Post-Traumatic Bone Loss of the Femur Treated with Segmental Bone Allograft and Bone Morphogenetic Protein: A Case Report

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• Reconstruction of a major bone loss in high energy trauma

  Challenge for the Orthopaedic Surgeon

• Gun wounds = extremely rare

Between 2000 and 2005 (in South Luxembourg Clinic) 7 cases (4 fireguns, 3 airguns) Suicides excluded
• ♂ 57-y Hunter

• Accidental gun shot left thigh (himself)

• In : P-L impaction
  Out : A-M aspect of the thigh

• Effect of cavitation without neurovascular injuries

⇒ Multifragmentary open fracture
Gustilo IIIA of 1/3 of the femoral shaft
• **Trauma Features:**
  - Severe open fracture
  - Great comminution innaccessible for fixing

• **Surgical Options:**
  - Vascularized bone graft +/- bone allograft  
    [Moran et al; Plast Reconstr Surg 2006][Masquelet et al; Ann Chir Plast Esthét 2000]
  - Bone transport  
    [Mathoulin et al; Rev Chir Orthop 1993]
  - Two-Stage reconstruction  
    [Mankin et al; Clin Orthop 2005]
    1. Bone cement spacer
    2. Bone graft
  - Bone allograft +/- BMPs

Our choice to treat this large bone defect of the femur
• First Line Treatment
  ➤ External Fixation

- Large wound exposure and debridment

- Bone fragments removal and preservation at - 80°C

- Wound primary closed and drained
• One month after initial injury:
  ➤ Immediate Reconstruction

  12-cm massive femoral bone allograft
  +
  Long Gamma Nail (Stryker)
  in a static mode
  +
  rhBMP-7
  (Osigraft TN, Stryker Biotec)

  ➤ Allow a rapid weight bearing
- Bone healing first signs at 7W
- Nail dynamisation at 3M
- Integration of bone graft at 4M
• Complete union with hypertrophic callus at 13M

• No axial deformity
• 8-mm limb shortening

3D CT Scan Reconstruction

Scaniometry
3D CT Scan Reconstruction
• **Post-traumatic bone defects** = rare
  < many options available for bone fixation

• **The use of a bone allograft remains rare**
  ➡️ Used in this particular case
  to allow rapid weight bearing
  not preclude the use of another method

• **Bone allografting**
  ➡️ High non-union rate and fracture  *Hornicek et al; Clin Orthop 2001*
• rhBMP-7 (OP1) to promote bone healing at the junction site

Conflicting results in literature

Effectiveness in the presence of allograft?

Demonstrated in experimental conditions

Cook and Barrack; Impaction Bone Grafting in Revision Arthroplasty; eds 2004
Lee et al; Clin Orthop 2002

Not so far in human beings

Delloye et al; Acta Orthop Belg 2004

Nevertheless ...

Union achieved in 13M without autografting (only reaming product)
Thanks for listening ...