

## CLASSIFICATION

### 1. Compartments Replaced

#### Unicompartmental: 1 component on medial OR lateral side

Predictors of success:

- No clinical symptoms in the contralateral compartment
- Noninflammatory osteoarthritis
- Unicompartmental degeneration
- Maximum of 10° varus or 5° valgus deviation from the mechanical axis; correctable
- Flexion contractures not exceeding 10°
- Intact ACL
- No signs of mediolateral subluxation
- No clinical patellofemoral symptoms
- Body mass index not exceeding 32

#### Bicompartmental: femoral and tibial components on median AND lateral sides

- Menisci and ACL are removed
- PCL removal is dependent on surgical approach
- Femoral and tibial components are typically metal with a polyethylene spacer

#### Tricompartmental: femoral, tibial, and patellar components

- Similar to bicompartmental with addition of polyethylene patellar button
- Patellar tilt or instability after surgery can reduce function and indicate revision surgery
- If patellar implant is too large, it constrains knee motion ("overstuffing"); implicated in postoperative flexion loss, patellar maltracking, excessive prosthetic wear, and pain

### 2. Fixation

#### Cemented

- Most common

#### Noncemented

- Longer rehabilitation required
- Bone growth needed for stability

#### Hybrid

- Cemented tibial and patellar components
- Noncemented femoral component

### 3. Surgical Approach

#### Medial Parapatellar (Paramedian)

- May contribute to quadriceps muscle weakness

#### Minimally Invasive Surgery (Quadriceps Sparing)

- Higher incidence of implant malposition
- Delayed wound healing
- Periloprosthetic fractures
- Patellar fractures
- Superficial infection
- Partial weight-bearing and bracing with limited flexion

#### Midvastus

- Minimizes quadriceps trauma

#### Lateral

- Technically challenging

#### Subvastus

- Decreased postoperative pain
- Better immediate postoperative knee flexion
- Earlier active SLR
- Better patellar tracking
- Improved early quadriceps force
- Higher patient satisfaction
- Faster recovery of ADLs

### 4. PCL Sparing or Sacrificing

#### PCL Sparing

- PCL retains function, maintaining femoral rollback and adding to knee stability
- More anatomically correct femoral rollback
- No evidence of different outcome

#### PCL Sacrificing

- Posterior-stabilized design with PCL function replaced with cam-and-post mechanism
- When flexed, the cam-on-femoral component comes against tibial post and blocks anterior translation of femur
- Allows femoral rollback kinematics similar to that of normal knee
- Better overall pain, knee function, and strength

## SCREENING

DVT leading to PE occurs at a rate of 41%, infection occurs at a rate of 1.5% (about 18% of failures), and mortality occurs at a rate of 53%

### DVT

- Most common reason for readmission post-TKA
- Greatest risk: first week after surgery
- Frequently asymptomatic; first clinical manifestation can be PE
- 15% higher risk every decade after 50 years of age
- Proximal DVT is associated with more serious potential for fatal PE
- Wells et al clinical prediction rule assesses likelihood of DVT
- Venography better diagnostic tool early after orthopedic surgery
- Prevention combines pharmacological thromboprophylaxis agents, mechanical compression devices and support stockings, and expanded use of regional anesthesia

### TKA Failure/Revision

- Expectations reduce (poorer outcomes 6 months and beyond)
- Lower scores on outcome measures for pain and activity
- Seen more often with greater medical comorbidities
- 82% aseptic: extensor mechanism rupture, stiffness, instability, fracture, loosening, patellar complications and malrotation, implant fracture

### Infection

- Higher in TKA than in total hip arthroplasty
- Risk factors: revision surgery, rheumatoid arthritis, diabetes mellitus, obesity, poor nutrition, immunosuppressive medication, and presence of psoriatic skin lesions
- Signs and symptoms: low-grade fever, night sweats, high skin temperature of the knee, redness, or drainage from the incision with or without red streaks, hardening of the incision, swelling, severe pain, malaise, or delayed healing
- Routine prophylaxis with antibiotic in some cases 2 years following TKA recommended
- Two most common forms: staphylococcus epidermis and aureus
- Acute infections undergo irrigation and debridement with retention of components if possible (success 10%-50%)
- Failure can include staged procedure of: removal of components and spacer implant, and revision surgery when joint is clear of infection

## EXAMINATION

### Impairments

#### Skin Integrity

- Wound development is increased due to increased comorbidities (eg, obesity, poor nutritional status, multiple prior incisions, rheumatoid arthritis, steroid use, peripheral vascular disease, lengthy tourniquet times during surgery, immunocompromised state)
- Skin necrosis can lead to infection of components
- Persistent wound drainage (>4 days after surgery) may indicate infection; requires immediate referral
- Sudden drainage from a dry wound requires immediate referral
- Increased skin tension may delay wound healing; may affect ability to perform aggressive continuous passive ROM

### Postoperative Complications

Complications	Rate of Occurrence	Signs/Symptoms
Stiff Knee	1%-15%	<ul style="list-style-type: none"> <li>• Flexion contracture <math>\geq 10^\circ</math> or a total arc of motion <math>&lt; 95^\circ</math></li> <li>• Risk factors: diabetes, lung disease, rheumatological disease, chronic regional pain syndrome, smoking, limited preoperative ROM, prior history of multiple surgeries</li> <li>• Intraoperative factors: errors in soft tissue balancing of flexion and extension gaps, wrong sizing or malrotation of implants, malalignment of components, PCL mismanagement resulting in a tight PCL, incorrect bone cuts, or failure to divide the posterior capsule</li> <li>• Postoperative risk factors: Heterotropic ossifications, arthrofibrosis, infection</li> </ul>
Peripheral Nerve Injury	0.01%	<ul style="list-style-type: none"> <li>• Dorsal lateral foot burning or hypersensitivity, dorsiflexor and evetor weakness</li> <li>• 68% had complete recovery after 18 months</li> </ul>
Infection	1.55% within 2 years 0.46% between 2 and 10 years post-TKA	<ul style="list-style-type: none"> <li>• Low-grade fever, night sweats, high skin temperature of the knee, redness or drainage from the incision with or without red streaks, hardening of the incision, swelling, severe pain, malaise, or delayed healing</li> </ul>
Quadriceps Tendon Rupture	0.1%	<ul style="list-style-type: none"> <li>• Avulsion of patellar tendon-tibial tubercle junction, leading to poor outcomes</li> <li>• Partial tears managed nonoperatively with immobilization for 6-8 weeks with better outcomes</li> </ul>

KEY:  
 6MWT=6-Minute Walk Test  
 ACL=anterior cruciate ligament  
 ADL=activities of daily living  
 DVT=deep venous thrombosis  
 HEP=home exercise program  
 KOOS=Knee Injury and Osteoarthritis Outcome Score (an extension of WOMAC)  
 KOS-ADLs=Knee Outcome Score-Activities of Daily Living  
 KSS=Knee Society Score  
 LEFS=Lower Extremity Functional Scale  
 PCL=posterior cruciate ligament  
 PE=pulmonary embolism  
 ROM=range of motion  
 SLR=straight leg raise  
 TUG=Timed "Up & Go"  
 WOMAC=Western Ontario and McMaster Universities Osteoarthritis Index

### Activities

#### KOOS

- Used to capture higher level of function for younger and more active individuals
- 42-item questionnaire with pain, other symptoms, function in daily living, function in sport and recreation, and knee-related quality of life subscales
- 100=best possible function

#### WOMAC

- 5 minutes to complete
- 24 items grouped into 3 dimensions: pain, stiffness, and physical function
- 0=best possible level of knee function

#### TUG

- Time to raise from an armchair, walk 3 m, turn, and return to sitting in the same chair without physical assistance
- Good interrater and intrarater reliability

#### KSS

- Questionnaire with 2 sections; one on knee joint and one on function
- Each scored 0-100; 100=best possible score
- Less responsive than WOMAC or SF-36

#### LEFS

- 20-item region-specific questionnaire regarding LE function
- Scored 0-80; 80=best outcome
- More responsive than WOMAC in subacute, post-op period

#### 6MWT

- Measures distance walked in 6 minutes by walking laps of 100 feet
- Excellent test-retest reliability

#### Stair Climb Test

Time taken to ascend and descend one flight of stairs  
 Correlates with TUG

#### KOS-ADLs

- Used to assess how symptoms and limitations affect ADLs
- 17 items
- 100%=best score possible
- ICC=.97 and good responsiveness and validity

## INTERVENTION

### Rehabilitative Strategies

#### Perioperative (Hospital)

- Average length stay: 4 days  
 Having procedure at joint center reduces risk of complications by 50%
- Out of bed first postoperative day for 4 hours of physical therapy and 8 hours daily thereafter
  - Reduced length of stay; increased ROM
  - Goals: pain reduction, education on restrictions, safety with walking and stairs, self-care and incision management, home exercise program, and meeting knee flexion milestones

#### Early Postoperative

Includes home health emphasizing neuromuscular reeducation and ROM

#### Postoperative

Outpatient physical therapy follows home health, emphasizes quadriceps recovery, functional mobility, pain management, and ROM

#### Swelling Cryotherapy

#### ROM

- Continuous passive ROM (achieves 5° more ROM at 2 weeks after discharge but no difference 6 weeks or 3 months later)
- Stairs require 85° flexion, standing 95°, and kneeling 125-135°
- Knee flexion ROM should measure within 5°-10° of preoperative range after rehabilitation
- Goal: 120-125° flexion
- Passive low-load stretch for extension
- Passive and active ROM with bike for flexion
- Flexion contractures occur in up to 15% of patients

#### Joint Motion

- Patellar subluxation is possible
- Need to assess patellofemoral mobility for hypomobility
- Tibiofemoral joint mobilization research is unavailable but needed

#### Quadriceps Strength

- Deficits of 20%-65% are seen after TKA due to muscle atrophy and muscle activation failure
- Gains of 25%-70% are seen in rehabilitation
- Use of neuromuscular electrical stimulation (NMES) at 60° knee flexion

#### Pain/Taping

- Patellofemoral taping may reduce 50%-80% of pain complaints
- Discontinue if no resolution

### Compensatory/Adaptive Strategies

#### Allowed

Bowling  
 Stationary cycling  
 Ballroom dancing  
 Golf  
 Shuffleboard  
 Swimming  
 Normal walking  
 Canoeing  
 Road cycling  
 Square dancing  
 Hiking  
 Speed walking

#### Allowed with Experience

Ice Skating  
 Stationary skiing  
 Doubles tennis  
 Rowing  
 Cross-country skiing  
 Horseback riding  
 Downhill skiing

#### No consensus

Weight Lifting  
 Fencing  
 Roller skating  
 Baseball  
 Gymnastics  
 Handball  
 Hockey  
 Rock climbing  
 Squash/raquetball  
 Singles tennis  
 Weight machine

#### Not Recommended

Jogging  
 Basketball  
 Football  
 Soccer  
 Volleyball

### Prevention

#### Aseptic Component Loosening

- Complication that occurs years after surgery
- Common reasons: wear of polyethylene liner, cement fracture, and metal debris
- Osteolysis without symptoms can occur, becoming symptomatic when joint becomes unstable
- Diagnosis through spiral computed tomography (CT)
- Treatment often requires revision surgery