Pediatric Knee OCD: Management and Current Concepts

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Disclosures

- Board or Committee Memberships:
  - POSNA Evidence Based Practice Committee
  - PRiSM Executive Committee
  - Research in OsteoChondritis of the Knee (ROCK) Study Group

- Editorial or Governing Boards:
  - Clinical Orthopedics and Related Research (CORR)
  - Journal of ISAKOS (JISAKOS)
Overview / Format

- Definition and etiology of OCD
- OCD Diagnostic Algorithm
- OCD Treatment Algorithm
- Clinical Outcomes

Osteochondritis Dissecans

- What is OCD?
  - “A chronic, idiopathic alteration of subchondral bone with risk for instability and cartilage disruption that may result in premature osteoarthritis”
  - Cartilage involvement is always secondary (UNLIKE ADULTS!)

- Not the same as an “osteochondral defect” or “osteochondral lesion”
  - Could be caused by OCD, trauma, degenerative causes
Osteochondritis Dissecans

- Population study of >1 million
  - 9.5 children (6-19y/o)/100,000/yr
  - Males ~4x Females
  - 12-19y/o ~3x 6-11y/o
    - Earlier reports: higher incidence, less male predominance
  - Mean age: 13y/o
  - Blacks > Non-Hispanic Whites, Hispanics, Asians, etc.

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Osteochondritis Dissecans

- Frequency of incidence of OCD of knee location:
  1. Medial femoral condyle (10.0%)
  2. Lateral femoral condyle (20.5%)
  3. Patella (4.5%)
  4. Lateral femoral trochlea (1.3%)
  5. Central femoral trochlea (0.1%)
  6. Lateral tibial plateau (0.9%)
Osteochondritis Dissecans

- A variety of potential etiologies and pathophysiologic pathways have been proposed
- Microtraumatic dysvascularization or necrosis of a focal area of bone
- Experts generally consider OCD to be an idiopathic phenomenon

Osteochondritis Dissecans

- 11 high level histological analyses
  - 5 = repetitive or direct trauma
  - 2 = poor blood supply
  - 4 = unclear, multiple
Osteochondritis Dissecans

- Discreet macrotrauma may be a cause
- Unclear how pathophysiologic pathway may differ from the chronic/repetitive microtraumatic pathway
Osteochondritis Dissecans

- Cadaveric testing
- 9.4-T MRI
- Watershed area in OCD predilection spot

Novel Application of Magnetic Resonance Imaging Demonstrates Characteristic Differences in Vasculature at Predilection Sites of Osteochondritis Dissecans

Ferenc Toth,1,11 DVM, PhD, Mikko J. Nissil,10,11 PhD, Jutta M. Ellermann,1 MD, PhD, Luning Wang,1 PhD, Kevin G. Shea,3,11 MD, John Pollock,1,11 MD, and Cathy S. Carlson,1 DVM, PhD

Investigation performed at the University of Minnesota, Minneapolis, Minnesota, USA

AJSM 2015

Osteochondritis Dissecans

- OCD diagnosis is made by imaging: X-Rays and MRI
Osteochondritis Dissecans – Imaging Features

**Imaging of Osteochondritis Dissecans**

Cin Sports Med 23 (2014) 221-250

Andrew M. Zbojnickiewicz, MD, Tal Laor, MD

<table>
<thead>
<tr>
<th>Features that may differentiate developmental ossification variation and juvenile OCD</th>
<th>Juvenile OCD</th>
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<tbody>
<tr>
<td>Demographics</td>
<td></td>
</tr>
<tr>
<td>Girls &lt;10 y of age, boys &lt;13 y of age</td>
<td>Girls or boys &gt;8 y of age</td>
</tr>
<tr>
<td>MRI Features</td>
<td></td>
</tr>
<tr>
<td>No adjacent bone marrow edema</td>
<td>Adjacent bone marrow edema</td>
</tr>
<tr>
<td>Posterior third location ± extension to middle third; not anterior third</td>
<td>Usually middle third location</td>
</tr>
<tr>
<td>No intracondylar extension</td>
<td>—</td>
</tr>
<tr>
<td>Spiculation, puzzle pieces, accessory ossification centers</td>
<td>—</td>
</tr>
<tr>
<td>&gt;10% residual cartilage</td>
<td>Rare with &gt;30% residual cartilage</td>
</tr>
<tr>
<td>Deeper lesion (lesional angle &lt;105°)</td>
<td>Flatter lesion (lesional angle &gt;105°)</td>
</tr>
<tr>
<td>—</td>
<td>Disruption of secondary physis</td>
</tr>
<tr>
<td>—</td>
<td>Widened overlying unossified epiphyseal cartilage</td>
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</table>

10M, Normal Variant

11M, OCD
Osteochondritis Dissecans

- My Imaging Algorithm

**OCD Detected** (XR)

- Ipsilateral MRI
- EOS Hip to Ankle
- Contralateral XR

29% bilateral with 40% asymptomatic (Cooper et al. JPO 2015)

**Osteochondritis Dissecans - Staging**

- OCD diagnosis is made by imaging: X-Rays and MRI

<table>
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<tr>
<th>Stage</th>
<th>OCD MRI Classification</th>
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<td>1</td>
<td>Signal change in subchondral bone without clear lesion margins</td>
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<tr>
<td>2</td>
<td>Clear lesion margins, but without clear linear high signal (fluid-like) pattern signal between fragment and adjacent bone</td>
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<tr>
<td>3</td>
<td>Clear linear high signal (fluid-like) pattern signal between some areas of lesion and adjacent bone, but not surrounding entire fragment (i.e. not seen in all sequences/images involving lesion)</td>
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<td>4</td>
<td>Clear linear high signal (fluid-like) pattern signal between entire in-situ fragment and adjacent bone (i.e. seen in all sequences/images involving lesion)</td>
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<td>5</td>
<td>Detached fragment loose body</td>
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Osteochondritis Dissecans – Staging and Treatment

- OCD diagnosis is made by imaging: X-Rays and MRI
- Treatment is based on lesion stability

### OCD MRI Classification

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- Crutches, Brace, No Impact
- Surgery – Drilling (if fail)
- Surgery – Drilling/Fixation
- Surgery – Cartilage Restoration

Osteochondritis Dissecans - Treatment

- Drilling
- Fixation + Drilling
- Restoration
Osteochondritis Dissecans – Clinical Outcomes

- N=62 patients, 76 lesions
- Activity restriction until pain-free
  - At 6 mos: 67% worse or no improvement
  - At 12 mos: 51% worse or no improvement
- Predictors of progression (nomogram):
  - Age
  - Lesion size (normalized)
  - Cyst-like lesion size

Osteochondritis Dissecans – Clinical Outcomes

- N=221 patients
  - 134 Fragment Excision
  - 78 Fragment Preservation
  - 9 Grafting
Osteochondritis Dissecans – Clinical Outcomes

- N=12 studies, 205 stable OCD lesions
  - No difference in outcome or complications due to technique

  - **Retro**: 86% radiographic evidence of healing at mean 5.6 months
  - **Trans**: 91% radiographic evidence of healing at mean 4.5 months

Drilling Fixation of unstable lesions have similar healing rates to drilling stable lesions (75-100%)

Alternative techniques (OATS, OCA, ACI, etc.) are promising for unsalvageable lesions

Lesion and treatment heterogeneity → Limited comparative studies
Osteochondritis Dissecans - Treatment

- Don’t forget to address mechanical alignment!
  - Look for contributing factors to LFC OCDs
    - Discoid
    - Valgus

Thank You!