Unusual Cases:

Elbow pain in 14 year old patient

Rens Bexkens
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3e SNN-WSE Schouder Congres
“Flexibility Matters”
Case: ♂, 14 years

Chief complaint: elbow pain


Physical examination:
- no visible abnormalities
- tenderness of radio-capitellar joint
- flexion/extension 140° /-10°; pronation/supination 80°/80°

Differential diagnosis?
## Differential diagnosis

<table>
<thead>
<tr>
<th>Lateral</th>
<th>Medial</th>
<th>Anterior</th>
<th>Posterior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiocapitellaire artrose</td>
<td>UCL lesion</td>
<td>Distal biceptendon rupture</td>
<td>Valgus extension overload</td>
</tr>
<tr>
<td>Osteochondrale loose body</td>
<td>Ulnar neuritis</td>
<td>Anterior capsule strain</td>
<td>Posterior osteophyte with impingement</td>
</tr>
<tr>
<td>Radial head fracture</td>
<td>Ulnar subluxation</td>
<td>Coronoid osteophyte formation</td>
<td>Tricepstenonitis</td>
</tr>
<tr>
<td>Osteochondritis dissecans</td>
<td>Golfer’s elbow</td>
<td></td>
<td>Olecranon bursitis</td>
</tr>
<tr>
<td>Tennis elbow</td>
<td></td>
<td></td>
<td>Olecranon stress fracture</td>
</tr>
</tbody>
</table>

**Imaging?**
Back to our case

**Imaging:**
Radiographs (AP + lateral): radiolucency; flattened capitellum
CT: fragmented subchondral bone with intra-articular fragments
MRI: disrupted cartilage of capitellum; fragment in situ with fluid underneath

→ suspected for osteochondritis dissecans of the capitellum
Osteochondritis dissecans

• Disorder of the subchondral bone and overlying cartilage
• 1887 Dr. Franz König
• Knee (75%), elbow (6%), ankle (4%), others (15%)
• Elbow: most commonly capitellum; less frequently radial head or trochlea
• 11-20 years; peak age 14 years
• ♂ > ♀

≠ Panner disease; 5-10 year, not activity related, self-limiting
OCD distribution
Background

Etiology: chronic valgus stress leads to compression of the radio-capitellar joint → compromised vascularization of capitellum → localized osteonecrosis

Commonly seen in baseball, gymnastics, tennis, volleyball, basketball, etc.

Prevalence: 2.1-3.4% among young baseball players
Biomechanics

Typical arm positions of baseball players and gymnasts that provide maximum stress to the proximal radius.

https://www.youtube.com/watch?v=BhNmUv4XkyU
Clinical presentation

- Physically active teenager → gymnastics, baseball, tennis, volleyball
- Dominant arm
- Initially subtle pain or swelling that relieves with rest; insidious onset that worsens gradually over time
- Poorly localized or lateral side elbow
- Effusion
- Advanced OCD with intra-articular fragments:
  - extension loss
  - mechanical symptoms: clicking, catching or locking
Physical examination

- Hyperthrophy
- Effusion → lateral soft spot
- Tenderness radio-capitellar joint
- Radio-capitellar compression test +++
- Extension loss up to 40°; less frequent flexion/pronation/supination loss.

Compare with contralateral side!
Imaging - ultrasound
Imaging

Radiograph  MRI  CT  3D-CT

A  B  C  D
Nonoperative treatment

Only indicated if cartilage is intact in a patient with an open growth plate:

1) Immediate cessation of sporting activities for 3-6 months
2) NSAIDs
3) Muscle strengthening exercises

Hypothesis: endochondral ossification at growth plate may play role in healing process
Surgical treatment

Indicated for advanced OCD → disrupted cartilage

- Arthroscopic microfracture/drilling
- Fragment fixation
- Osteochondral autologous transplantation
Rehabilitation

Nonoperative treatment:
1) Immediate cessation of sporting activities for 3-6 months
2) NSAIDs
3) Muscle strengthening exercises

Arthroscopic microfracture or drilling:
- Day 1: immobilization
- Day 2: active and assisted passive-motion of elbow and forearm
- 3 months: axial loading permitted
- 4 months: return to sport

OATS:
- Day 1: Immobilization in 90° of flexion
- Day 14: active and assisted passive-motion of elbow and forearm
- 3 months: strengthening exercises
- 4 months: throwing activity
- 6-9 months: return to previous level
Return to sports

### Studies

**Debridement**
- Miyake (2011)
- Schoch (2010)
- Baumgarten (1998)
- Byrd (2002)
- Jones (2010)
- Ruch (1998)
- Tivnon (1976)
- Bojanić (2012)
- Lewine (2015)
- McManama (1985)

**Fixation**
- Henrikus (2015)
- Harada (2002)
- Uchida (2015)
- Kuwahata (1998)
- Nobuta (2008)
- Takeda (2002)

**OATS**
- Iwasaki (2009)
- Lyons (2015)
- Maruyama (2014)
- Nishinaka (2014)
- Shimada (2012)
- Tsuda (2005)
- Yamamoto (2006)

### Technique vs. Time to RTS (m)

<table>
<thead>
<tr>
<th>Technique</th>
<th>Time to RTS (m)</th>
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</thead>
<tbody>
<tr>
<td>Debridement</td>
<td>4.2 ± 1.5</td>
</tr>
<tr>
<td>Fixation</td>
<td>5.9 ± 1.1</td>
</tr>
<tr>
<td>OATS</td>
<td>5.9 ± 0.9</td>
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</tbody>
</table>
Take home message

• **High index of suspicion** → any teenager with (lateral) elbow pain should be suspected for elbow OCD

• **Imaging is necessary** → ultrasound (CT or MRI)
References

3) Bexkens et al. - Osteochondritis dissecans of the capitellum: lesion size and pattern analysis using quantitative 3-dimensional computed tomography and mapping technique. J Shoulder Elbow Surg. 2017 Sep;26(9)
8) Matsuura et al. - Prevalence of Osteochondritis Dissecans of the Capitellum in Young Baseball Players Results Based on Ultrasonographic Findings. Orthopaedic Journal of Sports Medicine, 2(8), 2325967114545298
Questions?
<table>
<thead>
<tr>
<th>Time</th>
<th>ROM Exercise</th>
<th>Strength Training</th>
<th>Sports Activity</th>
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<tbody>
<tr>
<td></td>
<td>Active ROM exercise</td>
<td>Under immobilization</td>
<td>Shadow pitching</td>
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<tr>
<td></td>
<td>Elbow flexion/extension, forearm pronation/supination</td>
<td>Isometric training for forearm and upper arm</td>
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<tr>
<td></td>
<td>Elbow flexion/extension, forearm pronation/supination</td>
<td>Active exercises for fingers</td>
<td>Throwing activity</td>
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<tr>
<td></td>
<td>Passive ROM exercise</td>
<td>Cast off</td>
<td></td>
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<tr>
<td></td>
<td>Elbow flexion/extension, forearm pronation/supination</td>
<td>Forearm strength training (wrist curls, reverse curls)</td>
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<tr>
<td></td>
<td></td>
<td>Elbow strength training (arm curls, triceps curls)</td>
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<tr>
<td></td>
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<td>Rotator cuff training</td>
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<td></td>
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<td>Shoulder girdle training</td>
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<td></td>
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<td>Pitching motion training</td>
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<td></td>
<td></td>
<td>Start from partial kinematic chain movement</td>
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<tr>
<td></td>
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<td>(from lower extremities to trunk, from trunk to upper extremities)</td>
<td></td>
</tr>
</tbody>
</table>
Muscles

1) Elbow flexors
   - brachialis
   - biceps brachii → short: flexion, long: supination
   - brachioradialis → flexion, pronation

2) Elbow extensors
   - triceps brachii → extension
   - anconeus → extension, stabilizing role

3) Wrist flexors
   - e.g., pronator teres

4) Wrist extensors
   - e.g., Extensor Carpi Radialis Brevis (ECRB)
Neurovascular

3 nerves
1) medial nerve: lies in cubital fossa
2) ulnar nerve: medial to brachial artery,
3) radial nerve: dorsal → lateral of humerus
Arteries

- Right subclavian
- Axillary
- Humeral circumflex
- Deep brachial
- Brachial
- Ulnar collateral
- Radial
- Anterior crural interosseous
- Ulnar
- Deep palmar arch
- Superficial palmar arch
- Digital

- Right subclavian vein
- Axillary vein
- Brachial vein
- Cephalic vein
- Basilic vein
- Median cubital vein
- Median vein of the forearm
- Radial vein
- Basilic vein
- Ulnar vein
- Digital veins

(b)

Deep palmar venous arch
Superficial palmar venous arch