Outcomes In Patients With Severe Trochlear Dysplasia Undergoing Sulcus-Deepening Trochleoplasty: A Minimum 1-Year Follow-Up Prospective Study

S. Evan Carstensen, MD
M. Tyrrell Burrus, MD
Scott Feely, BS
Jourdan M. Cancienne, MD
David R. Diduch, MD
Disclosures

DRD:

- Royalties: Smith and Nephew
- Consultant: Depuy Mitek
- Institutional research support: Zimmer, Moximed, Aesculap
Our Study - Purpose

• To evaluate the outcome data of patients undergoing sulcus-deepening trochleoplasty for high-grade trochlear dysplasia.
Materials and Methods

- IRB approved database with prospective data collection
  - Yearly clinical and radiographic follow up

- Indications for Deepening Trochleoplasty
  - Recurrent instability with failure of conservative care
  - J sign and patellar apprehension
  - Type B or D trochlea
  - Spur height > 5 mm (ideal >7 mm)
Materials and Methods

• Physical examination, radiographic analysis as well as clinical follow up were obtained for all patients.

• All patients completed pre and post-operative Kujala and International Knee Documentation Committee (IKDC) scores, and data was collected on return to sport and recurrent dislocation events.

• 25/54 (46.3%) of knees had prior surgery related to patellar instability, and five knees had more than one such surgery.
Table 1. Patient Demographics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Number of Knees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort Size</td>
<td>75 patients, 82 knees</td>
<td></td>
</tr>
<tr>
<td>Included Knees (Patients)</td>
<td>54 (49)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>20.0 +/- 7.0 years</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>77.8% female</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>27.2 +/- 6.3 kg/m^2</td>
<td></td>
</tr>
<tr>
<td>Duration of Symptoms</td>
<td>75.7 +/- 71.5 months</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Pre-operative Radiographic Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Number of Knees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dejour Type B</td>
<td>D</td>
<td>79.6%</td>
</tr>
<tr>
<td>Caton Deschamps Ratio</td>
<td>1.19 +/- 0.2</td>
<td>n/a</td>
</tr>
<tr>
<td>TT-TG</td>
<td>20.4mm +/- 5.1</td>
<td>n/a</td>
</tr>
<tr>
<td>Spur Height (≥4mm)</td>
<td>7.45mm +/- 1.81</td>
<td>51</td>
</tr>
<tr>
<td>Trochlear Sulcus Angle (≥145°)</td>
<td>152.13° +/- 19.9</td>
<td>39</td>
</tr>
<tr>
<td>Trochlear Facet Asymmetry (&lt;40%)</td>
<td>60.3% +/- 16.4</td>
<td>6</td>
</tr>
<tr>
<td>Patello-trochlear Index</td>
<td>0.41 +/- 0.40</td>
<td>n/a</td>
</tr>
</tbody>
</table>
## Concomitant Procedures Performed

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medial Patellofemoral Ligament Reconstruction</td>
<td>100</td>
</tr>
<tr>
<td>Lateral Release or Lengthening</td>
<td>51.5</td>
</tr>
<tr>
<td>Tibial Tubercle Osteotomy</td>
<td>33.8</td>
</tr>
<tr>
<td>Cartilage Procedures</td>
<td>42.6</td>
</tr>
<tr>
<td>Shaving Chondroplasty</td>
<td>39.7</td>
</tr>
<tr>
<td>Chondral Allograft</td>
<td>10.3</td>
</tr>
<tr>
<td>Microfracture</td>
<td>7.4</td>
</tr>
<tr>
<td>Removal of Loose Body</td>
<td>23.5</td>
</tr>
</tbody>
</table>
Radiographic Measurements

a – lateral trochlear facet size
b – medial trochlear facet size
c – height of the lateral femoral condyle
d – distance from the center of the trochlea to the posterior femoral condylar line
e – height of the medial femoral condyle

Trochlear depth = [(c+e)/2] – e
Trochlear facet asymmetry = (b/a)x100

The spur height (red asterisk) by measuring the distance between the anterior femoral cortex (white dotted line) and the highest (most anterior) part of the supra-trochlear spur (solid white line).
Surgical Technique

A. Proximal

B. Distal apex

C. Osteotome

D. Proximal
Surgical Technique

Distal

Proximal

Distal

Proximal
## Results

### Average Follow Up

<table>
<thead>
<tr>
<th>Pre-operative Value</th>
<th>Post-operative Value</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IKDC</td>
<td>49.7 +/- 19.1</td>
<td>78.8 +/- 19.5</td>
</tr>
<tr>
<td>Kujala</td>
<td>55.7 +/- 18.7</td>
<td>85.3 +/- 17.2</td>
</tr>
<tr>
<td>Sulcus Angle</td>
<td>152.1 +/- 19.0</td>
<td>135.5 +/- 8.8</td>
</tr>
<tr>
<td>VAS</td>
<td>R: 2.29 +/- 2.4</td>
<td>R: 1.51 +/- 1.5</td>
</tr>
<tr>
<td></td>
<td>L: 3.63 +/- 1.4</td>
<td>L: 1.89 +/- 1.4</td>
</tr>
</tbody>
</table>

- **IKDC**
  - Pre-operative: 49.7 +/- 19.1
  - Post-operative: 78.8 +/- 19.5
  - P Value: <0.001

- **Kujala**
  - Pre-operative: 55.7 +/- 18.7
  - Post-operative: 85.3 +/- 17.2
  - P Value: <0.001

- **Sulcus Angle**
  - Pre-operative: 152.1 +/- 19.0
  - Post-operative: 135.5 +/- 8.8
  - P Value: <0.001

- **VAS**
  - R: Pre-operative: 2.29 +/- 2.4
    - Post-operative: 1.51 +/- 1.5
    - P Value: R: 0.045
  - L: Pre-operative: 3.63 +/- 1.4
    - Post-operative: 1.89 +/- 1.4
    - P Value: L: <0.001

- **Recurrence Instability Events**
  - Post-operative: 0

- **Patellar Apprehension**
  - Post-operative: 0

- **J-sign**
  - Post-operative: 1

- **Patient Satisfaction**
  - Post-operative: 9.4 (out of 10)

- **Return to Sport**
  - Post-operative: 88.1%

- **Post Op ROM**
  - Post-operative: 132.4° +/- 13.2
Complications

• 1 wound dehiscence – POD0, fell and hyperflexed knee

• Arthrofibrosis
  – 16.7% (9/54) – MUA or MUA/LOA
  – Motion normalized after MUA/LOA
  – Have modified postoperative protocol with accelerated rehabilitation and early ROM

• One superficial delamination of the lateral facet
  – Required arthroscopic debridement
Conclusions

• Sulcus-deepening trochleoplasty can provide a **predictable solution** to disabling recurrent patella dislocations.

• Early follow up demonstrates no further dislocation events, improved radiographic parameters, and positive clinical outcomes.

• Postoperative **stiffness** can be an issue but may be mitigated by more aggressive and earlier initiation of physical therapy.