ICD-10 and Fracture Descriptors

Tal Laor, MD
Department of Radiology
Cincinnati Children’s Hospital
• Disclosures: None
ICD-10

- 10th revision of *International Statistical Classification of Diseases and Related Health Problems*
  - World Health Organization (WHO) classification list
  - Standard used to report diseases globally (>100 countries)
  - Health trends and statistics
- National variant: ICD-10 CM (clinical modifications)
- October 1, 2015
- Affects all HIPAA covered entities (all US payors and radiology practices)
- Over 70,000 ICD-10-CM codes
ICD-10

• Basic structure of the code made of 7 alphanumeric characters
  \[XX.XXX.XXX.X\]
  - 1-3: category of disease
  - 4: etiology of disease
  - 5: body part affected
  - 6: severity of illness
  - 7: place holder increases specificity

• Examples: W55.22XA, V91.07XA
ICD-10 Fracture Report

- Etiology
- Encounter (initial, subsequent, sequelae)
- Fracture Descriptors
  - Localization
  - Category
  - Pattern
  - Displacement
- Healing status (normal, delayed, non-union, malunion)
ICD-10 Fracture Report

- Etiology
- Encounter (initial, subsequent, sequelae)
- Fracture Descriptors
  - Localization
  - Category
  - Pattern
  - Displacement
- Healing status (normal, delayed, non-union, malunion)

Clinical History and Procedure Comments
ICD-10 Fracture Report

- Etiology
- Encounter (initial, subsequent, sequelae)
- Fracture Descriptors
  - Localization
  - Category
  - Pattern
  - Displacement
- Healing status (normal, delayed, non-union, malunion)
ICD-10 Fracture Report

- Etiology
- Encounter (initial, subsequent, sequelae)
- Fracture Descriptors
  - Localization
  - Category
  - Pattern
  - Displacement
- Healing status (normal, delayed, non-union, malunion)
Fracture Descriptors

• Common descriptors used by Orthopedics and Radiology
  – Localization (side, body part, part of bone)
  – Category (open/closed, pathologic, stress, etc)
  – Pattern (buckle, transverse, spiral, etc)
  – Displacement
    • Type
    • Direction
    • Magnitude
• Understand the impact of what is reported
Hi All,

I saw a girl today in clinic with a displaced distal radius salter 2 fracture seen in the *** ED 7 days ago who was sent home in a splint without reduction and told to follow-up with ortho in "one week". At 7 days out now, it is too late to safely reduce it, especially since it would require a trip to the OR to do so now. No ortho consult was called in the ED, potentially because the radiology read said "3mm" of displacement, which was measured at the Thurstan Holland fragment, despite more than 50% dorsal translation of the epiphysis and at least 15 degrees of angulation. She will remodel but she has a noticeable clinical deformity that will persist for some time. 

Can you touch base with the *** ED folks about sending out displaced physeal fractures without calling us? Tal, can we revisit the fracture descriptors with regards to physeal injuries?

Thanks,
Fracture Category and Pattern
Incomplete
• Plastic deformation
• Buckle
• Greenstick
• “Incomplete with cortical disruption”

Complete and Other
• Transverse
• Oblique
• Spiral
• Physeal
• Comminuted
• Bucket handle/corner
• Pathologic
• Stress
Incomplete Fractures
Plastic Deformation

- Some bones are bowed normally, so prefer term “plastic deformation”
- No fracture line
Plastic Deformation

- Some bones are bowed normally, so prefer term “plastic deformation”
- No fracture line
- +/- periosteal new bone on f/u
Diaphysis

Metaphysis (rare)

Metadiaphysis (most common)

Diaphysis
Buckle Fracture

- Unicortical failure on the *compression* side, without cortical break
- Metadiaphyseal location
- Zone of normal bone between fracture and physis
Buckle Fracture

- Unicortical failure on the compression side, without cortical break
- Metadiaphyseal location
- Zone of normal bone between fracture and physis
Torus

- “Circumferential” cortical bulge
  - (e.g. inner tube, doughnut, bagel)
- Doesn’t really happen in bones
- Term no longer used in Orthopedics
• “Circumferential” cortical bulge
  – (e.g. inner tube, doughnut, bagel)
• Doesn’t really happen in bones
• Term no longer used in Orthopedics
Other Incomplete Fractures

- Unicortical failure on the **tension** side = greenstick fracture

Greenstick

[Image: X-ray showing a greenstick fracture with a break on the tension side]
Other Incomplete Fractures

- Unicortical failure on the **tension** side = greenstick fracture
- If not on tension side = “incomplete fracture with cortical disruption”

**Greenstick**

Break on **tension** side

“Incomplete fracture with cortical disruption”

Break on **compression** side
Greenstick Fractures
Greenstick Fractures

Not a Greenstick Fracture
Incomplete Fracture with Cortical Disruption

“a broken buckle fracture”
Not a buckle (or other incomplete) fracture!
Not a buckle (or other incomplete) fracture! This is a radial Salter Harris II fracture (and ulnar incomplete versus physeal fracture)
Other Fractures

- Transverse
- Oblique
- Spiral
- Physeal
- Comminuted
- Bucket handle/corner
- Pathologic
- Stress

Complete
Transverse, Oblique, Spiral
Physeal
(Salter Harris Fractures)
Physeal Fractures: Part 2. Two Previously Unclassified Types

Hamlet A. Peterson, M.D., M.S.

Department of Orthopedic Surgery, Mayo Clinic and Mayo Foundation, Rochester, Minnesota, U.S.A.

Summary: This article describes two physeal fractures not previously classified. The first is a fracture completely across the metaphysis with extension to the physis. There is usually no extension of the fracture along the physis, as is seen with the Salter–Harris type II fractures. It is a common fracture, occurring in 15.5% of the Olmsted County study. The second previous unclassified fracture is one in which a portion of the physis is missing. This is always an open fracture, and, thus, always requires initial surgery. It almost always develops premature physeal closure and almost always requires late reconstructive surgery. Key Words: Metaphyseal-to-physeal fracture—Physeal fracture with part missing.
Summary: This article describes two physeal fractures not previously classified. The first is a fracture completely across the metaphysis with extension to the physis. There is usually no extension of the fracture along the physis, as is seen with the Salter–Harris type II fractures. It is a common fracture, occurring in 15.5% of the Olmsted County study. The second previous unclassified fracture is one in which a portion of the physis is missing. This is always an open fracture, and, thus, always requires initial surgery. It almost always develops premature physeal closure and almost always requires late reconstructive surgery.
• Peterson Type 1
• “Salter Harris Type II variant”
Comminuted Fracture
Bucket handle or Corner Fracture (Metaphyseal Fracture)

metadiaphysis
Bucket handle or Corner Fracture (Metaphyseal Fracture)
Classic Metaphyseal Lesion (CML)

Corner Fracture = Bucket Handle Fracture
Metaphyseal Component of a Salter Harris Fracture
Pathologic Fracture
Stress Fracture
versus “Stress Response/Reaction”

- No fracture line
- Area of sclerosis
- Fine line between healing stress fracture and stress response (both chronic)
- Versus sclerosis as a response to acute injury
Descriptors for Displacement
Displacement

- The difference between the initial position of something (as a body or geometric figure) and any later position

Type, Direction, and Magnitude
Displacement Type

• Translation
  – Sideways
  – Shortening/distraction

• Angulation
  – Apex location
  – (Rotation)
Displacement Type

• Translation
  – Sideways
  – Shortening/distraction

• Angulation
  – Apex location
  – (Rotation)
Translation
Direction and Magnitude

• Direction:
  – Medial/lateral, dorsal/volar, plantar/palmar, anterior/posterior, radial/ulnar, etc.
  – Do NOT use medial/lateral for wrist and hand

• Magnitude:
  – Extra-articular: in percent (%)
  – Intra-articular: in mm
    • Must comment on joint alignment (concentric, subluxated, dislocated)
Translation
Direction and Magnitude

• Extra-articular, so use %
Translation
Direction and Magnitude

• Extra-articular, so use %
• *Radius*: 95% translation in ulnar direction
Translation
Direction and Magnitude

- Extra-articular, so use %
- *Radius*: 95% translation in ulnar direction
- *Ulna*: 40% translation in ulnar direction
• Intra-articular, so use mm
• Distraction and step-off
• Intra-articular, so use mm
• Distraction and step-off

Translation
Direction and Magnitude

2 mm lateral translation, no step off, concentric joint
Intra-articular, so use mm

Distraction and step-off

Translation
Direction and Magnitude

2 mm lateral translation, no step off, concentric joint

1 mm step off, no translation, concentric joint
Translation
Joint concentricity
Translation
Joint concentricity

3 mm dorsal translation < 1 mm lateral translation
Translation
Joint concentricity

3 mm dorsal translation,
Concentric joint alignment

< 1 mm lateral translation,
Concentric joint alignment
Translation
Joint concentricity

3 mm dorsal translation, Concentric joint alignment

< 1 mm lateral translation, Concentric joint alignment
Shortening/Distraction
(Overlap or Separation)

• Direction
  – Shortening or distraction
• Magnitude
  – in mm
Angulation
Direction and Magnitude

• Apex location (e.g. anterior/posterior, radial/ulnar, superior/inferior), varus/valgus, etc.
• In degrees (°)
• Do NOT use mild, moderate, severe, minimal, substantial, etc.
Angulation
Direction and Magnitude

- Apex location (e.g. anterior/posterior, radial/ulnar, superior/inferior), varus/valgus, etc.
- In degrees (°)
- Do NOT use mild, moderate, severe, minimal, substantial, etc.

45 degrees apex volar angulation
Salter Harris Fractures

• Displacement
Salter Harris Fractures

• Displacement
  • Use the epiphysis for angulation
    • Transverse axis of epiphysis should be 90° to shaft
Salter Harris Fractures

• Displacement
  • Use the **epiphysis** for angulation
    • Transverse axis of epiphysis should be 90° to shaft

30 degrees apex volar angulation
Salter Harris Fractures

• Displacement
  • Use the epiphysis for angulation
    • Transverse axis of epiphysis should be 90° to shaft
  • Use the epiphysis for translation
    • Do not use the Thurston Holland fragment for quantification
Salter Harris Fractures

• Displacement
  • Use the *epiphysis* for angulation
    • Transverse axis of epiphysis should be 90° to shaft
  • Use the *epiphysis* for translation
    • Do not use the Thurston Holland fragment for quantification
Salter Harris Fractures

• Displacement
  • Use the **epiphysis** for angulation
    • Transverse axis of epiphysis should be $90^\circ$ to shaft
  • Use the **epiphysis** for translation
    • Do not use the Thurston Holland fragment for quantification

epiphysis translated 30% dorsally relative to metaphysis
Ortho wrote:

“Also note the clinical deformity! The overall contour will be deceptively normal due to swelling, but when the cast comes off, this is a crooked wrist.”
Rotation

- Can be difficult to determine radiographically
- Is often used interchangeably with angulation
Rotation

• Can be difficult to determine radiographically
• Is often used interchangeably with angulation
• “Lateral condylar fracture with 45 degrees varus rotation” (or angulation)
Rotation
Rotation

Courtesy of Roger Cornwall, MD
Healing Status
Healing

- No callus or periosteal new bone (very early)
Healing

• Early signs of healing (callus, periosteal new bone, + fracture line)
Healing

- Further or continued routine healing (callus, periosteal new bone, +/- fracture line)
Healing

• “No signs of ongoing healing process”
  – (do not use HEALED if dealing with current injury because radiographic and clinical union are not necessarily the same)
Summary: ICD-10 Fracture Report

- Etiology
- Encounter
- Fracture Descriptors
  - Localization
  - Category
  - Pattern
  - Displacement
- Healing status
Take-Home Points

• Reserve “buckle fracture” for unicortical deformity on compressive side
Take-Home Points

• Incomplete fracture with cortical disruption = “broken buckle fracture”
Summary: ICD-10 Fracture Report

• Extra-articular translation in % (but use mm for shortening/distraction)

Humerus:
• 100% medial translation
• 5 mm shortening
• 30 degrees apex lateral angulation
Summary: ICD-10 Fracture Report

- Intra-articular translation in mm and comment on joint concentricity

Distal tibia:
- 3 mm medial translation
- 2 mm articular step-off
- Talus medially subluxated (non-concentric joint)
Summary: ICD-10 Fracture Report

- Use epiphysis to determine displacement for Salter Harris II fractures, not Thurston Holland fragment

Radius:
- 35 degrees apex volar angulation
- 7 mm dorsal translation
CLINICAL HISTORY: 7-year-old boy with small finger metacarpal fracture following football injury. Subsequent visit.


PROCEDURE COMMENTS: Three views of the right hand.

FINDINGS:
FRACTURE: Present.
FRACTURE TYPE AND LOCATION: Transverse metacarpal neck fracture of the small finger.
DISPLACEMENT: Approximately 40 degrees of apex dorsal angulation, which is similar to the prior study.
HEALING: Periosteal new bone formation consistent with early healing.
SOFT TISSUES: Normal.
OTHER FINDINGS: None.

IMPRESSION: Routine healing fracture (or: Routine healing of transverse metacarpal neck fracture of the right small finger) with unchanged alignment.
Thank you!