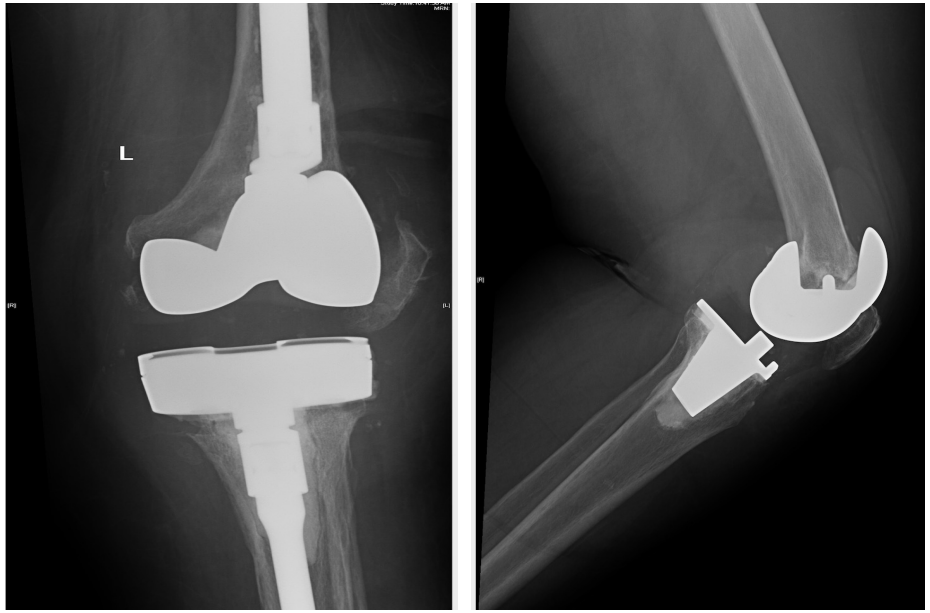
Zonal Fixation in Revision Total Knee Arthroplasty

Ali Al Belooshi
MB Bch LRCPSI FRCSC MBA
Orthopedic Consultant
Assistant Professor UAEU/MBRU

Revision TKR

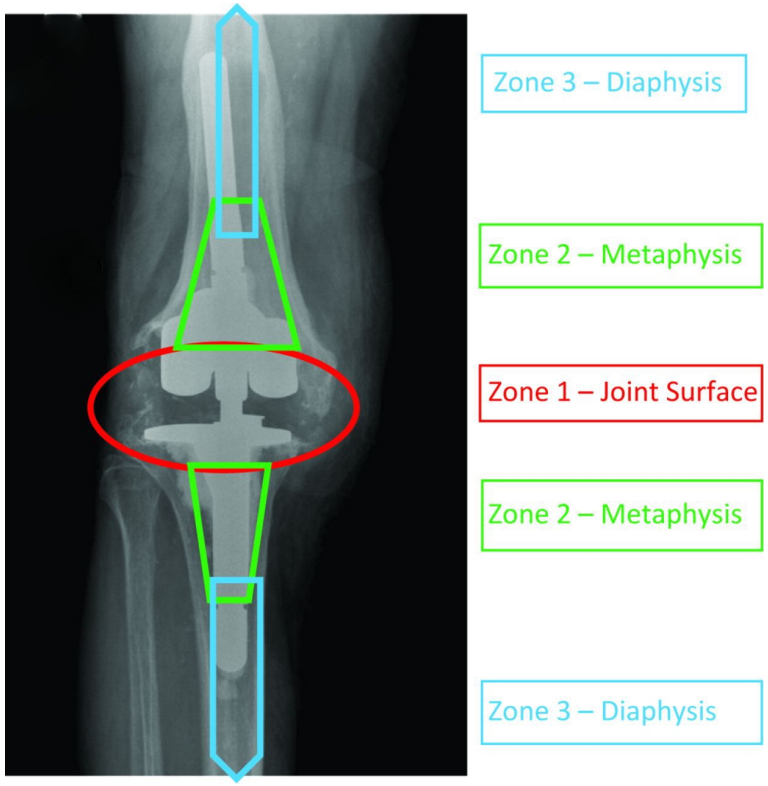
- Large bone defects & compromised bone stock can make reconstruction and fixation challenging
- Achievement of solid fixation of revision implants is essential
  - allow early post-operative mobilization & rehabilitation
  - improves the longevity of the construct



Fixation zones identified in planning the revision procedure

Distal femur and proximal tibia divided into three anatomical zones:

- Zone 1: Joint surface or Epiphysis
- Zone 2: Metaphysis
- Zone 3: Diaphysis



Principal of Zone fixation

- Pre-operative planning is key for successful planning a revision
- You need at least two zones of fixation to achieve adequate stability

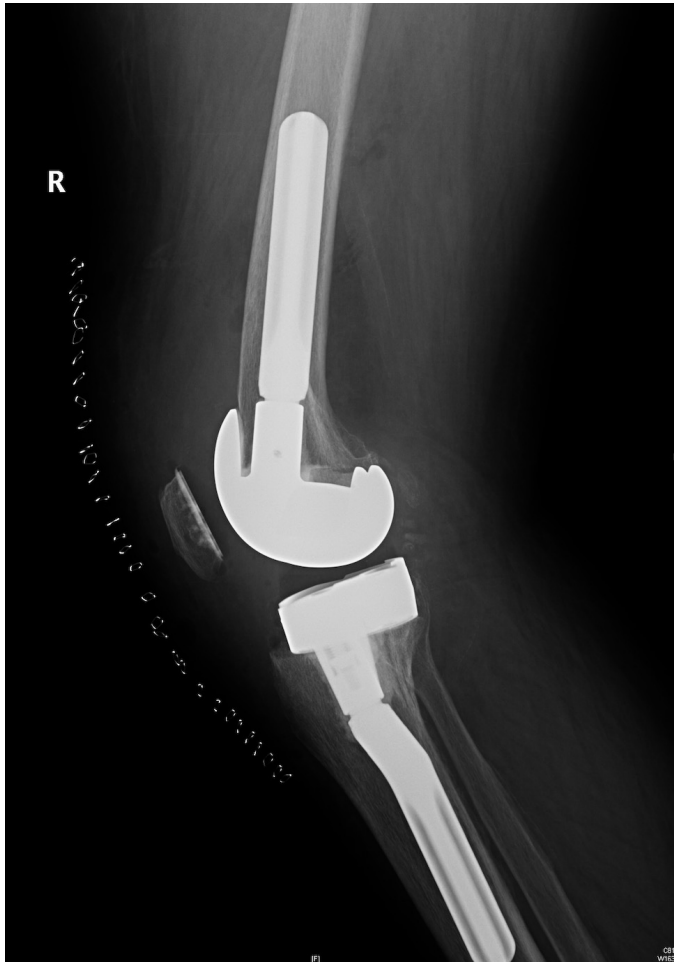
1. Which zones are available for fixation?
2. Which fixation method is appropriate?
3. Which implants are best suited to the case?

Zone 1 fixation

- Establish a stable surface
- Free of cement debris, avascular bone and fibrous membrane
- Augmentation can be by cement, bone graft or metal augment

Zone 1 fixation

- Achieve fixation in another zone using diaphyseal stems
- Connect zone 1 with zone 3
- Use offset as geometric centers of epiphysis and diaphysis are not usually aligned

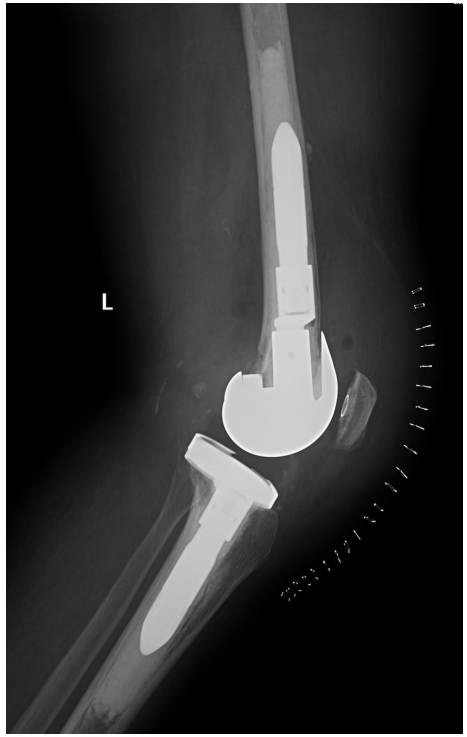


Zone 2 fixation

- Fixation in zone 2 allows the use of shorter diaphyseal stems
- Decrease stress on anterior femoral cortex
- Allow posterior translation of the articular component

Zone 3 fixation

- Cemented stems are preferred in patients with poor diaphyseal bone and large canal diameter
- Immediate fixation
- in infected revisions, allows the delivery of antibiotics
- Ability to Obtain Anatomic Alignment
  - Tibial bowing / No overhang
  - Center of Tibial IM canal is
    - Anterior and anteromedial to the Tibial Plateau
  - Femur , straight diaphyseal engaging canal
    - Anteriorize / Lateralize the femoral component



Zone 3 fixation

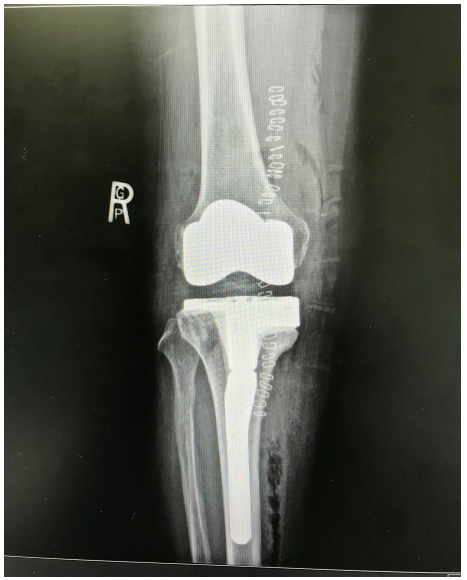
- Uncemented stems are indicated in patients with good diaphyseal bone and favourable canal geometry allowing a press fit
- Reduce toggle and microscopic movement at bone implant interface
  - Aseptic loosening
- Add rigidity to the construct
- Load transfer to the cortical bone

Zone 3 fixation

- Long Diaphyseal Press Stems
  - Initial Press Fit Mechanical (Torsional and Axial Stability) in sagittal and coronal planes
  - Restoration of the Mechanical Axis of the Lower extremity
  - Cement removal challenging
  - *Fleischman et al* , 319 Rev TKR, better component alignment in cementless group than the cemented group
    - DIAPHYSEAL ENGAGING STEMS

Cementless Stems

- CANAL FILLING RATIO (CFR)
  - Ratio of stem diameter to the endosteal bony diameter near the tip of the stem measured in both the AP and lateral x-rays
  - > 0.85
  - More relevant than length and/or the diameter of the stem



Diaphyseal Stems

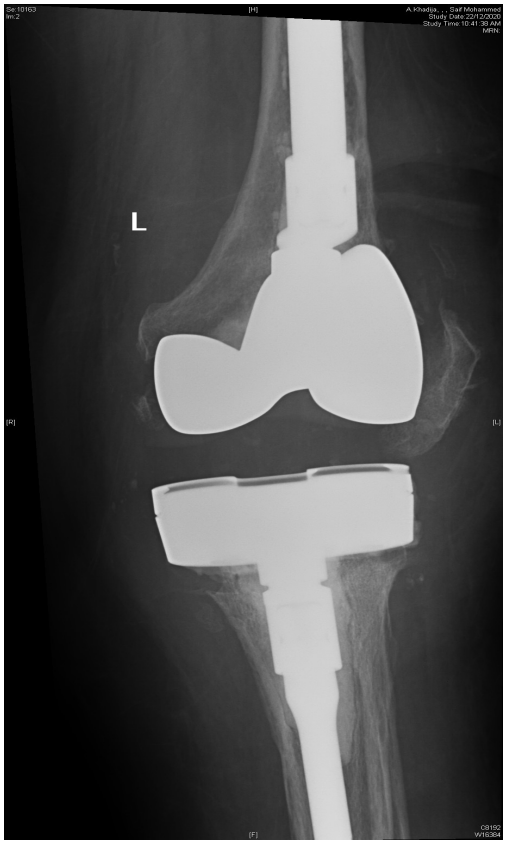
- Minimal 100 mm length
- Optimal length ?? (CFR)
- 4 cm of diaphyseal scratch fit
- Anatomic Challenges
  - Tibial Bow
  - Femoral Bow
    - Anteriorization /Perforation

Diaphyseal Stems

- OFFSET Options
- Monoblock
- Coupler
- Allows engagement of the stem into the canal while translating the the component to the anatomic alignment / coverage
- Avoid Eccentric placement of the stem
  - Perforation
  - Impingement

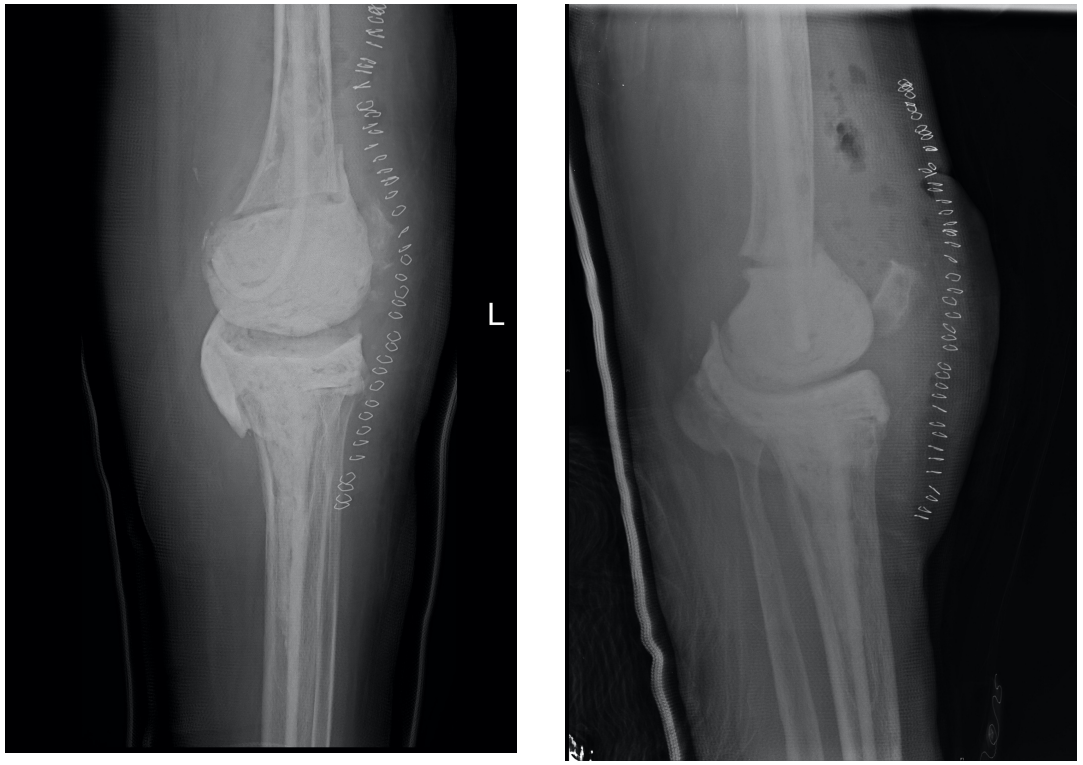
Case

- 75 years old lady
- c/o Pain , instability un able to walk
- Fever
- Had two failed previous exchange arthroplasty for infection
- ESR 50 , crp 30
- Knee aspiration Fungal infetion & MRSA

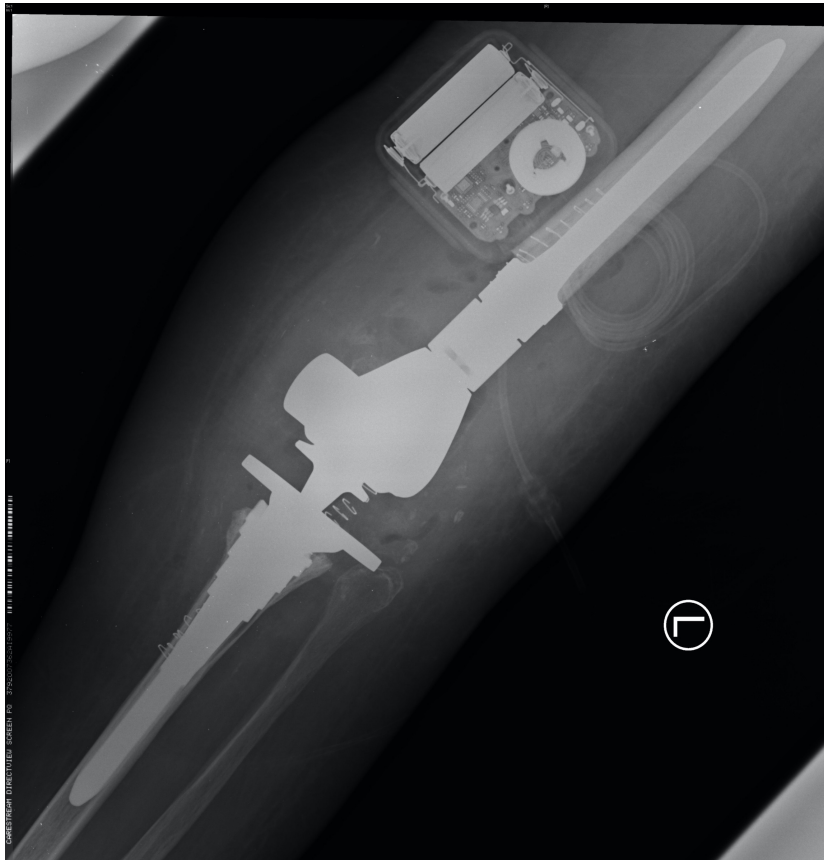


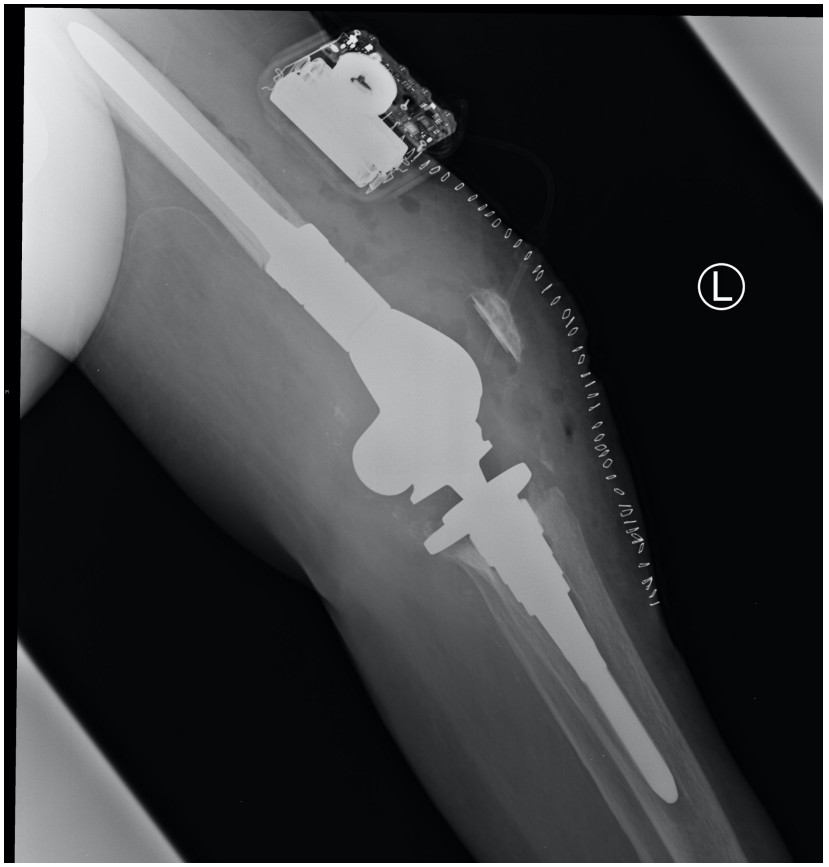
Case

- 2 stage exchange
- Antifungal + and Bacterial antibiotic spacer
- IV Antibiotic & antifungal for 3 months



Case





Conclusion

- Careful preoperative planning is key
- Aim to achieve solid stable fixation using at least two zones of fixation
- Choose the right implant to adequate stability to allow early mobilization

Thank You