Distal Radius Buckle (Torus) Fractures

Last Updated: January 2018
Topic Owner: Aya Reiss MD (aya.reiss@seattlechildrens.org)

OBJECTIVE: To guide appropriate, evidence-based treatment of distal radius buckle fractures in outpatient clinical settings.

1. Provide criteria for accurate diagnosis and imaging
2. Provide criteria for appropriate immobilization
3. Outline indications for pain management, follow-up, referral to orthopedics or physical therapy and return to play
4. Prevent complications of fractures
5. Potential measurable outcomes after initiation of guideline:
   a. Patient appropriately immobilized based on fracture type
   b. Percent of patients appropriately seen for follow-up

Summary:

a. Distal radius buckle fractures are common in children and typically present after a fall on an outstretched hand.

b. Amsterdam Pediatric Wrist Rules may be used to guide decision making in obtaining radiographs in patients presenting with pain after wrist trauma but 2-3V wrist radiographs are the definitive test to assess for fracture.

c. These fractures are inherently stable and may be managed with a prefabricated volar wrist splint for 2-4 weeks.

d. PCP follow up in 10-14 days is recommended to assess healing and provide appropriate anticipatory guidance for return to activity. Substantial variation exists in the outpatient management of distal radius buckle fractures. The range of management may include only one initial visit with radiograph confirmation of fracture at time of diagnosis and no follow up or up to three visits with possible subspecialty referral and radiographs at week 1 and 4.

e. Patients with atypical pain may be referred to orthopedics for casting in addition to physical therapy to minimize long-term complications.

Inclusion criteria

a. Previously healthy child
b. Suspected or confirmed fracture

Exclusion criteria

a. Bone disease: consider referral to orthopedics for skeletal health evaluation for bone fragility if:
i. Fracture with history of minimal trauma or history that “does not make sense” for fracture type.
ii. Signs on initial x-ray or x-ray report with concerns for osteopenia.
iii. More than 2 fractures in one year (not refracture)

b. Chronic steroid use

c. Age of patient does not preclude using these guidelines for management. For children <18 months of age, where there is clinical concern, or if history or development level is not consistent with fracture presentation, consider referral for child abuse evaluation.
   i. See Appendix A\textsuperscript{1,2} for a list of common fractures types concerning for child abuse.
   ii. Distal radius buckle fractures may not always cause children significant pain. Delayed presentation to care for accidental fractures may occur due to absence of physical signs of injury or little irritability on the part of the child.\textsuperscript{3}

d. Patient extremely active and/or unable to tolerate splint or family uncomfortable/unable to manage splint care

e. Need for emergent orthopedic evaluation:
   i. Open fractures
   ii. Acute neuropathy
   iii. Tenting of the skin
   iv. Compartment syndrome
   v. Vascular compromise
   vi. Angulated fracture needing reduction

Assessment:

a. Background
   i. Buckle fractures of the distal radius are one of the most common fractures of childhood and represent about 20% of all pediatric fractures\textsuperscript{4}
   ii. These fractures typically occur in the distal radius after longitudinal trauma along the shaft of the bone, i.e. fall on an outstretched hand
   iii. Buckle fractures occur from compression of the bony cortex and are inherently stable

b. Definitions:
   i. Anatomy of wrist\textsuperscript{5-6}
      1. Anatomy of growth plates UpToDate 2018
      2. Anatomy of the volar aspect of the wrist UpToDate 2018

c. Diagnosis
   i. Clinical assessment
      1. Clinical exam
         a. Video review of clinical exam: CHOP Pediatric Orthopedic Exams Hand&Wrist
b. Inspection (open fracture, swelling, bruising, deformity/dislocation)
c. Palpation, range of motion
d. Neurovascular status
   i. Assessment of capillary refill, palpation of radial and ulnar pulse
   ii. Motor and sensory function *(Appendix B)*

2. Amsterdam Pediatric Wrist Rules
   a. Clinical decision model used to facilitate decision making for when to obtain radiographs after acute wrist injury
   b. Validation study of model found it to have 95.9% sensitivity and 37.3% specificity while missing 4.1% of fractures
   c. Model only valid for patients >3 years old
   d. Per model, obtain a radiograph if **any** of the following criteria are **positive**:
      i. Swelling of the distal radius
      ii. Visible deformation
      iii. Distal radius tenderness to palpation
      iv. Anatomical snuffbox tenderness to palpation
      v. Painful or abnormal supination

3. If clinical suspicion for fracture is high, radiographs should be obtained regardless of wrist rules. In one study of wrist trauma, 34.9% of children <18yo who presented with history of trauma and had pain on examination were found to have a fracture.

4. Phone triage: Pediatric Telephone Protocols
   a. Call 911 if serious injury with multiple fractures, major bleeding that can’t be stopped, amputation or open fracture
   b. Go to ED if need for sutures, deformity, dislocation, swelling, color change, decreased ROM, concern for tendon/joint injury, child abuse
   c. Follow up in clinic in 1-3 days if none of the above and tetanus up to date
      i. Home care or rest, ice, ibuprofen/tylenol

ii. Radiographic Imaging
   1. Cortical disruption from distal radius buckle fractures should be evident on x-ray from the time of injury. Distinguishing characteristic would be bump or bend in bone rather than a crack. *Example of Buckle Fracture UpToDate 2018*
   2. Differential diagnosis to consider: Salter Harris I fracture (distal wrist bony tenderness with negative x-ray), radial head subluxation or dislocation, greenstick radius fracture, occult supracondylar fracture.
Consider forearm, elbow and scaphoid radiographs as indicated clinically.

3. AP/lateral wrist x-rays (children <10 yo)
4. AP/lateral/oblique wrist x-rays for adolescents (children >10 yo)
   a. Oblique image will assess for scaphoid fractures at the distal pole. Scaphoid fractures uncommon in children < 10 years old

Disposition:

a. **Placement in removable volar splint**
   i. Measure wrist circumference to appropriately size splint and refer to commercial specific sizing guide.
   ii. If child does not fit preformed wrist splint, customized volar wrist splint may be placed (**Appendix C**). [Husky Orthopedics Volar Resting Splint](#)
   iv. Equivalent healing to casting
   v. Improved functional outcomes (writing, drawing, grooming, bathing, return to regular play/sports), no difference in pain outcomes
   vi. Increased family satisfaction and convenience
   vii. Cost savings for family as does not require referral for specialty placement of cast and less complications (ED visits for wet cast, etc.)
   viii. No need for casting unless significant pain after 3-5 days
   ix. Distal radius buckle fractures can be managed by a primary care physician and do not need referral to orthopedics. Managing these fractures in the primary care setting allows for continuity and provides significant cost savings to family. Consider referral in these situations:
      1. Patients who are unable to tolerate or maintain a splint due to age, activity or developmental level
      2. Those with significant pain despite splint placement who may require a cast
      3. Significant family anxiety
      4. If the primary care physician is uncomfortable with placing or sizing a splint

b. **Pain management**
   i. Once immobilized, patient should have very little pain
   ii. Ibuprofen or acetaminophen for pain
      1. Effective and equivalent pain management
      2. Better functional outcomes and less undesirable side effects than management with opioids. After initial assessment, management and immobilization, opioids are not indicated for pain management of healing fractures.
      3. No increased risk for clinically important bone healing complications

c. **Anticipatory guidance at initial visit**
   i. May remove splint briefly for bathing
   ii. Keep splint clean and dry, do not put in to water
iii. 2 feet on the ground activities only. Avoid activities that may lead to risk of reinjury.
iv. Loosen or remove splint and return to your PCP or medical care urgently if injured arm feels
   1. more painful
   2. more swollen
   3. numb
   4. tingles
   5. turns blue
   6. Arm/ fingers are not a healthy color, warm, or do not have good movement
v. Once a splint is placed, child should not have pain. If he/she does, return to medical care for re-evaluation.
d. If child is referred to orthopedics, remember, if applicable, to upload imaging from PACS to SCH system or send family with disc to avoid repeat imaging.

Reassessment:

a. Follow up
   a. Assess skin (for breakdown, pressure ulcers, infection), pain and function
   b. 3-5 days as needed if patient has significant pain, consider referral to orthopedics for casting
   c. 10-14 days PCP follow up to reassess child and provide anticipatory guidance
   d. Older children with reliable caregivers, may consider home discontinuation of splint with follow up only as needed
   e. Anticipatory guidance at follow up visit
      1. If no pain after 2-3 weeks, discontinue immobilization, encourage ROM of wrist
      2. Fractures typically heal in 2-4 weeks, if still having pain at 3-4 weeks, return to medical care for reassessment
      3. Return to play guidelines
         a. Often best done as consensus decision of all stakeholders. Objective measures include 90% mobility, strength and functional performance. Performance based assessments can be obtained with tests such as the Functional Movement Screen.
         b. Can counsel families that if wrist has near-normal strength and painless functional range of motion, should be ready to return to play. Education may be given as anticipatory guidance during initial follow up or as part of additional scheduled follow up.
         c. Use volar splint for vigorous activity until week 4-5 post-injury.
   b. Physical therapy:
Buckle fractures rarely need physical therapy unless concern for repeat or recurrent injury.

References:

5. 2018 UpToDate Graphic 79444 Version 4.0 and
6. 2018 UpToDate Graphic 69097 Version 3.0
7. UpToDate 2018 Graphic 53902 Version 6.0
11. 2018 UpToDate Graphic 81117 Version 4.0

APPENDIX A: Resources for Fractures associated with child abuse
OrthoBullets Pediatric Abuse
APPENDIX B:  *Motor and Sensory Function of the Nerves of the Arm*

APPENDIX C:  *Scotchcast splinting guide*