Session 28: Revision TKA: Complicated Cases

Learning Objectives
Upon completion of this activity, participants should be able to:

1. Recognize extensor mechanism complications after total knee arthroplasty and discuss preferred treatment options for optimal functional reconstruction.

2. Recognize instability as a presenting complaint of failed total knee arthroplasty and discuss preferred treatment options using revision components with increasing degrees of constraint.

3. Recognize and assess periprosthetic fractures around total knee components to determine preferred treatment options based upon fracture repair or component revision.

Moderator
Vincent D. Pellegrini, MD
James L. Kernan Professor and Chair
Department of Orthopaedics
University of Maryland School of Medicine
Baltimore, Maryland

Periprosthetic Fractures: Treatment Options

David K. DeBoer, MD
Orthopaedic Surgeon
Southern Joint Replacement Institute
Nashville, Tennessee

Chief of Staff
Baptist Hospital
Nashville, Tennessee

Results With a Hinged Knee Arthroplasty

Mary I. O’Connor, MD
Chair & Associate Professor, Department of Orthopaedic Surgery
Mayo Clinic Florida
Jacksonville, Florida

Background & Premise of Talk: Hinged knee arthroplasty is an appropriate implant in very select patients. Indications for use of a hinged arthroplasty, with a standard femoral
component or modular segmental component (megaprosthesi) clinical results, and technical tips are reviewed.

Methods and Materials: Clinical examples of appropriate indications for use of a hinged knee arthroplasty are presented, and current clinical data reviewed.

Clinical Results: Indications for use of a hinged knee arthroplasty include massive bone loss, severe ligamentous instability, significant imbalance of the flexion-extension gap, absence of a functional extensor mechanism, revision of a previous hinged arthroplasty and complex fractures (particularly periprosthetic) in the elderly. In retrospective clinical studies both standard and megaprosthesi rotating hinge knee arthroplasty have been effective in managing complex knee problems but with high rates of complications. Postoperative range of motion is typically satisfactory, and the average Knee Society Score improved from approximately 40 to 77. Good to excellent functional outcomes were shown in only 33 of 44 knees (75%) in one series. Complication rates are significant, with 32% of patients in one series having at least one complication and prosthetic survival of 79.6% at 1 year and 68.2% at 5 years in another series. In treatment of distal femur fractures in the elderly, 42% of patients had died 1 year after injury but the survivors had regained their prior level of mobility.

Conclusion: Rotating hinge knee arthroplasty can be an effective procedure for patients with complex primary and revision knee arthroplasty and fracture challenges. The surgeon and patient should be aware of the high rate of complications associated with this salvage procedure. Careful patient selection and education regarding outcomes and risk is essential.

Clinical Relevance: Rotating hinge knee arthroplasty should remain in the armamentarium of the advanced knee reconstructive surgeon but used with caution.

References:
Patella Fractures Following Total Knee Arthroplasty

Kevin L. Garvin, MD
L. Thomas Hood Professor
Chairman, Department of Orthopaedic Surgery
University of Nebraska Medical Center
Omaha, Nebraska

Patella fractures are an unusual complication after total knee replacement, ranging from 0.3% up to 6%. The majority of patella fractures occur within 2 years of total knee replacement, implying that the fractures are related to the surgery and not to trauma. Specific risk factors have been grouped as patient related (body weight, increased activity, increased knee range of motion, osteoporosis, rheumatoid arthritis, steroids), implant design (large central patellar peg, type of fixation), or surgical technique (excessive bone resection, malalignment or maltracking or lateral release, asymmetric patella resection, increased patellar thickness).

The classification system of Goldberg et al helps direct the surgeon toward the most appropriate treatment for the patient. Type I fractures are marginal fractures not involving the prosthesis or compromising the extensor mechanism. Type II fractures disrupt the extensor mechanism or implant fixation. Type IIIa are inferior pole fractures with disruption of the patellar ligament, and Type IIIb are nondisplaced inferior pole fractures with an intact patellar ligament. Type IV fractures are lateral fracture dislocations of the patella or shear fractures. Fractures involving the extensor mechanism or loosening of the patellar implant (Type II, IIIa, IV) normally require surgical treatment. Marginal fractures, or those without extensor mechanism disruption, can be treated nonoperatively. It is also important for the surgeon to correct any malalignment at the time of surgery.

In one series of 16 surgically treated knees with major malalignment and patella fracture, results were satisfactory in only 4 knees. The authors attributed these poor results to persistent knee malalignment. Thus, the operative treatment of these patients must focus on restoring the malalignment and the integrity of the extensor mechanism. In patients with osteoporotic bone or a lack of bone for implant fixation, a patellectomy with extensor repair may be required. Rarely, extensor mechanism reconstruction with an allograft is required.

References:


Session 28
Extensor Mechanism Allograft Reconstruction in Total Knee Arthroplasty

Richard A. Berger, MD
Department of Orthopaedic Surgery
Rush Medical College
Chicago, Illinois

**Background:** Disruption of the extensor mechanism is an uncommon but catastrophic complication of total knee arthroplasty. We evaluated two techniques of reconstructing a disrupted extensor mechanism with use of an extensor mechanism allograft following total knee arthroplasty.

**Methods:** Twenty consecutive reconstructions with use of an extensor mechanism allograft consisting of the tibial tubercle, patellar tendon, patella, and quadriceps tendon were performed. The first 7 reconstructions (Group I) were done with the allograft minimally tensioned. The 13 subsequent procedures (Group II) were performed with the allograft tightly tensioned in full extension. All surviving allografts were evaluated clinically and radiographically after a minimum duration of follow-up of 24 months.

**Results:** All of the reconstructions in Group I were clinical failures, with an average postoperative extensor lag of 59° (range, 40° to 80°) and an average postoperative Hospital for Special Surgery knee score of 52 points. All 13 reconstructions in Group II were clinical successes, with an average postoperative extensor lag of 4.3° (range, 0° to 15°) \((P < .0001)\) and an average Hospital for Special Surgery score of 88 points. Postoperative flexion did not differ significantly between Group I (average, 108°) and Group II (average, 104°) \((P = .549)\).

**Conclusions:** The results of reconstruction with an extensor mechanism allograft after total knee arthroplasty depend on the initial tensioning of the allograft. Loosely tensioned allografts result in a persistent extension lag and clinical failure. Allografts that are tightly tensioned in full extension can restore active knee extension and result in clinical success. On the basis of the number of knees that we studied, there was no significant loss of flexion. Use of an extensor mechanism graft for the treatment of a failure of the extensor mechanism will be successful only if the graft is initially tensioned tightly in full extension.
**Critical Concepts:**

**Indications:**
- Disruption of the extensor mechanism (extensor lag) not amenable to or having failed a primary repair.
- Patellar tendon rupture, avulsion, or prior excision.
- Quadriceps tendon rupture, avulsion, or prior excision.
- Patellar fragmentation, nonreconstructible patellar fracture.
- Severe heterotopic ossification of the extensor mechanism.
- Previous patellectomy with a TKA and symptomatic extensor lag.
- Severe patella infera and arthrofibrosis of the extensor mechanism.
- Conversion of previous knee arthrodesis to a TKA with fibrosed or deficient extensor mechanism.

**Contraindications:**
- Ongoing infection or concurrent sepsis of TKA at or near the operative site.
- Reconstructible extensor mechanism with primary repair or local autogenous reinforcement tissue.
- An unreliable noncompliant patient unable to cooperate with postoperative rehabilitation.

**Pitfalls/Important Technique Notes:**
- A fresh frozen, nonirradiated allograft specimen consisting of a quadriceps tendon, patella, patella tendon, and tibial bone is required. It is preferable to have at least 5 cm of quadriceps tendon allograft for suture repair into the host quadriceps mechanism.
- We recommend using a midline approach through the extensor mechanism, anteriorly. Large medial and lateral flaps are developed that provide excellent tissue for closure over the extensor mechanism allograft. If there is native patella remaining, this is osteotomized transversely in line with the midline arthrotomy. The patella remnant is then shelled out and removed.
- Component revision is often necessary. It is important that the knee be able to be passively brought to full extension with the trial implants in place, in order to ensure full extension is attainable postoperatively.
- It is important that the proximal aspect of the allograft tibial bone and the bone trough on the native tibia be dove-tailed in order to lock/press-fit the allograft into the native tibia and resist proximal migration.
- When the allograft is sutured proximally into the native quadriceps, tension must be maintained on the allograft with the knee in full extension.
- It is not desirable to have an overly long allograft quadriceps tendon. A too long segment will end up being sewn proximally into the rectus femoris muscle, instead of into the host quadriceps tendon.
- The host retinaculum medial and lateral flaps should be sewn over the allograft as much as possible in order to cover the allograft.
The knee should not be flexed intraoperatively to assess the flexion of the construct. The patient is immobilized in full extension with touchdown weight bearing for 8 weeks and then begins a directed physical therapy program.

The allograft patella is not resurfaced in order to avoid creating a stress riser in it.

References:


Patella Maltracking

Paul F. Lachiewicz, MD
Professor of Orthopaedics
University of North Carolina, Chapel Hill

Orthopaedic Consultant
Chapel Hill, North Carolina

Maltracking of the patella component of total knee arthroplasty usually leads to complications such as subluxation-dislocation, fracture, excessive wear, or implant failure. Patella maltracking is usually a sign of some technical problems in the arthroplasty. These include incorrect rotation or alignment of the femoral or tibial components and incorrect resection or position of the patella component. The author recommends posterior-stabilized components, with the femoral component aligned with Whiteside’s lines (epicondylar axis), tibial component rotation determined by anatomic landmarks, and an asymmetric patella resection. A trial reduction to test patella tracking
is performed using a towel clip. A lateral retinacular release may be required for knees with excessive preoperative valgus alignment, severe patellofemoral arthritis, a preoperatively subluxed patella, or a very stiff knee. An Insall-type proximal realignment is reserved for those knees with a dislocated patella preoperatively, a history of recurrent patella dislocation or revision for maltracking-dislocation if the orientation of the components is correct.

The author performed 255 consecutive primary posterior-stabilized knees using an anatomic femur and 3-peg offset-dome patella. Component alignment was performed using Whiteside’s lines for the femoral component, medial border of the tubercle for the tibial component and previously reported\(^1\) techniques for the patella. The prevalence of lateral release was 6.6% and most knees requiring this had excessive preoperative valgus (mean 15°). At follow-up of 2 to 7 years (mean 3.5), there had been 3 patella fractures (1.2%) and no reoperations for the patellofemoral joint. Two patella components have radiographic loosening, but the patients are asymptomatic.

Patella maltracking is an avoidable problem in total knee arthroplasty. When treating a patient with obvious patella maltracking, it is necessary to evaluate the entire knee arthroplasty for alignment, component rotation, and stability. At reoperation for maltracking, the surgeon must be prepared to revise all components. A proximal realignment will usually be successful if component position is satisfactory.

References:

Case Presentations and Discussion
Richard A. Berger, MD; David K. DeBoer; Kevin L. Garvin, MD; Paul F. Lachiewicz, MD; Mary I. O’Connor, MD;

Please note that not all article abstracts for this session were available at time of printing.