

Complications following Upper Extremity Trauma



Atlanta Medical Center

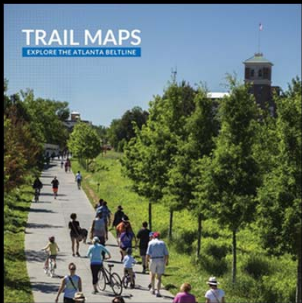
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Disclosures

- No ~~relevant~~ disclosures

The Patient

- 34 yo male presents to the Emergency Department with an open forearm fracture after hopping a fence and falling onto his right arm
- No other injuries
- 2pm



TRAIL MAPS
EXPLORE THE ATLANTA BELTLINE

The Patient

- Past Medical History: right forearm fracture as child
- Social History: no tobacco
- Current Medications: none

The Patient

- Exam:
 - 5mm volar wound at distal third of forearm
 - “Mild contamination”
 - Doesn’t appear to have tendinous injury
 - Sensory intact, motor intact, vascular supply intact

Injury X-rays



Immediate Plan

- Tetanus and IV antibiotics in ED
- Splint for comfort
- I&D, ORIF in the morning
- IV Ancef 2g q8h

Review

- Healthy young man sustains an open forearm fracture, GA I
- Contamination of fracture with flecks of dirt, not caked in "Georgia clay"
- Healthy host, doesn't smoke
- Plan to washout and fix in the morning, interim antibiotics

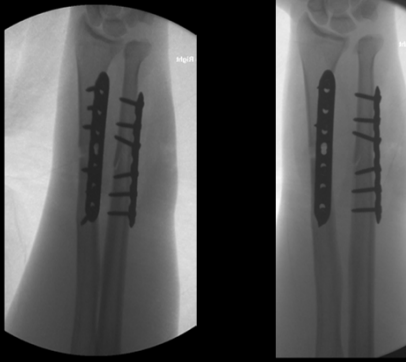
Surgical Planning

- Open fracture management
 - Timing of surgery
 - Timing of antibiotics
- Surgical approach
- Fixation
 - Plate, nail, external fixator

Surgical Goals

- Adequate debridement of skin, soft tissues, bone
- Restoration of radial bow, forearm length, and rotation; cortical opposition; compression
- Anatomic reduction and fixation

Next Morning



Postoperative Imaging









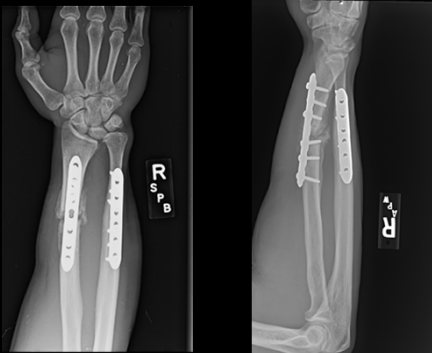
3 Months Post Op

- WBC: 13.4, 75% Neutrophils
- CRP 0.4
- ESR 8

Reconstruction – 2 Weeks Later

- WBC: 13.4 → 8.6, 50% Neutrophils
- CRP 0.4 → 0.8
- ESR 8 → 17

Reconstruction – 2 Weeks Later



Surgical Planning

- Revision of nonunion vs infected nonunion
- Hardware failure
 - Restoration of radial length and bow
 - Allograft cortical/cancellous
 - Bridge plating with cancellous autograft
 - Compression plating of tricortical iliac crest autograft
 - Acute shortening
 - Vascularized graft
 - Bone graft augments?
- Infected nonunion
 - Antibiotics in interim?
 - Staged procedure?
 - External fixation?
 - Multiple debridements?
 - Local antibiotic delivery?

Recon
Surgical Techniques
Antibiotic Beads
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Antibiotic Beads

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The author has no commercial relationships with any of the companies mentioned in this article. He is a member of the American Academy of Orthopaedic Surgeons.

Abstract

Antibiotic beads are used to deliver high concentrations of antibiotics to the site of infection. They are made of porous ceramic or plastic and are filled with antibiotic. They are used in conjunction with debridement and fixation to treat infected nonunions and osteomyelitis.

Indications and Contraindications

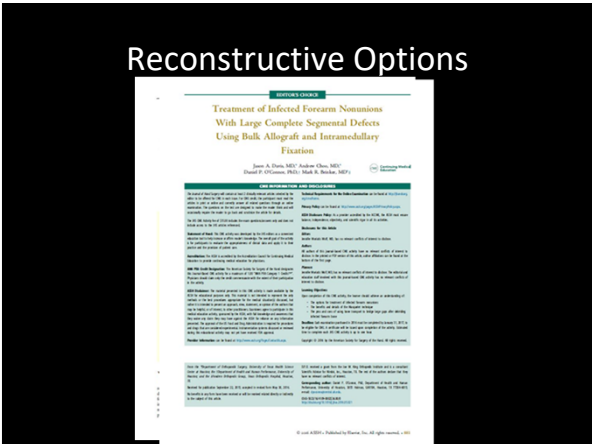
Antibiotic beads can be used in most orthopedic applications. Typical indications include the treatment of infected nonunions, osteomyelitis, and the treatment of infected hardware. Contraindications include the use of antibiotic beads in patients with renal failure, patients with known hypersensitivity to the antibiotic used, and patients with known hypersensitivity to the bead material.

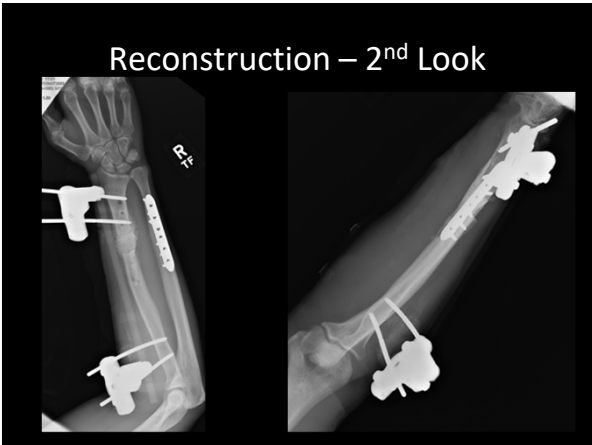
Technique

Antibiotic beads are prepared by mixing antibiotic powder with a porous ceramic or plastic matrix. The beads are then fired in a furnace to create a porous structure. They are used in conjunction with debridement and fixation to treat infected nonunions and osteomyelitis.

Reconstructive Options

- Allograft cortical/cancellous
- Bridge plating with cancellous autograft
- Compression plating of tricortical iliac crest autograft
- Acute shortening
- Masquelet
- Vascularized graft
- External fixation with bone transport
- Bone graft augments?
- Plate fixation
- Nail fixation





Infectious Disease Consultation

- Surgical culture positive for *Enterobacter cloacae*, pan-sensitive except for cefazolin
- Surgical pathology consistent with inflammation and granulation tissue
- Patient refused home intravenous antibiotic therapy, prescribed oral Levaquin and Rifampin for 6 weeks

Pearls and Pitfalls

- Don't be afraid of the initial debridement of open fractures
- Don't forget about local antibiotic delivery
- Don't forget about the Masquelet technique for segmental bone defects
- Understand the radiographic signs of osteomyelitis vs normal bone healing