Gymnasts' Wrist - Distal Radius Growth Plate Injury

Background

1. Definition
   o Chronic stress injury of distal radial physis
   o Also known as epiphysiolysis

2. General info
   o Common injury in pediatric gymnast
   o Diagnosis made by history and physical exam
     • Confirmed with plain x-rays or MRI
     • Treatment often nonsurgical
       • Rest until pain free
     • Web Site:
       • Gymnast's Wrist
         http://www.medcyclopaedia.com/library/topics/volume_vii/g/gymnasts_wrist.aspx

Pathophysiology

1. Pathology of disease
   o Repetitive axial loading of wrist in pronation and extension
     • Causes stress injury to distal radial physis
     • Causes injury to metaphyseal blood vessels
       • Interferes with calcification
       • Prolongs the life of chondrocytes

2. Incidence/prevalence
   o Incidence of acute gymnast wrist-unknown
     • Most do not seek medical attention
     • Chronic wrist pain occurs in 46-79% of elite and non-elite gymnasts\(^2,3\)

3. Risk factors
   o Age 10-14
   o 80-90% female
   o Bilateral presentation in one third of athletes
   o Starting gymnastics at a younger age
   o Higher number of years training
   o Higher skill level
   o Greater number of elements performed per week
   o Higher intensity training
   o Specific activities most associated with wrist pain:
     • Floor
     • Pommel horse
     • Balance beam

4. Morbidity
   o 42% of gymnasts with wrist pain report that pain interferes with performance\(^2\)
   o Effect of shortening of radius resulting in future complication-not clear
Diagnostics
1. History
   - Initially achy wrist pain
     - Worse with axial loading/extension
   - Swelling may be present
   - No history of acute trauma
   - Age for physeal immaturity
2. Physical exam
   - Pain with palpation
   - Possible swelling at distal radius over physeal area
   - Pain with extension
   - Restricted extension compared to contralateral wrist
     - Note: normal wrist extension is 60-75°
       - In gymnasts this can exceed 90°
3. Diagnostic testing
   - Laboratory evaluation:
     - Not indicated
     - May be used to diagnose other conditions
   - Diagnostic imaging:
     - Plain films:
       - Anterior/Posterior (AP), oblique radiographs usually sufficient
       - AP radiographs of contralateral wrist should be used for comparison
       - Note: Changes may be seen bilaterally
     - MRI:
       - May show increased T2 signal in and surrounding radial physis
       - Not necessary in all cases, useful if diagnosis is in doubt
     - Bone scan will show uptake
       - Normal immature physis will show uptake as well
4. Diagnostic "Criteria"
   - No commonly used clinical diagnostic criteria
   - Radiographic criteria have been developed
     - Grade Findings
       - 0 - Normal
       - 1 - Haziness of physis or irregularity of physeal border or both
       - 2 - At least one of the following: cystic changes, metaphyseal sclerosis, striations, or beaking of metaphysis
       - 3 - Widening of physis (with or without any additional findings)
Differential Diagnosis
1. Key DDx
   - Distal radius fracture
   - Scaphoid fracture
   - Distal radioulnar joint (DRUJ) instability
   - Wrist capsule sprain
   - Scapholunate instability
   - Ulnar abutment syndrome
2. Extensive DDx
   - Kienbock's Disease
   - Madelung's Deformity
   - Osteomyelitis
   - Bone tumor
   - Muscle tumor
   - Juvenile Rheumatoid Arthritis
   - Gout

Therapeutics
1. Acute treatment:
   - Remove athlete from play
   - Ice
   - Compression
   - Analgesic as needed for pain
     - Narcotics rarely needed

2. Further management (24 hrs)
   - Grade 0-1
     - Relative rest (avoiding loading of wrist) for 2-4 weeks
     - Pain control as needed
   - Grade 2
     - Absolute wrist rest for 4-6 weeks
     - Pain control as needed
     - Splinting or casting is rarely indicated
   - Grade 3
     - Absolute wrist rest for 6-12 weeks
     - Consider immobilization in cast or splint

3. Long-term care
   - Relative rest (see above) for 4-8 weeks
   - Slow return to practice as long as the athlete remains pain free
   - The focus should be on limiting repetitive loading
   - Bracing that limits extension may be helpful

Follow-Up
1. Return to office
   - After initial visit, follow-up in 2-3 weeks
   - Serial radiographs if persistent or worsening symptoms

2. Refer to specialist
   - Referral to orthopedic surgeon if:
     - Patients develop significant ulnar positive variance (>2.5mm)
     - Fail conservative management
   - Urgency: non-urgent

Prognosis
1. Majority of athletes return to competition without restriction or growth abnormalities
2. Long-term complications:
   - Symmetrical and asymmetrical growth plate retardation
   - Positive ulnar variance
o Associated pathoanatomic sequelae Madelung's deformity

**Prevention**

1. Minimal information on effectiveness of modifications leading to injury prevention in gymnastics (SOR:3C)
   - Correct poor technique
   - Strengthen wrist flexors/extensors
   - Wrist braces

**References**


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