

3<sup>rd</sup> Advanced Course in  
Knee Surgery  
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# Do we need graft?

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# Do we need graft?

# Do we need graft?

- Probably not,

Rim or marginal fracture

Metaphyso-diaphyseal fracture without depression

# Objectives of the treatment

- To reconstruct the articular surface
- To rebuild the anatomical organization of the bone
- To stimulate a cartilage repair process

# Objectives of the treatment

- Solid fixation
  - Good enough for an early mobilisation of the knee joint
  - Provide some mechanical stimulus to the bone

# Objectives of the treatment

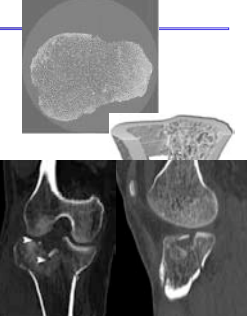
- Cartilage repair process
  - Reconstitution of the subchondral bone
  - CPM

ESSKA Subchondral bone meeting  
Luxemburg 2009


## Principles

- Tibial epiphysis
- Cancellous bone
  - Highly organised interlaced tissue
  - Thin cortex

Complete disorganisation of the bone architecture resulting in a bone void



## Objectives of the treatment



At 9 months

## Do we need graft?

- **Yes, based on:**

Lobenhoffer P, Gerich T, Witte F, Tschorne H: Use of injectable calcium phosphate bone cement in the treatment of tibial plateau fractures: A prospective study of 26 cases with 22 months mean follow-up. *J Orthop Trauma* 2002

Simpson & Keaton: Outcome of tibial plateau fracture managed with calcium Phosphate cement. *Injury* 2004

Russel TA, Leighton RK: Comparison of autogenous bone graft and endothermic calcium phosphate cement for defect augmentation in tibial plateau fractures. A multicenter, prospective, randomized study. *J Bone Joint Surg Am* 2008

Bajammal SS, Zlowodzki M, Lelwica A et al: The use of calcium phosphate bone cement in fracture treatment. A meta-analysis of randomized trials. *J Bone Joint Surg Am* 2008


## Meta-analysis

- 11 studies + 3 unpublished RCT
  - CaPO4 cement had lower loss of reduction compared to bone graft
  - Less pain at the fracture site than no graft
  - Better functional outcomes when CaPO4 was compared to no graft (n=3)

Bajammal SS, Zlowodzki M, Lelwica A et al: The use of calcium phosphate bone cement in fracture treatment. A meta-analysis of randomized trials. *J Bone Joint Surg Am* 2008

## Bone and substitutes

- Autologous cancellous bone graft
- Heterologous cancellous bone graft
- Calcium phosphate cement
- Tricalcium ceramic
- Polyméthyl-methacrylate cement
- Heterologous demineralized bone matrix
- Bioactive scaffolds (collagen)
- Synthetic bone (PGA + hydroxyapatite)






## Bone mineral density

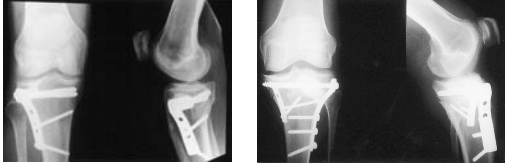
- "BMD around the fracture site had the best correlation with the failure load regardless of the fixation technique"

Ali et al *J Orthop Res* 2006

## Calcium phosphate cement

- Injectable thermosensible cement
  - 
  - 
  - 
- High initial mechanical strength
- Better prevention of the fragment subsidence and maintenance of joint congruency than autologous graft in unstable fracture
  - Lobenhoffer et al J Orthop Trauma 2002
  - Welch et al J Bone Joint Surg 2003
  - Russel et al J Bone Joint Surg 2008

## Calcium phosphate cement

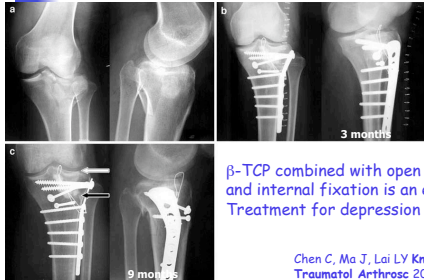


- 27 months post-surgery, pain free, full ROM
- Injection of 19 ml Norian CRS
- All patients healed without displacement (n=25)
- Early weight bearing after a mean 4.5 weeks post-op
  - Lobenhoffer et al J Orthop Trauma 2002

## TCP ceramic

- Tricalcium phosphate granules
- 130 patients Schatzker II-VI
- FU 12 months
- No displacement, bone healed in all patients
  - Chen C, Ma J, Lai LY Knee Surg Sports Traumatol Arthrosc 2009

## TCP ceramic



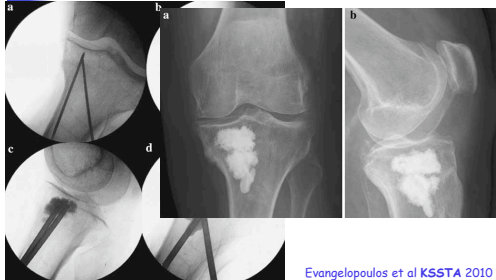
$\beta$ -TCP combined with open reduction and internal fixation is an effective Treatment for depression fractures

- Chen C, Ma J, Lai LY Knee Surg Sports Traumatol Arthrosc 2009

## BMP-2

- Subchondral defect in canine
- BMP-2/calcium-phosphate matrix versus autologous cancellous bone
- Accelerated healing and superior mechanical properties in BMP group
- But...
- ...have not been shown to be efficient in patients, worse.. have induced heterotopic bone formation
  - Schaefer et al J Orthop Res 2009
  - Boraiah et al J Bone Joint Surg 2009

## Tibialplasty



- Evangelopoulos et al KSSTA 2010

## Take home message

- Do we need a graft? YES
- Voids must be filled up
- Bone mineral density at its best
- Reconstruction and support of the subchondral bone
- Early motion and weight bearing

