## Clinical Management of Total Knee Arthroplasty (TKA)

### Classification

#### 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  
- 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

#### fixation

**Cemented:**  
- Most common

**Noncemented:**  
- Longer rehabilitation required  
- Bone growth needed for stability

**Hybrid:**  
- Cemented tibial and patellar components  
- Noncemented femoral component

### Surgical Approach

**Medial Parapatellar (Paramedian):**  
- May contribute to quadriceps muscle weakness

**Midvastus:**  
- Minimizes quadriceps trauma

**Lateral:**  
- Technically challenging

**Minimally Invasive Surgery (Quadriceps Sparing):**  
- Higher incidence of implant malposition  
- Delayed wound healing  
- Periprosthetic fractures  
- Patellar fractures  
- Superficial infection  
- Partial weight-bearing and bracing with limited flexion

### 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**  
- 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
### Skin Integrity

- Wound development is increased due to increased comorbidities (e.g., 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

<table>
<thead>
<tr>
<th>Complications</th>
<th>Rate of Occurrence</th>
<th>Signs/Symptoms</th>
</tr>
</thead>
</table>
| Stiff Knee         | 1%-15%             | - Flexion contracture ≥10° or a total arc of motion <95°  
|                    |                    | - Risk factors: diabetes, lung disease, rheumatological disease, chronic regional pain syndrome, smoking, limited preoperative ROM, prior history of multiple surgeries  
|                    |                    | - 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  
|                    |                    | - Postoperative risk factors: Heterotopic ossifications, arthrofibrosis, infection                                                                                                                                |
| Peripheral Nerve Injury | 0.01%       | - Dorsal lateral foot burning or hypersensitivity, dorsiflexor and evertor weakness  
| Infection          | 1.55% within 2 years 0.46% between 2 and 10 years post-TKA | - 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  
| Quadriceps Tendon Rupture | 0.1%          | - Avulsion of patellar tendon-tibial tubercle junction, leading to poor outcomes  
|                    |                    | - Partial tears managed nonoperatively with immobilization for 6-8 weeks with better outcomes                                                                                                                |

**KEY:**

- 6MWT=6-Minute Walk Test
- ACL=anterior cruciate ligament
- ADL=activities of daily living
- DVT=deep venous thrombosis
- HEP=home exercise program
- KI-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
## Clinical Management of Total Knee Arthroplasty (TKA)

### 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

### Compensatory/Adaptive Strategies

<table>
<thead>
<tr>
<th>Allowed</th>
<th>Allowed with Experience</th>
<th>No consensus</th>
<th>Not Recommended</th>
</tr>
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<tbody>
<tr>
<td>Bowling</td>
<td>Ice Skating</td>
<td>Weight Lifting</td>
<td>Jogging</td>
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<tr>
<td>Stationary cycling</td>
<td>Stationary skiing</td>
<td>Fencing</td>
<td>Basketball</td>
</tr>
<tr>
<td>Ballroom dancing</td>
<td>Doubles tennis</td>
<td>Roller skating</td>
<td>Football</td>
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<tr>
<td>Golf</td>
<td>Rowing</td>
<td>Baseball</td>
<td>Soccer</td>
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<tr>
<td>Shuffleboard</td>
<td>Cross-country skiing</td>
<td>Gymnastics</td>
<td>Volleyball</td>
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<tr>
<td>Swimming</td>
<td>Horseback riding</td>
<td>Handball</td>
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<tr>
<td>Normal walking</td>
<td>Downhill skiing</td>
<td>Hockey</td>
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<tr>
<td>Canoeing</td>
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<td>Rock climbing</td>
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<td>Road cycling</td>
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<td>Squash/raquetball</td>
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<td>Square dancing</td>
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<td>Singles tennis</td>
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<tr>
<td>Hiking</td>
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### 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

### 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

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### Swelling
- Cryotherapy

- Continuous passive ROM (achieves 5° more ROM at 2 weeks after discharge but no difference 6 weeks or 3 months later)
- Stairs require 65° flexion, standing 95°, and kneeling 125-135°
- Knee flexion ROM should measure within 5°-10° of preoperative range after rehabilitation
- Goal: 120-125° flexion

### ROM
- Passive low-load stretch for extension
- Passive and active ROM with bike for flexion
- Flexion contractures occur in up to 15% of patients

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