5th course of advanced surgery of the knee
Val d’Isère, 02-2014

Gap balancing in TKA: dealing with the sagittal plane (recurvatum, flexion contracture, patellar height)

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Recurvatum

• < 1% of TKA patients
• Associated to other deformities: genu valgum, capsular, ligamentous laxity & neurological diseases
• Specific attention to neurol. disorders: Fixed plantar flexion, limb muscle function

From: Erceg M, Rakic M, Acta Clin Croat 2012

Neurological disorders must be ruled out (recurrence of recurvatum)

Recurvatum

Distribution (n=57)

Recurvatum

Hyperextension collapse
Recurvatum
Severe stretching of posterior capsule & PCL

Bony collapse distal femur & proximal tibia
Recurvatum

Proximalisation of patella & shortening of extensor mechanism
1. Minimum resection of distal femur
2. Underresection proximal tibia (debatable)
3. Choose small femoral component
4. Choose right level of constraint
5. Avoid slight residual recurvatum intraoperatively
Planning extension gap
Planning extension gap

**Triathlon® TS Knee System**

- Up to 15 mm femoral distal augment
- 8.5 mm femoral condyle
- Up to 31 mm PE insert
- Up to 10 mm tibial augment

17.5 - 64.5 mm
Planning extension gap: epicondylar referencing

Medial epicondylar line serves as reference (ME at 28 ± 3,5 mm from joint line)
Planning flexion gap

Use previous or contralateral x-rays

**If tight flexion gap:**
Use smaller femoral component rather than reconsidering increasing tibial resection
Which level of constraint?

Continuum of constraint

Lombardi AV, JBJS-A, 2007
Levels of ligamentous incompetency

<table>
<thead>
<tr>
<th>Level of constraint</th>
<th>Type of prosthesis</th>
<th>PCL</th>
<th>Collaterals</th>
<th>Quad</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>PCL retaining</td>
<td>+</td>
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<tr>
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<tr>
<td>3</td>
<td>Rotating hinge</td>
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Recurvatum knee

*Lombardi AV, JBJS-A, 2007*
♀, 63 years
Rheumatoid arthritis
Major frontal & sagittal instability,
30° recurvatum

Which level of constraint?

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1. Minimum resection of distal femur & proximal tibia
2. Restoring extension gap
2. Choose adequate level of constraint
Recurvatum

♂, 61 years
140 kg
Moderate recurvatum

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Recurvatum

♀, 59 years
Congenital abnormality,
Mild recurvatum

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Flexion contracture

- Osteoarthritis
- Inflammatory arthritis
- Hemophilia
- Neuromuscular disorders
- More frequent than recurvatum
- Either isolated or in association with varus/valgus knee
Flexion contracture

Mild
< 10°

Moderate
10°-30°

Severe
> 30°
Flexion contracture
Flexion contracture

Shortening of posterior capsule & soft-tissues
Flexion contracture

Increase of patellofemoral forces
Flexion contracture

Posterior femoral osteophytes

Anterior tibial & intercondylar osteophytes
Surgical goals:
1. Realign limb
2. Bone resection
3. Restore soft tissue balance
4. Replace PCL (depending on degree of ©️)
Adequate bone resection & removal of posterior condylar osteophytes

+/- subperiosteal elevating of posterior capsule
Flexion contracture

Planning extension gap

Proper ligament balancing

Here: Stryker Ligament Balancer
Flexion contracture

Planning extension gap

Additional distal femur resection
(systematic in moderate flexion contractures: +2mm)
Incisions of posterior capsule

- In extension
- Laminar spreader

Which level of constraint?

Conservation of PCL?

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Patellofemoral

♂ 73 years

Anterior femoral undersizing

Quadriceps insufficiency + anterior knee pain
Patellofemoral

Patellofemoral overstuffing

Lack of flexion
Patellar resurfacing:

- Not systematically (in my hands)
- As proximal as possible with smaller patellar button
- Remove inferior portion of patella without compromising stability of patellar tendon

ATT proximalization

1. Identify physiologic patellar height by lateral radiograph at 90° of knee flexion on contralateral knee
2. Fluoroscopic intraoperative control
3. ATT osteotomy (fragment > 5 cm)
4. Create step-off at superior pole
5. Use compression screws (posterior cortex)

Laurin CA, JBJS-B, 1977
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