The Painful TKA: Are we going to experience an epidemic?

David R. Mauerhan, MD
Department of Orthopedic Surgery
Carolinas Health Care System

Disclosures

• Biomet: Consultant, royalty recipient
• Chairman, Quality Committee, American Association of Hip and Knee Surgeons
• Reviewer, Journal of Arthroplasty

The Painful TKA

• Discuss the scope of the problem
• Review some of the more relevant and significant causes
• Discuss Surgeon Factors
• Discuss Patient Factors

Total Knee Arthroplasty

85% satisfaction rate
Low complication rate
Excellent long term outcome, registry reported
“It gave me back my life”
So, What’s the Problem?

- 44% of TKA patients report pain of any severity 3-4 yrs PO
- 15% severe-extreme persistent pain

Wylde, V. et al, Pain 152(3) March 2011

Common Severe Problems

- Persistent Pain 20%
- Pain walking 17%
- Problems kneeling 57%
- Shopping 16%

Baker, P.N. et al, JBJS 89B July 2007

NJR (UK)

- 7% TKA patients not satisfied
- 11% unsure

Baker, P.N. et al, JBJS 89B July 2007

The Concerning Issue

- 7.4% had another surgery on the TKA
- 18% another surgery was planned
- 27% had problems with the knee

Baker, P.N. et al, JBJS 89B July 2007
**How’s the Patient Doing?**

- Most studies are surgeon reported
- Most registries report revision rates as failure
- Few have outcome measures (NZJR)
- We lack large patient reported outcome data bases
- Discordance between surgeon and patient reported outcomes

---

**“Predicting Dissatisfaction Following Total Knee Replacement Prospective Study of 1217 patients”**

- Very satisfied 55% → 82%
- Satisfied 27% → 19%
- Unsure 13% → 19%
- Dissatisfied 6% → 19%

Scott, C.E.H et al, JBJS 92B Sept. 2010

---

**“Patient Satisfaction after Total Knee Arthroplasty: Who is Satisfied and Who is Not”**

- 19% dissatisfied
- Satisfaction with:
  - Pain relief: 72-86%
  - Function: 70-84%

Bourne, R et al, CORR Jan. 2010
“Patient Satisfaction after Total Knee Arthroplasty: Who is Satisfied and Who is Not”

Strongest Predictors of Dissatisfaction

- Expectations not met 10.7x greater
- Low 1 yr WOMAC 2.5x
- Preoperative pain at rest 2.4x
- Postop complication with readmission 1.9x

Bourne, R et al, CORR Jan. 2010

“High Level of Residual Symptoms in Young Patients with Total Knee Arthroplasty”

661 patients—multicenter
1 to 3 year PO TKA

90% satisfied

66% felt the knee was “normal”

Parvizi, J et al, Knee Society, AAOS, 2013

How About TKA in the United States?

“High Level of Residual Symptoms in Young Patients with Total Knee Arthroplasty”

- Some degree of pain 32.5%
- Stiffness 40.8%
- Grinding/noise 33.4%
- Swelling or tightness 32.5%
- Difficulty in/out of car 37.9%
- Difficulty in/out of chair 30.7%
- Difficulty with stairs 54%
- No limp 47%
What about Patient TKA Volumes in the USA

"Total Knee Arthroplasty Volume, Utilization, and Outcomes Among Medicare Beneficiaries, 1991-2010"

- 161.5% increase in primary TKA
  ~ double per capita utilization
  31 to 62 per 10,000
- 106% increase in revision TKA
  ~ 59% increase in utilization
  3.2 to 5.1 per 10,000


Unadjusted Outcomes 1991-2010

<table>
<thead>
<tr>
<th>Complications within 30 days of discharge</th>
<th>1991-1994</th>
<th>2007-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>0.5 (0.4-0.5)</td>
<td>0.3 (0.3-0.3)</td>
</tr>
<tr>
<td>PE</td>
<td>0.2 (0.2-0.2)</td>
<td>0.3 (0.3-0.3)</td>
</tr>
<tr>
<td>DVT</td>
<td>0.4 (0.4-0.4)</td>
<td>0.4 (0.4-0.4)</td>
</tr>
<tr>
<td>wound infection</td>
<td>0.7 (0.6-0.7)</td>
<td>0.4 (0.4-0.4)</td>
</tr>
<tr>
<td>sepsis</td>
<td>0.1 (0.1-0.1)</td>
<td>0.2 (0.2-0.2)</td>
</tr>
<tr>
<td>hemorrhage</td>
<td>0.1 (0.1-0.1)</td>
<td>0.3 (0.3-0.3)</td>
</tr>
<tr>
<td>MI</td>
<td>0.2 (0.2-0.2)</td>
<td>0.3 (0.3-0.3)</td>
</tr>
<tr>
<td>Composite outcome</td>
<td>1.9 (1.9-2.0)</td>
<td>1.9 (1.9-1.9)</td>
</tr>
<tr>
<td>All cause readmission 30 days</td>
<td>4.2 (4.1-4.2)</td>
<td>5.0 (4.9-5.0)</td>
</tr>
</tbody>
</table>

Patient Characteristics 1991-2010

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>10.5</td>
<td>24.2</td>
</tr>
<tr>
<td>Renal failure</td>
<td>0.4</td>
<td>6.8</td>
</tr>
<tr>
<td>CHF</td>
<td>3.4</td>
<td>7.9</td>
</tr>
<tr>
<td>Obesity</td>
<td>4.0</td>
<td>10.1</td>
</tr>
</tbody>
</table>

No. of comorbid conditions, mean (SD)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.2 (1.2)</td>
<td>2.3 (1.5)</td>
</tr>
</tbody>
</table>
“Estimating the Burden of Total Knee Replacement in the United States”

- Validated computer simulation model of knee OA
- Data on annual TKA utilization
- Estimate prevalence of primary and revision TKA on adults ≥ 50 years in US

Weinstein, AM, et al. JBJS Am 95, March 2013

How many are there?

- 4,000,000,000 adults in US with TKA
- 3.5 million with intact primary TKA
- 500,000 with revised TKA

Projections for Primary TKA in US

Weinstein, AM, et al. JBJS Am 95, March 2013

Kurtz, S et al. JBJS 89A April 2007
TKA in the US

Kurtz, S et al JBJS 89A April 2007

So what does this imply?

• 600,000 knees annually---more to come
• 3.5 million US adults ≥ 50 yrs with TKA

10-20% of patients are dissatisfied
15% with significant pain at 3-4 years

Orthopedic Work force

• 23,000-24,000 AAOS members
• 7% primarily knee and hip
• 52% do some area of knee surgery
• Assume 40% do some TKA.
• Roughly 9600 surgeons caring for TKA patients

9 to12 patients/yr/surgeon

More likely many more for TKA specialists

60,000-120,000 Patients a year are dissatisfied with their TKA and.....

90,000 have significant pain which compromises their result

This number is increasing annually
Epidemic
An epidemic occurs when new cases of a certain disease, in a given human population, and during a given period, substantially exceed what is expected based on recent experience.

Managing the Patient with a Painful TKA
• Understanding the causes
• Understanding surgeon factors
• Understanding patient factors
• Creating treatment algorithms that allow efficient and compassionate care

Painful TKA is significant problem

Painful TKA
Common causes
• Infection
• Aseptic loosening
• Instability
• Patellofemoral problems
• Periprosthetic osteolysis
• Component failure

Painful TKA
Less Common Causes
• Particulate induced synovitis
• Peripatellar scar/patellar clunk
• Regional Pain Syndrome
• Arthrofibrosis
• Hemarthrosis
• Femoral or Tibial overhang
• Popliteus snapping/fabellar impingement
• Heterotopic ossification
• Extra-articular tendonitis/impingement
• Cutaneous neuroma formation

Early
Late
Work up always begins with a good history

- Did the wound heal without problems?
- Was there ever a pain free interval?
- Does it hurt all the time? Relieved by rest?
- Worse with activity? Start up pain?
- Does it swell or feel full of fluid?
- Does it give way or feel as if it will?
- Trouble with stairs or walking up and down grade?
- Is there noise: snapping, popping, clicking, grinding?

Then moves to a targeted exam

- Inspection and palpation
- ROM and stability
- Patellar tracking/grinding
- Examine the spine and the ipsilateral hip
- Relevant neurological and vascular exam

Could this be referred pain?

Painful TKA
Always look for other source of pain

6 mo S/P R TKA Rev

Painful TKA
Always look for other source of pain

5 years S/P PKA with lateral knee pain
Painful TKA
First and Foremost Exclude

**Infection**

ESR, CRP
Aspirate Joint
>2500 WBC, >60% PMN
**Culture**

Infected TKA
2 Stage Reimplantation

**Current gold standard**

Aseptic Loosening

- Start up pain-initially
- Walking pain as loosening progresses
- Usually relieved by rest
- Background ache

Aseptic Loosening
The value of sequential X-rays
Aseptic Loosening

• Good quality tangential view to bone-prosthetic interface

• Failure of bone ingrowth in Hybrid TKA

Aseptic Loosening

• Radiolucent line bone-prosthetic interface

• Angular change-migration of tibial component

• Proximal migration femoral component

Aseptic Loosening

Periprosthetic Osteolysis

• Aseptic, mechanical loosening can usually be diagnosed with good history and careful review of serial radiographs

• Always R/O infection

• Bone scans of little value

• CT scan may help with determining bone loss with severe osteolysis
Feels Bad, Looks Good

- These are the patients who continue to have pain at 1-2 years
- They are dissatisfied with their TKA
- They are seeking answers

Fisher, D et al., JOA, 2007

TKA Instability

- Feeling as if it won’t go or hold me up.
- Sudden unpredictable buckling.
- Can’t go up and down stairs
- Difficulty walking up and down grade
- Pain most of the time with activity
- Patients avoid many activities

TKA Instability Exam

- Soft tissue tenderness is very common
- ROM usually quite good
- Stability exam
  - $ done both lying down and sitting
- Check for instability apprehension
Instability Apprehension

- Knee hanging flexed over edge of exam table
- Varus/valgus stress applied
- Patient will be uncomfortable

Instability Apprehension

- Anterior-posterior drawer maneuver
- CR TKA: no end point
- PS TKA: increased anterior excursion

TKA Instability Radiographic Analysis

- CR TKA
  - Posterior sag in flexion

TKA Instability Radiographic Analysis

- PS TKA
  - Loss of posterior femoral offset, i.e. over-resected posterior condyle
  - Flexion gap instability
The Importance of Femoral Offset

Maintains collateral tension and flexion kinematics

TKA Instability Radiographic Analysis

Over resected distal femur
Over resected Posterior condyle

23 mm bearing

TKA Instability Stress Radiographs

- Stress: valgus and varus may demonstrate laxity
- If subtle may be difficult

TKA Instability Use of CT Scan

- 18 patients with flexion-lateral instability
- Femoral component IR more than control

5.5° vs 1.0°

Romero, Jose et al, JOA Vol 22, 2007
TKA Instability
“Looks good feels terrible”

Clinical flexion instability with instability apprehension

Revision for Instability Successful if:
- Joint Line is restored to normal
- Flexion and Extension Gaps Balanced
- Rotational alignment restored
- Appropriate constraint used to achieve above

TKA Instability
Use of CT Scan

“Additive Mismatch” of Malrotation

Patellofemoral Pain
- Anterior knee pain: 10-15% in TKA
- May have associated grinding or clunk
- Getting out of chairs and climbing stairs
- Many patients obese
- With relative quadriceps weakness
Anterior knee pain

- ACL absent in TKA: leads to 30% increase patellofemoral force
- Paradoxical roll forward ---- decreased quadriceps lever arm
- Reinforce long term strengthening and weight management
- May also be sign of instability

Anterior knee pain from peripatellar scar

- A continuum from crepitance and grinding
- To obvious “clunk” in the PS TKA
- Arthroscopic debridement is highly successful in eradicating problem

What Can we do as Surgeons?

Surgeon Factors
Pre-Operative

- Proper patient selection
- Shared decision making with appropriate informed consent and setting realistic expectations.
- Correcting comorbidities as much as possible
- Don’t be afraid do discuss aspects of depression, anxiety, and suggest maximizing Rx prior to surgery
Surgeon Factors
Operative

- Have a pre-operative plan
- Pay attention to alignment: coronal, sagittal, rotational
- Recreate anatomic joint line
  “Replace what you resect”
- Maintain femoral offset
- Balanced flex-ext gaps

Surgeon Factors
Operative

Navigation, custom guides, robots are only instruments and don’t supplant surgeon judgement

Surgeon Factors
Post-Operative

Multi-modal pain management strategy
- Neuraxial anesthesia
- Soft tissue field blocks, peripheral nerve blocks, pain catheters.
- Liberal narcotic usage as needed
- Anti-inflammatory blockade
- Anti-emetics
- Structured PT

What are the Patient Factors we need to know
Patient Factors

- Patient fear and anxiety regarding pain management
- We can do a better job

Patient Factors Associated with Painful TKA

- Depression 35% vs 19%
- Low preop OKS
- Low preop SF-12 mental
- Back pain
- Pain in other joints

Scott C.E.H. et al JBJS 92-B, 2010

Patient Factors Associated with Painful TKA

- Persistent pain is the strongest predictor of dissatisfaction
- Low postop OKS score as well

Scott C.E.H. et al JBJS 92-B, 2010

“Impact of Psychological Distress on Pain and Function following TKA”

- Depression
- Anxiety
- Poor coping skills
- Somatization

Distressed patients have worse pre-operative pain and function compared to non distressed patients

“Impact of Psychological Distress on Pain and Function following TKA”

- Distressed group 24 mo. WOMAC significantly less than non-distressed
- Delta was the same: so improved
- Psychological stress is reversible: Treatment is key

Patient Expectations

- 51-56% of dissatisfied patients with painful, functioning TKA attributed to:
  "UNREALISTIC EXPECTATIONS"


Patient Expectations Influence Satisfaction

Satisfaction correlated with:
- Prevention of residual pain
- Addressing stiffness and swelling
- Patient’s preoperative understanding of outcome

Noble, PC, et al, CORR Nov. 2006

Summary
Could we be facing an epidemic of painful TKA’s?

You can decide

As Surgeons

- Understand the causes, preventative measures and treatment alternatives
- Continue advanced surgical skills training
- Improve and advance pain management
- Develop next generation of knee implants that may be more kinematically normal
- Continue to develop patient oriented outcome instruments

For Patients

- More preoperative education
- Setting appropriate expectations
- Reassuring aggressive pain management goals
- Follow up and pursue patients complaints of continued pain

Thank-You