Principles of Revision Knee Arthroplasty

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Aims

- Current and Predicted revision burden
- Causes of failure and revision
- Principles of Revision TKR
- Revision Strategy
- Future Direction of Revision Surgery

Burden

- 90,000 pa TKR - NJR
- 700,000 USA - predicted to increase by 600% by 2030, with 250,000 revisions.
- 92% increase in NJR revisions in 5 years. C.6000
- Increased trend in younger patients
- 4 million in US with a TKR
- Aged >77, 90% chance of outliving TKR
- <55, 5x 3year revision rate

Hamilton et al JBJS Br 2015

Financial Analysis

- Approx £8000 NHS England Tariff
- Costs £9655 for aseptic revision
- £30,000 infected revision

- Mean loss £4655 per case

Kallala et al JBJS Br 2015

Principles of Revision

- Diagnosis
- Revise, don’t repeat
- Complete revision
- Pre operative plan (A, B, C, Z)
- Stable fixation with compensation for bone loss
- Restoration of Joint Line
- Restoration of Anatomical Alignment and rotation
- Soft Tissue balancing with functional stability

Reasons for failure of TKR

- **IDENTIFY A CAUSE**

- Mont MA, Serna F, Krackow K, Hungerford Exploration of radiographically normal total knee replacement for unexplained pain. CORR 1996;1:216-20.

Causes of failure of TKR NJR

Aseptic loosening	24%
Pain	17%
Instability	10%
Infection	30%
Malalignment	6%
Periprosthetic #	3%
Stiffness	6%

Early Revision

- Instability
- Malalignment
- Malposition
- Fixation failure
- Patella

75% <2yr

- **Infection**

Sharkey PF, Hozack WJ, Rothman RH, Shastri S, Jacoby SM. Why Are Total Knee Arthroplasties Failing Today? Clin Orthop Relat Res 2002;1:7-13.

Workup

History

- “never been right” vs new onset
- Peri op issues
- Pain – mechanical, loading vs constant
- Hip & spine
- Bloods
- Aspiration

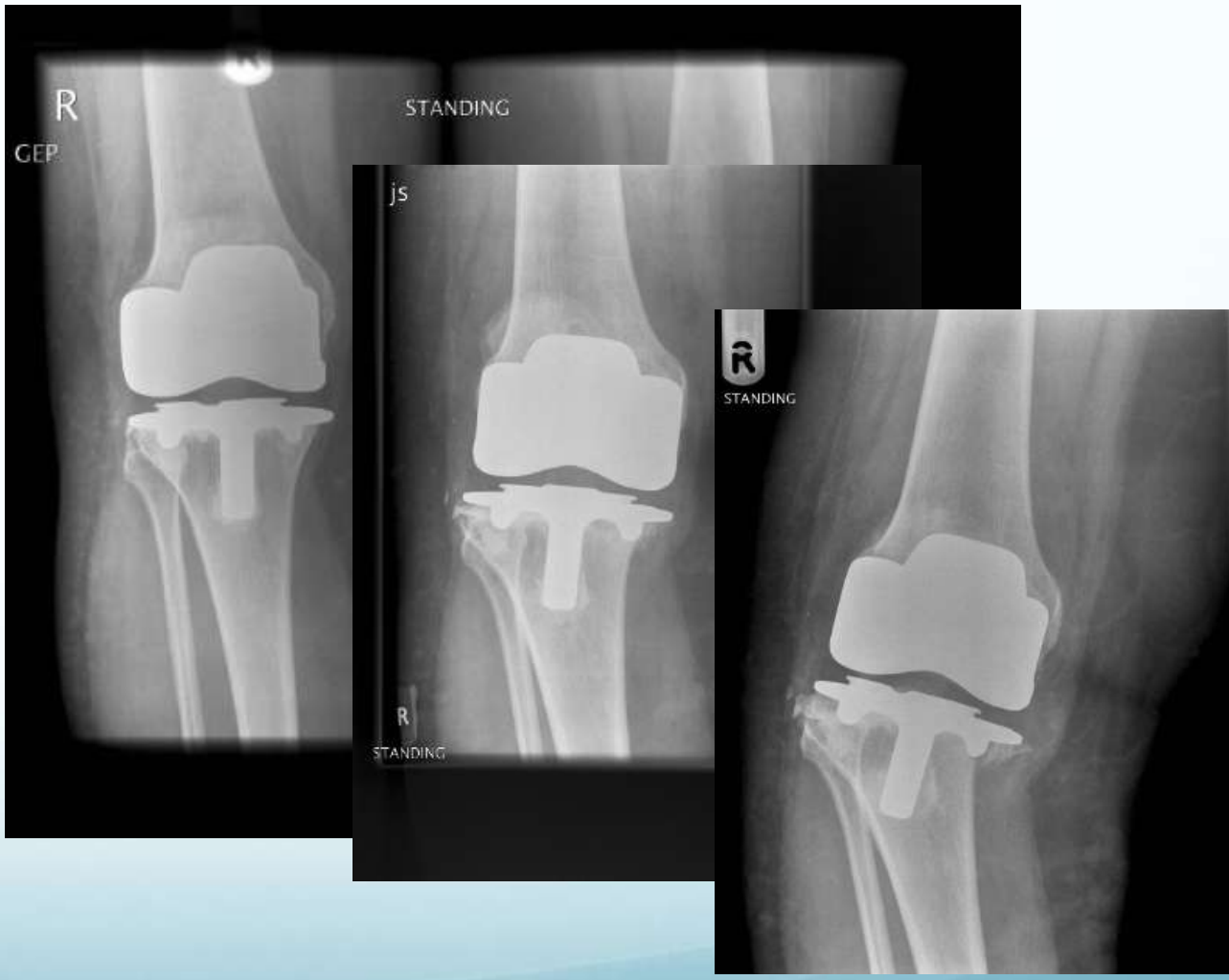
Examination

- Soft tissues
- Alignment
- ROM
- Instability – AP, varus/valgus, collaterals
- Extensor function
- Patellar tracking

INFECTION

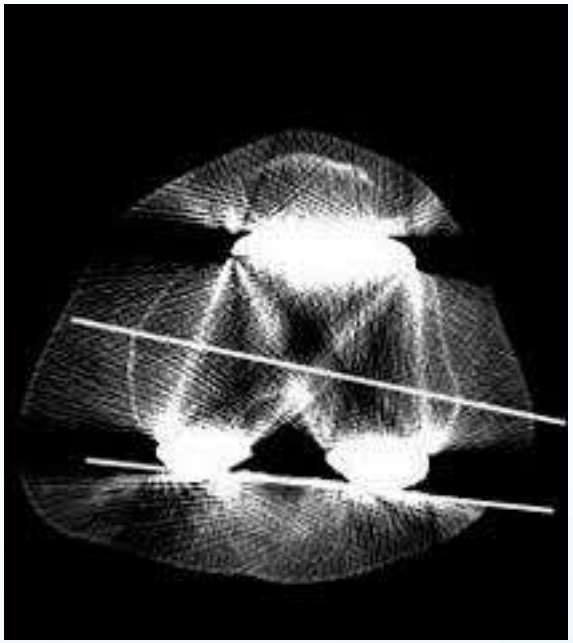
XR

- Sequential



XR

- Alignment
- CT for rotation

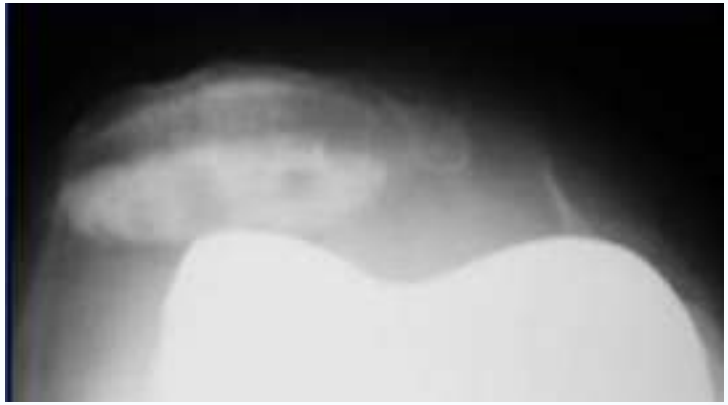


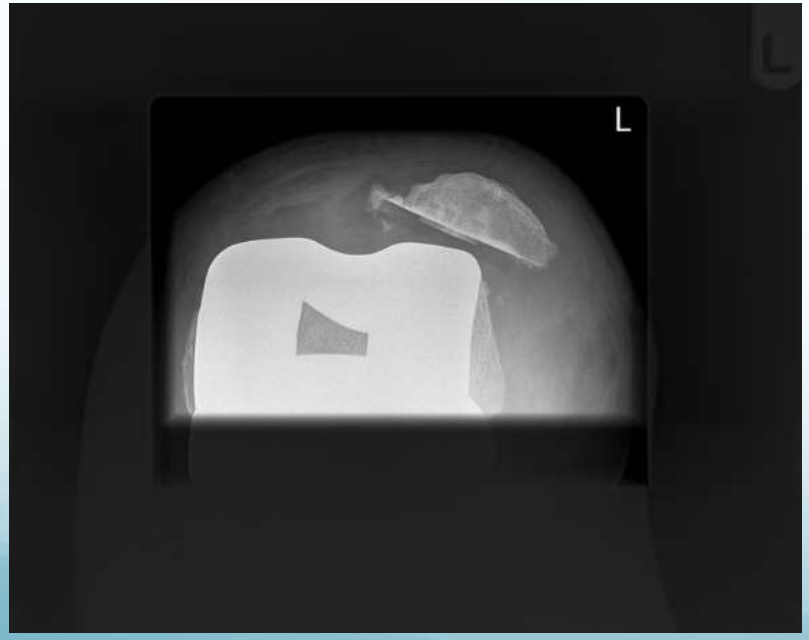
THE PERTH CT PROTOCOL FOR TOTAL KNEE ARTHROPLASTY

S.K. Chauhan, G.W. Clark, R.G. Scott, S. Lloyd and J.M. Sikorski

XR

- Patella





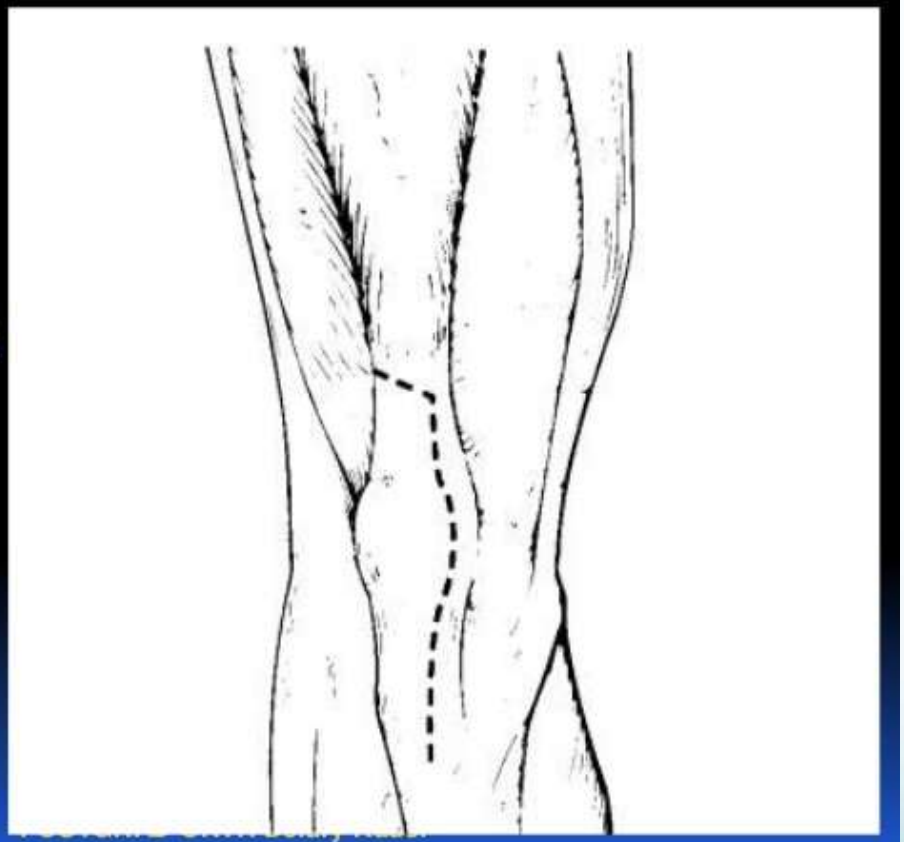
Surgical Technique

Exposure

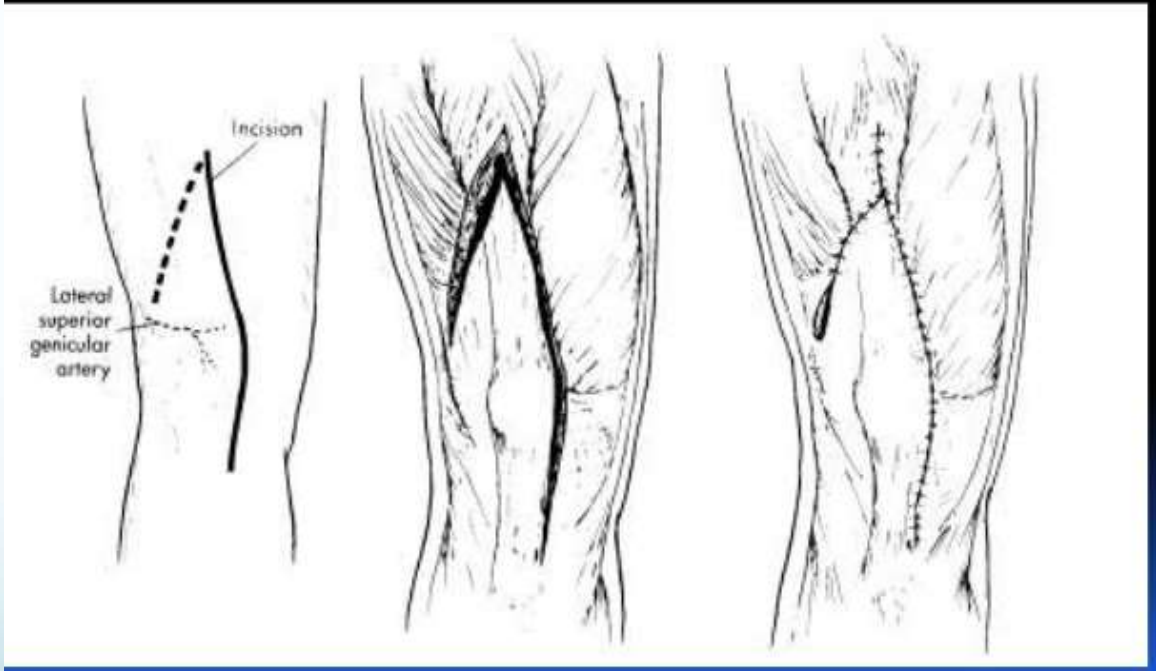
- Attention to detail
- Steady, gradual exposure
- Scarred, fibrotic extensors
- Shortened PT

- Supra patellar pouch, gutters
- Patella subluxation
- Femoral peel
- Plastics

Rectus snip (Insall)

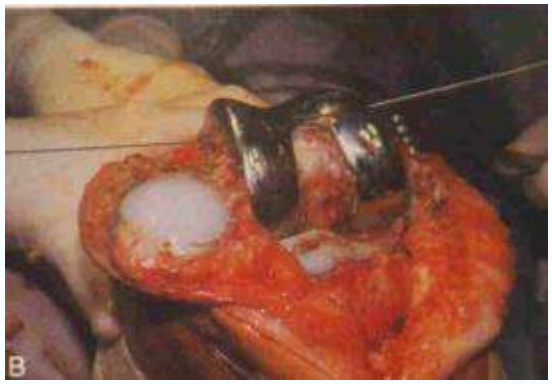


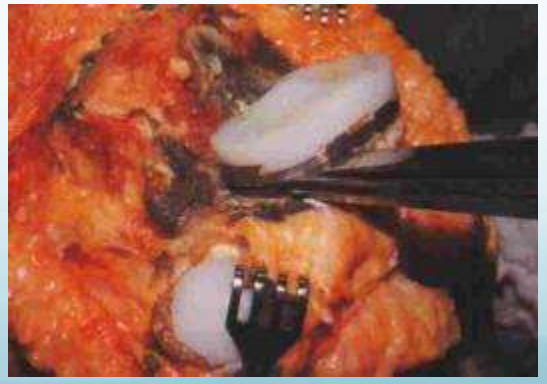
Scott Siliski V-Y Quadricepsplasty



Removal

- Remove surrounding soft tissue
- Femur
  - Gigli saw
  - Stacked osteotomes
  - Sagital saw
  - Punch
  - Posterior condyles

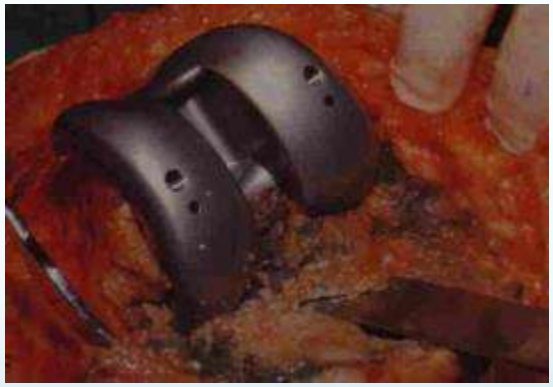




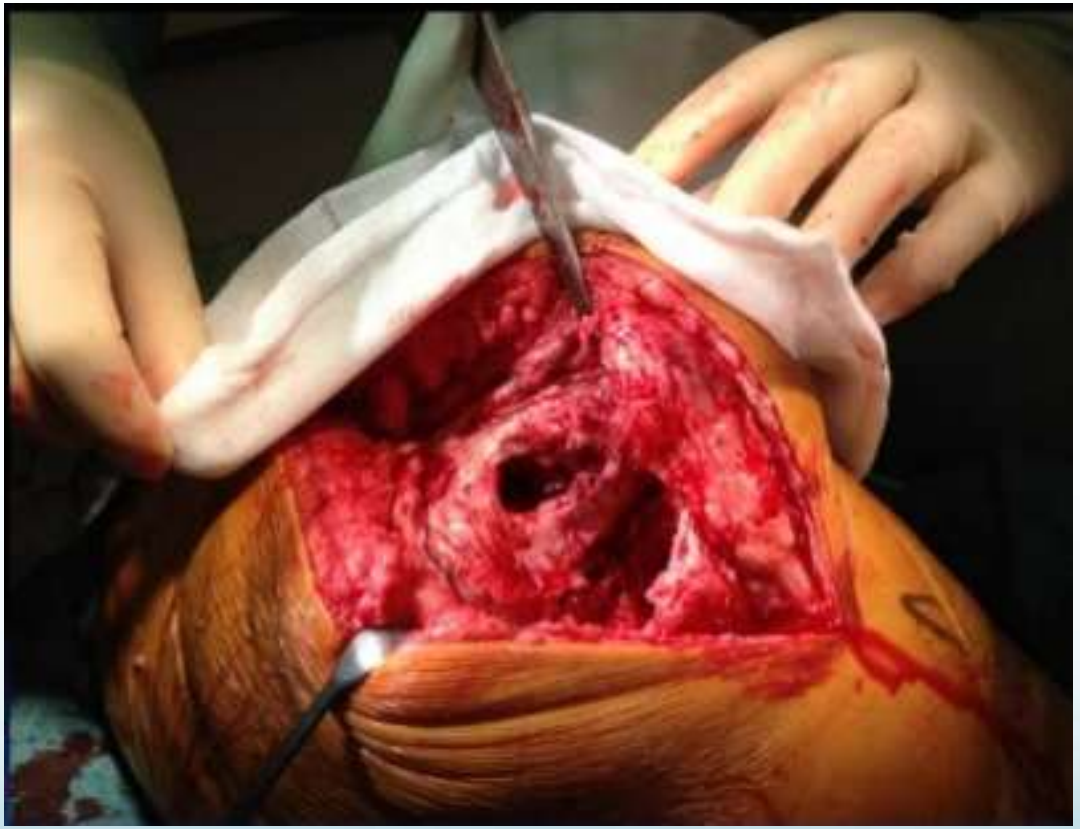
Removal

- Remove surrounding soft tissue
- Tibia
  - Oscillating saw
  - Stacked osteotomes
  - Clearance of posterior

tibia off femur



Bone Loss

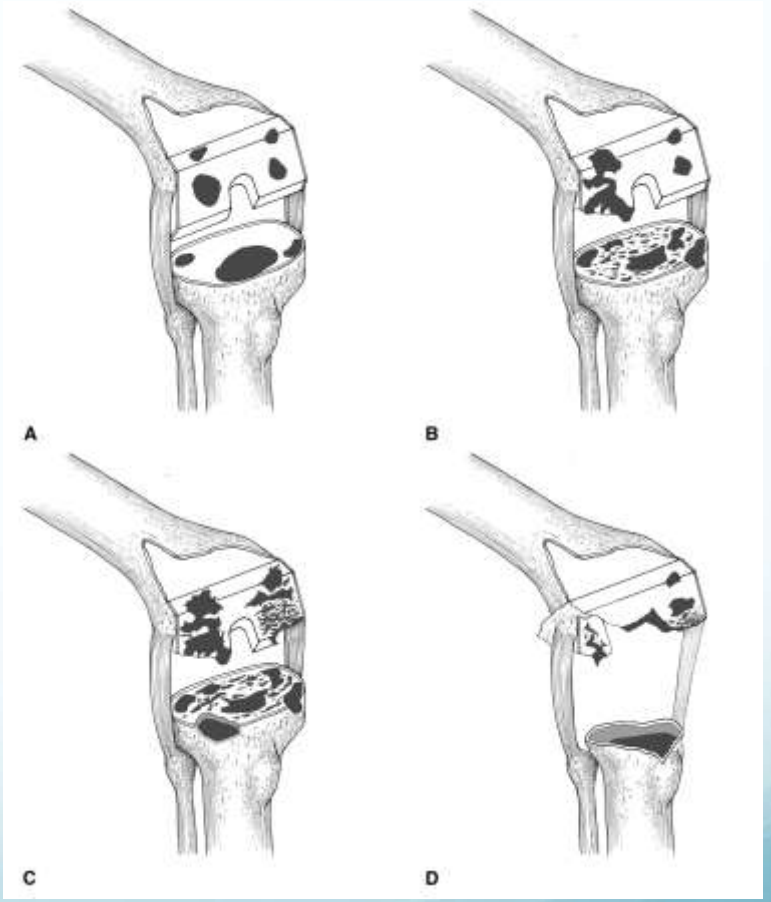


Bone Loss - AORI

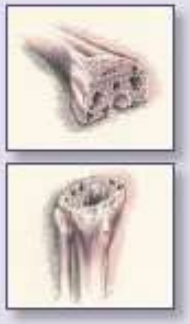
Table 1

Anderson Orthopaedic Research Institute Classification of Bone Defects

Type	Severity of Bone Deficiency Encountered
1	Minor femoral or tibial defects with intact metaphyseal bone, not compromising the stability of a revision component
2	Damaged metaphyseal bone. Loss of cancellous metaphyseal femoral bone requiring reconstruction (cement fill, prosthetic augment, or bone graft) to provide stability of the revision component.
	A: Defects in one femoral or one tibial condyle
	B: Defects in both femoral or both tibial condyles
3	Deficient metaphyseal segment compromising a major portion of either femoral condyles or tibial plateau, occasionally associated with collateral or patellar ligament detachment.



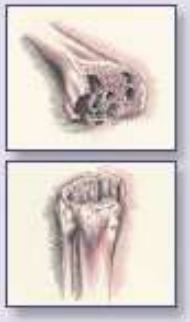
Indications



Type I

Femoral
There is no component subsidence or osteolysis. The femur maintains a normal joint line with full condylar profile. Primary components are generally used unless soft tissue deficiencies dictate
a greater level of constraint.

Tibial
There is no component subsidence or osteolysis. The tibial plateau is above the level of the fibular
head and there is a full metaphyseal segment.



Type II

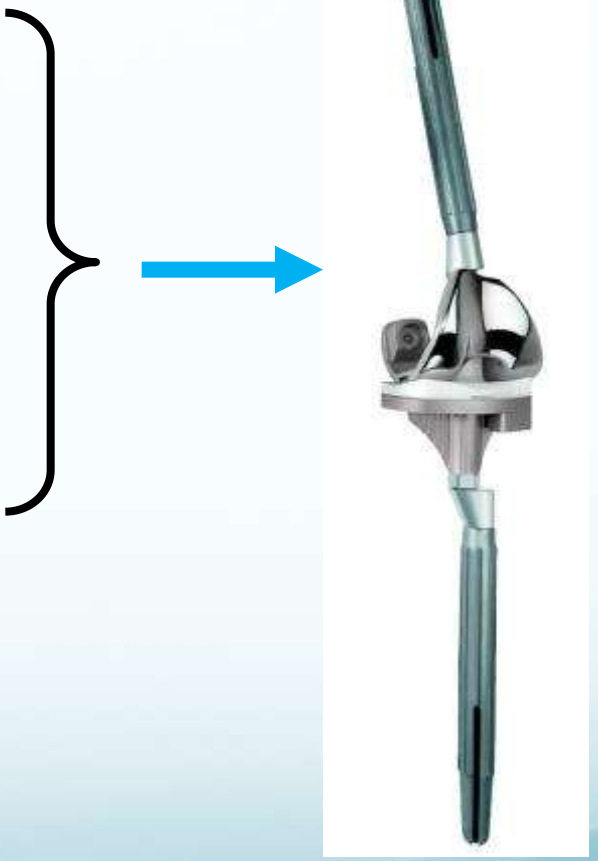
Femoral
The joint line is elevated and the condylar profile
is reduced. F2A – one condyle involved. F2B – both condyles involved.

Tibial
The tibia plateau is at or below the level of the fibular head. The tibial flare is reduced. T2A – One plateau involved. T2B – both plateaus involved.

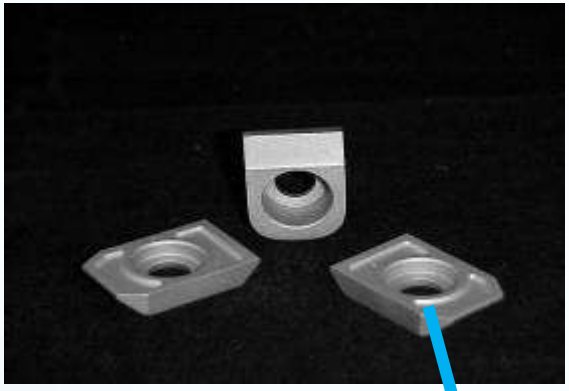
Type III

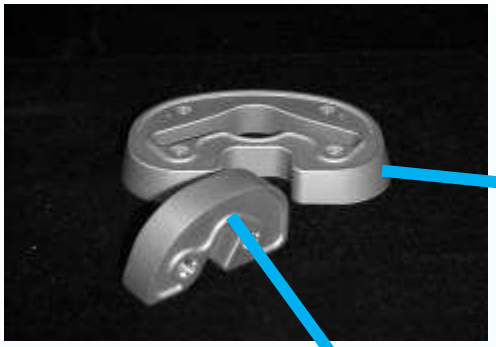
Femoral
The femoral metaphyseal segment is deficient. There may be severe condylar bone loss and the collateral ligament attachments may be compromised.

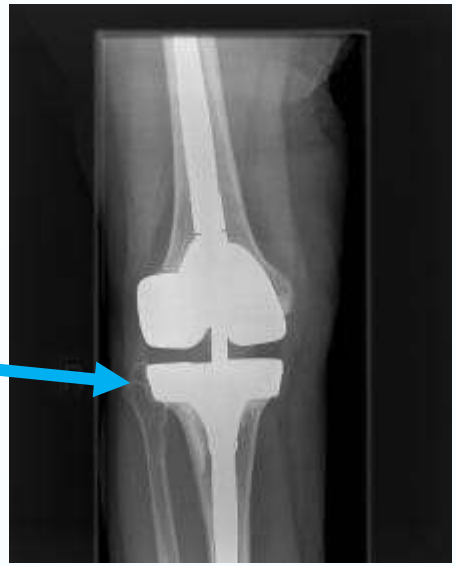
Tibial
Characterized by extensively damaged cancellous bone. The metaphyseal segment is deficient. The tibial plateau is below the level of the fibular head.

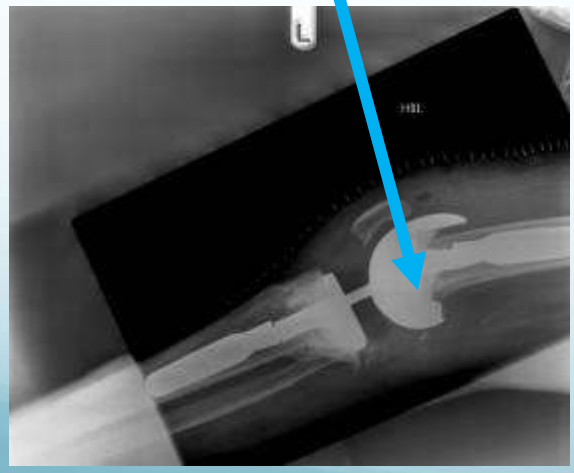


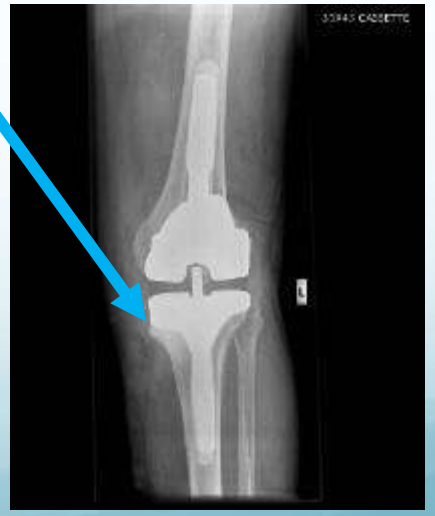
Bone loss











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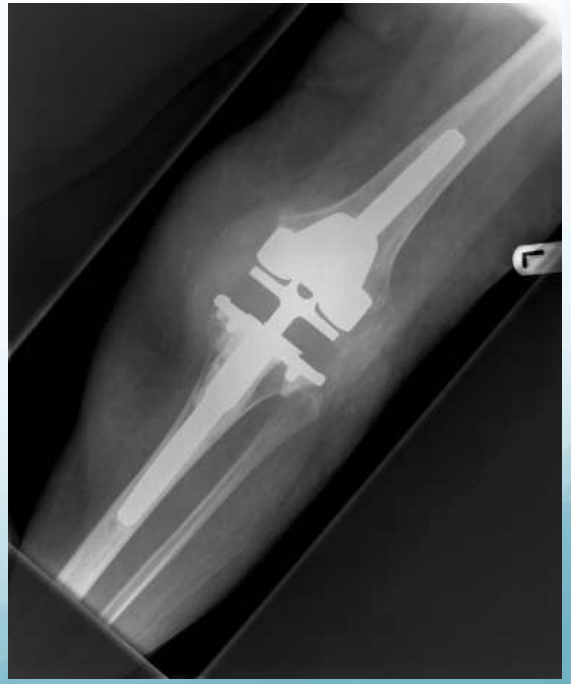
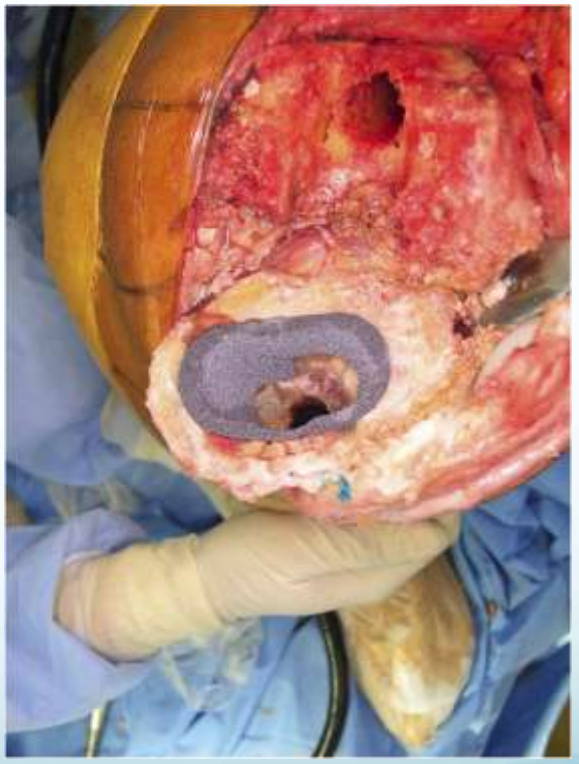


Cones



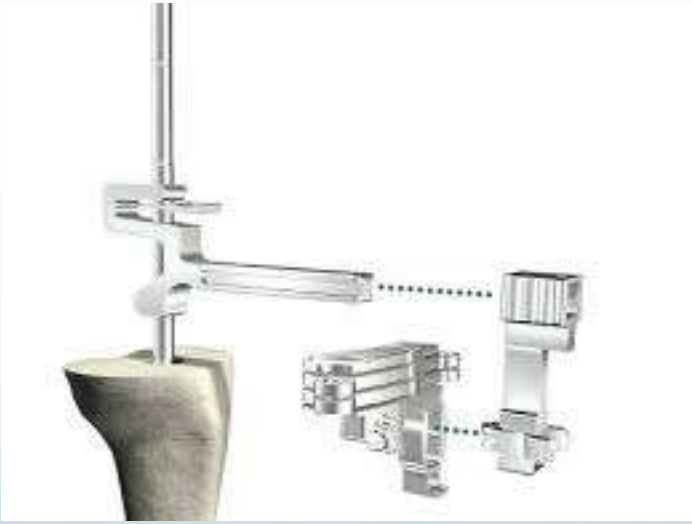
Principles of Revision

- Diagnosis
- Revise, don’t repeat
- Complete revision
- Pre operative plan
- Stable fixation
- Restoration of Joint Line
- Restoration of Anatomical Alignment – rotational and anatomical alignment
- Soft Tissue balancing with functional stability

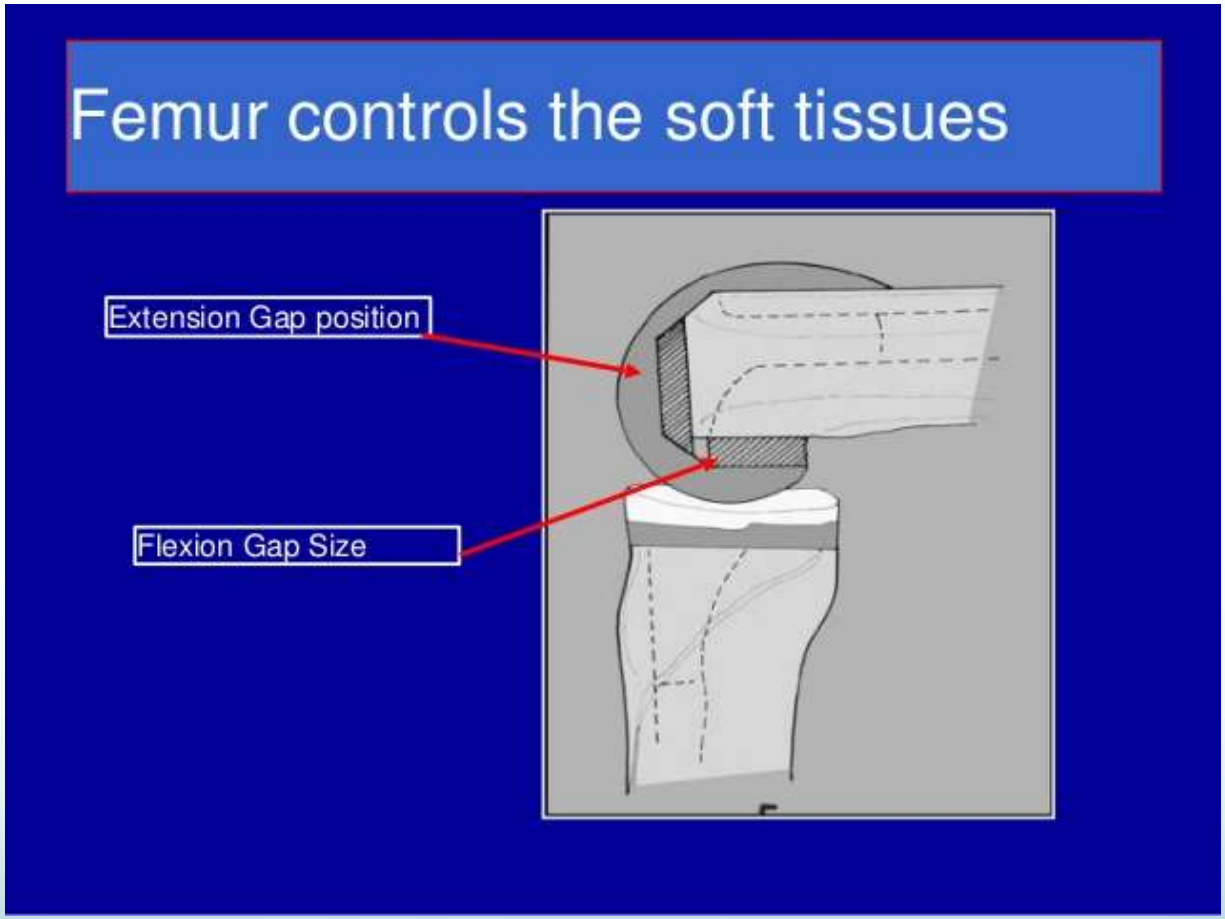
How I do it

- Step 1 – restoration of stable tibial platform

- Augments below or thicker poly

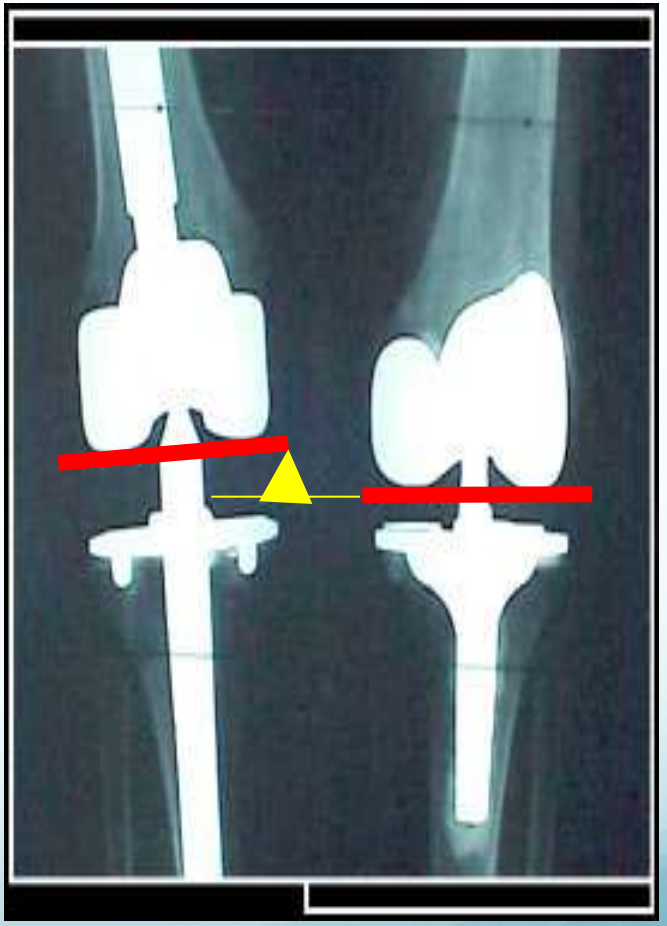


Step 2 link femur to tibia



Importance of Joint-Line Restoration

- Issue: Inadequate Joint Line restoration:
  - Lower functional score
  - Increased need for manipulation
  - Increased chance of re-revision
  - More pain, less stability



- Partington Clinical Orthop 1999
  - JL elevated
- > 5 mm 85/107 (79%)
- Mason, Whistler 2002
  - Knee society clinical rating score
    JL elevated >8mm 125
    JL elevated <8mm 141
- Martin, Whiteside Clinical Orthop 1990
- Results:
  - JL elevated 5mm mid-flexion instability
  - JL lowered 5mm mid flexion tightening
  - JL elevated or lowered 5mm varus / valgus instabilit

Where is the joint line ? RESULTS CADAVERIC

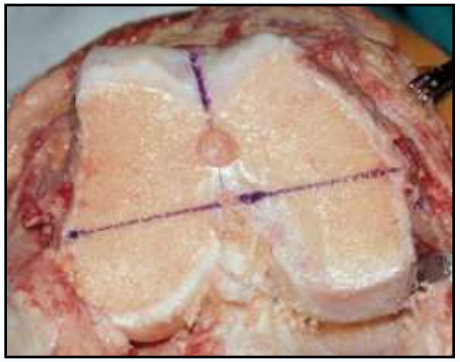
- ME 28mm (+/- 3.54 mm)
- IPP 14mm (+/- 4.29)
- TT 32mm (+/- 7.73)

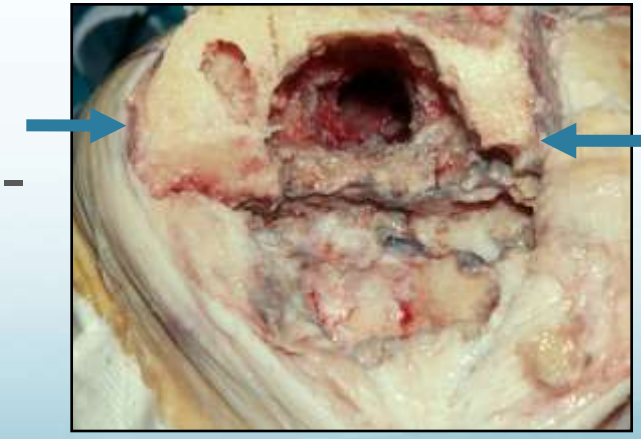
Joint Line

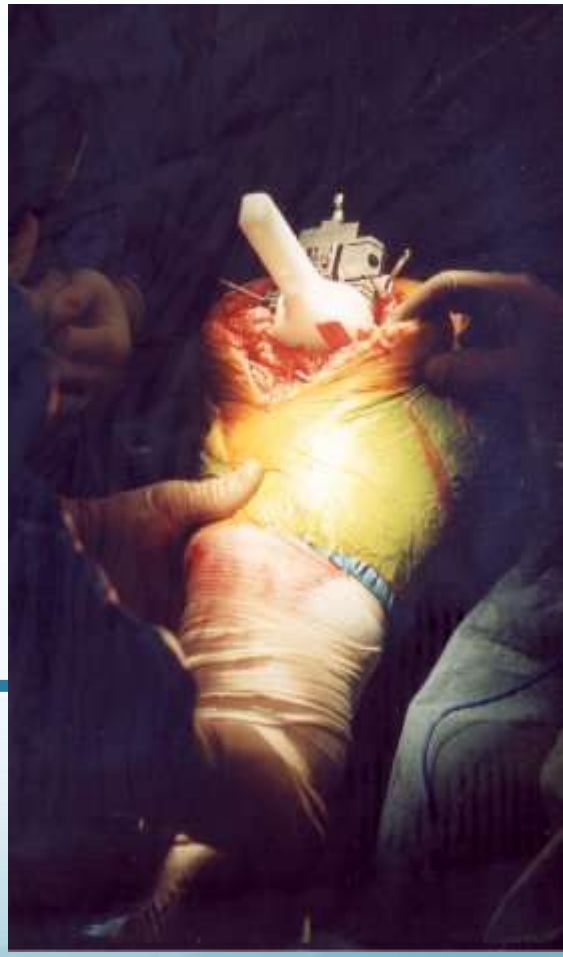
- Distal Femoral Augments
- ME
- Meniscal remnants
-

ESTABLISHING FEMORAL COMPONENT ROTATION

- Must re-establish the transepicondylar axis
- Often cannot reference the posterior condyles
- Reference the epi-condyles for proper rotation







Rotation and Size

constraint

- As little as necessary for a stable knee

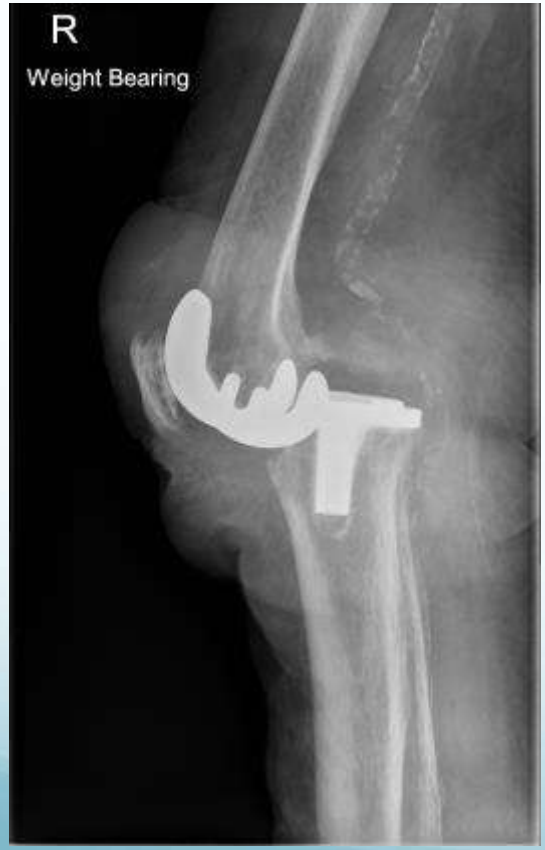
- CR
- CS
- PS
- CCK
- Hinge

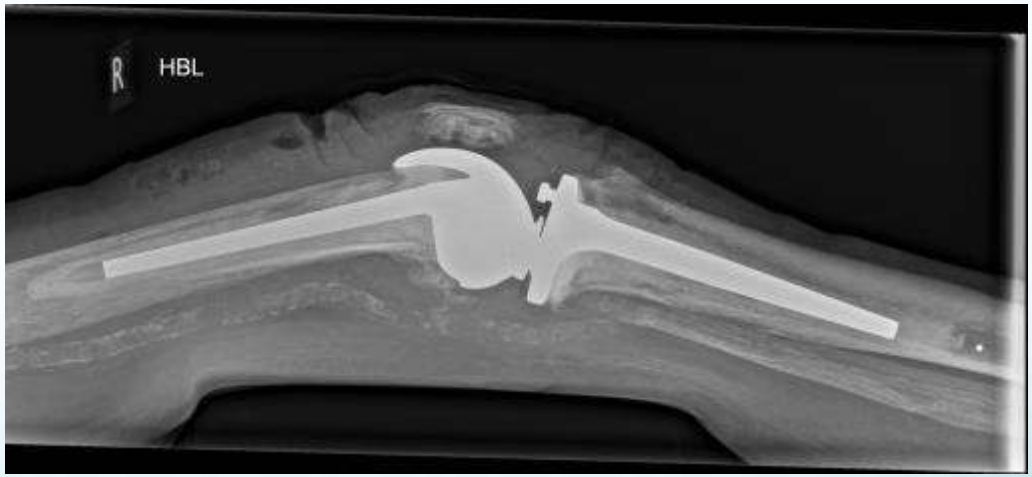
CCK


Commonly used CCK systems in UK
northumbria UNIVERSITY
NexGen (Zimmer)
Triathlon TS (Stryker)
Legion Smith & Nephew
Vanguard SSK (Biomet)
PFC Sigma TC3 (DePuy)
POSTGRAD ORTH Delary Kader

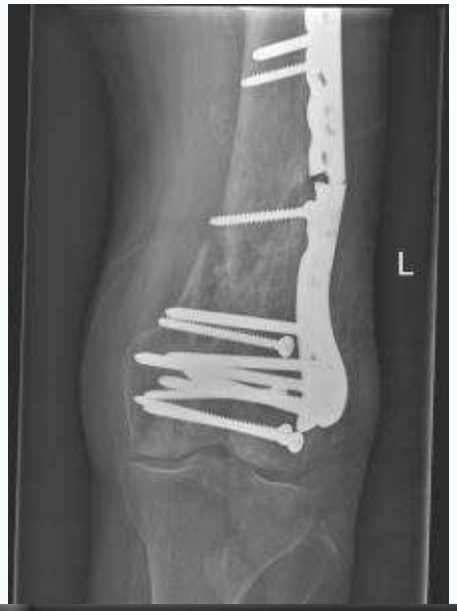
Hinge

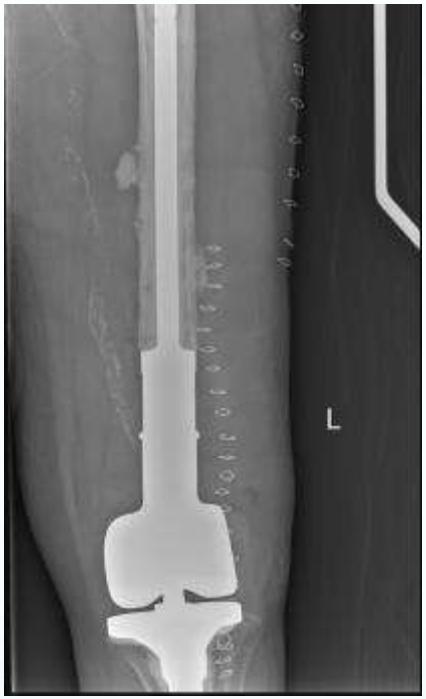
- Lack of soft tissue constraints

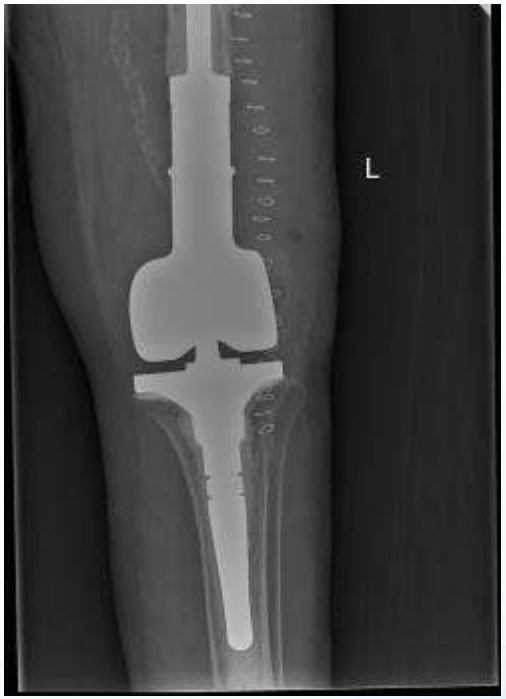




Distal Femoral Replacement







Revision workload

369 hospitals revision TKR

60% <10

40% <5

30% surgeons currently perform less than 5/year

THR analysis suggests >35/year needed (Ravi et al BMJ 2014)

Summary

- Rising demand is a challenge
- Expensive, resource intensive
- Multidisciplinary team, specialist centres
- When to operate
- What issues to address
- Logical plan of attack

Principles of Revision

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