considered a contraindication to a unicondylar knee replacement.

In summary, in addition to well-localized pain with no patellofemoral involvement, the indications for a unicondylar knee replacement include the following:

- Range of motion of no less than 110 degrees with no more than a 5-degree flexion deformity.
- A correctable varus on valgus deformity of no more than 5 degrees of varus or 15 degrees of valgus, with the correctability of the deformity to be determined on physical examination.
- An intact anterior cruciate ligament.
- Osteoarthritis localized to either the lateral or medial compartment, keeping in mind that the vast majority of unicondylar knee replacements are medial.
- For some fixed-bearing tibial component designs, a weight limit of 114 kg.

Based on the above, it is clear that not every patient with knee osteoarthritis is a candidate for a unicondylar knee replacement, and the final decision is up to the orthopaedic surgeon. Typically, only 10% to 20% of patients undergoing knee replacement are candidates for unicondylar knee arthroplasty.

Results

It is difficult to sort out the results for unicondylar knee arthroplasty, as there are different types of unicondylar knee arthroplasties. Additionally, it is difficult to distinguish between medial side versus lateral side procedures with respect to outcomes. Furthermore, one has to compare the results of a unicondylar knee replacement with other options such as a high tibial osteotomy and a standard total knee replacement. Again, various authors have reported varying degrees of success with unicondylar knee arthroplasty. Recently authors have reported 96% survival of the implant at a 10-year follow-up and excellent or good outcome in 92% of patients.[5]

Most recently Newman and colleagues[6] compared unicondylar knee replacement with total knee replacement in a prospective randomized control trial. This report stated that the 15-year survivorship for a unicondylar knee replacement was close to 90% compared with 80% for a total knee replacement. Additionally, the report stated that the unicondylar knee replacements had more "excellent" results and a better range of motion compared with the total knee replacement. Registry data, however, such as the Swedish Knee Replacement Registry, have shown a higher reoperation rate for unicondylar knee replacement, with the main reason for revision being progression of the arthritis. The results for revision of a unicondylar knee replacement to a full knee replacement are similar to the results for a primary total knee replacement, and even though unicondylar knee replacements may not last as long, the outcome of revision is better than that of a revision of total knee replacement.

Complications

The complications after a unicondylar knee replacement are similar to a total knee replacement. These complications include inadequate pain relief, deep venous thrombosis in 1% to 5% of patients, infection in less than 1% of patients, and unexplained pain about the knee.

Late complications include loosening of a component, subsidence of the component, degeneration of the other compartment resulting in pain, infection, polyethylene wear, and possible dislocation of the polyethylene component in a mobile-bearing knee replacement.

Patellofemoral arthroplasty

A patellofemoral replacement (**Figure 2**) is indicated for the management of isolated osteoarthritis of the patellofemoral joint. It has to be clear that this form of partial knee replacement is not indicated for patellofemoral pain in the absence of radiographically proven osteoarthritis.

Patient selection

Patellofemoral arthritis occurs in up to 9% of patients over the age of 40 and 15% of patients over 60.[7] Most patellofemoral pain or arthritis can be treated with nonoperative measures such as activity modification, physical therapy, analgesics, braces, and/or injections. Patellofemoral arthroplasty may be an option for patellofemoral arthritis when other treatment modalities have failed.

Patients with chondromalacia of the patella have been treated with arthroscopic debridement with limited success.[8] A patellectomy has been used in the past as well. Unfortunately, a patellectomy has its own set of problems, which include loss of extension power and increased risk of arthritis in the tibiofemoral compartment.

Indications

According to Lonner[9] the indications and contraindications for a patellofemoral arthroplasty are isolated patellofemoral osteoarthritis, posttraumatic arthritis, or advanced chondromalacia with eburnation on either or both of the trochlear and patellar surfaces. It is contraindicated in patients with medial or lateral joint line pain or tibiofemoral arthritis or chondromalacia. It is not felt to be appropriate for inflammatory arthritis or crystalline arthropathy. It should be used with extreme caution in a patient who has a highly malaligned patellofemoral articulation with a high Q angle and is thus at risk for dislocation.

Results

The component for patellofemoral arthroplasty consists of a metal trochlear component and a polyethylene button that replaces the articular surface of the patella. Good to excellent results have been reported in short, mid-term, and medium follow-up. The results are reported as being 80% to 90% good to excellent.[9]

Complications

The complications after a patellofemoral arthroplasty include patellar snapping and instability. Additionally the standard complications for unicondylar knee arthroplasty can be included. There can be ongoing residual anterior knee pain and dysfunction. There can be subsidence, polyethylene wear, or loosening. Long-term arthritis in the tibiaofemoral joint can also occur.

There is renewed interest in partial knee replacements with recently reported good long-term outcomes, complications similar to total knee replacement, and the fall-back option of a conversion to a total knee replacement.

Conclusions

Partial knee replacements may be an option for a select group of patients. There is renewed interest in partial knee replacements with recently reported good long-term outcomes, complications similar to total knee replacement, and the fall-back option of a conversion to a total knee replacement. For the unicondylar knee, it is a more conservative option with a fast recovery, good functional outcome, and is a possible good option to a high tibial osteotomy or total knee replacement. The unicondylar knee is most commonly done for isolated medial compartment osteoarthritis and has very specific indications. The patellofemoral arthroplasty is possibly indicated in patients with isolated patellofemoral arthritic pain. The limited reports on the patellofemoral arthroplasty suggest very good results.

Competing interests
None declared.

References

1. Kozinn SC, Scott R. Unicondylar knee arthroplasty. J Bone Joint Surg Am 1989; 71:145-150.
2. Pennington DW, Swienckowski JJ, Lutes WB, et al. Unicompartmental knee arthoplasty in patients sixty years of age or younger. J Bone Joint Surg. 2003;85-A:1968-1973.
3. Tabor OB Jr, Tabor OB, Bernard M, et al. Unicompartmental knee arthroplasty: Long-term success in middle-age and obese patients. J Surg Orthop Adv 2005;14:59-63.
4. Christensen NO. Unicompartmental prosthesis for gonarthrosis. A nine-year series of 575 knees from a Swedish hospital. Clin Orthop Relat Res 1991; 273:165-169.
5. Berger RA, Meneghini RM, Jacobs JJ, et al. Results of unicompartmental knee arthoplasty at a minimum of ten years follow-up. J Bone Joint Surg Am 2005; 87:999-1006.
6. Newman J, Pydisetty RV, Ackroyd C. Unicompartmental or total knee replacement. The 15-year results of a prospective randomized controlled trial. J Bone Joint Surg Br 2009;91:52-57.
7. Davies AP, Vince AS, Shepstone L, et al. The radiological prevalence of patellofemoral osteoarthritis. Clin Orthop Relat Res 2002;402:206-212.
8. Federico DJ, Reider B. Results of isolated patellar debridement for patellofemoral pain in patients with normal patellar alignment. Am J Sports Med 1997;25:663-669.
9. Lonner JH. Patellofemoral arthroplasty. In: Lotke PA, Lonner JH (eds). Master techniques in orthpaedic surgery: Knee arthroplasty. 3rd ed. Philadelphia, PA: Lippincott Williams and Wilkins; 2009:343-359.