Extra-articular deformities in TKA

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Treatment of extra-articular deformities

The challenge: extensive releases or osteotomies in TKA?
planning

• Determine the overall deformity
• X-rays, incl. Long standing X-rays
• CT if axial malrotation (clinical observation!)
• Make a plan, no a la carte surgery!
• Exposure, implant constraint, stems, hardware removal ea
Effects location deformity on bone cuts

Wolf & Hungerford 1991 CORR: close to joint = large effect on joint angle
Metaphyseal versus diaphyseal deformity?

- Metaphyseal: simultaneous with TKA?
  - Better healing

- Diaphyseal: not with TKA
  - Slow healing

Small diaphyseal deformity = small effect joint
Large diaphyseal deformity = no metaphyseal correction

Courtesy M. Bonnin/Neyret/Ait Selmi
Treatment plan

1. Separate corrective osteotomy at apex of the deformity
2. Compensatory osteotomy distant from the deformity but accessible from the arthroplasty exposure
3. Intra-articular correction by component positioning (usually with excessive releases / constrained implants)
What are limits releases?

- Insall: 15 mm
- Dejour 10°
- Krackow def FTA 20°
- Lerat def 7°
- Wang 20-30°

no clear consensus

**Question:** Is there a difference femur and tibia deformities? .......................... **YES!**
Treatment plan

- Corrections on the tibial side are “less complex” than corrections on the femoral side.
- Corrections of tibial deformities affect both extension / flexion space
Limited extra-articular deformity, acceptable overall alignment

• Consider the use of navigation/PSI

Klein et al. JOA 2006
Catani et al. (20 pts) KSSTA 2012
Thienpont et al. (10 pts) The Knee 2013
Strategies femoral deformity

• Anticipated femoral condylar resection: violation of collateral ligaments?
Strategies femoral deformity

- TKA + intra articular correction of extra articular deformity (GAP PROBLEM!)

  *Wang et al JBJS-Am 2002 up to 20°* good results, no instability

  *Nelson et al JBJS-Am 2003* TKA after varus femur deformity: demanding / 50% constrained / inferior results clinically, medial releases could not correct lateral instability

  **Personal preference: deformity < 10°**
Strategies femoral deformity

- In larger deformity two stage: OT first, TKA later

NO GAP PROBLEM -
2 operations
Good solution if you are confident with SCOT
Strategies femoral deformity

- Other possibility larger deformity: One stage: **Osteotomy + TKA**
- Metaphyseal-fixation - plate / stem + k-wires
  (NO GAP PROBLEM)

_Lonner et al JBJS-Am 2000_
11 femoral OT + TKA, difficult, limited range of motion, no gap problems
Simultaneous femoral OT and TKA

- Our own experience:
  - 7 x combined femur osteotomy with TKA
  - Use of revision stem and threaded k-wires for rotational stability
  - 2 re-operations for nonunion
  - ROM limited 90 – 100 degrees of flexion
  - Consider: sliding epicondyle osteotomy (Brilhault et al. JBJS 2002)

Deschamps et al Orth Traum Surg Res 2010
Similar results 2/16 non unions

Single-stage total knee arthroplasty and osteotomy as treatment of secondary osteoarthritis with severe coronal deviation of joint surface due to extra-articular deformity

Ewout S. Veltman1 · Remco J. A. van Wensen1 · Koen C. Defoort1 · Gijs G. van Hellemond1 · Ate B. Wymenga1
Strategies tibial side

• Line within or outside tibial condyle
Strategies tibial side

- Smaller deformity (<15): TKA + intra articular correction
- Often after HTO: Med / lat displacement of the tibial shaft

NO GAP PROBLEM

*Wang et al JBJS 2002* up to 30°, good results, no instability

Personal opinion: up to 15° correction is possible
Strategies tibial side

- Larger deformity: two stage
- Osteotomy first, TKA later

2 surgeries

safe if you are experienced in OT
only in > 15° jointline deviation
Strategies tibial side

- Other option in larger deformity (>15°)
- One stage OT + TKA
  (metaphyseal-fixation - plate / stem + k-wires / step cut tuberosity osteotomy)

*Radke et al J Arthr. 2002*, 10 cases with more than 15 def stemmed tibia component, good results.
Simultaneous tibia OT and TKA

- Our own experience (deformities >15°):
  - 7 combined tibial osteotomy with TKA
  - revision stem / small plate
  - OT plate and primary prosthesis (young pt)
  - Always with tuberosity osteotomy
    Facilitates view on osteotomy
    Maintaines patellar height in open and closed osteotomy
  - In all patients excellent ROM and good bone healing

Gaasbeek et al. 2005 Knee
What about rotational deformity

- Limited correction possible *intraarticular* (10-15°) on tibia side

- Rotation correction extraarticular in *femur*: TKA + osteotomy metaphyseal *possible* but *not easy*!

- Rotation correction extraarticular on tibia side: TKA + OT easier then femur side!

- Ramaswami, Cameron et al JBJS 2009 40° derotation

Patella malalignment, release fibula, beware of peroneal nerve!
What about the sagittal plane

• Up to 15 degrees intra-articular (?) femur side

• Up to 15 -20 degrees tibia side (?) (recurvatum knee) : minimise tibia cut thickness !

• Liu et al Europ. J Orth Trauma 2011
• (Xiao-Gang Int Orthop 2012)
• In some cases use custom implants might be useful (± more constrained)

• Elderly patients with extra-articular deformity (esp Femoral side)
  lower threshold in using a hinge
Summary

• Analyse deformity first, preplanning!

• PSI / navigation in small deformity’s

• Femoral deformities might cause flexion laxity on the released side, in case of tibia deformities this is less of a problem

• Femur deformity $> 10^\circ$ : OT needed (preferably 2 stage or one stage with TKA = complex!)

• Tibia deformity $> 15^\circ$ : OT (2 stage or one stage with TKA is easier)

• Sagittal deformity/rotation up to $15-20^\circ$ corrected with TKA

• Hinges and CCK type of implants can be considered in some deformities

• Custom-made implants might be usefull
Thank you