The Painful TKA

Brian T. Palumbo, M.D.
Florida Orthopaedic Institute
Department of Hip and Knee Reconstruction
Assistant Professor at University of South Florida
Department of Orthopaedic Surgery
Disclosure

Consultant:

DJO Orthopaedics

Zimmer Orthopaedics
Objectives

- Introduction and Expectations in TKA
- Identifying the Painful TKA
- Causes for TKA pain
- Management of the Painful TKA
Knee Arthritis Defined

- Progressive deterioration and loss of articular cartilage with reactive bone changes of the joint margin and subchondral bone.

Standard of Care: Osteoarthritis of the Knee
The Brigham and Women's Hospital. Department of Rehabilitation Services.
Defined

• Etiology Multifactorial
  – Age
  – Weight
  – Genetics
  – Activity
  – Previous Injury

• Genu varum or valgum likely to impact disease severity

Epidemiology

• Knee osteoarthritis –
  – Most common joint disease causing disability
  – Effects more than 7 million people in the United States

Deyle et al. Phys Ther. 2005
Total Knee Arthroplasty

- Resection of arthritic bone and resurfacing with metal femoral and tibial components
- Metal femur articulates on polyethylene tibial component
Primary TKA expected to grow to >3 million by 2030!!

The projected number of primary total hip arthroplasty (THA) and total knee arthroplasty (TKA) procedures in the United States from 2005 to 2030.

Kurtz. 2007
Demand for Performance
PERFECT
P.C. Noble - 2006

- 253 TKAs at minimum of 1 year post-op
- 75% patients satisfied with TKR
- 14% dissatisfied with TKR
- Activity level determines Satisfaction!

Noble, Philip C PhD
Chronic Pain After TKA is NOT Normal!!
Outcome Factors
Why Are Total Knees Failing Today? Etiology of Total Knee Revision in 2010 and 2011

William C. Schroer, MD\textsuperscript{a}, Keith R. Berend, MD\textsuperscript{b}, Adolph V. Lombardi, MD\textsuperscript{b}, C. Lowry Barnes, MD\textsuperscript{c}, Michael P. Bolognesi, MD\textsuperscript{d}, Michael F. Berend, MD\textsuperscript{e}, Merrill A. Bitter, MD\textsuperscript{e}, Ryan M. Nunley, MD\textsuperscript{f}

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
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<tbody>
<tr>
<td>All Patients</td>
<td>844</td>
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<tr>
<td>Aseptic Loosening</td>
<td>263</td>
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<tr>
<td>Instability</td>
<td>158</td>
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<tr>
<td>Infection</td>
<td>137</td>
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<tr>
<td>Poly Wear</td>
<td>84</td>
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<tr>
<td>Arthrofibrosis</td>
<td>59</td>
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</table>
Causes for a Painful TKA

- Infection
- Instability
- Aseptic Loosening
- Wear and Osteolysis
- Arthrofibrosis or stiffness
Periprosthetic TKA Infection
Periprosthetic TKA Infection

- Bacterial infection of the TKA prosthesis
- Implants are avascular and incapable of eradicating organism
Periprosthetic TKA Infection

• Especially difficult to treat and to eradicate
• Biofilm- extracellular matrix consisting of DNA, protein and polysaccharides
  – Impenetrable to antibiotic therapy
Acute Periprosthetic TKA Infection

- Acute- <6 weeks after the onset of infectious symptoms
- Inoculation
  - At time of index procedure
  - Acute post-op period with wound contamination
  - Hematologic seeding
Acute Periprosthetic TKA Infection

• Signs and Symptoms
  – Increasing knee pain
  – Drainage
  – Wound dehiscence

• Systemic illness
  – Fever
  – Chills
  – Nausea/vomiting
Acute Periprosthetic TKA Infection

• **Diagnosis**
  – Serum inflammatory markers
    • CBC with diff, CRP and ESR
Acute Periprosthetic TKA Infection

• Diagnosis
  – Knee Aspiration (performed by the treating surgeon)
    • Gross pus
    • Synovial fluid cell count with differential
      – WBC >2500 cells/μL
      – >60% PMNs
    • Synovial alpha defensin
Tips and Pearls

• If concerned for an acute infection
  – Refer patient back to treating surgeon for surgical management
  – DON’T start PO antibiotics unless cleared by surgeon!
  – If concerned patient not receiving adequate treatment.....refer to tertiary center/surgeon
THE BEST DEFENSE IS A GOOD OFFENSE.
Acute Periprosthetic TKA Infection

• Prevention!!-
  – Patient screening optimization
    • Obesity – BMI <40 kg/M²
      – Or lose 10%
    • Diabetes- A1C < 7.5
    • Albumin > 3.5 mg/dL
    • Decrease or stop tobacco
Tips and Pearls

• Periprosthetic infection risk reduction begins with the PCP!
  – “Patient is cleared for surgery”
    • Hgb= 9
    • HgA1C = 9.5
  – Once diagnosis of advanced knee arthritis is made...optimize and inform!!
Acute Periprosthetic TKA Infection

• Treatment
  – ONLY OPERATIVE
    • Starting antibiotics without surgical evaluation is deleterious
Acute Periprosthetic TKA Infection

• Acute Treatment
  – <6 weeks-
    • I+D, modular exchange and 6 wk course of IV abx
      – Approx. 50% effective
        » Surgical experience
        » Patient comorbidities
        » Organism virulence
Chronic Periprosthetic TKA Infection

- Infection > 6 weeks
  - Often diagnosed months or years after TKA
Chronic Periprosthetic TKA Infection

• Signs and Symptoms-
  – Worsening pain
    • Since the time of surgery
  – Joint warmth
  – Draining sinus
  – Arthrofibrosis or stiffness
  – Fevers/chills
Tips and Pearls

• Best managed a tertiary centers with fellowship trained arthroplasty surgeons
Chronic Periprosthetic TKA Infection

- Treatment
  - Gold standard -
    - Two-stage reconstruction
      - 1<sup>st</sup> Stage
        » Resection of prosthesis and wound debridement
        » Implantation of antibiotic spacer for 6 weeks to 3 months
Chronic Periprosthetic TKA Infection

- **Treatment**
  - Gold standard-
    - Two-stage reconstruction
      - 2\textsuperscript{nd} stage
        » Resection of spacer and debridement
        » Re-implantation of revision TKA
    - 80% effective
Causes for a Painful TKA

- Infection
- Instability
- Aseptic Loosening
- Wear and Osteolysis
- Arthrofibrosis or stiffness
What is instability?

Excessive Medial Tightness
Why Are Total Knees Failing Today? Etiology of Total Knee Revision in 2010 and 2011

• Revision knee data from six joint arthroplasty centers to determine mechanism of failure and time to failure.

• 844 Revision TKAs between January 1, 2010 and December 31, 2011
TKA Instability

Under diagnosed!!!

- Severe disabling pain
- Most clinical and lab data is normal
- X-rays show well implanted TKA

- “Patient is CRAZY!”

Instability
The Unstable TKA

- Worsening pain with activity throughout day
- Painful since the time of surgery and increases over years
- Improved with rest
- Knee gives out/falls
- X-rays often normal
X-Rays Normal
X-Rays Normal
TKA Instability Treatment

• Conservative-
  – Observe for at least 1 year for improvement
  – T-ROM hinged knee brace
  – Physical therapy
    • Secondary stabilizer strengthening

• Generally not effective!!
TKA Instability Treatment

• Revision TKA
  – Re-balance the collateral ligaments
  – Constraining implants if collaterals incompetent
Causes for a Painful TKA

- Infection
- Instability
- Aseptic Loosening
- Wear and Osteolysis
- Arthrofibrosis or stiffness
Aseptic Loosening

Loosening of the cement or ingrowth fixation interface between implant and bone
Aseptic Loosening

• Causes-
  – Young/Active Patients
  – Obesity
  – Component malposition
  – Instability
  – Poor cementation technique
Aseptic Loosening

• Diagnosis
  – Often occurs years after surgery
  – Pain often constant but worsened with activity
  – Radiographic diagnosis
Aseptic Loosening

Diagnosis

– Triple phase bone scan may be helpful
Aseptic Loosening

- Treatment
  - Revision of loose components
  - May be complex with severe bone loss
Causes for a Painful TKA

- Infection
- Instability
- Aseptic Loosening
- Wear and Osteolysis
- Arthrofibrosis or stiffness
Wear and Osteolysis

<table>
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<th>Particle Generation</th>
<th>Biochemically Mediated Response</th>
<th>Osteoclastic Destruction of Bone</th>
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</table>


Particle Generation

- Polyethylene Particles
  - Formed by:
    - Articulating surfaces
    - Modular interfaces
Particle Generation

- Biologic response to particles dependent:
  - Size
  - Shape
  - Composition
  - Concentration of particles
Particle Generation

Bone

Osteoclast differentiation and activation
Osteolytic Lesion
Osteolysis

Femur
Lateral Condyle
Treatment for Wear and Osteolysis

- Observation for wear and osteolysis
- Revision TKA
  - Wear is severe
  - Progressive osteolysis
Causes for a Painful TKA

- Infection
- Instability
- Aseptic Loosening
- Wear and Osteolysis
- Arthrofibrosis or Stiffness
Arthrofibrosis

- Incidence = approx. 5-10%
- Diminished motion after TKA that impacts return to function

Arthrofibrosis

- Progressive development of adhesions in the acute post-operative period (0-3 months)
- Inadequate progression of flexion and extension permits buildup and stiffness
Arthrofibrosis

Etiology

- Patient Factors
  - Narcotic use
  - Poor compliance
  - Lack of social support
  - Previous surgeries
  - Pre-op ROM
Arthrofibrosis

Etiology

• Surgical Factors
  – Surgical technique
  – Implant design
  – Post-op complications
    • Hematoma/infection/etc.
Arthrofibrosis

Etiology

- Post-operative Factors
  - Home health/PT
  - Rehab facilities
Arthrofibrosis

• Severe pain and disability
  – Difficulty sitting
  – Climbing stairs
  – Squatting
  – Impacts
  ADLs/Recreational activities
Tips and Pearls

• Post-op Tips to Reduce Stiffness
  – Adequate management of pain...
    • NSAID’s most effective
  – Educate to frequently flex and extend knee throughout the day...Don’t wait for the therapist
Arthrofibrosis

• Timeline
  – 3 months to obtain functional motion
    • 2 weeks- >90°
    • 6 weeks- >115°
Treatment of Arthrofibrosis

- Conservative management
- <90° at 2 weeks
  - Education!
  - Attentive physical therapy
  - Extensionator/flexionator
Treatment of Arthrofibrosis

• <90 ° at 6 weeks
  – Conservative management likely ineffective
  – Consider MUA and/or arthroscopic lysis of adhesions
Treatment of Arthrofibrosis

- Back to work!
  - Education!
  - Attentive physical therapy
  - Extensionator/flexionator
Treatment of Arthrofibrosis

- Recalcitrant Arthrofibrosis
  - Multiple attempts at MUA/LOA and therapy
  - Evaluate for surgical factors contributing for stiffness
Treatment of Arthrofibrosis

• “There is nothing else we can do? “
  – Wrong!!
  – Instability
  – Patella overstuffing
  – Infection
Treatment of Arthrofibrosis

• Recalcitrant Stiffness
  – May require revision to correct pathology leading to stiffness
Summary

• Periprosthetic TKA infection is a complicated life altering complication
• Infections are best prevented by pre-op screening
• Treatment of infections is primarily surgical and should not be delayed or prolonged with PO abx therapy
Summary

• TKA instability is a common yet often under diagnosed, disabling condition
• A second opinion should be sought out if there is concern for instability
• Aseptic loosening is the debonding of the implant from the bone and necessitates revision
• Osteolysis is bone destruction due to an inflammatory reaction to polyethylene debris
Summary

- TKA ankylosis difficult issue that is best managed acutely with patient education and attentive therapy
- Chronic ankylosis may require revision surgery to correct the inciting pathology
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