Patellofemoral Instability in the Pediatric and Adolescent Patient

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Anatomy - Trochlea

- Patella = “knee cap”
- Trochlea = “groove”
- Cartilage on surface of bones
  - Often injured with dislocation
- MPFL = main stabilizing ligament
  - Torn/stretched with dislocation
Normal relationship between knee cap and groove

- The MPFL prevents the knee cap from dislocating during the first 30 degrees of knee bend.
- By 45 degrees, the knee cap is contained in the groove.
- Changes in normal anatomy can lead to instability.

Altered Anatomy– Increased Femoral Anteversion

• Attachment of patella tendon too far to the outside of leg.
• As thigh muscles straighten leg, knee cap is pulled to the side out of the groove.
Altered Anatomy– Genu Valgum (knock knee alignment)

- Attachment of patella tendon too far to the outside of leg.
- As thigh muscles straighten leg, knee cap is pulled to the side out of the groove.
Altered Anatomy– Increased TT-TG distance

- Attachment of patella tendon too far to the outside of leg.
- As thigh muscles straighten leg, knee cap is pulled to the side out of the groove.
- Risk higher if distance > 16 mm
Altered Anatomy– Patella Alta

- Knee cap too high
- More knee bend required to get knee cap in the groove
### Altered Anatomy – Trochlea Dysplasia (flat groove)

- Varying severity
- Groove not deep enough to contain knee cap

<table>
<thead>
<tr>
<th>Radiographic Dejour</th>
<th>MRI Dejour</th>
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<tbody>
<tr>
<td><strong>Type A</strong></td>
<td></td>
</tr>
<tr>
<td>crossing sign</td>
<td>shallow trocklea  &gt;145°</td>
</tr>
<tr>
<td><strong>Type B</strong></td>
<td></td>
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<tr>
<td>supra trochlear spur</td>
<td>flat trocklea</td>
</tr>
<tr>
<td><strong>Type C</strong></td>
<td></td>
</tr>
<tr>
<td>double contour</td>
<td>lateral convexity, medial hypoplasia</td>
</tr>
<tr>
<td><strong>Type D</strong></td>
<td></td>
</tr>
<tr>
<td>supra trochlear spur</td>
<td>cliff</td>
</tr>
</tbody>
</table>

Figure 1. Representative images of the radiographic and magnetic resonance imaging (MRI) for Dejour classifications.

The Orthopaedic Journal of Sports Medicine: Trochlear Dysplasia in Skeletally Immature Patients
Risk for Recurrence After First Dislocation Without Surgery

<table>
<thead>
<tr>
<th>Jaquith and Parikh <em>JPO</em> 2017</th>
<th>Lewallen et al. <em>AJSM</em> 2013</th>
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<tbody>
<tr>
<td>• Trochlea dysplasia</td>
<td>• 38.4% overall recurrence</td>
</tr>
<tr>
<td>• Patella Alta (CDI &gt; 1.45)</td>
<td>• Open physes + dysplasia = 69% failure of non-op treatment</td>
</tr>
<tr>
<td>• Skeletal Immaturity</td>
<td></td>
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<td>• Contralateral dislocation</td>
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4/4 = 88%
3/4 = 75%
2/4 = 30%
1/4 = 14%
Treatment Algorithm – Step # 1

- Correct malalignment (if needed)
  - Guided growth vs. osteotomy
• Arthroscopic evaluation
  • Address chondral/osteochondral injury
Treatment Algorithm – Step # 3

- **Patella Realignment**
  - Lateral release with repair to get knee cap in center of groove
  - Tibial tubercle transfer (if needed)
A Modified Osteotomy for Anteromedialization of the Tibial Tubercle

Michael G. Saper, D.O., Benjamin A. Cox, D.O., and David A. Shneider, M.D.

https://www.arthroscopytechniques.org/article/S2212-6287(17)30088-9/addons
Treatment Algorithm – Step # 4

- Trochleoplasty (if needed)
  - Deepen the groove
Treatment Algorithm – Step # 5

- Stabilize Patella
  - MPFL reconstruction vs. medial plication (in very young patients)
  - Cadaver hamstring (allograft) tendon is used to replace the torn MPFL
Rehabilitation

- WBAT or TTWB
- Knee brace until adequate quad strength regained
  - Usually 6 weeks
- Encourage range-of-motion exercises
- Healing typically at 3 months
- High-loading / return to sport activities at 6-12 months
Return-to-Sport Testing After Medial Patellofemoral Ligament Reconstruction in Adolescent Athletes

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Investigation performed at the Department of Orthopedics and Sports Medicine, Seattle Children’s, Seattle, Washington, USA

May need prolonged rehab programs beyond 8 months
Conclusions

- Goals = remove diseased tissue, stabilize knee cap, preserve the joint
- Surgery results in improved outcomes
- Treatment of underlying risk factors is key
- Slow, progressive rehabilitation
- Return to sports (6-12 months)

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