Supracondylar Fractures

Henry J. Iwinski Jr., MD
Anything New?

• Neurologic and vascular injury associated with supracondylar humerus fractures and ipsilateral forearm fractures
  • Is there a higher risk for compartment syndrome?
  • Is there a higher rate of neurologic injury?
• How much do post-treatment x-rays assist in management?
  • 1 week, 3 weeks, 6 weeks, 3 months, 6 months?
  • Do we need so many?
Neurologic and Vascular Injury Associated with Supracondylar Humerus Fractures and Ipsilateral Forearm Fractures in Children

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Christine A. Ho, MD
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BACKGROUND

• 5% Supracondylar Humerus Fractures (SCH) associated with ipsilateral Forearm Fracture (FFx)
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• 5% Supracondylar Humerus Fractures (SCH) associated with ipsilateral Forearm Fracture (FFx)

• Neurologic Injury – 20-25%

• Pulseless Extremity – 6-9%

• Compartment Syndrome – 9%

Roposch et al, *JPO* 2001
Tabak et al, *JBJS Br* 2003
Blakemore et al, *CORR* 2000
PURPOSE

• To evaluate the acute neurologic and vascular complications associated with ipsilateral supracondylar humerus and forearm fractures in pediatric patients
METHODS

• Retrospective case-control study – Children’s Medical Center Dallas

• Study population:
  • Supracondylar Humerus Fracture (SCH) and ipsilateral Forearm Fracture (FFx)
  • Gartland Type II and III SCH
  • FFx = BBFFx, DRF, Ulna fx, olecranon fx, and Monteggia

• Control population:
  • Isolated Supracondylar Humerus Fracture
  • Gartland Type II and III SCH
METHODS – Study Population

Ipsilateral SCH and FFx

IRB-Registered Trauma Database
2001 – 2012

- 93 patients
- 16 – no Ipsi SCH and FFx
- 77 patients

EMR Billing Query
2008 – 2012

- 1575 SCH Fx
- 1498 – no Ipsi FFx
- 73 patients

150 patients
METHODS – Control Population

Isolated Type II and III SCH

- IRB-approved, retrospective review 2004-2007
  - Previously reported cohort of patients

1228 patients
Supracondylar Humerus and Forearm Fractures

**SCH**

- Type II = 40 (26.7%)
- Type III = 110 (73.3%)

**Forearm Fracture**

- BBFFx - 73
- DRF - 57
- Buckle Fx - 16
- Ulna Fx - 4
- Monteggia - 1
Supracondylar Humerus and Forearm Fractures

150 patients

- 73 BBFFx
  - 23 CR
  - 11 Nerve Palsies
  - 8 Nerve Palsies

- 56 DRF
  - 15 CR
  - 32 PP
  - 15 CR

- 16 Buckle Fx
  - 16 splint
  - 2 Nerve Palsies
  - 1 Pulseless

- 4 Ulna Fx
  - 1 CR
  - 1 PP
  - 1 Nerve Palsy

- 1 Monteggia
  - 1 PP

No cases of compartment syndrome
SCH and FFx - Nerve Palsy and Pulseless Extremity

22 Nerve Palsies

- AIN=9
- PIN=8*
- ULN=3*
- AIN/PIN=1
- AIN/ULN=1

* 2 patients w/ persistent nerve palsies at final f/u

6 Pulseless Extremities

- 5 pulses returned in OR
- 1 pink, perfused hand
RESULTS – Nerve Palsy Associated w/ FFx Reduction

**Nerve Injuries**

- 150 patients
  - FFx Reduction: 95 patients
    - 18 nerve injuries
  - No FFx reduction: 55 patients
    - 4 nerve injuries

*18.9% v. 7.3%, p=0.05*

**Vascular Compromise**

- 150 patients
  - FFx Reduction: 95 patients
    - 4 pulseless extremities
  - No FFx reduction: 55 patients
    - 2 pulseless extremities

4.2% v. 3.6%, p=0.86
# Ipsilateral SCH and FFx v. Isolated SCH

- **SCH and FFx**
  - Age = 6.8
  - SCH Classification:
    - Type II = 40 (26.7%)
    - Type III = 110 (73.3%)
- **SCH**
  - Age = 5.8
  - SCH Classification
    - Type II = 355 (28.9%)
    - Type III = 873 (71.1%)

## Nerve Injury vs. Pulseless Extremity vs. Compartment Syndrome

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CONCLUSION

• Case-control study SCH and FFx = ↑ incidence neurologic injury
  • 14.7% v. 7.8%
  • No difference in pulseless extremities or compartment syndrome

• Ipsilateral SCH and a FFx requiring reduction = ↑ incidence neurologic injury
  • 18.8% v. 7.4%
  • No difference in pulseless extremities or compartment syndrome
The Utility of Postoperative Radiographs After Pinning of Pediatric Supracondylar Humerus Fractures

Jake Stanfield, MD • Philip Ashley, MD • Laura Blum, MD • Ryan Muchow, MD • Henry Iwinski, MD • Vishwas Talwalkar, MD • Janet Walker, MD • Todd Milbrandt, MD
Impact

• Practice evidence-based medicine

• Reduce costs: $425/radiograph

• Reduce radiation exposure: 0.003mSv
Purpose

• Investigate the frequency at which postoperative radiographs resulted in a change in management following CRPP for SCH fx
Hypothesis

• Only the immediate Post-Operative Radiograph will lead to management decisions following SCH FX eliminating the need for the 3 and 8 week radiographs
Methods

- Single large academic center
- Database queried for all patients treated with CPT code 24538
- January 2008 through December 2013.
- Inclusion
  - Displaced (Gartland type II and III) SCH fractures
  - Complete radiographic data
  - Adequate follow-up
- Exclusion
  - Flexion type
  - Intra-articular
  - Transphyseal
  - Open fractures
Results

• 508 patients identified
• 90 patients excluded
• 418 patients included in final analysis
Demographics

- 418 patients, 208 M & 210 F
- Mean age 5.75 years (std 2.34)
  - 134 type II (32%)
  - 259 type III (62%)
  - 16 type IV (4%)
- Mechanism of injury
  - Fall from playground equipment 116 (28%)
  - Fall from furniture 84 (20%)
- Days to pin removal 26 days
  - First Visit at 8 days
Complications Detected and Changes in Management Initiated

- Fracture Displacement: 3.8%
- Pin Displacement: 4.5%
- Revision Surgery: 1.0%
- Prolonged Immobilization: 1.0%
- N=412

1st Follow-up Visit (7-10 days)
- Fracture Displacement: 3.8%
- Pin Displacement: 4.5%
- Revision Surgery: 1.0%
- Prolonged Immobilization: 1.0%

Pin Removal Visit (3-4 weeks)
- Fracture Displacement: 2.9%
- Pin Displacement: 0.7%
- Revision Surgery: 0.0%
- Prolonged Immobilization: 0.0%

12.6%
Revision Surgery

4 patients required a revision surgery

- 2 pinned by pediatric orthopaedic surgeons
- 2 pinned by adult trauma surgeons

All patients requiring revision surgery

- Type 3
- Initial fixation with 2-pin configuration
Prolonged Immobilization

52 Patients

- Incomplete Healing
- TTP at fracture site
- Unclear reason
- Adult trauma attending
- Parents' request
- Forearm fracture
Changes in Management

- No change in management occurred with final radiographs at 8 weeks visit

- No change in management occurred in any Type II fractures with any radiographs
Conclusions

• Post-operative radiographs rarely led to a change in management (3.5% re-operation)
  • When they did it was found on the first Post-Op x-ray.
• Radiographs at the time of pin removal may be useful
  • 12.6% had changes in management
• Continued Immobilization?
Conclusions

• Radiographs following pin pull were not clinically relevant and should be not be routinely used
• Any follow up radiographs in Type 2 injuries may not be necessary