

AMSER Case of the Month

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10 y/o female with intermittent bilateral ulnar wrist pain

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Patient Presentation

History of Present Illness: 10 y/o female presents with 4 months of bilateral ulnar wrist pain described as stabbing and intermittent. The pain is aggravated with overuse of the hands such as holding a pencil and relieved with rest.

Past Medical History: No past medical history. No prior upper extremity surgery or injury. No medications.

Focused Physical Exam: Bony deformities noted on both ulnar wrists, which are tender to palpation over the ulnar styloid. Able to make fist, okay sign, thumbs up, perform thumb opposition and crossover maneuver of the index and middle finger. 5/5 APB and intrinsic muscle strength testing. Brisk capillary refill and sensation intact to all digits distally and bilaterally. Wrist extension/flexion, forearm pronation, and ulnar/radial deviation are intact. Supination limited.

What Imaging Should We Order?

ACR Appropriateness Criteria

Variant 1: Chronic wrist pain. With or without prior injury. Best initial study.

Procedure	Appropriateness Category	Relative Radiation Level
Radiography wrist	Usually Appropriate	⊕
MRI wrist without IV contrast	Usually Not Appropriate	○
MRI wrist without and with IV contrast	Usually Not Appropriate	○
MR arthrography wrist	Usually Not Appropriate	○
US wrist	Usually Not Appropriate	○
CT wrist without IV contrast	Usually Not Appropriate	⊕
CT wrist with IV contrast	Usually Not Appropriate	⊕
CT wrist without and with IV contrast	Usually Not Appropriate	⊕
CT arthrography wrist	Usually Not Appropriate	⊕
Radiographic arthrography wrist	Usually Not Appropriate	⊕
Bone scan wrist	Usually Not Appropriate	⊕⊕⊕

Initially evaluated with wrist radiographs.

Subsequently evaluated with non-contrast CT for surgical planning.

Right Wrist Imaging Findings (Unlabelled)



PA X-Ray



Lateral X-Ray



Coronal CT
through distal
radioulnar joint



Sagittal CT
through
distal ulna

Left Wrist Imaging Findings (Unlabelled)



PA X-Ray



Lateral X-Ray



Coronal CT
through distal
radioulnar joint

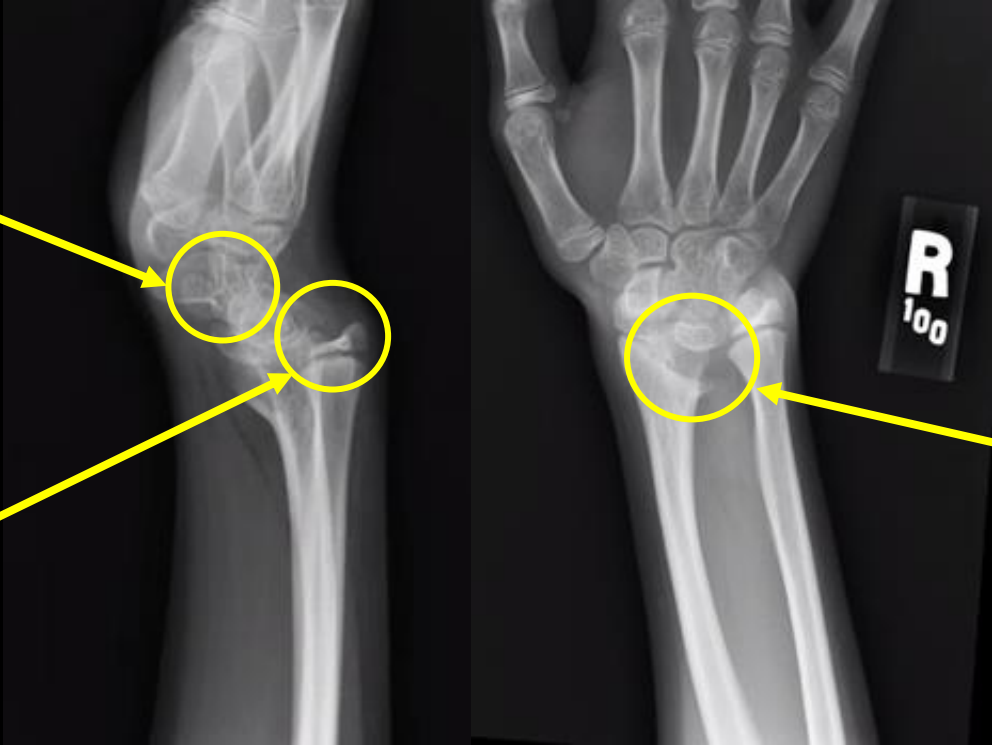


Sagittal CT
through distal
radius

Right Wrist Radiographic Findings (Labelled)

Palmar displacement of the carpus

Dorsal subluxation of distal ulna.



Mild widening of distal radioulnar joint. Ulnar and palmar curvature of distal radius. Neutral ulnar variance.

Lateral X-Ray

PA X-Ray

Left Wrist Radiographic Findings (Labelled)

Dorsal
subluxation of
distal ulna.



Lateral X-Ray



PA X-Ray

Mild widening of
distal radioulnar
joint. Ulnar and
palmar curvature
of distal radius.
Neutral ulnar
variance.

Right Wrist CT Findings (Labelled)



Coronal CT

Downsloping of volar-ulnar aspect of distal radial epiphysis/physis with increased radial inclination

Mild widening of distal radioulnar joint



Sagittal CT

Dorsal subluxation of distal ulna

Not pictured:
increased volar tilt with apex dorsal bowing of distal radius, neutral ulnar variance

Left Wrist CT Findings (Labelled)



Coronal CT

Downsloping of volar-ulnar aspect of distal radial epiphysis/physis with increased radial inclination

Mild widening of distal radioulnar joint

Neutral ulnar variance



Sagittal CT

Increased volar tilt of distal radius with apex dorsal bowing of the distal radius

Not pictured: dorsal subluxation of distal ulna

Final Diagnosis:

Bilateral congenital Madelung deformity.

Madelung Deformity

Summary: Premature closure of the *medial* (ulnar) physis of the distal radius leading to dorsal subluxation of the distal ulna, increased distal radioulnar joint (DRUJ) space, and palmar displacement of the carpus.

Common Clinical Features: Prominence of the distal end of the ulna, limitation of supination, and DRUJ incongruity with forearm rotation. Increased wrist pain with activity as well as decreased wrist strength develops later on in adolescence.

Initial Differential Diagnoses: Pseudo-madelung deformity resulting from trauma or infection, Turner's syndrome, skeletal dysplasia.

Epidemiology: More common in females than males, M:F ratio 4:1

Associated Congenital Conditions: Leri-Weill dyschondrosteosis, Hurler syndrome, Turner syndrome, achondroplasia, Madelung dyschondrosteosis, and Ollier disease. ^{2,4,5}

Madelung Deformity

Treatment Performed:

Dome Osteotomy of the distal radius to restore the inclination of distal articular surface of the radius to within normal limits (i.e. 22° - 23° on the anteroposterior view and 10° - 11° on the lateral projection)²

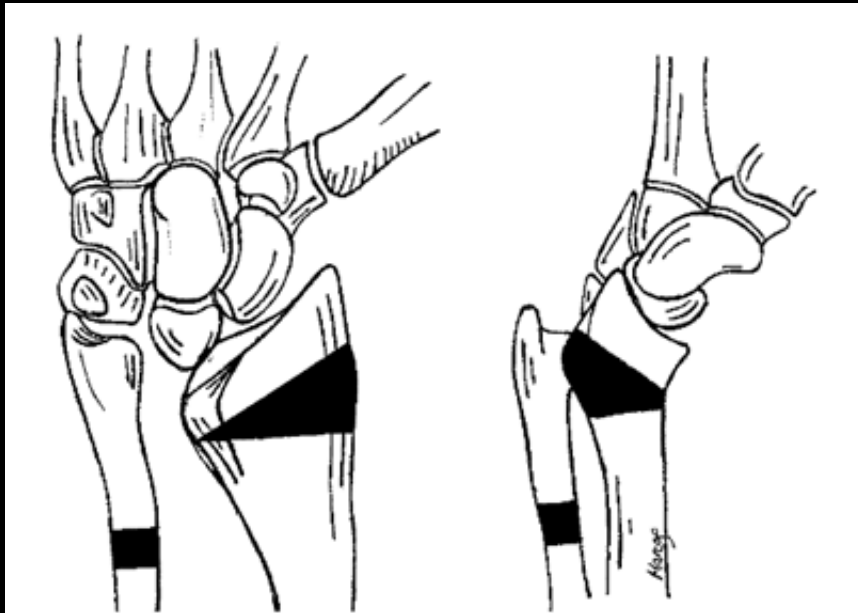


Fig. 1

Diagram showing the site of the radial and ulnar osteotomies (shaded areas).



Intraoperative fluoroscopic image of a dome osteotomy performed on the 10 y/o female identified in the case

References:

1. American College of Radiology ACR Appropriateness Criteria® Chronic Wrist Pain. (n.d.). Retrieved January 5, 2023, from <https://acsearch.acr.org/docs/69427/Narrative/>
2. Golding JS, Blackburne JS. Madelung's disease of the wrist and dyschondrosteosis. *J Bone Joint Surg Br.* 1976 Aug;58(3):350-2. doi: 10.1302/0301-620X.58B3.956255. PMID: 956255.
3. Hanson TJ, Murthy NS, Shin AY, Kakar S, Collins MS. MRI appearance of the anomalous volar radiotriquetral ligament in true Madelung deformity. *Skeletal Radiol.* 2019 Jun;48(6):915-918. doi: 10.1007/s00256-018-3094-2. Epub 2018 Oct 20. PMID: 30341713.
4. Squires, J. H., England, E., Mehta, K., & Wissman, R. D. (2014). The role of imaging in diagnosing diseases of the distal radioulnar joint, triangular fibrocartilage complex, and distal ulna. *American Journal of Roentgenology*, 203(1), 146-153.
5. Upton, S., & Chorley, J. (2022, April 5). *Overview: Causes of chronic wrist pain in children and adolescents*. UpToDate. Retrieved January 4, 2023, from https://www.uptodate.com/contents/overview-causes-of-chronic-wrist-pain-in-children-and-adolescents?search=madelung+deformity&source=search_result&selectedTitle=1~7&usage_type=default&display_rank=1#H21