WHY KNEE REPLACEMENTS FAIL IN 2015?
Patient, Surgeon, or Implant?

26.03.2015

Pit Putzeys
Ortholux
Service d’Orthopédie
Introduction

• Modern patients are very different from those 10 or 15 years ago!

• Patients are better educated and informed (internet)
• Patients have higher expectations, are younger, are more demanding

• Surgeons are faced with increased pressure in regard to healthcare costs to more accountability for what they do
4 philosophies

CR

PS

CR

PS

FIXED BEARING

MOBILE BEARING
Total Knee Replacement (TKR)

- Traditional Goals
  - Pain relief
  - Stability
  - Low infection
  - Increased survivorship

- Actual Goals
  - Rapid recovery
  - High level of Function
  - Improved cosmesis
  - Best technology
  - Fast rehabilitation
High Demand Knee
The goal of Knee arthroplasty

1. **Alignment** of 5° to 7° valgus angulation in the anatomical axis or 0° to slight varus in the mechanical axis

2. Equal & balanced flexion & extension gap

3. Stable varus valgus in flexion, mid-flexion and extension

4. Optimize kinematics i.e. 0/O/125-130°

5. Correct patellofemoral tracking
Things we know

- more common in females
Soft Tissues

• Stabilizes and guides the osseous structures as they rotate about the three axes that provide the six degrees of freedom.

• Ex.: anterior force tibia, gives internal rotation of the knee and vice versa.

• with flexion/extension being the key movement (rotation around axis x). The remaining degrees of freedom are the upper/lower translations (translation along axis z), medial/lateral translation (translation along axis y) and internal/external rotations (rotations around axis z) as abduction/adduction (rotation around axis y).
Do small changes make a difference?

Check the balance in extension with a reduced spacer block
Medial laxity
Lateral tightness
Recheck the balance

½ spacerblock +12.5mm
stability

Full extension
Stress X-ray

30 cm
50 N
10°-15°
100 cm

stable in the clinical examination
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<table>
<thead>
<tr>
<th></th>
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Upper surface wear
+ Post wear

Under surface wear
backside
Lesson from Genu Valgum

- Femur Valgum
- Normo Tibia
BEST LESSON!

Case study
If you want to achieve correct surgery:
Correct cuts
PS
But medial laxity
Revised with a TC3 + "some" lateral release
With still medial laxity
IA medial wedge (to regain IA stability) + Concomitant HTO (to regain alignment)
Valgus knee

malrotation
## Reasons for Failures of TKR in recent studies (2010-2014)

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* 2014
Recent Modifications to Improve the Current Situation

- Navigation (cas)
- Rotating platform
- High flex Knees
- Gender specific implant
- Custom cutting guides
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## Most Prevalent Reasons for Failure

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<th>Unexplained Pain</th>
<th>Infection %</th>
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<td><strong>Australia (30,000)</strong></td>
<td>38</td>
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Patient Dissatisfaction after TKR

- Surgeon derived outcome assessments
  - TKR is satisfactory in pain relief and daily function
- Patients released outcome measures (PROMs)
  - 15% - 30% are less than fully satisfied
  - 66% report their knee to feel normal
Aseptic Loosening

• General term somewhat misunderstood
  
  • Implant was once well fixed and than became loose!

• **Message**
  
  We should differentiate

  FAILURE OF FIXATION

  and

  ADEQUATE FIXATION WAS NEVER ACHIEVED!
Aetiology of Aseptic Loosening

• Cemented or cementless
• Joint malalignment
• Surgical technique
• Cement technique
• Implant design
• Degree of constraint
• Loading during activity
• Wear debris
73y overcorrection 175° loosening at 3y medial approach cementless osteoporosis

RLL tibial
• Is the leading cause of failure at less than two years after surgery!

• Is attributable to
  • Surgical technique
  • Ligament balancing
  • Flexion – extension GAP
  • Design (/ sagittale Radius curve )
Genu Valgum type 1

- Independent cuts with reference to posterior condyles
  lateral laxity in flexion

Instability

Here dislocation
Most of the **PS or RP DISLOCATIONS** occur due to lateral laxity at 90° with varus stress.
Varus + Flexion

jump height & dislocation
Femoral implant revision with increased ER if LCL is good

TC3 or hinge
## Infection Risk (53759 patients)

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<th>OP Time (h)</th>
<th>NNIS Score</th>
<th>Average Risk (%)</th>
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<td>TKR</td>
<td>2</td>
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<td>Sup 2</td>
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Nnis depends on ASA score, OP Time, Class 1
CDC 2003
Many of these early failures can be reduced in number!

- Better control of the operating room environment
- Reduce intra-operative contamination by paying attention to detail
- Administer perioperative antibiotics (evidence-based !!)
- Reduce operating room traffic
- Limit bystanders to a minimum
- Minimise tissue trauma
- Improve haemostasis
- Manage wound complications early and closely
Polyethylene Wear

• Reduced in more recent studies

Why?
- Improved P.E quality
- Better anchorage mechanisms
- More highly polished surfaces
- Improved surface morphology
- Sterilisation in oxygen free environments
- Highly cross-linked PE
Arthrofibrosis

• **Many are patients related !!**
  
  • Diabetes
  • Rheumatoide arthritis
  • Ankylosing spondylistis
  • Restricted preoperative range of movement

• **But surgical technique !**
  
  • Ligamentous dysbalance
  • Unrecognised tightness of the posterior cruciate ligament
  • Component malposition
  • Oversize
Question

• Are our patients fully satisfied after a TKR?

• Many patients remind they have a TKR.

• LCS at 36 years follow-up

• Sigma (PFC) at 27 years

• In 2005, Depuy J&J initiated the “Blue book project”
System Goals

• Provide improved **STABILITY** and **MOTION**

• Provide better **PATIENT FIT**

• Enhance **PATELLO-FEMORAL FUNCTION**

• Improve design and materials for **IMPLANT DURABILITY**

• Elevate surgical process for **IMPLANT POSITIONING** and **EFFICIENCY**
Sagittal Radius of Curvature

Multi-Radius of Curvature

Single Radius of Curvature

ATTUNE GRADIUS™ Curve
-constant center of rotation & low level of conformity fem / insert
-freedom of rotation BUT reduced A/P stability,
   especially during early flexion
UNDERSTANDING A MULTI RADIUS J-CURVE

- Large distal radius for conformity & stability followed by smaller radius for rotational freedom in flexion
- Long successful clinical history BUT reduced stability during radius transition... Leading to anterior paradoxal movement
Cruciate retaining

ATTUNE GRADIUS™: Gradually reducing radius from 5° to 65° flexion

“Brake” Radius: Increase in radius which controls anterior slide

High Flexion Radii: Reduced radii allow freedom to rotate in maximum flexion
Femoral Transitions

![Graph showing femoral transitions](image)

- **ATTUNE CR FB System**
- **Traditional Multi-Radius Design**

Medial Femoral Condyle
Lateral Femoral Condyle

Knee Flexion (Deg)

A(+)/P Translation (mm)

Poster #1044, from the ORS 2012 Annual Meeting, February 2012, San Francisco, CA.
Tendofemoral Sharing & Patella Loading

Moderate Knee Flexion
Patella Tracking:
GLIDERIGHT Articulation

Funnel Effect
Patella Tracking:
GLIDERIGHT Articulation

Trochlear Angle
Trochlear groove

“Q-Angle” (Quadriceps Angle)

Small Q-angle

Large Q-angle
Femoral Shape
Optimized insert articulation for FB and RP

Consistent 3 mm A/P increments between femoral sizes

J-curve and femoral-tibial articulation

1 mm increments in insert thicknesses

Ability to shift femoral component 1.5 mm anterior or posterior

STABILITY IN MOTION™
Conclusion 1

• A substantial number of TKR failures still occur early

• A kinematically aligned TKR should be the goal

• Aseptic loosening is the predominant failure mode poorly defined and not well understood

• Infection, instability, arthrofibrosis, malalignment occur early and are controllable by the surgeon

• Polyethylene wear has been reduced and not a major cause until > 15 years
Conclusion 2

- Each surgeon must analyse their own Data and results on patient-perceived outcomes (PROMs)

- Each surgeon must find ways to improve through:
  - Training
  - Improved instrumentation
  - Evidence-based medicine
  - And make patient satisfaction their top priority

- Good pre-operative education is extremely important
Check the balance in extension with a reduced spacer block