30th Annual Orthopaedic Trauma Update: A Tale of Two Cities

Bone Grafting: Allograft

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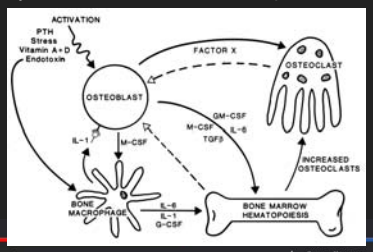
Bone Grafts

- **Indications**
  - Marked Bone Loss
  - Any time the Nonunion site is opened



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Functions of Bone Graft

- **Osteoconduction**
  - provides matrix for bone growth
- **Osteoinduction**
  - growth factors encourage mesenchymal cells to differentiate into osteoblastic lineages
- **Osteogenesis**
  - transplanted osteoblasts and periosteal cells directly produce bone
- **Structural support**

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Types of Bone Grafts

- Autogenous bone
- Allograft bone
- Osteoconductive synthetics
- Osteoinductive agents
- Composites

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Iliac Crest Bone Graft

MANY COMPLICATIONS

- Pain at donor site (38% patients at 6 months)
- Latrogenic Fracture (iliac crest)
- Nerve Injury – Lat fem cut nerve
- Infection
- Increased blood loss (tranfusions reported)
- General Anesthesia risks
- 6 Authors specifically note ICBG donor site complications in the treatment of humeral nonunions
  - Goulet et al CORR, 1997
  - Kurz et al Spine, 1989

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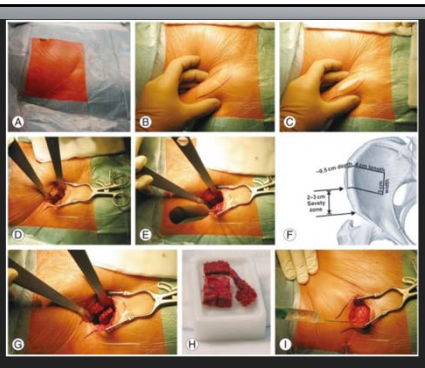

Zenner et al

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Treatment of Humeral Nonunions with Allograft, Demineralized Bone Matrix, and Plate Fixation

N. L. Taylor
F. J. Raia
S. A. Crow
B. E. Heyworth
M. P. Rosenwasser

Retrospective review of 11 consecutive patients, June 1998- Dec 2001

All patients treated with plate fixation supplemented with Canc allograft and DBM

Indications -

- painful, unstable, humerus nonunion with disability
- no history of infection or open fracture

Osteo Trauma Care 2005

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Allografts

Can be cancellous or cortical

Plentiful supply

Good osteoconductive properties

Limited osteoinductive properties

Good structural support

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Allografts

Pretreatment for sterilization

Alters immunological / biomechanical properties

Genetic discrepancy

Contraindicated if previous infection

Interferes with healing / remodeling process

Types:

- Fresh
- Fresh-Frozen
- Freeze-Dried

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Allograft-based Bone substitutes

Grafton

- Musculoskeletal transplant foundation
- Demineralized bone matrix
- Combined with carrier glycerol

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Allograft + Grafton

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My preferred graft +/- BM asp

Cancellous Allograft (CA)

- Osteoconductive

Demineralized Bone Matrix (DBM) – Grafton

- osteoconductive
- osteoinductive

CA + DBM = successful use in distal radius fxs

Herrera, JHS 1999

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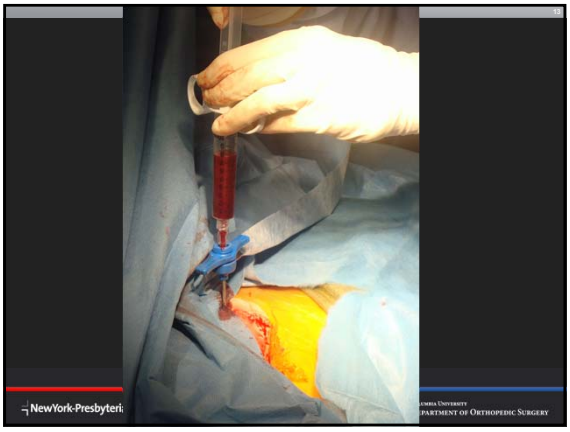

Case: 50 y/o RHD F

- Hit by truck 1/99: L humerus fx
- L split depression tibial plateau, rib fx
- Treated with unreamed locked retrograde IM nail, to nonunion, pain
- Inadequate locking screws in 8.5 mm nail?

Revision

- Plating with only 6 cortices above and below
- Inadequate exposure proximally via post approach
- Failure

Gross Deformity

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Re-Revision

- Previous 7 hole plate and screws removed
- AO 12-hole plate placed with 12 cm structural fibular allograft
- Allograft cancellous chips, Grafton gel, and iliac crest bone marrow aspirate

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Union 13.5 weeks

DASH score 25

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Union 13.5 weeks

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Plate Fixation of Ununited Humeral Shaft Fractures: Effect of Type of Bone Graft on Healing

By Christian Hierholzer, MD, Domenico Sama, MD, Jose B. Toro, MD, Margaret Peterson, PhD, and David L. Helfet, MD

Investigation performed at the Orthopaedic Trauma Service, The Hospital for Special Surgery, New York, NY

78 patients with aseptic, atrophic humeral shaft delayed union or nonunion

- 45 treated with ORIF and autogenous iliac crest bone graft
- 33 treated with ORIF and demineralized bone matrix

100% union rate in AICBG group at mean of 4.5 month

97% union rate in DBM group at mean of 4.2 months

No difference in functional outcome

44% of AICBG group had some donor site morbidity

JBJS 2006

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In conclusion…

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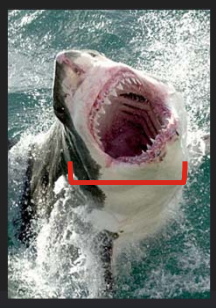
Your choice



vs.

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Thank You

AMAZING THINGS ARE HAPPENING HERE

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Case

50 year-old man hit by truck

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Post-Op X-rays

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1 month Follow-Up

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3 Month Follow-Up

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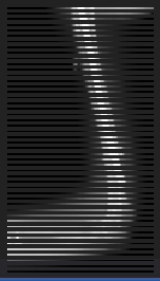
6 Months Later…

Despite prolonged bracing and electrical stimulation, non-union humerus fracture



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Revision Surgery

Operation: removal of intramedullary nail and locking screws and application of 4.5 BC plate and screws w/allograft, cancellous cubes and graft on hydroxyapatite gel

Continued nonunion shows hardware failure and screw loosening

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3 Months Post-Revision

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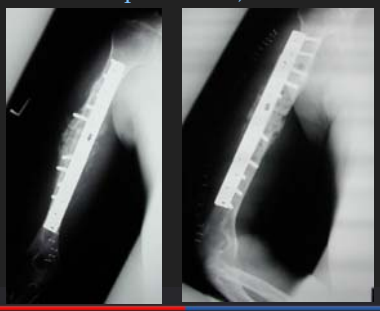
Post Third Surgery (10 months after initial procedure)



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2 Week Follow-Up

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4 Week Follow-Up

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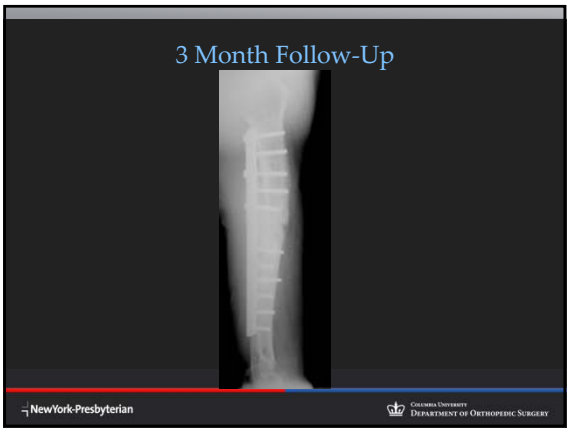
3 Month Follow-Up
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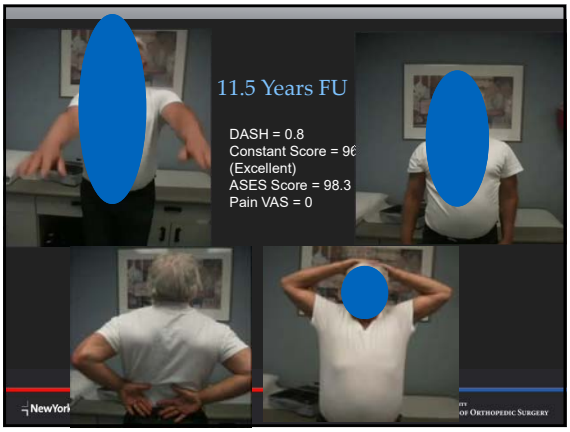
11.5 Years FU
DASH = 0.8
Constant Score = 9
(Excellent)
ASES Score = 98.3
Pain VAS = 0


CASE
16 y/o male, OCD Capitellum and Trochlea
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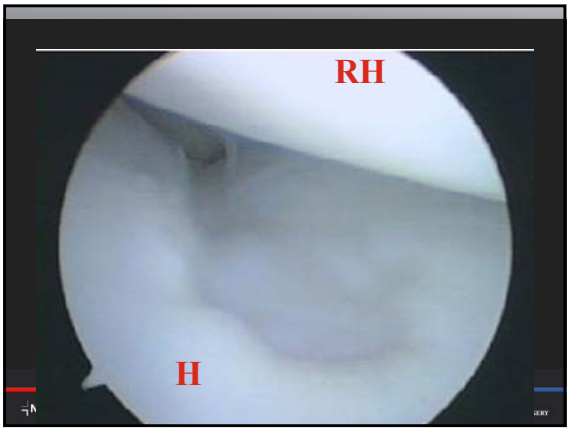
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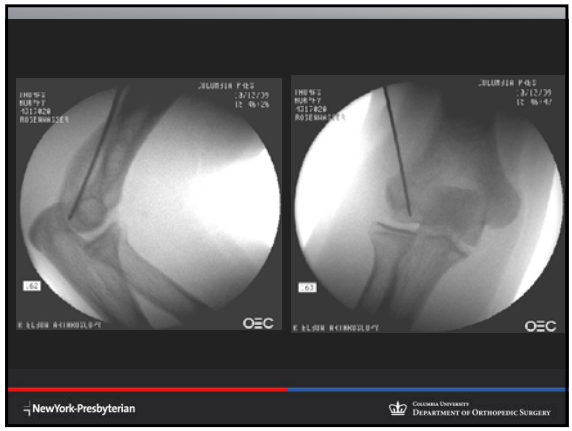
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