Pediatric Forearm Post-Injury Deformity

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Closed Reduction and Casting is the Primary Treatment

- 90-95% treated with closed reduction and casting in ED
  - Conscious sedation
Acceptable Reduction Parameters

**EXPECT REMODELING**

- **Rule of Tens**
  - < 10 year old
    - < 20° angulation
  - > 10 year old
    - < 10° angulation
  - < 30° malrotation
  - Bayonet apposition
    - 2 years growth remaining

- Proximal radius fractures
- Loss of interosseous space
- Skeletally mature patients
Malunion of the Forearm

- Loss of rotation
  - Functional issues
- Poor cosmesis
  - “Crooked arm”
Correction of Malunion
*Less than 6 weeks from Injury*

- Wedge cast
- Repeat manipulation
- Deformity correction and fixation
  - Closed osteoclasis
  - Open osteotomy

2 weeks after injury

4 weeks after injury
Osteoclasis and Fixation

- Mini-open reduction of radius
  - IM nail fixation
- Closed osteoclasis of ulna
- Long arm cast
Correction of Malunion
More than 6 weeks after Injury

Osteotomy for Malunited Forearm Shaft Fractures in Children

JPO, 2006
Charles T. Price, MD and D. Raymond Knapp, MD

- Angulation > 30°
  - Immediate osteotomy
- Angulation 20-30°
  - Observe remodeling for 6 m
Best Outcomes of Osteotomy

Factors determining outcome of corrective osteotomy for malunited paediatric forearm fractures: a systematic review and meta-analysis

K. C. Roth¹,², M. M. J. Walenkamp², R. C. I. van Geenen³, M. Reijman¹, J. A. N. Verhaar¹ and J. W. Colaris¹

- Surgery < 1 year from injury
- Angulation > 20°
- Use of 3-D CT for pre-operative planning
Planning for Surgery

Normal Anatomy

- Radius: Radial tuberosity, Varus bow in shaft, Radial styloid
- Ulna: Coronoid process, Ulna styloid
Closing Wedge Osteotomies
Address Angulation and Rotation
Fixation

Radius: Henry approach
Ulna: Ulnar approach

2.7 mm compression plates
Preoperative 3D Modeling

Computer-Assisted Corrective Osteotomy for Malunited Diaphyseal Forearm Fractures

Junichi Miyake, MD, Tsuyoshi Murase, MD, PhD, Kunihiro Oka, MD, PhD, Hisao Moritomo, MD, PhD,
Kazuomi Sugamoto, MD, PhD, and Hideki Yoshikawa, MD, PhD

JBJS 2012  Investigation performed at Osaka University Graduate School of Medicine, Osaka, Japan
Pre-manufactured Cutting Jig
Summary

- Remodeling of forearm fractures has limits
- Malunion leads to poor outcomes
  - Loss of pronation/supination
- Osteotomy yields best results
  - When performed early for > 20° of angulation
- Preoperative planning and surgery must be executed well

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