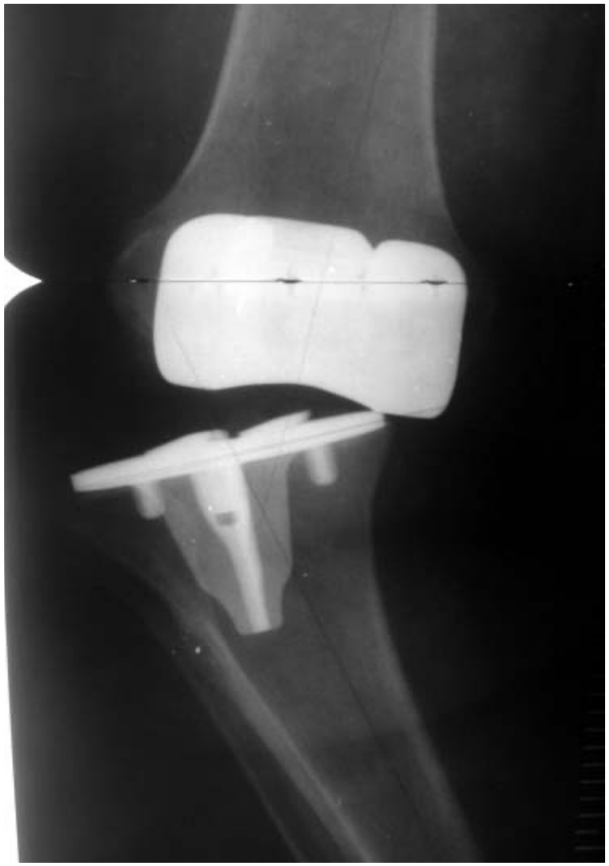
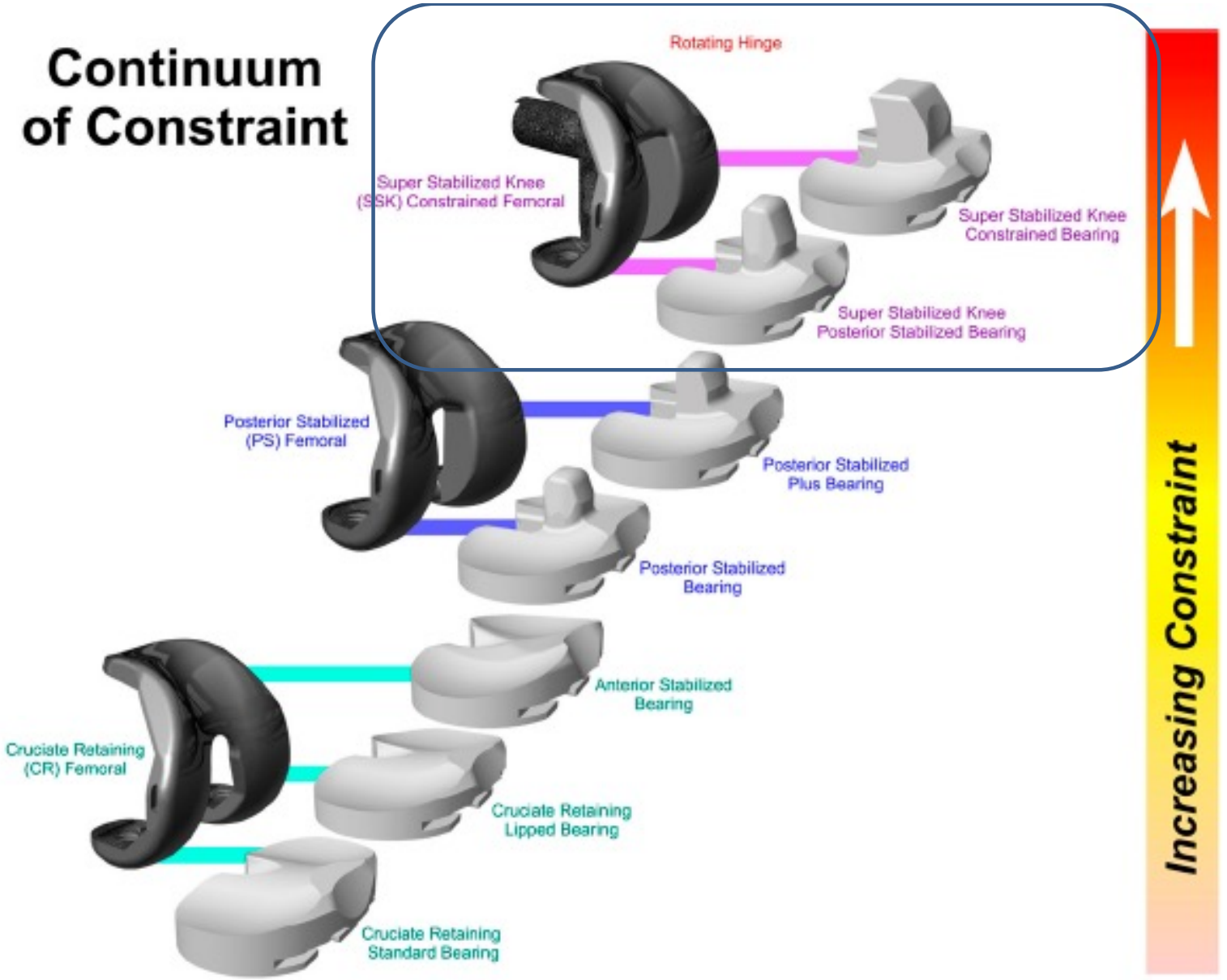
CCK vs RH

Anders Troelsen

Sébastien Lustig



Continuum of Constraint



Constrained Condylar

- Varus-valgus constrained implants
- Tibial post height is greater ++ than in PS designs
- Rotational limitation +++ (<5°)

⟹ Higher stress to the prosthesis-bone interface (long stem)

McAuley J, Eickmann T. Choosing your implant. In Surgery of the Knee. 284-289. 2006.
Lachiewicz P, Falatyn S: Clinical and radiographic results of the total condylar III and constrained condylar total knee arthroplasty. J Arthroplasty. 11 : 916, 1996.

Rotating Hinge

Major historical concerne

1) Stress transfer at the implant-bone surface

=

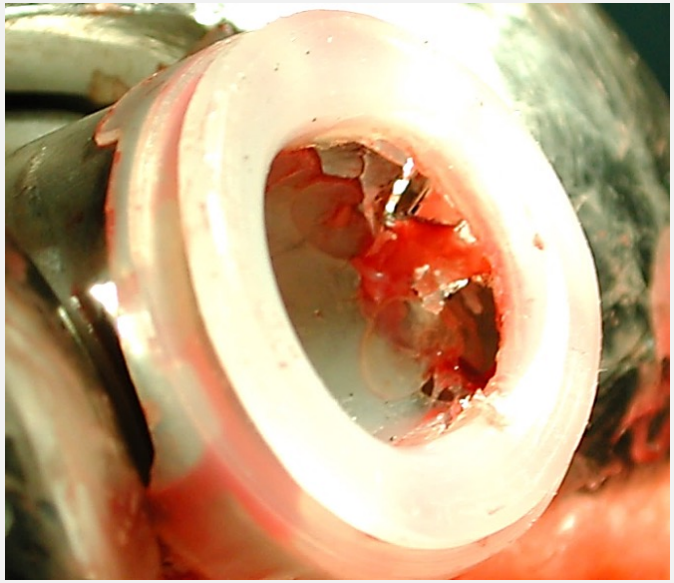
Early loosening

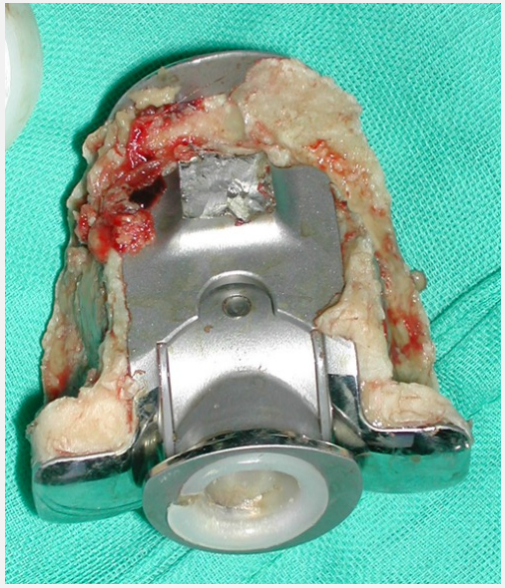
Pour AE - J Bone Joint Surg Am. 2007
Rotating hinged total knee replacement: use with caution.

Sandiford - Clin Orthop Surg 2018
Three Cases of Femoral Stem Failure in Rotating Hinge Revision Total Knee Arthroplasty: Causes and Surgical Considerations.

Discussion: major historical concerne

2) Rupture of the implant (usually the hinge)





Friesenbichler J - Int Orthop. 2012 .
Failure rate of a rotating hinge knee design due to yoke fracture of the hinged tibial insert…review of the literature.

Nikolopoulos DD - Knee Surg Sports Traumatol Arthrosc 2012. Fracture at the stem-condylar junction …..

Discussion: new concernes

Unnatural patellofemoral tracking

A biomechanical evaluation of hinged total knee replacement prostheses

Long et al Proc Inst Mech Eng H 2013

Robin Long[1], Sabina Gheduzzi[1], Thomas A Bucher[2], Andrew D Toms[2] and Anthony W Miles[1]

- Five hinged TKRs were evaluated in this study: a Biomet RHK, a DePuy S-ROM, a PLUS Orthopaedics RT-PLUS, a Stryker MRH (modular rotating hinge) and a Zimmer NexGen

- Significant differences were identified between the five prostheses in quadriceps force and patellar tendon moment arm. Analysis of the correlation between these two parameters indicates that while patellar tendon moment arm influences quadriceps force, it is not the only factor. Also important is the lever function of the patella, and it is suggested here that the non-physiological nature of the prosthetic patellofemoral geometry may result in unnatural joint function.

Discussion: new concernes

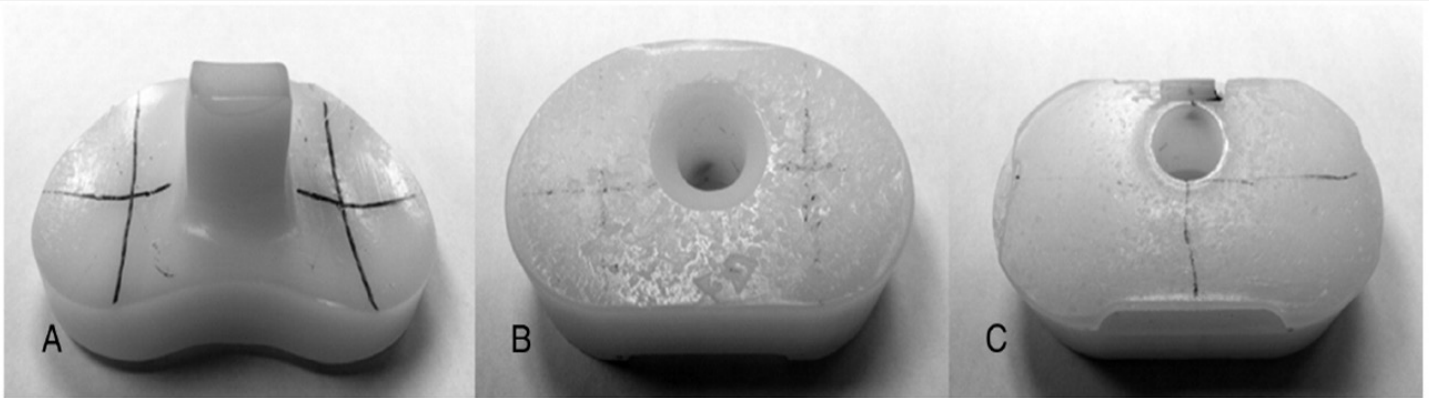
Increased UHMWPE wear and damage

J Arthroplasty 2016

Comparison of Tibial Insert Polyethylene Damage in Rotating Hinge and Highly Constrained Total Knee Arthroplasty: A Retrieval Analysis

Kamal Bali, MBBS, MS, DNB [a], Douglas D. Naudie, MD, FRCSC [a], James L. Howard, MD, MSc, FRCSC
Richard W. McCalden, MD, MPhil(Edin), FRCSC [a],
Steven J. MacDonald, MD, FRCSC [a], Matthew G. Teeter, PhD [a,b,c]

- The tibial inserts with increased constraint (HC or RH) show higher damage when compared to previous published results on damage scoring for lesser-constrained (PS or CR type) inserts in TKA.
- Mobile bearing RH inserts are associated with much higher backside wear while the fixed bearing HC inserts are prone to low-grade damage to the post of the tibial insert.
- These results suggest that the use of RH implants could lead to higher volumetric wear (and possible mechanical failure), while the use of HC implants could result in the generation of greater osteolytic polyethylene debris (and fail by post wear, osteolysis or implant loosening).



Indications for Hinged Total Knee ?

Revision surgery:

femoro-tibial instability

- a) primary: deficiency of the collateral ligament

Absent collateral ligament support is an almost universal indication for RHK implantation vs VVK

Review: 544 VVK and 254 RHK patients; average follow-up 66 months

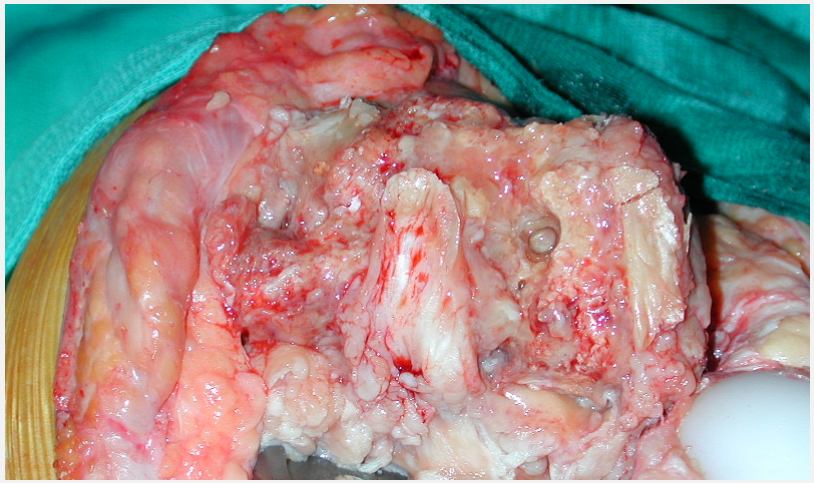
Malcolm TL – Orthopedics 2016 : Outcomes of Varus Valgus Constrained Versus Rotating-Hinge Implants in Total Knee Arthroplasty

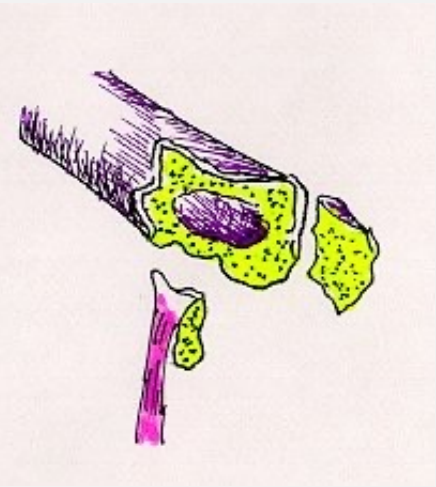
Indications for Hinged Total Knee:

Revision surgery:

femoro-tibial instability

- b) secondary:
  - Bone loss
  - peri-prosthetic fractures
  - Infections





Indications for Hinged Total Knee:

Revision surgery:

femoro-tibial instability

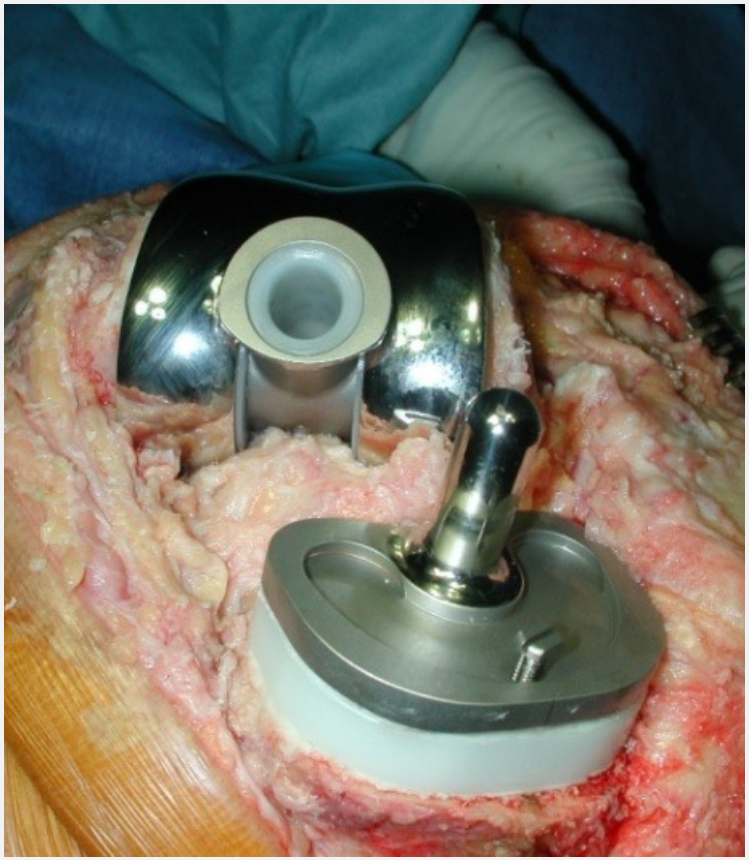
- b) secondary:
  - Bone loss
  - peri-prosthetic fractures
  - Infections

Indications for Hinged Total Knee:

Revision surgery:

<u>Not only for femoro-tibial instability</u>

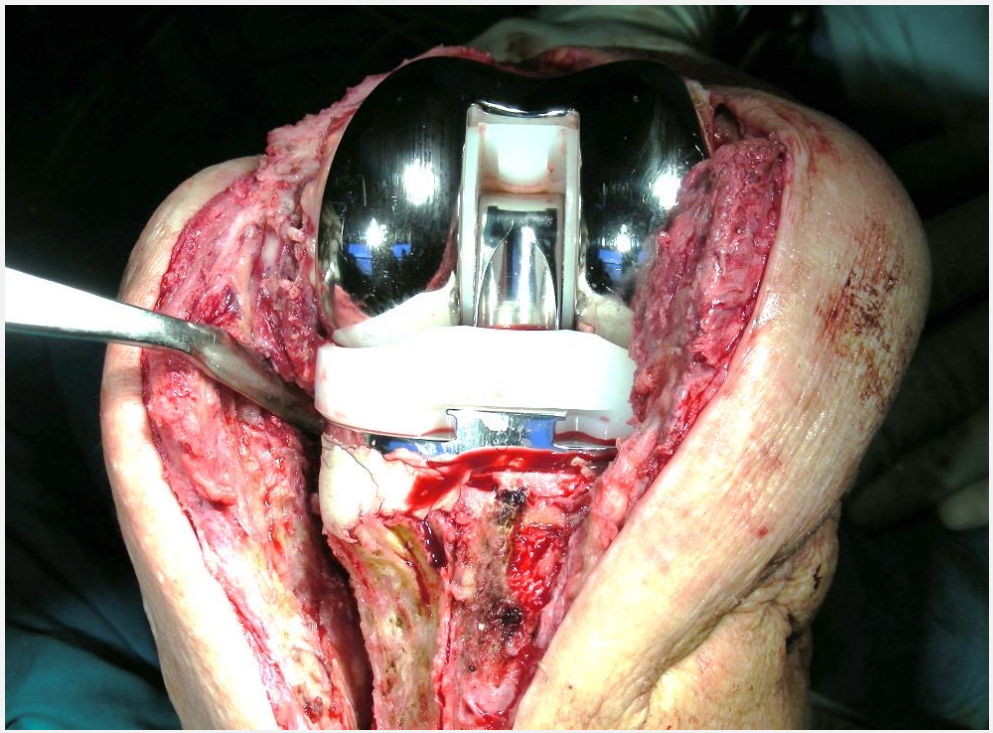
- b) secondary:
  - Bone loss
  - Stiffness
  - Patella infera
  - Difficult flexion extension balancing
  - Difficul testoration of joint line

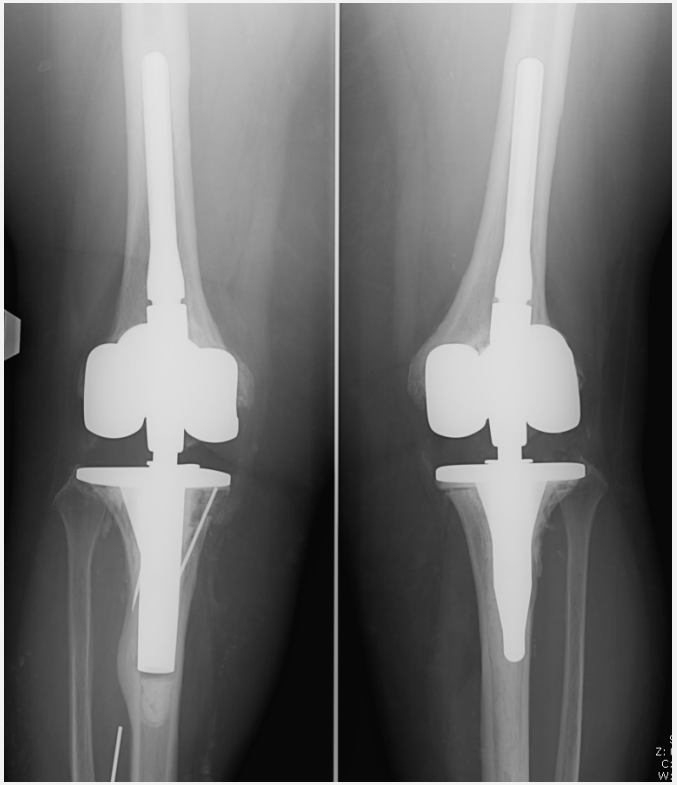


Discussion

Rotating-hinge knee implants provided:

- acceptable mid-term outcomes for revision knee surgery with ligamentous instability
- low 10-year cumulative incidence of revision for aseptic loosening





Discussion

The high percentage of failures is more related to the complex surgery and to the status of the patients
than to the hinged mechanism.

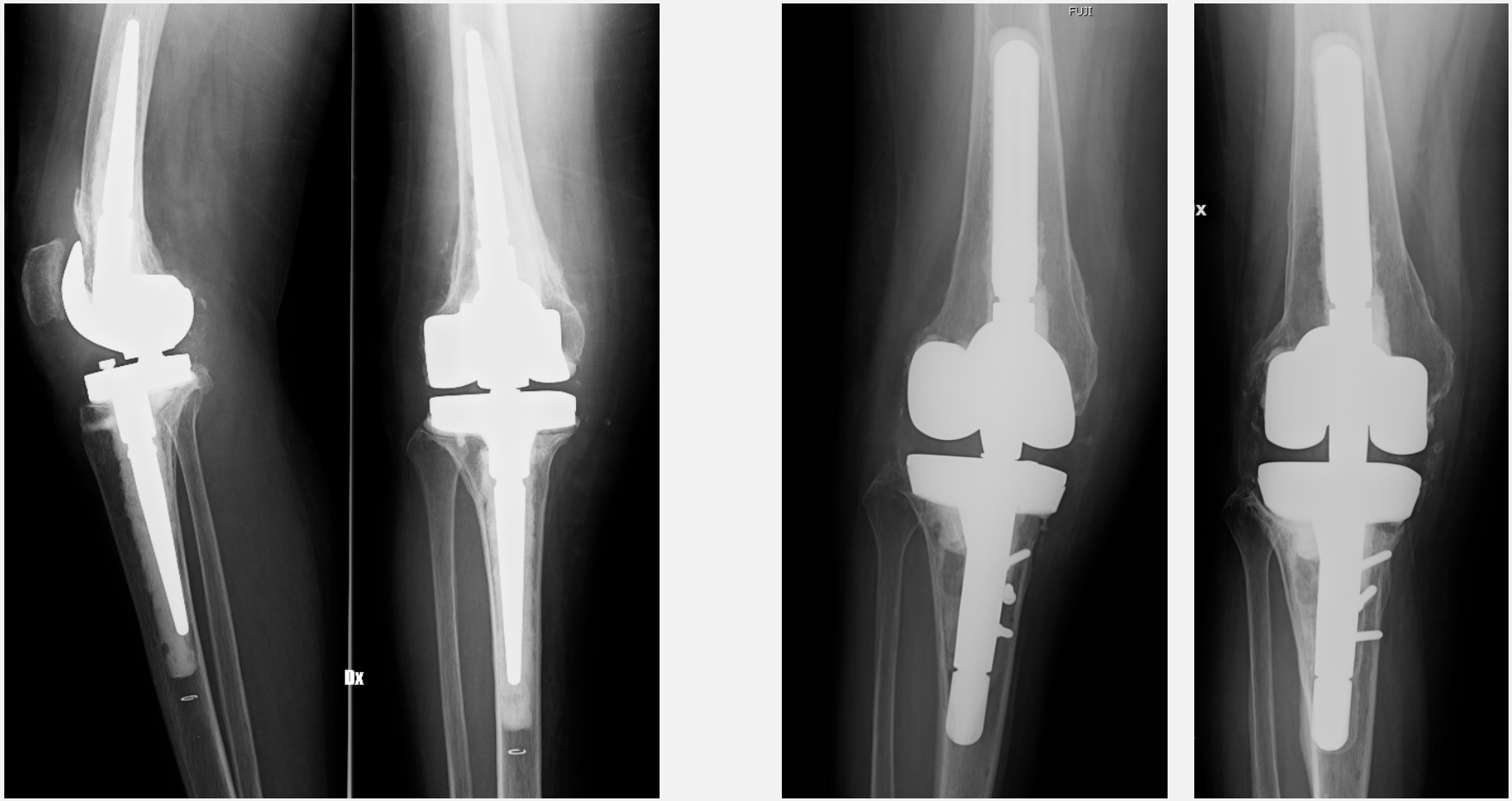
Discussion

They are **not at higher risk for early loosening unless fixation is not strong:**

- **Avoid short stems**

Discussion

They are **not at higher risk for early loosening unless fixation is not strong:**



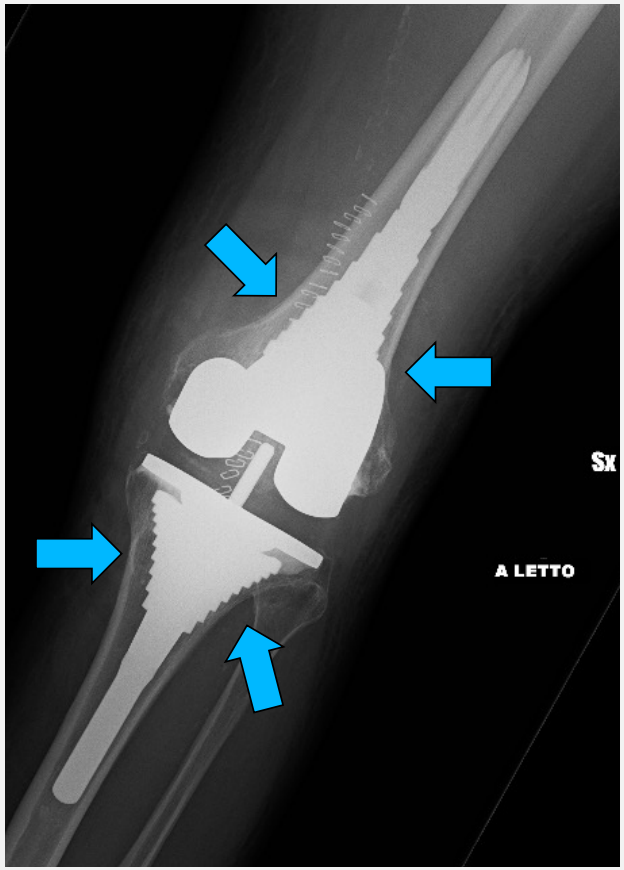
Optimal fixation: 2 to 3 zones….

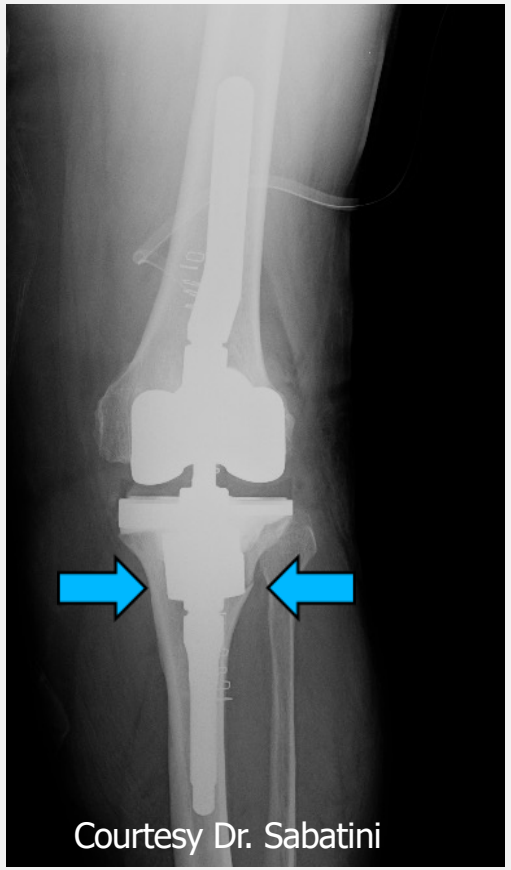
Discussion

Greater **use of metaphyseal fixation** helped to reduce incidence of revision for aseptic loosening

Patients can expect substantial improvements in clinical outcomes with this revision strategy

Cottino et al. J Bone Joint Surg Am. 2017





I. My Practice

SICOT-J 2021, 7, 45
© The Authors, published by EDP Sciences, 2021
https://doi.org/10.1051/sicotj/2021046

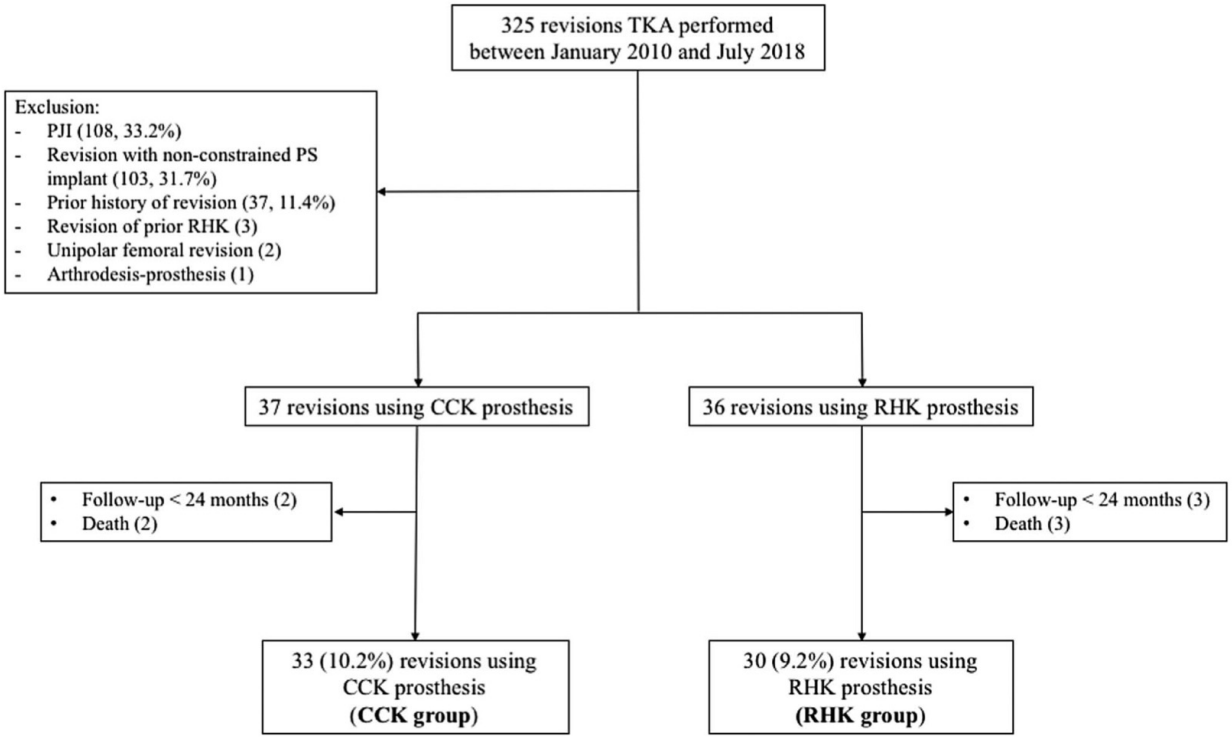
SICOT-J

Available online at:
www.sicot-j.org

ORIGINAL ARTICLE OPEN ACCESS

Condylar constrained knee prosthesis and rotating hinge prosthesis for revision total knee arthroplasty for mechanical failure have not the same indications and same results

William Barnoud[1], Axel Schmidt[1,*], John Swan[1], Elliot Sappey-Marinier[1], Cécile Batailler[1], Elvire Servien[1,2], and Sébastien Lustig[1,3]



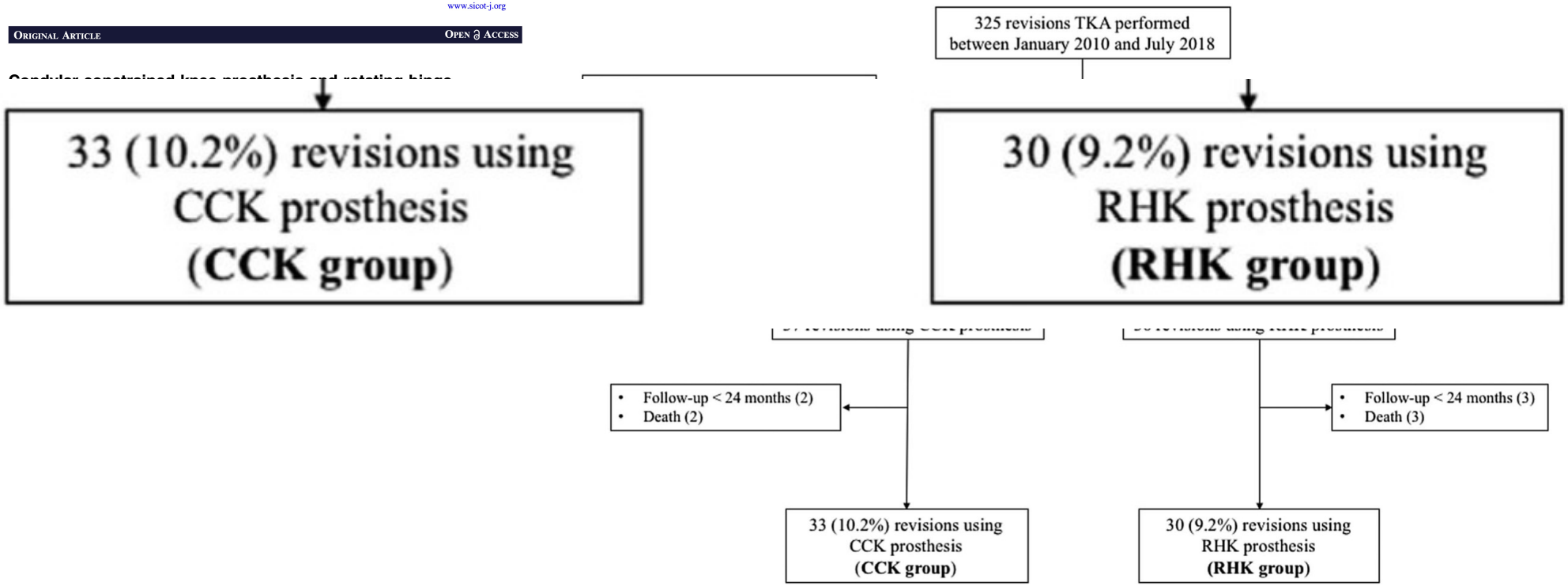
I. My Practice

SICOT-J 2021, 7, 45
© The Authors, published by EDP Sciences, 2021
https://doi.org/10.1051/sicotj/2021046

SICOT-J

Available online at:
www.sicot-j.org

ORIGINAL ARTICLE OPEN ACCESS



VOTE

For a revision TKA,

1. I almost never use CCK or RHK
2. My favorite option is CCK
3. My favorite option is RHK

II. Indications

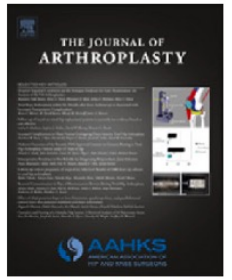
- Overall approach to selection between CCK and RH
- Patient factors that would influence (age, activity, any cut offs)
- Pros and Cons for CCK vs RH for different indications

The Journal of Arthroplasty xxx (2020) 1–11

Contents lists available at ScienceDirect

The Journal of Arthroplasty

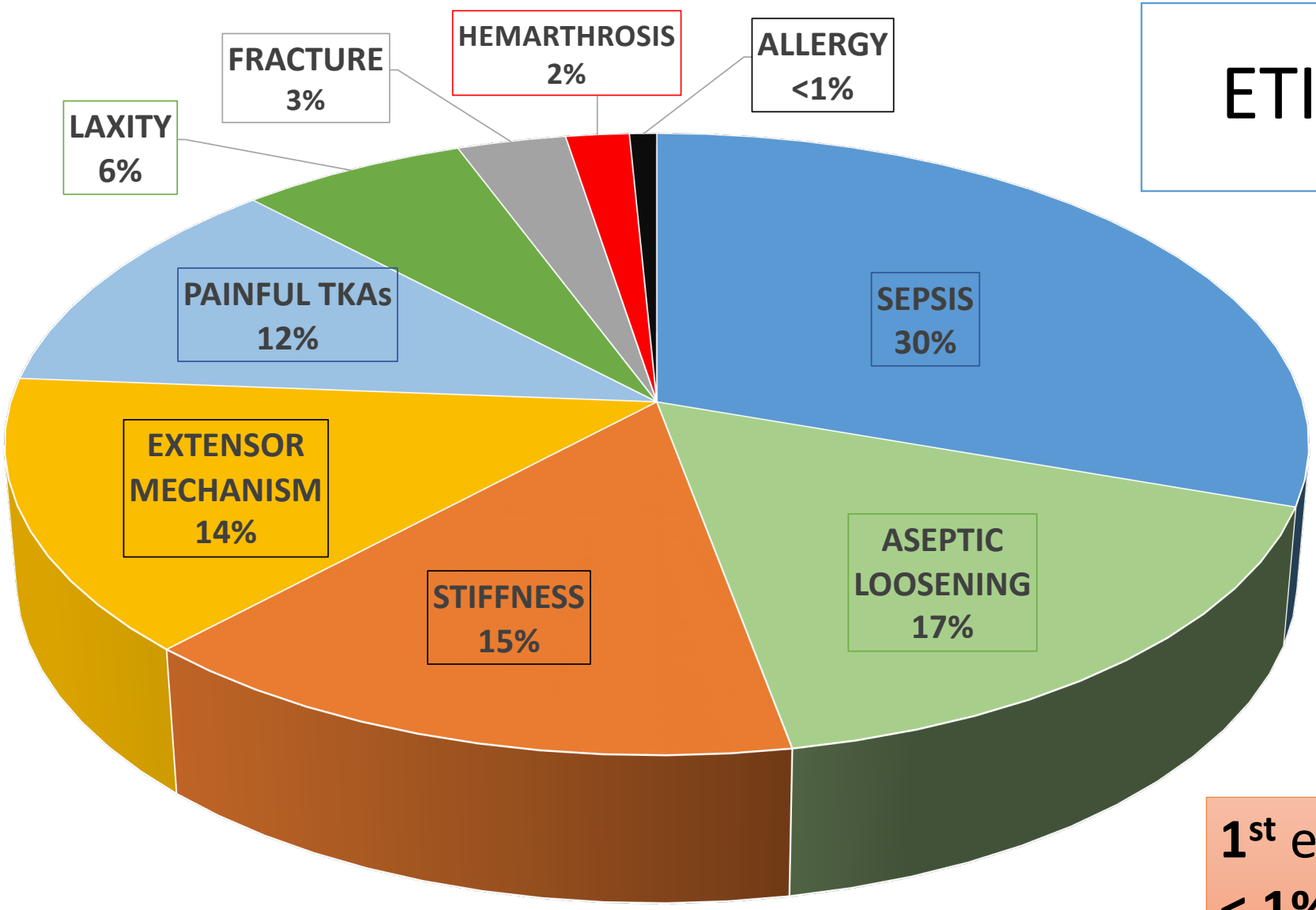
journal homepage: www.arthroplastyjournal.org



Why Reintervention After Total Knee Arthroplasty Fails? A Consecutive Cohort of 1170 Surgeries

Axel Schmidt, MD [a, *], Cécile Batailler, MD [a], Timothy Lording, MBBS [b], Roger Badet, MD [c], Elvire Servien, MD, PhD [a, d], Writing Committee, Sébastien Lustig, MD, PhD [a, e]

ETIOLOGIES



1st etiology = **Sepsis**

< 1% = Allergy

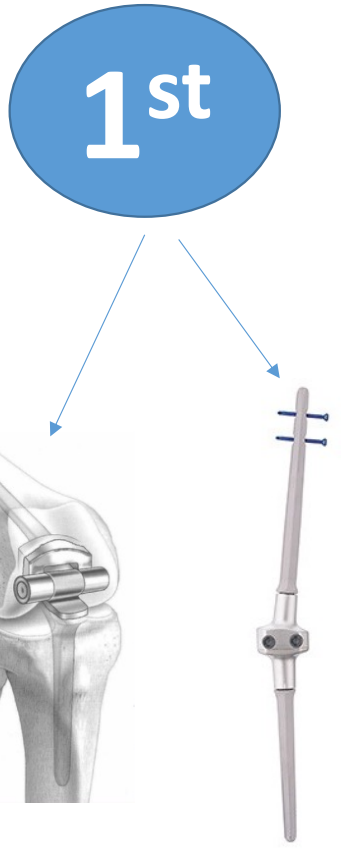
VOTE

use of CCK vs RH for different indications

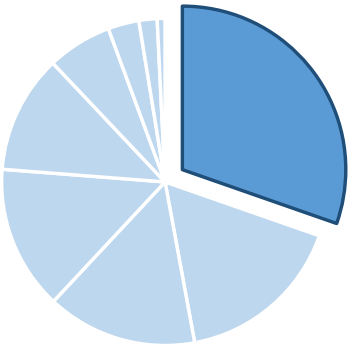
INFECTION
355/1170 (**30%**)

- 1st etiology
- CRIOAC
- Men = Women
- Surgery :
  - Prosthetic Revisions (**50%**)
  - « two-stage » surgery (**90%**)

- Acute Infection = **35%**
  - Arthrotomy - Lavage (98%)
- Chronic Infection = 65%
  - Prosthetic Revisions (80%)



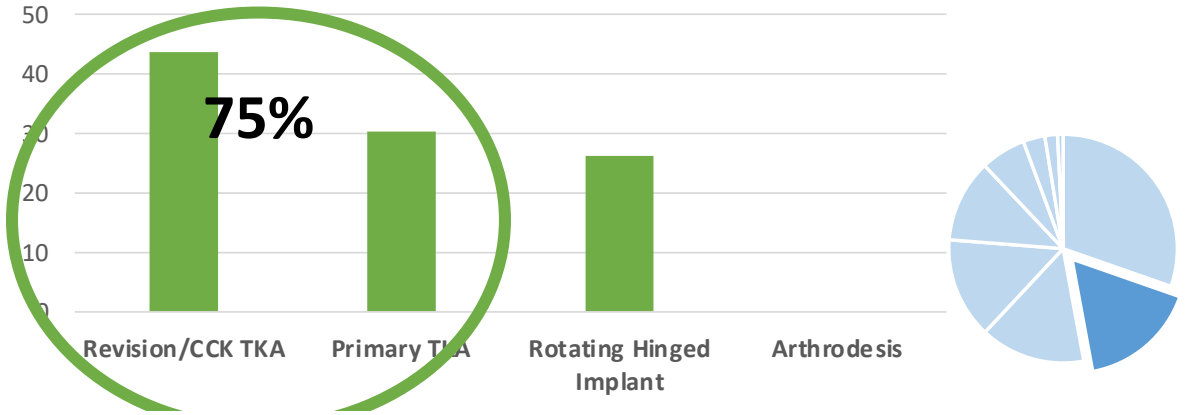
RHK = **70 (40%)**
CCK = **59 (33.7%)**
PS = **28 (16%)**
Arthrodesis = **18 (10.3%)**



ASEPTIC LOOSENING
196/1170 (**17%**)

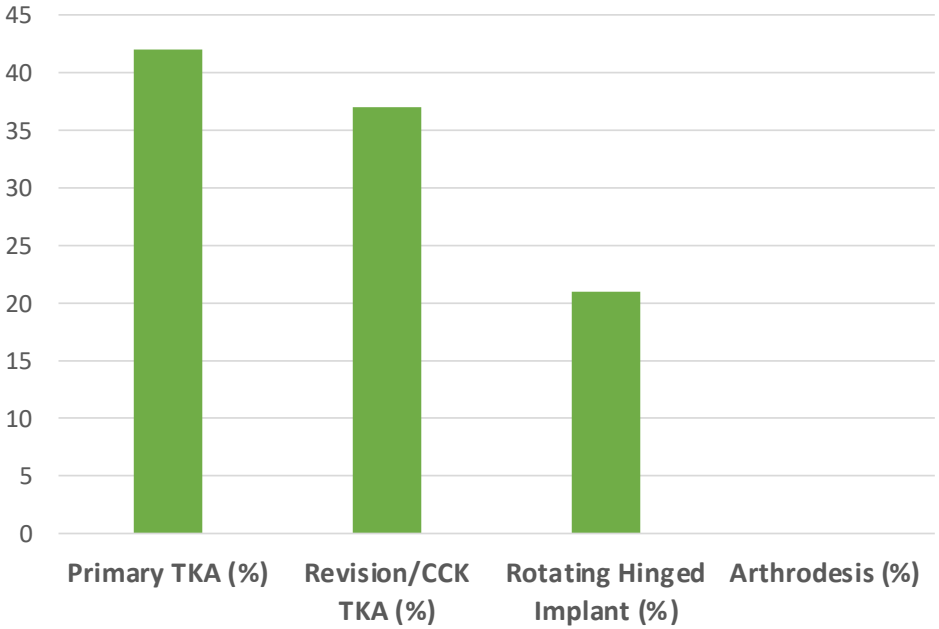
- 2nd etiology
- Delay : **7** (0,8 – 19,9) years
- **95%** : Prosthetic Revision « one - stage » surgery
- Origin :
  - **Tibia = 45%**
  - **Bipolar = 28%**
  - **Femur = 27%**

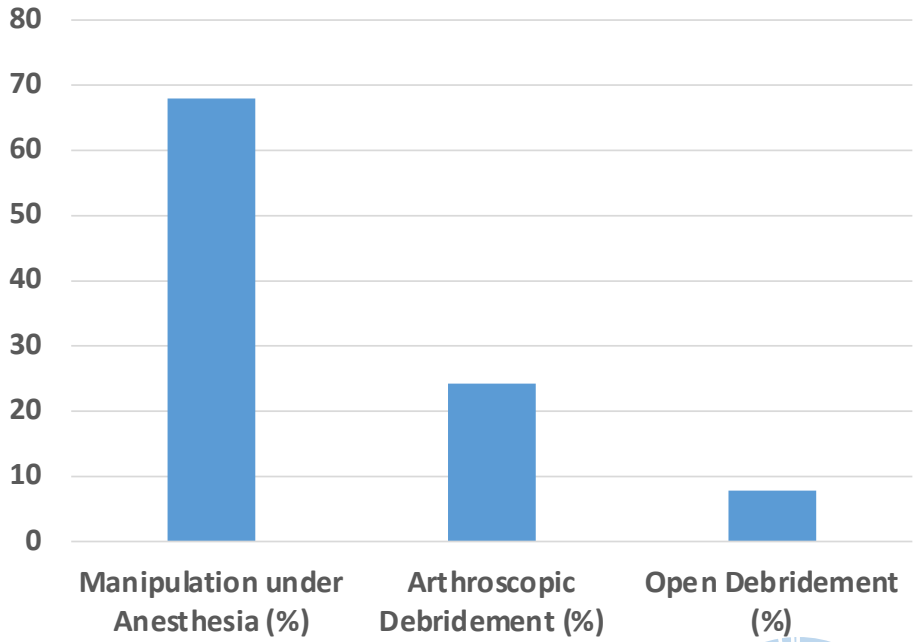
75% : Primary or Revision/CCK TKA



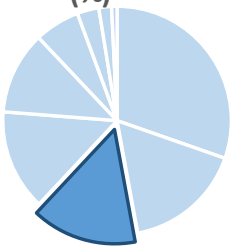
STIFFNESS
174/1170 (**15%**)

- **3rd etiology**
- **Younger patients** = 64 y.o.
- **75% :** Manipulation & Release Surgery





- **25%** : Prosthetic Revision
  - 1 stage +++
  - Primary TKA (> 40%)

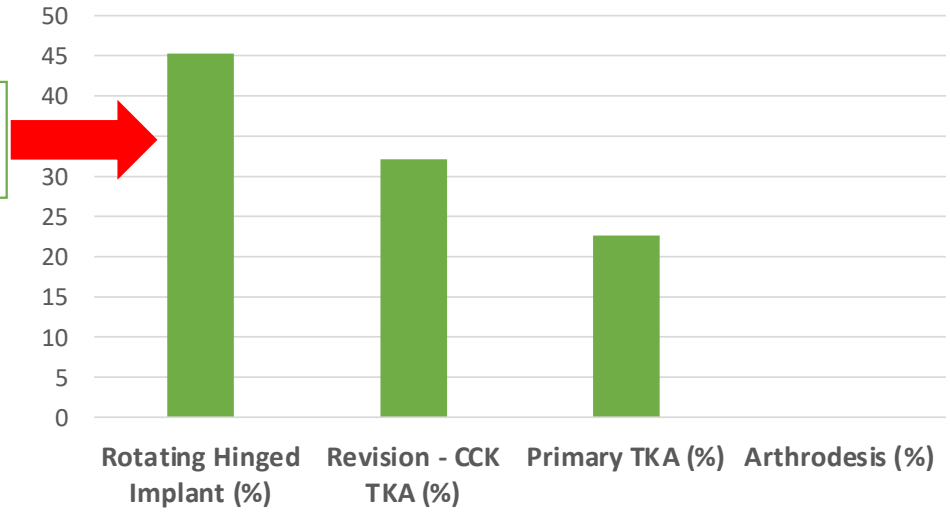


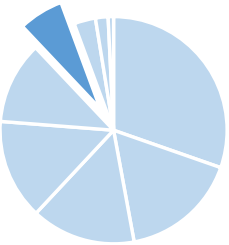
LAXITY & INSTABILITY

75/1170 (**6%**)

- **6th etiology**
- **70%** : Women
- **70%** : Prosthetic Revision « one-stage » surgery
- **30%** : Isolated Balancing Surgery

- **45%** : Rotating Hinged Implant



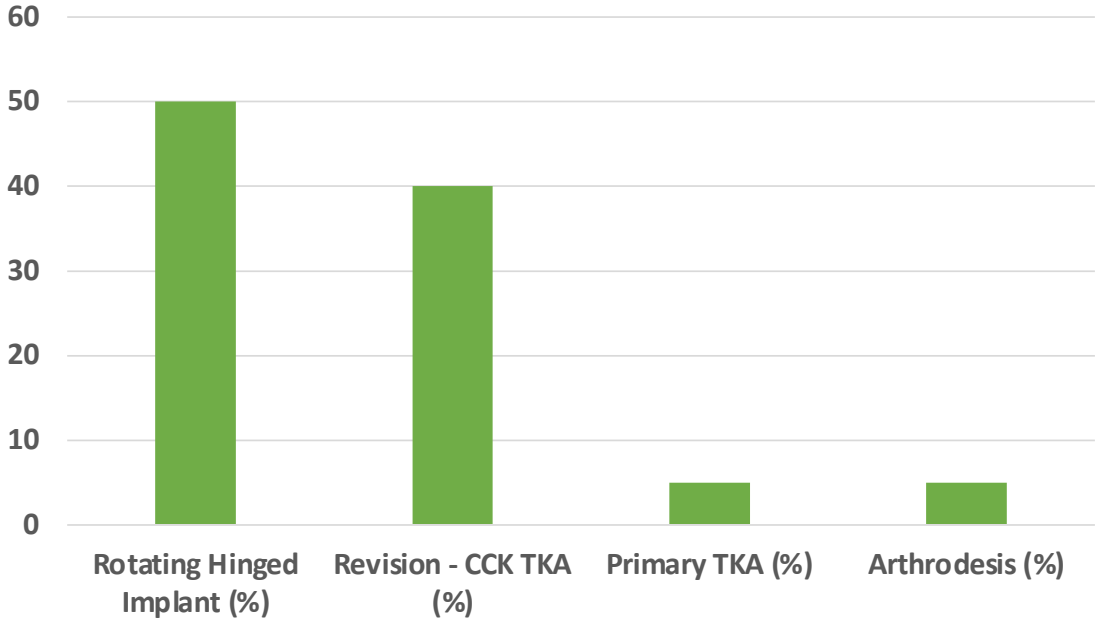


FRACTURE

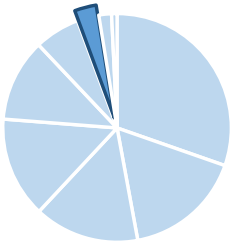
36/1170 (**3%**)

- **7th** etiology
- **Older** patients
- **Femur** = 82% >>> Tibia = 18%

- **> 50%** : Prosthetic Revision
- **50%** : Hinged TKA



- **Failed Revision:**
  - 4/36 (**11%**)
  - Infection = 50%



III. Clinical assessment supporting the indication

- Clinical tips to diagnose:

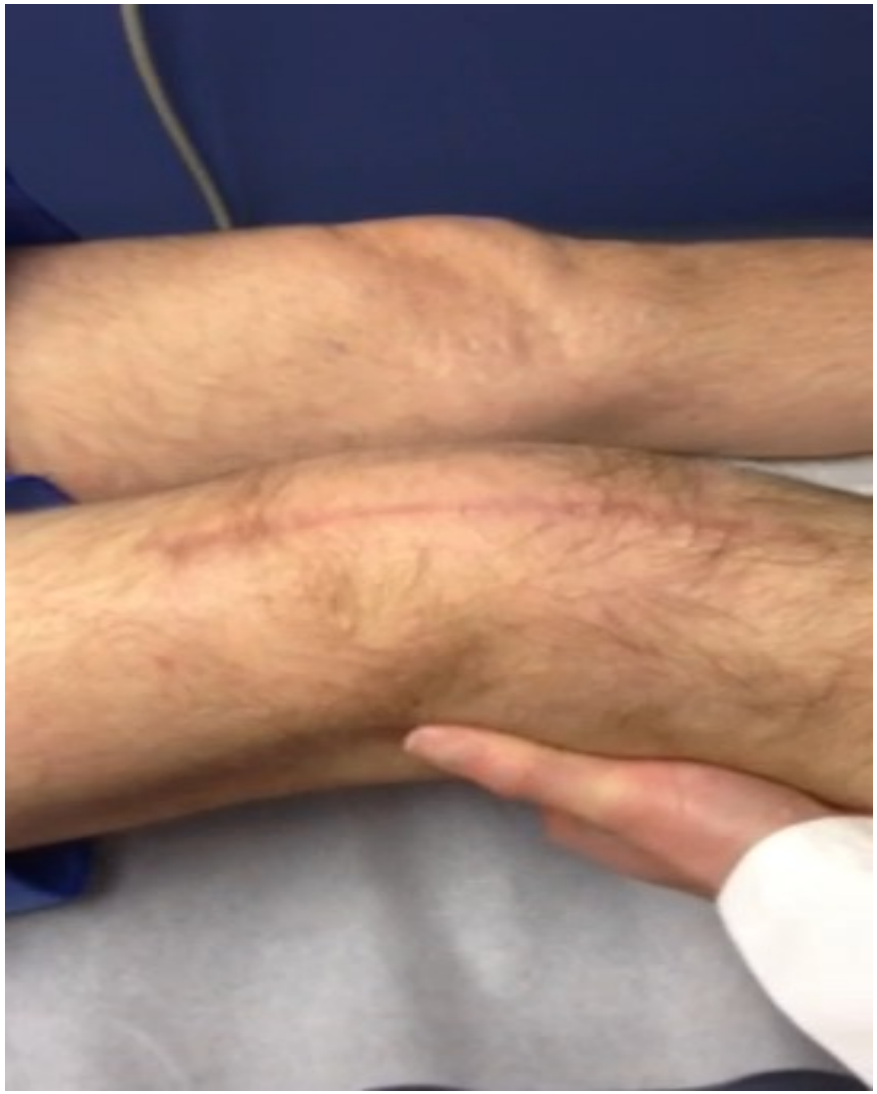
Subtle instability

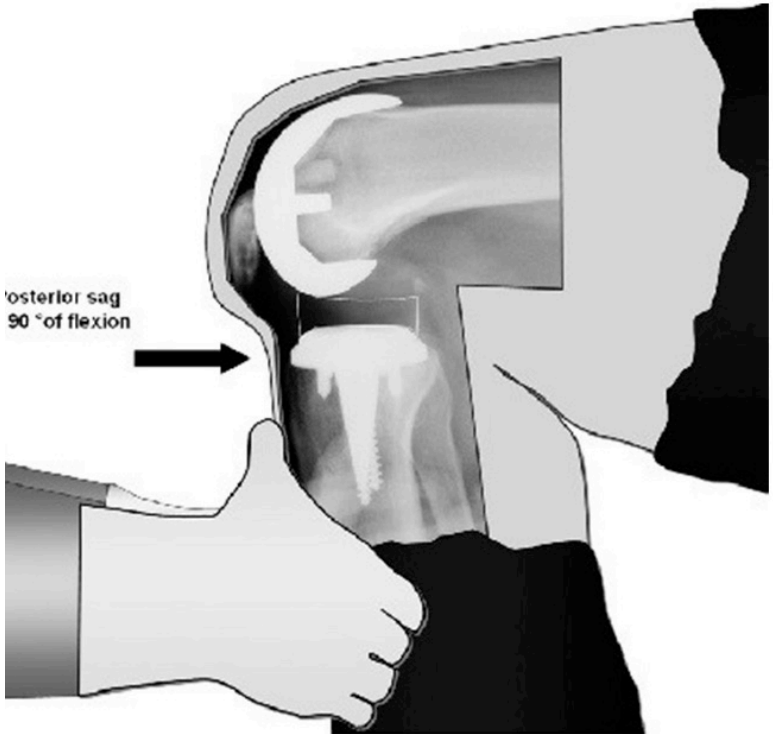
Gross instability

Ligament insufficiency

Flexion instability

- Collateral ligament deficiency
    - Global Instability





Rajgopal A, J Arthroplasty 2017

THE BONE & JOINT JOURNAL

■ KNEE

Stepwise surgical correction of instability in flexion after total knee replacement

- Decreased PCO > 4mm
- Distalization Femur > 6mm
- Increased Tibial Slope

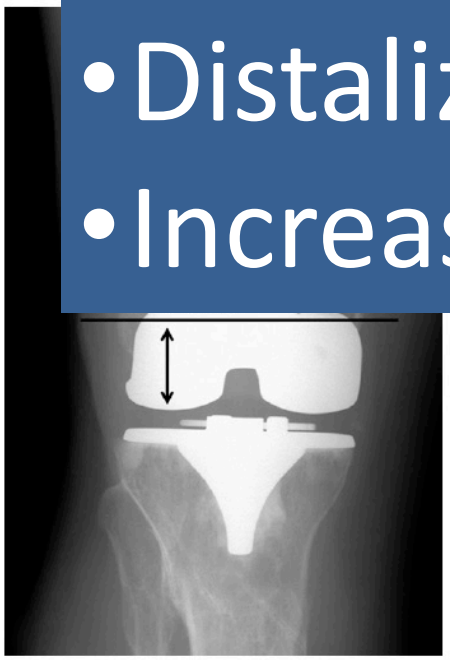


Fig. 1a

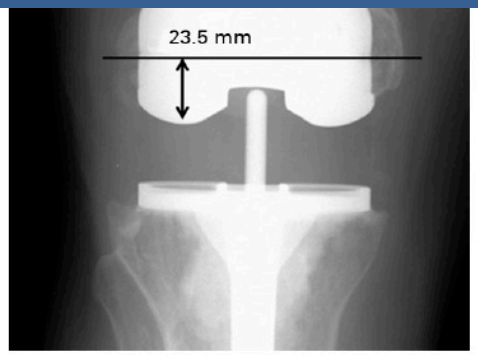


Fig. 1b

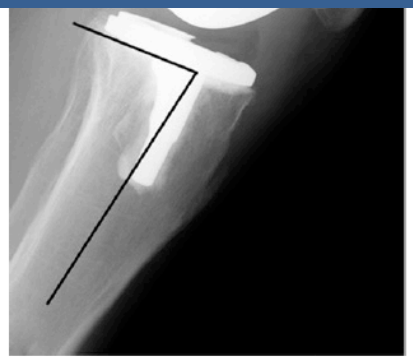
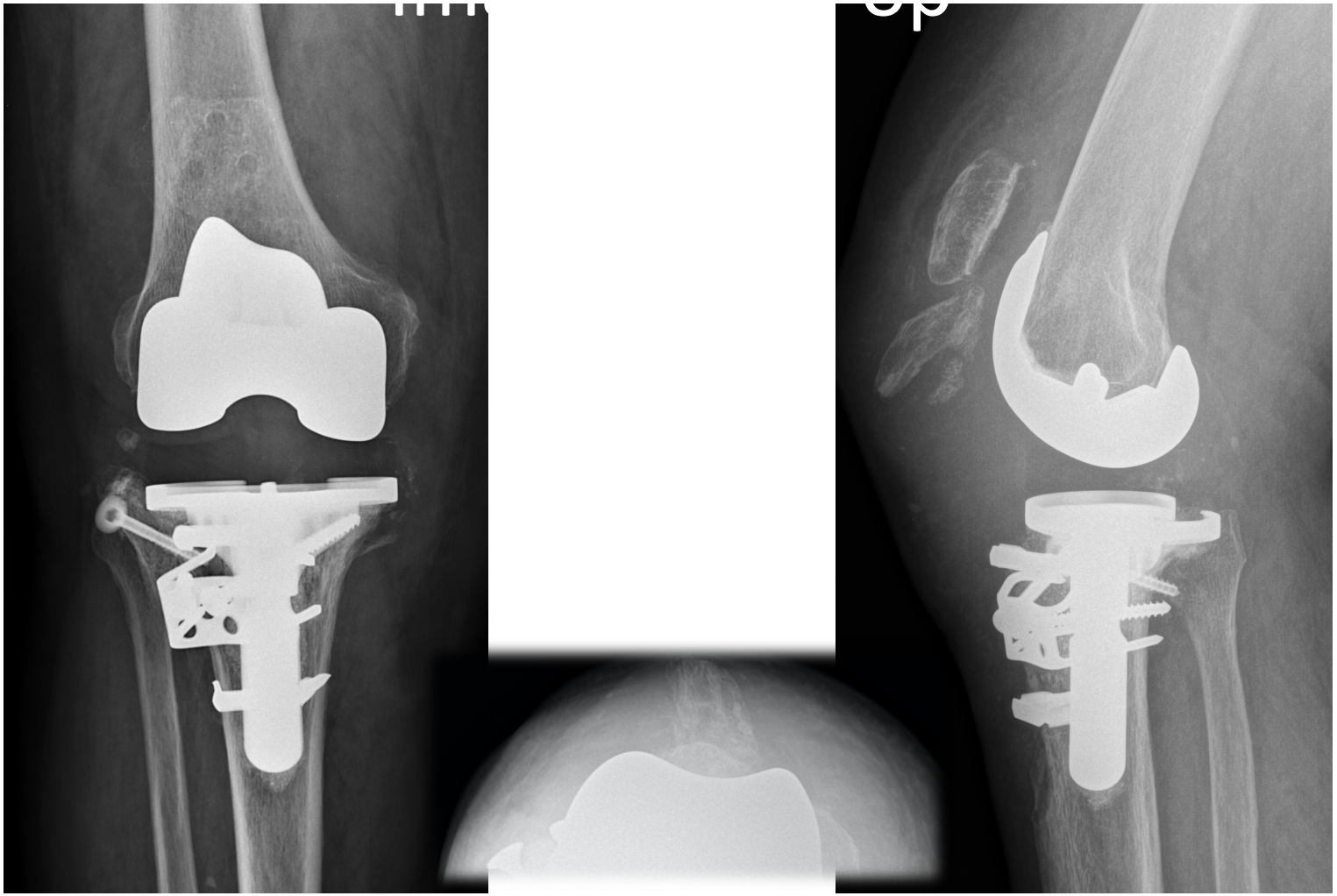
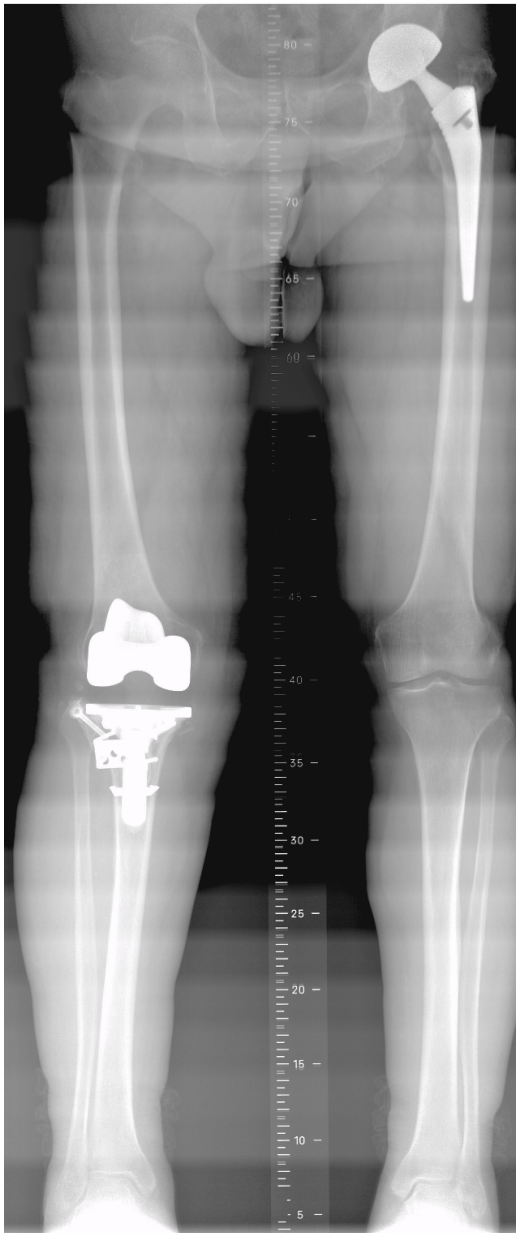


Fig. 2a

Fig. 2b






D


COUCHE


D
COUCHE

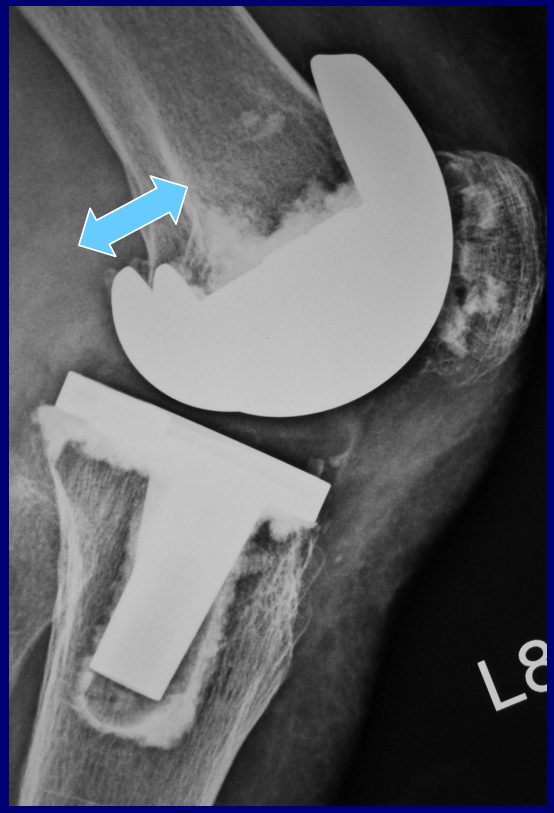
Operative technique

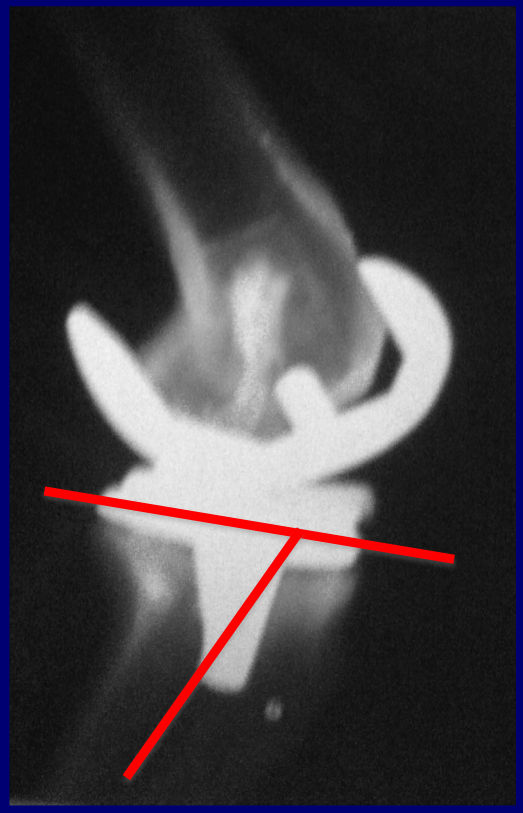
- Any differences in surgical strategy between CCK and RH:
  - Approach,
  - Soft tissue handling (collaterals, capsule),
  - Thoughts around joint reconstruction for CCK vs RH,
  - Thoughts around fixation for CCK vs RH.

6 steps to balancing gaps

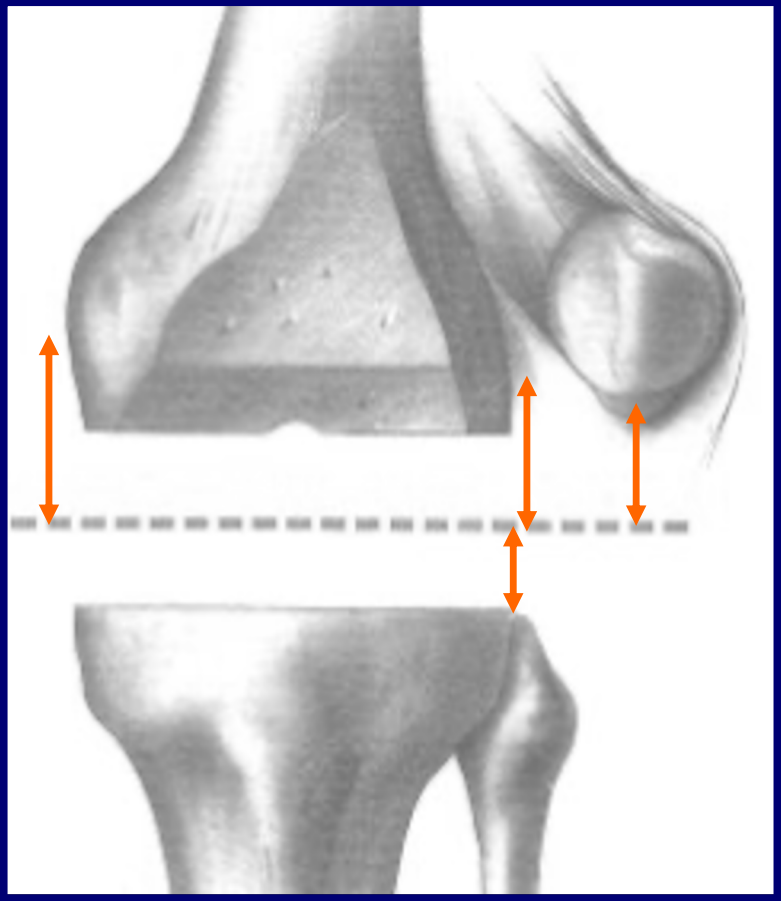
1. Assess joint line before explantation
2. Measure gaps after careful explantation
3. Restore tibial plateau
4. Establish flexion gap
5. Equalise extension gap
6. Add constraint only if imbalance persists

1. Assess preop xrays for causes of large flexion gap



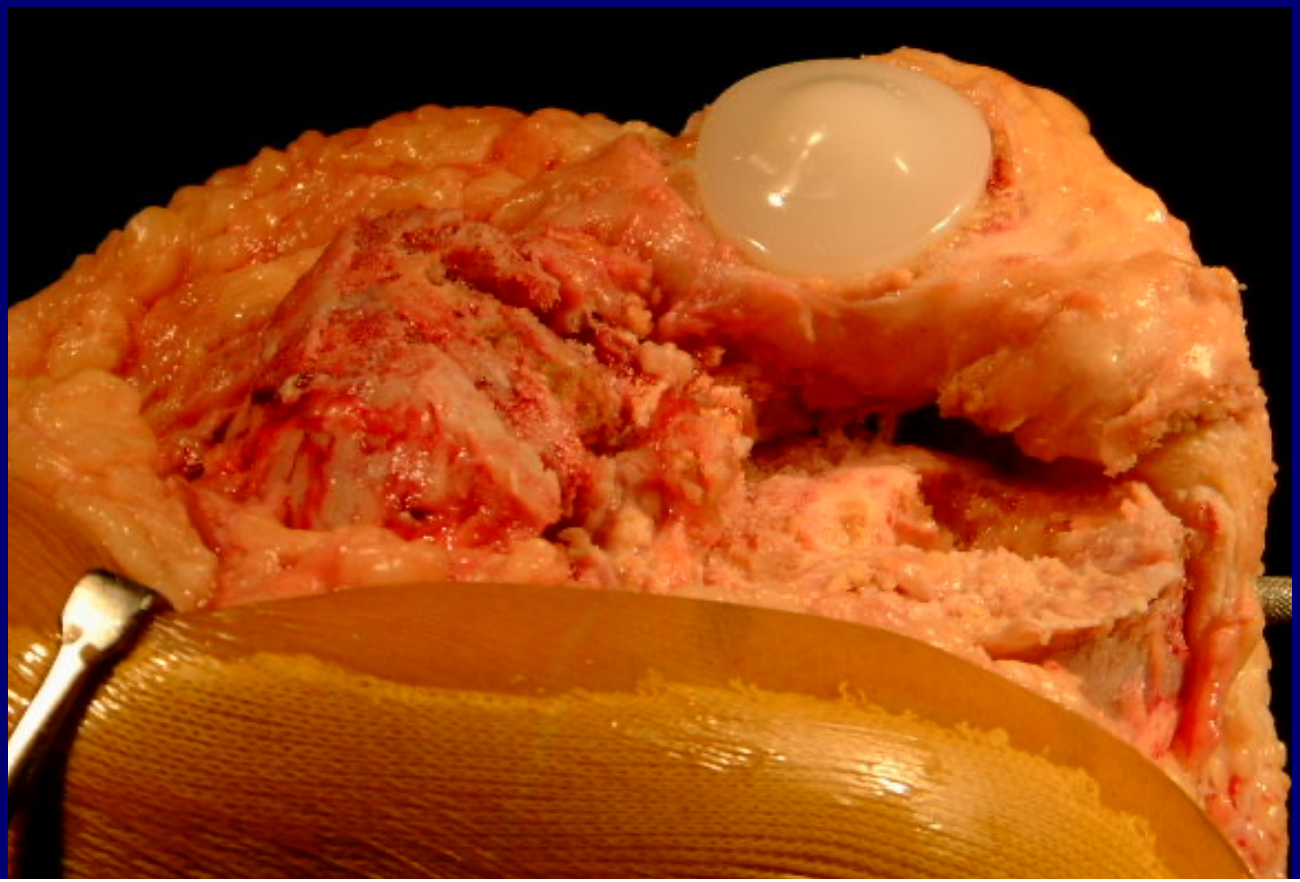


Assess joint line level ***before*** implant removal

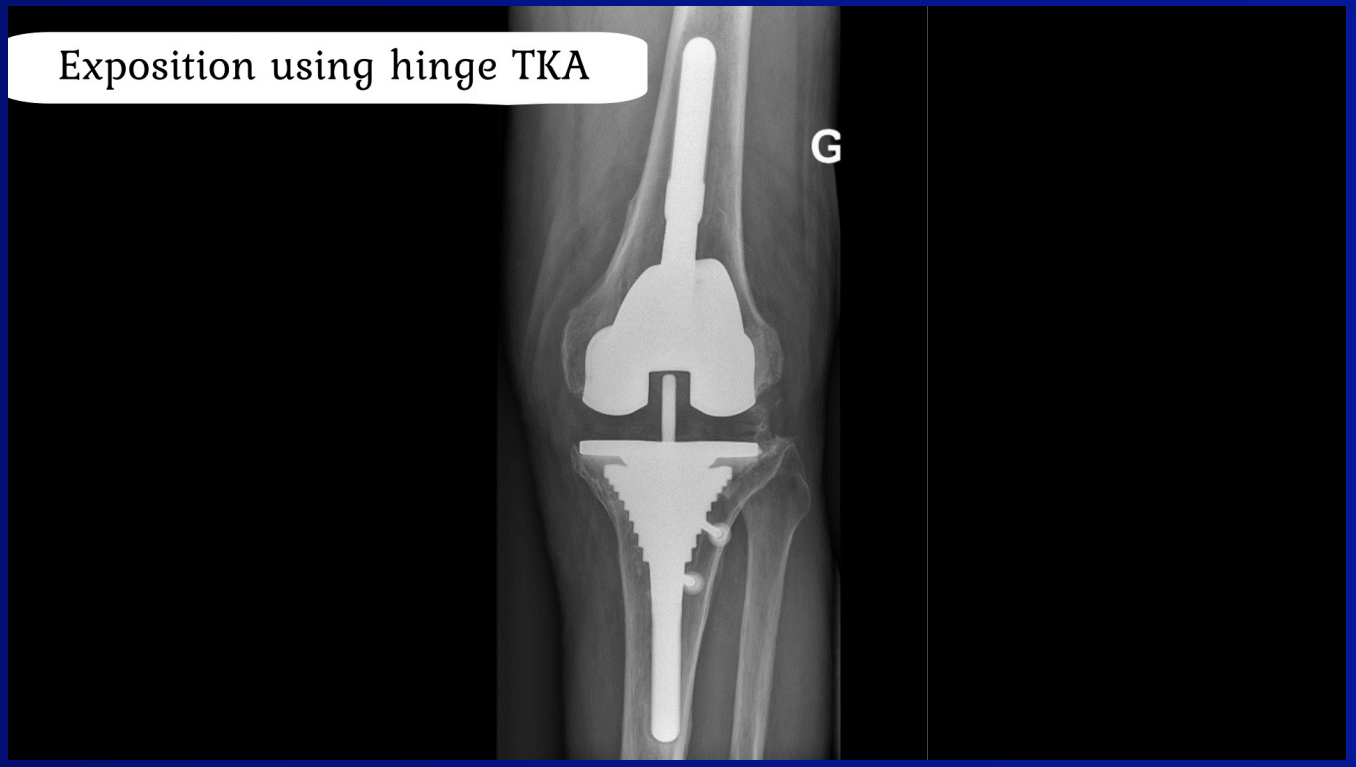


Medial epicondyle
Lateral epicondyle
Patella
Fibular head
Meniscal remnant

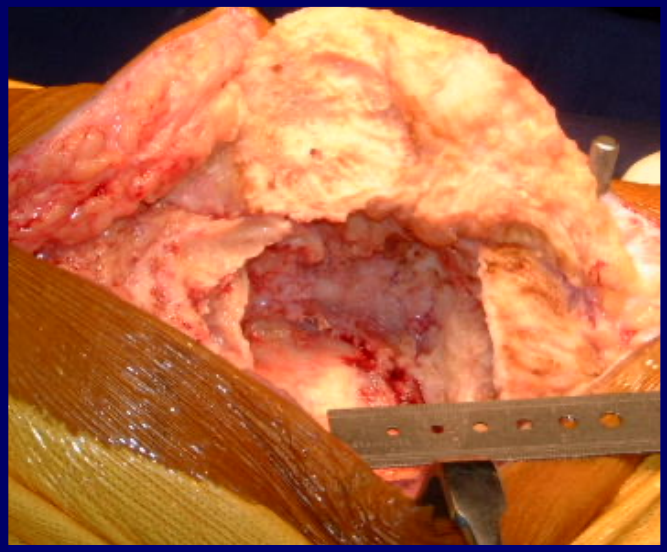
2. Careful explantation: Preserve maximum bone & minimise soft-tissue release



How to manage ?
Exposure : Hinge TKA

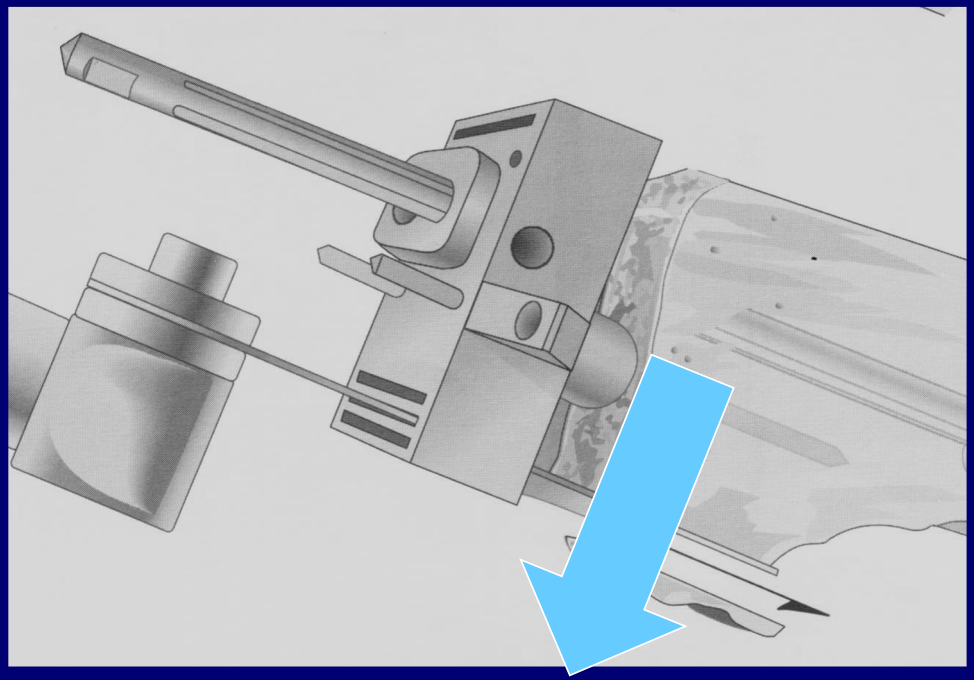


Assess flexion-extension gaps

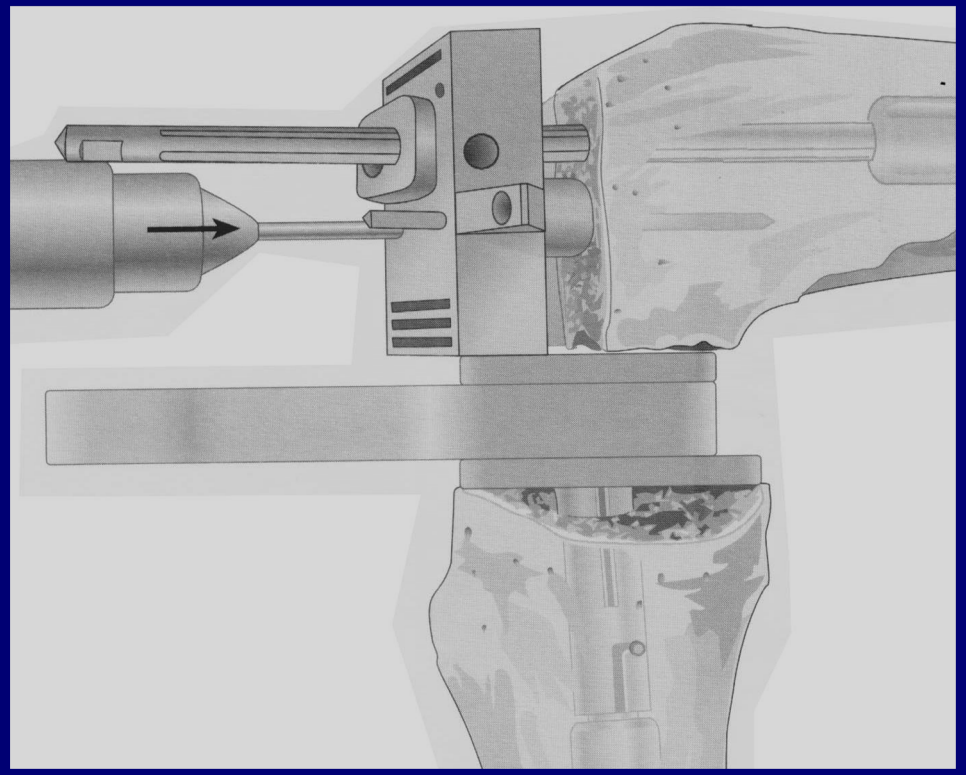


3. Correct tibial slope and height: sleeves/stem/augment

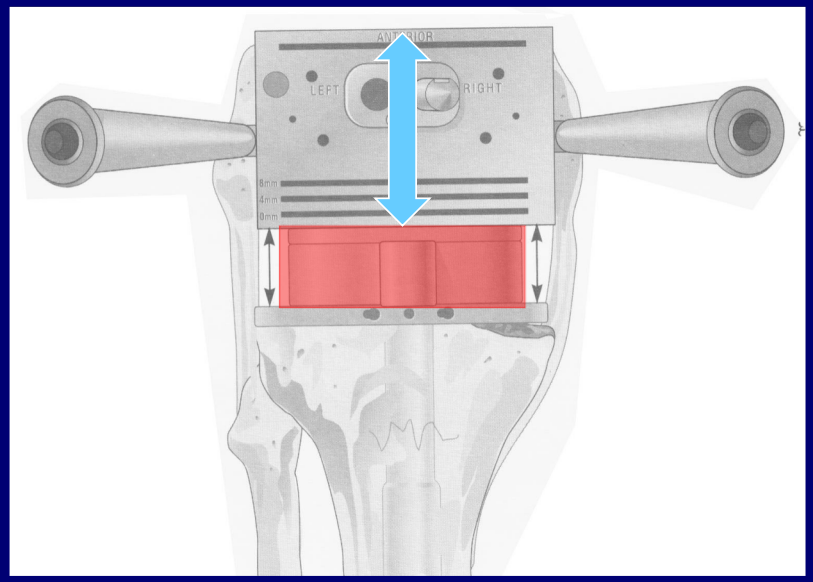
4. Prepare femur: posteriorize IM rod or use short rod if anterior bowing

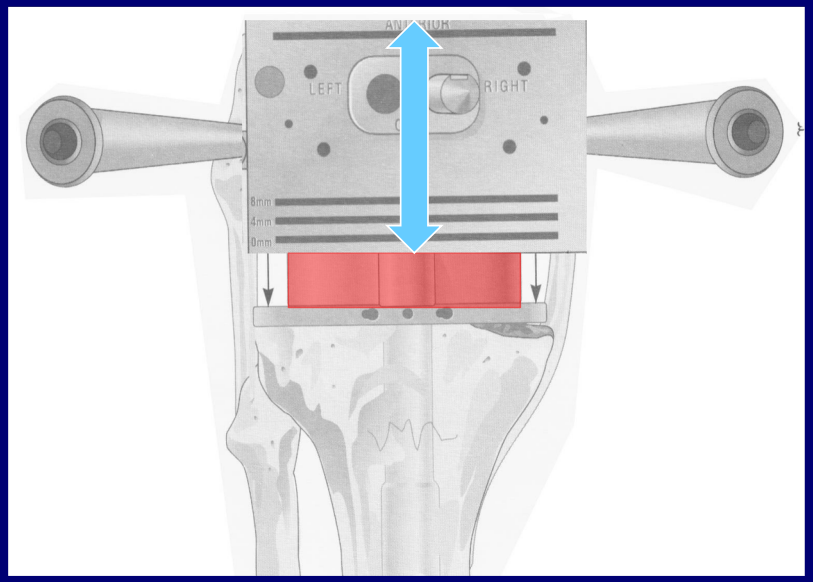


Size distal femur & check flexion gap



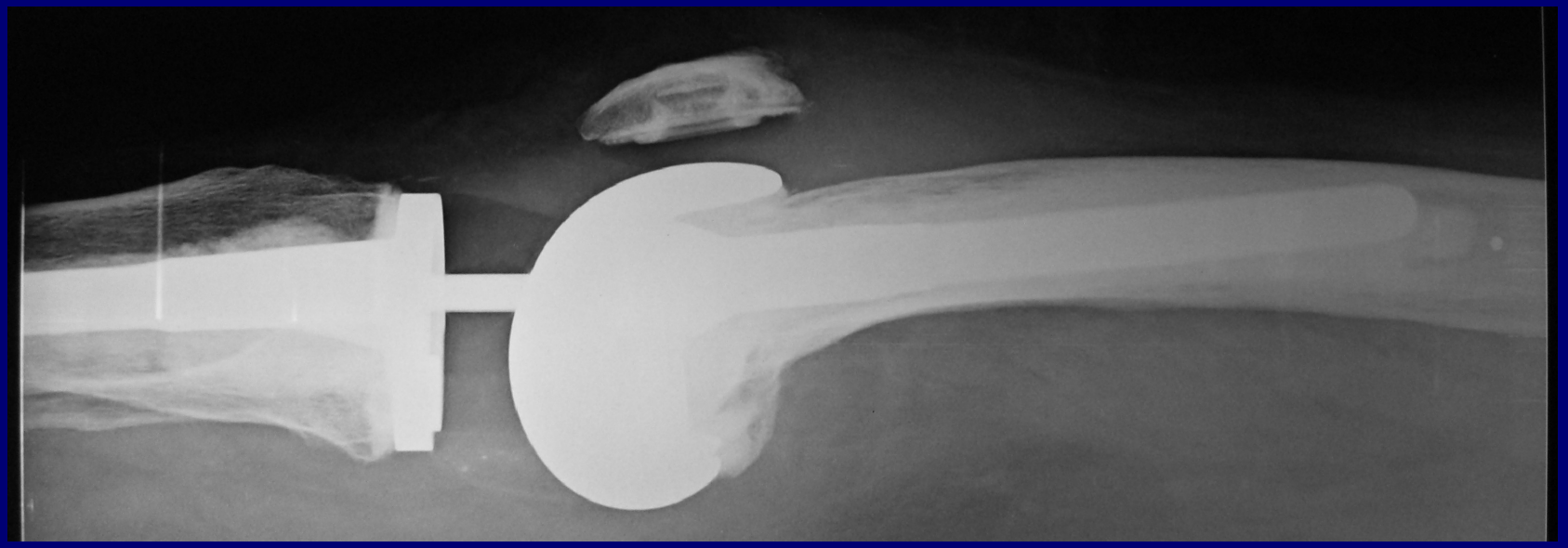
Equalise flexion to extension gap: Upsize femoral component



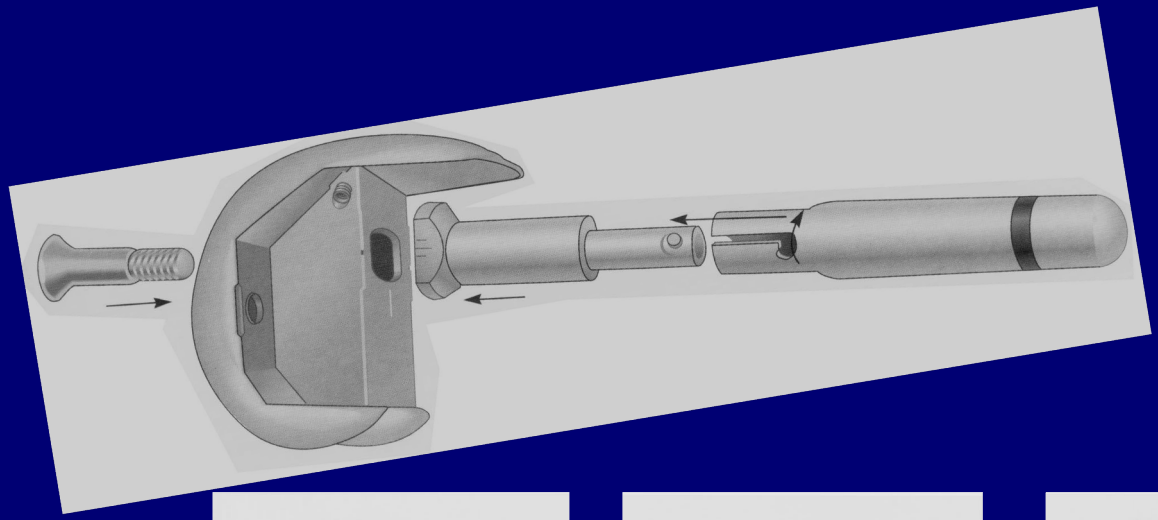


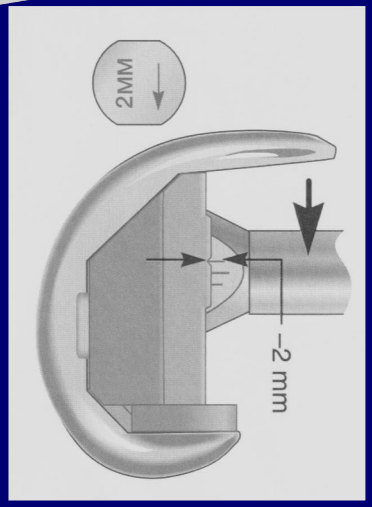
Larger flexion gap occurs by reaming for a longer stem in a bowed femur

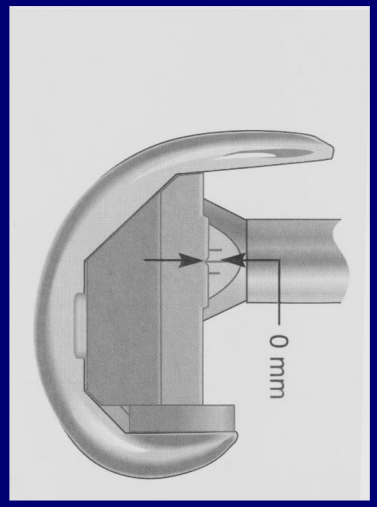
Use short cemented stem to flex the femoral component & close flexion gap

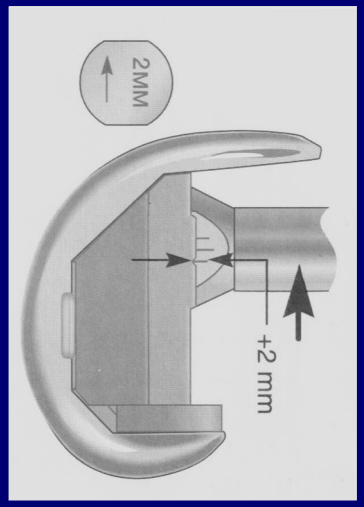


Or use an offset stem

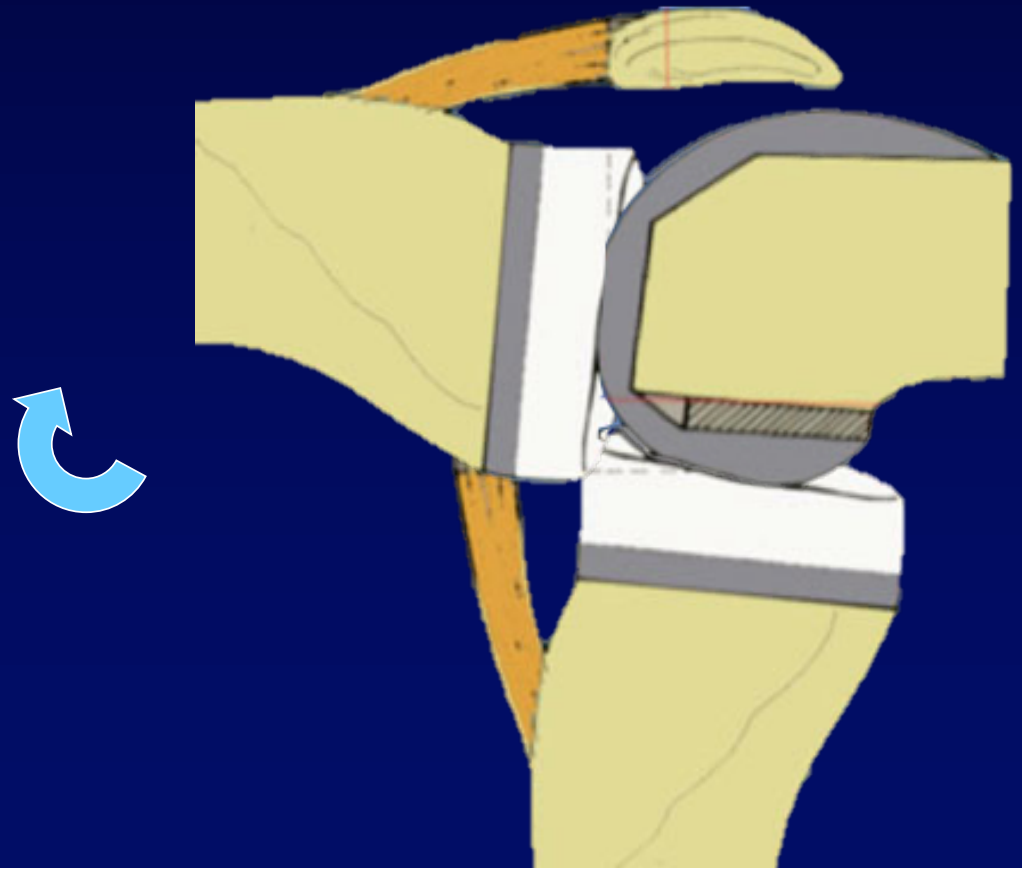




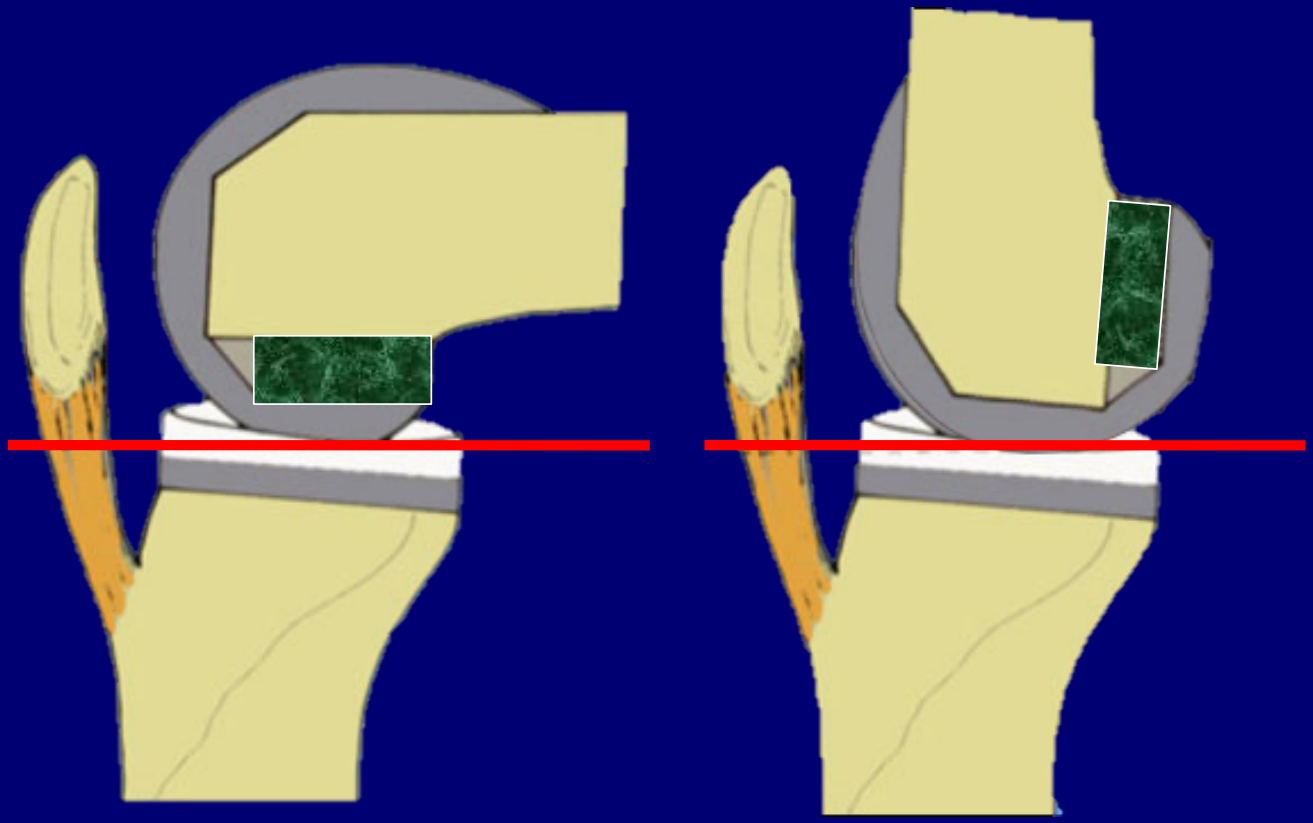




5. Extend knee & equalise extension to flexion gap by proximal-distal placement



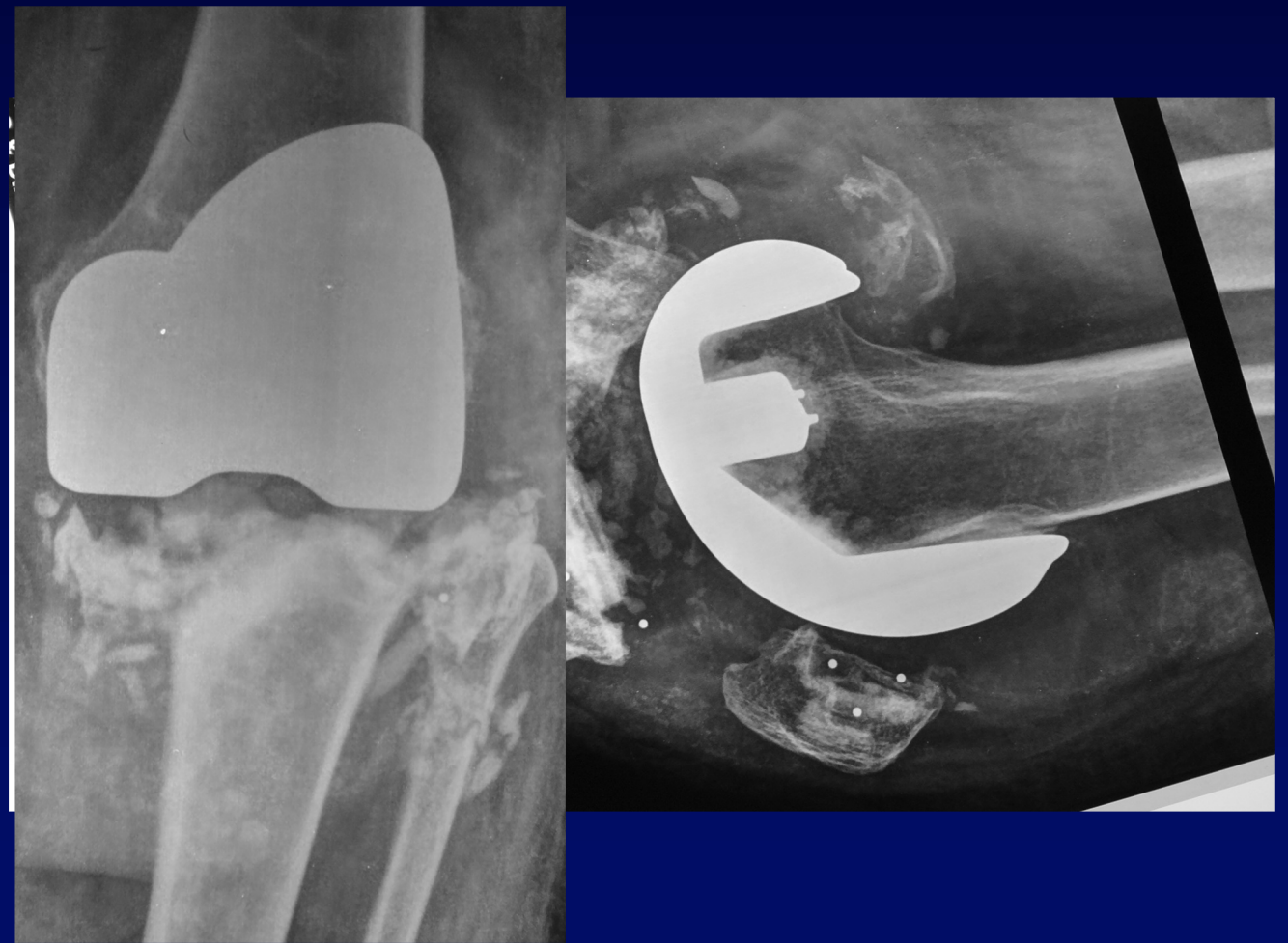
With trials in place, verify joint line relative to prior references



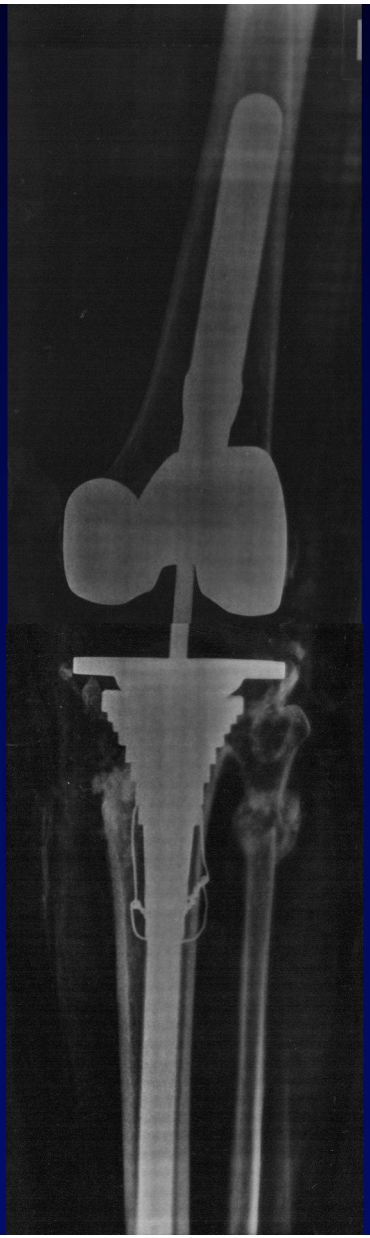
6. Use additional constraint only if flexion gap > jump height of PS post

TC3 or VVC

8 y post TKA; 50-y-old F with RA



Stemmed femoral component; rotating platform TC3 insert; tibial sleeve & stem


Constrained implant unable to balance gaps: Hinge