

Clinica Ortopedica e
Traumatologica
Università degli Studi di Pavia

Fondazione IRCCS Policlinico
San Matteo

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Rationale for stability and mobility

F.M. Benazzo

5th Advanced Course on Knee Surgery



07/02/14

Key points

- Goal of properly functioning TKR
- Definition of balance, and balanced knee
- General principles: how can we get there
- Planning
- Extension gap
- Flexion gap
- Difference tips with CR/PS designs

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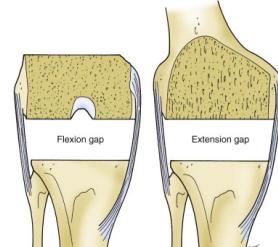
Goals of TKR

Alignment ← Total Knee Arthroplasty → Stability

Fixation
↑
Kinematics
↓

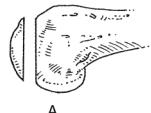
Surgical theories

- gap balancing technique
- measured resection technique



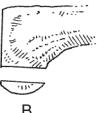
General principles

Affects extension gap



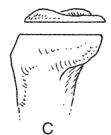
A

Affects flexion gap



B

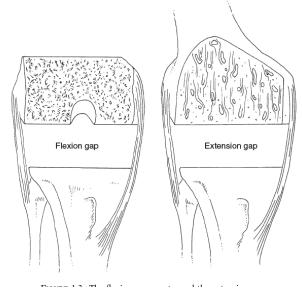
Affects both gaps



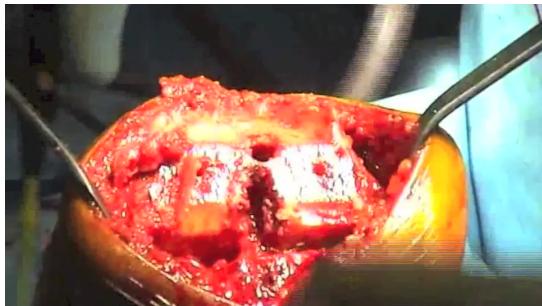
C

General principles

- Aim is to have same gap in flexion and extension



General principles



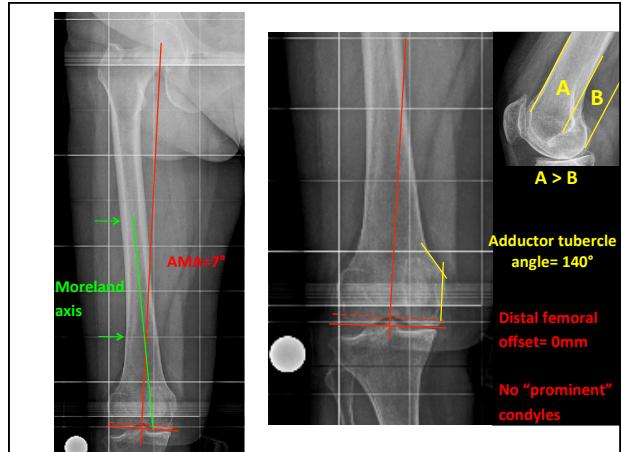
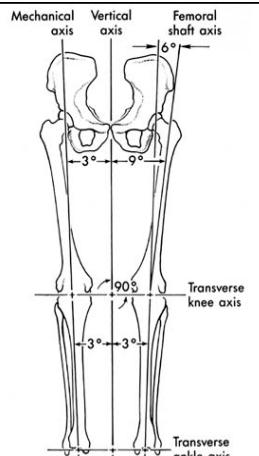
Extension gap

Correct pre-op planning

→ Alignment

→ Extension gap

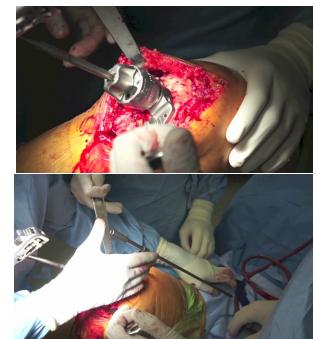
Alignment:
important for balance!



Extension gap

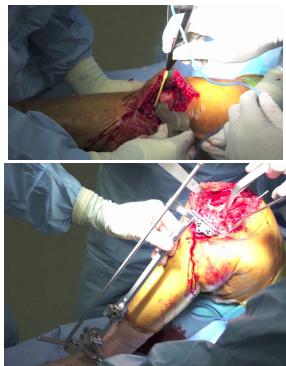
- Degrees of valgus

- Intra- op check



Extension gap

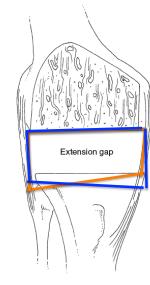
- Level of resection on the tibia
- Alignment



Extension gap

Role of tibial cut

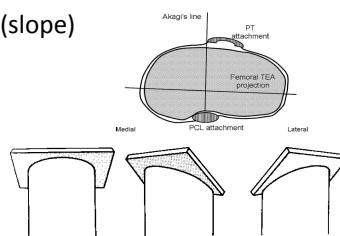
- Beware of varus/valgus
- Correct rotation (slope)



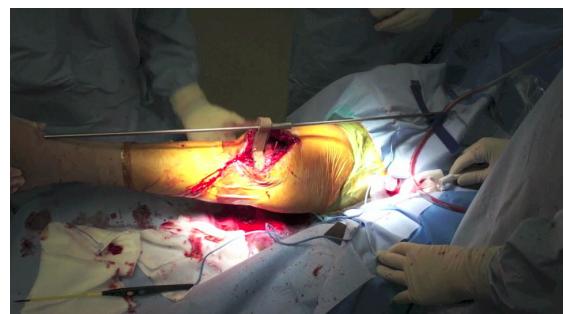
Extension gap

Role of tibial cut

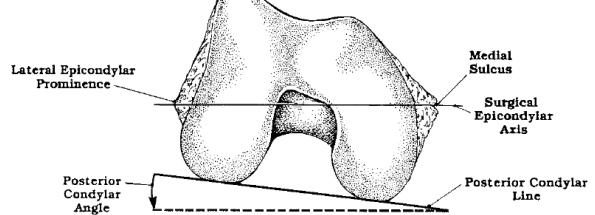
- Correct rotation (slope)



Extension gap



General principles



Flexion gap

- Correct sizing
- Correct rotation
- Correct balancing

Flexion gap

Correct sizing

- Know your implant
- How and how much it grows



Laxity in flexion can be filled by upsizing...



Flexion gap

Correct rotation of the femoral component

How to minimize error:

- Functional Whiteside line
- Bony landmarks

Flexion gap

Correct rotation:

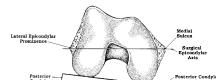
➡ Functional Whiteside line



Flexion gap

Correct rotation:

➔ Bony landmarks for
epicondyles



Flexion gap



Flexion gap

Implant choice: CR/PS

PCL removal → increase flexion gap

2-3 mm

CR: downsize

PS: upsize

Flexion gap

CR implant

Cut less distal femur

- Flexion space will remain small
- Keep extension space small

If too much distal femur cut

- Stiff knee for thicker PE (to fill the extension gap)
- Flexion instability (overrelease of PCL)

Flexion gap

PS implants

Cut more distal femur

- Flexion space is 2-3 mm bigger

Too small distal femur cut

- Flexion gap > extension gap

➡️ → thicker PE= flexion contracture

➡️ → thinner PE= instability in flexion

Flexion gap

CR implants

Tibial cut

↑slope

➡️ → opens flexion space

➡️ → better flexion without release of PCL

Flexion gap

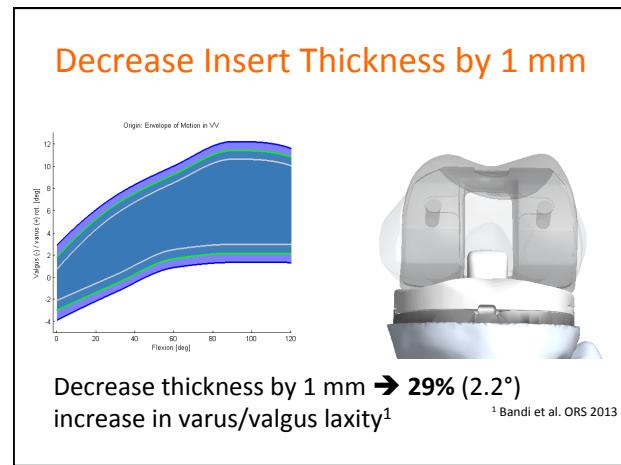
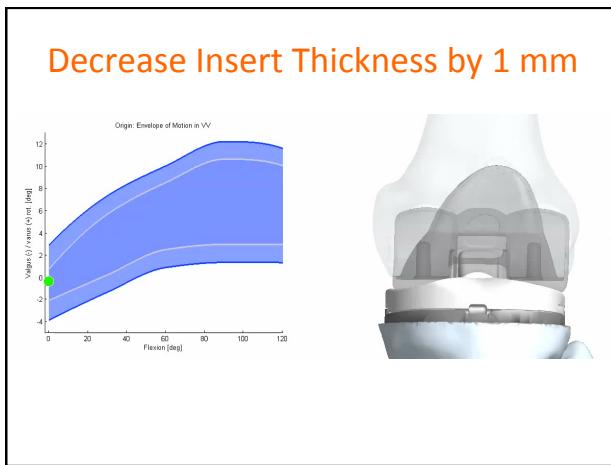
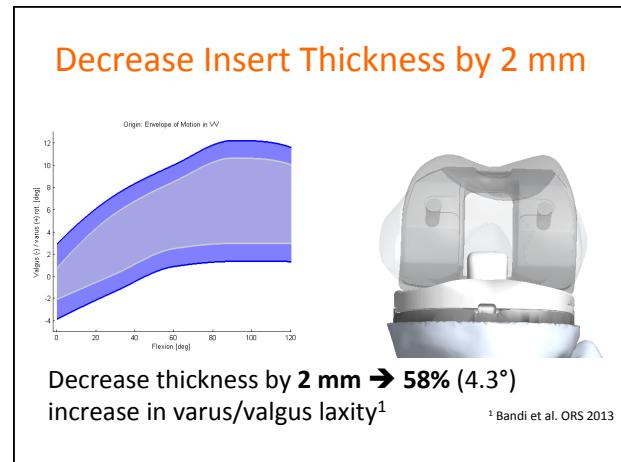
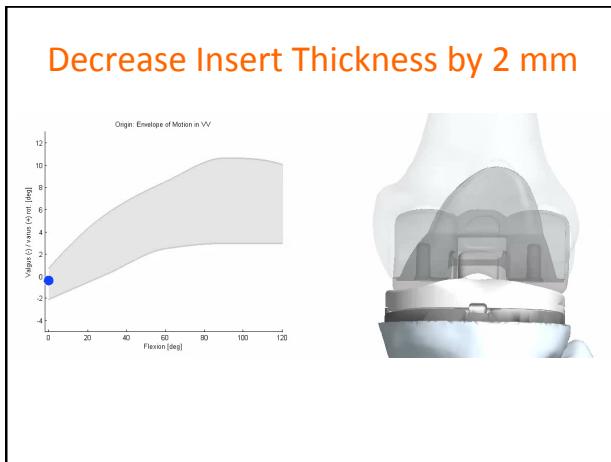
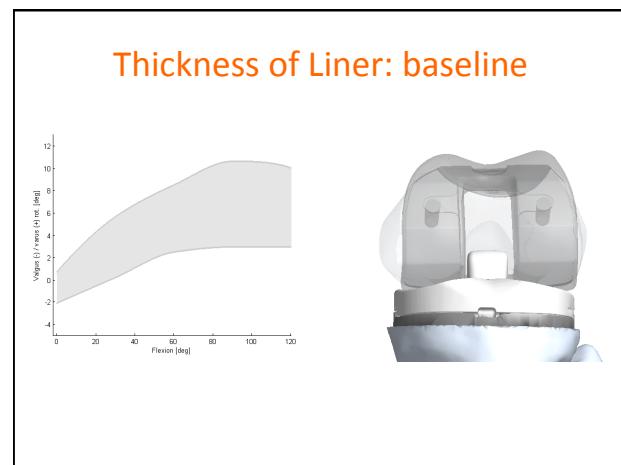
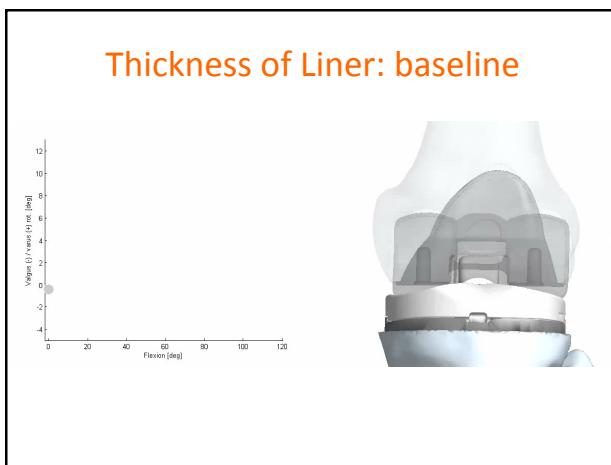
PS implants

Tibial cut

↓slope

➡️ → slope increases flexion space

➡️ → flexion space already ↑



Conclusions

- Measured resection:
 - place prosthesis in that way that load passes evenly through the prosthetic components
 - and then „balance“ the knee (releases)
- Gap balancing technique
 - bone resection according to soft tissues tensions (regained the original)
- No matter the technique: TKR works only if balancing has been achieved