Proximal tibial fractures : Bone defect filling, yes or no ?

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Introduction

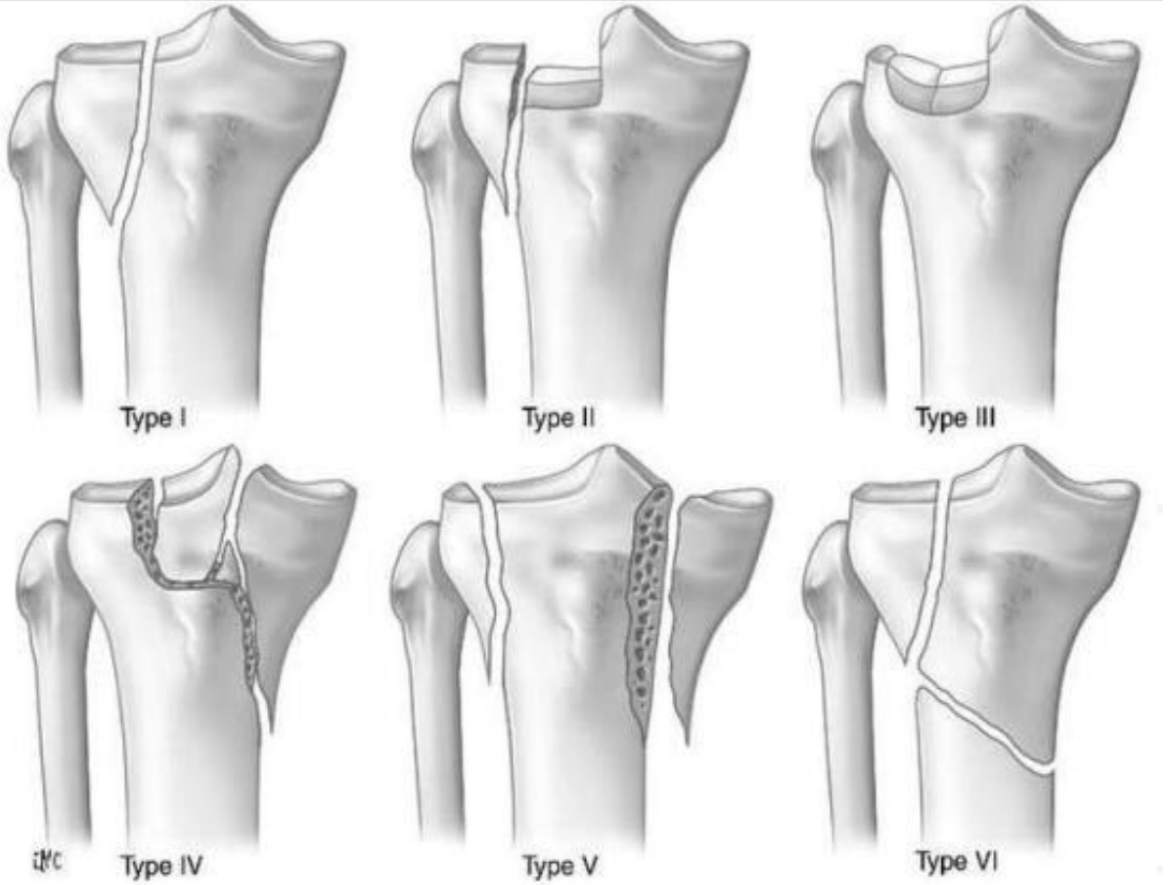
- Common Fracture
- External tibial plateau ++ (75%)
- Articular fracture with need of a perfect reduction
- Epidemiology : young patient with high cinetic trauma

== > Major functional prognosis…

…With sometimes really poor results

Classification

Most known = Schatzker



Clin Orthop Relat Res. 1979 Jan-Feb:(138):94-104.

The tibial plateau fracture. The Toronto experience 1968--1975

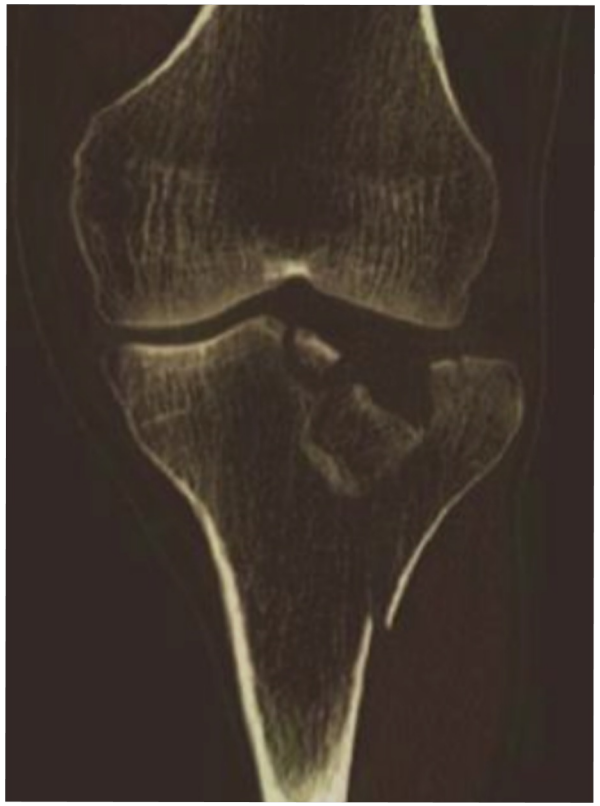
J Schatzker, R McBroom, D Bruce

- Type 1 : Split fracture of the lateral tibial plateau
- Type 2 : Split depression of the lateral tibial plateau
- Type 3 : Central depression of the lateral plateau
- Type 4 : Split of the medial tibial plateau
- Type 5 : Bicondylar tibial plateau fracture
- Type 6 : Dissociation between metaphysis and diaphysis

Bone Defect Assessment

Xrays

CT Scan +++

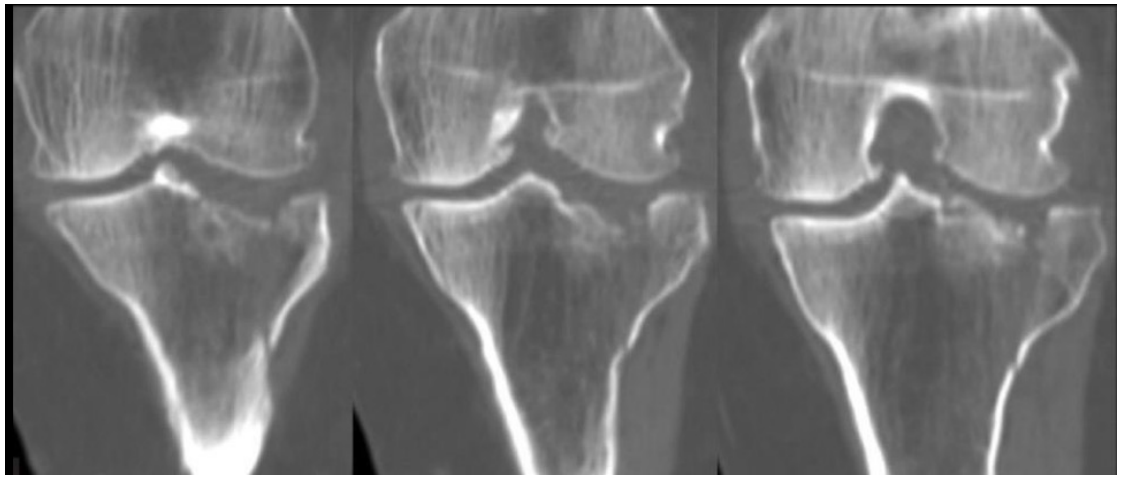


Objective of bone filling

- Keep the bone from collapsing
  - Support for osteosynthesis
  - Promote consolidation

Criteria for bone filling

- Significance of the depression/collapse
- Localisation defect (medial/ lateral / Posterior)
  - ➢Weight bearing zone ? +++
- Size of the defect
- Age, bone quality, BMI…

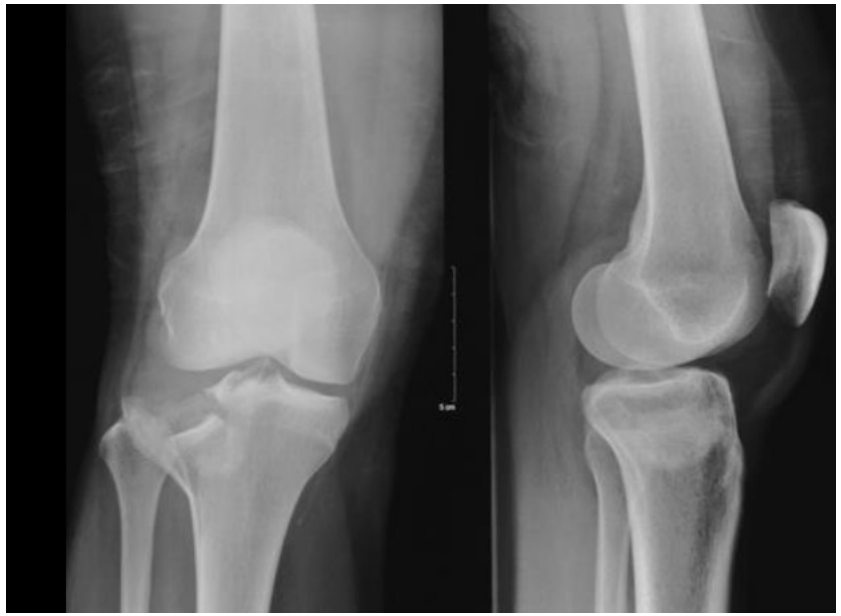


Filling ? : Not necessary

- **No collapse**
- Small size defect
- Stable osteosynthesis
- Good bone quality

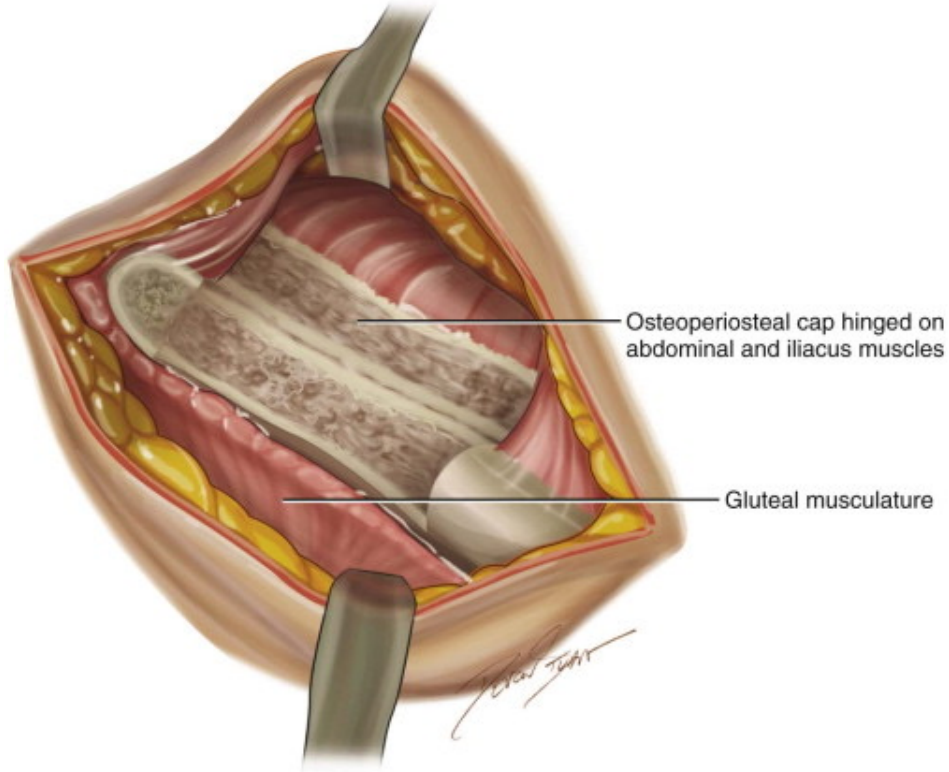
Filling ? : Yes !

- **Collapse** (++ Schatzker 2 and 3, split depression)
- Major bone defect
- Poor osteosynthesis
- Bad bone quality, BMI >>



Bone defect filling : yes, but with what ?

- **<u>Autograft</u>** = iliac crest +++, cancellous bone
  - Healing + => For large defects, with bad vascularization
  - But *donor site morbidity*… (Pain, neurovascular, haematoma, infections cosmetic…) and also *quantitative limitations* (elderly ++)



Iliac crest still the gold standard for bone grafting

Bone defect filling : yes, but with what ?

- **<u>Allograft (Bone Bank)</u>** : ease of use, no pathogenicity, less operative time
  - *Fragmented graft* : ease of use, but less mechanical property
  - *Bone block, Femoral Head…* : better biomechanical property

Bone defect filling : yes, but with what ?

- **Bone graft substitute** : alone or as additional materials

Needs osteo-inductivity, osteogenicity and osteoconductivity

  - **Biological** : *allograft / xenograft* (Corals, natural polymer, demineralized bone matrix)

  - **Synthetic** : *bioactiv glasses, hydroxyapatite, calcium phospahtes/sulfates, porous titanium*

Contents lists available at SciVerse ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Use of bone graft substitutes in the management of tibial plateau fractures

Thomas Goff, Nikolaos K. Kanakaris, Peter V. Giannoudis *

Academic Department of Trauma and Orthopaedics, Leeds Teaching Hospitals NHS Trust, Leeds, UK

Bone defect filling : yes, but with what ?

Synthetic :

- *Bioactiv glass (GLASSBone ®*, S53P4®…)

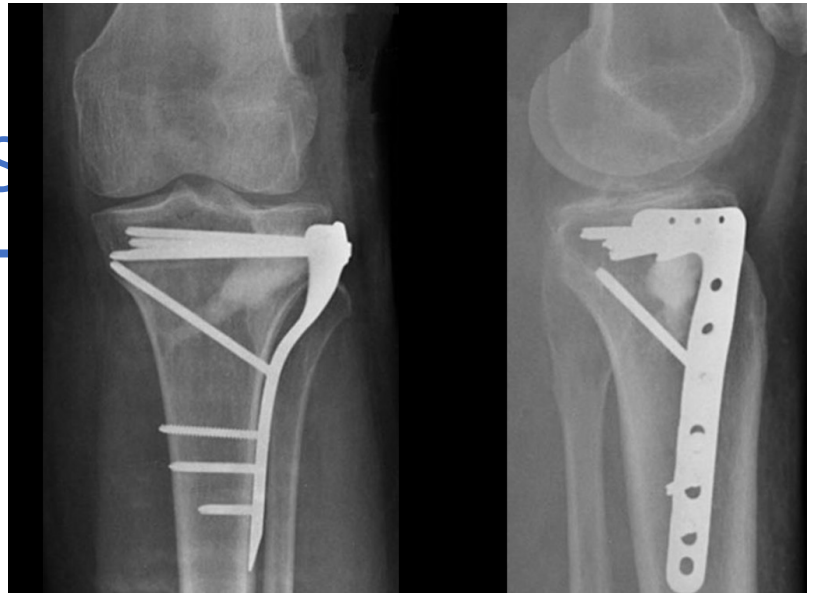
- *Hydroxyapatite (Interporous®, Interporous bloc®*…)

- *Calcium phosphates cement (Norian SRS®, Graftys HBS®, Calcibon®, Hydroset®*, Cerament®*…)*

- *Calcium sulfates (MIIGX3®*, Snow White®…)

- *Porous titanium granules*

Results : allograft and substitutes



- **Healing** in approximatively 90% of the cases
- Excellent **incorporation**
- 0 to 8.7% of post operative infections
- Secondary collapse : Cut off = 2 mm
  - *Biological substitutes* : **8.6%**
  - *Synthetic grafts* : **5.4%** with hydroxyapatite, **3.7%** with calcium phosphate, **11.1%** with calcium sulfate

Literature review. 19 studies.

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Results : autograft / substitutes / no graft

- **Lower pain with graft** (vs no graft)
- **Decreased loss of fracture reduction with subsitute** vs autograft.
- 3 studies independently demonstrated **improved functional outcomes** with calcium phosphate vs no graft

The Use of Calcium Phosphate Bone Cement in Fracture Treatment

A Meta-Analysis of Randomized Trials

By Sohail S. Bajammal, MBChB, MSc, FRCSC, Michael Zlowodzki, MD, Amy Lelwica, MD, Paul Tornetta III, MD, Thomas A. Einhorn, MD, Richard Buckley, MD, FRCSC, Ross Leighton, MD, FRCSC, Thomas A. Russell, MD, Sune Larsson, MD, PhD, and Mohit Bhandari, MD, MSc, FRCSC

Investigation performed at the Orthopaedic Research Division, Department of Surgery, McMaster University, Hamilton, Ontario, Canada

Results : autograft / substitutes

Comparative Study > Eur J Orthop Surg Traumatol. 2017 Jul;27(5):665-671.
doi: 10.1007/s00590-016-1863-y. Epub 2016 Oct 8.

Autograft versus allograft reconstruction of acute tibial plateau fractures: a comparative study of complications and outcome

Abolfazl Bagherifard [1], Hassan Ghandhari [1], Mahmoud Jabalameli [1], Mohammad Rahbar [1], Hosseinali Hadi [1], Mehdi Moayedfar [2], Mohammadreza Minatour Sajadi [1], Alireza Karimpour [1]

Affiliations + expand

PMID: 27722903 DOI: 10.1007/s00590-016-1863-y

Comparable complication rate, clinical and radiological outcome of allogenic versus autologous
Freeze-dried allograft could be recommended as an appropriate substitute of autograft in this treatment.

Comparative Study > J Bone Joint Surg Am. 2003 Feb;85(2):222-31.
doi: 10.2106/00004623-200302000-00007.

Experimental tibial plateau fractures augmented with calcium phosphate cement or autologous bone graft

Robert D Welch [1], Hong Zhang, Dwight G Bronson

Affiliations + expand

PMID: 12571298 DOI: 10.2106/00004623-200302000-00007

Cancellous autograft did not maintain an anatomical reduction of the tibial plateau fractures, in contrast with calcium phosphate cement augmentation.

Proximal tibial fractures ?bone filling
Take home message

- A collapse : **Yes**, Graft ! +++

- A defect : **Yes**, Graft !

Allograft / Substitute : you can use it !
Calcium Phosphate cement ++

Always to be prepared for bone defect filling…

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Thank you for your attention

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