Medial Fractures of the Patella

(= Patellar Dislocation)

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Medial Patella Fractures

- Medial Patella Fractures are typically the “tip of the iceberg”
- Treatment is often determined by underlying pathology and preexisting conditions
- The fracture is seldom the factor that predicts or drives outcomes.

Patella Avulsion Fracture

- PF Malalignment
- Patella Alta
- MPFL Tear
- Trochlea Dysplasia
- Chondral Damage
- Hyperlaxity

- 46/122 (38%) acute patellar dislocations (12-20 yrs old) have osteochondral patellar fractures.
- Fractures occurred at the patella in 35 pts. (76%), LFC in 11 pts (24%).
- In 21 patients (44%), MRI confirmed osteochondral injury despite the plain radiograph interpretation as negative for fracture.
Medial marginal fracture of the patella was an avulsion fracture of the MPFL that occurred at the middle one-third of the patella.

- The bony fragments were continuous with the thick and taut MPFL in all cases.

Toritsuka Y; Horibe S; Hiro-Oka A; Mitsuoka T; Nakamura NKnee, Dec 2007, 14(6) p429-33
Three Patterns of Injury medially with patellar dislocation:

**P₀** 1. Avulsion of MPFL, all soft tissue

2. Avulsion of MPFL with non-articular bone fracture

**P₁** 3. Avulsion of MPFL with bone fracture involving articular surface
• 44/56 patients with patellar detachment injury to the MPFL followed at average 4 yrs.
• 13 pts had undergone MPFL repair and osteochondral medial patellar fixation.
• 31 pts. with patellar MPFL injures had non-operative TX.
• 2/13 (15%) surgery pts had patellar instability and 17/31 (55%) of non-operative TX had patellar instability
Complications with MPFL Reconstruction


- 38 complications in 29 knees (16.2%) from 179 MPFL reconstruction, 34 major and 4 minor.
  - Recurrent lateral patellar instability (8 patients, 4.5%)
  - Motion stiffness with flexion deficits (8 patients, 4.5%)
  - Patellar fractures (6 patients, 3.4%)
  - Patellofemoral arthrosis /pain (5 patients, 3%)
- 18/38 (47%) complications were considered technical errors. Female gender and bilateral MPFL reconstructions were risk factors
Effect of Trochlea Dysplasia and Tunnel Position on MPFL Reconstruction

Does degree of trochlear dysplasia and position of femoral tunnel influence outcome after medial patellofemoral ligament reconstruction? Hopper GP; Leach WJ; Rooney BP; Walker CR; Blyth M: Am J Sports Med, Mar 2014, 42(3) p716-22

- Distance of the femoral tunnel from the anatomic position predicted clinical outcome (Kujala score, P = .043; Lysholm score, P = .028).
- ≤10 mm of the anatomic position defined by Schottle
- 4/68 pts (6%) had patella fractures postoperatively
- All pts with severe trochlear dysplasia (n = 7) failed with recurrent dislocations (57% satisfied) vs. only 9.3% of pts (n = 5) with mild trochlear dysplasia (83% satisfied) (P = .05)
Patellar Tendon Shortening for Patellar Dislocation

Patellar tendon tenodesis in association with tibial tubercle distalization for the treatment of episodic patellar dislocation with patella alta. Mayer C; Magnussen RA; Servien E; Demey G; Jacobi M; Neyret P; Lustig S: Am J Sports Med (United States), Feb 2012, 40(2) p346-51

- Combination of Tibial Tubercle distalization and tenodesis of tendon to original tubercle site with anchors, 22 pts.
- No recurrent dislocation at 9.6 yr follow-up, IKDC score was 75.6
  - Patellar tendon length decreased from 56.3 mm to 44.3 mm (P < .0001).
  - Caton-Deschamps index decreased from 1.22 to 0.95 (P < .0001)
  - Insall-Salvati ratio decreased from 1.42 to 0.91 (P < .0001)
- Patellar tendon tenodesis and tibial tubercle distalization result in normalization of patellar tendon length and a stable patellofemoral joint
1st Episode Patellar Dislocation Systematic Review Recommendations


• Recommend initial non-operative management of a first-time traumatic patellar dislocation except:
  • Osteochondral fracture
  • Significant disruption of the medial patellar stabilizers
  • Persistent laterally subluxed patella with normal alignment of the contralateral knee
  • Second dislocation
  • No improvement with appropriate rehabilitation
Knee Osteochondral Fractures
“French Arthroscopy Society Study”


- 14 adolescent pts with OCF followed ave. 30 months
- Lateral condyle:9, Patella:5; injury mechanism was patellar dislocation (n=9) or a direct impact (n=4)
- All detached fragments were fixed: screw fixation (n=5), resorbable pins (n=5), or pull-out suture (n=4). Biological glue was added (6); Patellar stabilization performed in 2 cases
- All fractures united; IKDC 88.6, All satisfied
- 3 (21%) pts underwent secondary patellar stabilization
Case Based Discussion
Secondary Issues of Patellar Avulsion Fracture and Patellar Dislocation

- 16 year old American Football with recurrent Patellar Dislocation, Medial Fracture
- 6 months after (Outside Clinic) MPFL Reconstruction, Lateral Release, Removal of Loose bodies and Chondral Biopsy (concomitant articular cartilage injury)

- TT-TG 23.9 mm
- IS pre op 1.45 - post op 1.2
- CD pre op 1.51 – post op 1.18
- Q angle 18
Recurrent Injury Imaging

Now What?

- Risk Factors on evaluation:
  - FT Chondral Defect
  - Valgus alignment
  - Increased Q-angle
  - Increased TT-TG
  - Patella alta
  - Hypermobility/Hyperlaxity

Temporary Treatment:
- Aspiration
- Pre-habilitation program
- Bracing while awaiting definitive surgery
Case Based Discussion
Secondary Issues of Patellar Avulsion Fracture and Patellar Dislocation

• Biopsy already done so definitive surgery in 4 wks. (cells available quickly)

• Recommended Treatment:
  • Scope Loose Bodies
  • Open ACI Patellar defect
  • Trochleoplasty (grooveplasty)
  • AMTT (Fulkerson) with distalization
  • Medial Imbrication/Reefing
  • Lateral lengthening
Case Based Discussion
Definitive Treatment (Single Stage)

1. Arthroscopy: Removal of loose bodies,
Case Based Discussion
Definitive Treatment (Single Stage)

2. Trochleoplasty (grooveplasty): create concave entrance to trochlear groove

Convex Trochlea Entrance
Case Based Discussion

Definitive Treatment (Single Stage)

3. AMTT (Fulkerson) with distalization
4. Medial Imbrication/Reefing of MPFL
Case Based Discussion
Definitive Treatment (Single Stage)

5. Autologous Chondrocyte Implantation
Patella FTCD with Absorbable Collagen Membrane

Type I/III Collagen Membrane
Case Based Discussion
Definitive Treatment (Single Stage)

- Post-Operative Imaging
Autologous Chondrocyte Implantation (ACI)

Articular Cartilage Defects of the Patellofemoral Joint

Treatment of both the articular cartilage defect and abnormal biomechanical loading and malalignment.

2nd Look at 2 yrs
<table>
<thead>
<tr>
<th>Patella ACI Studies</th>
<th># Pts</th>
<th>Follow-up</th>
<th>Defect size cm²</th>
<th>Clinical Outcome</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brittberg, Peterson, NEJM 94</td>
<td>7 Isolated</td>
<td>36.4 mos.</td>
<td>3.5</td>
<td>Only 28% G/Exc (2)</td>
<td>No TTO</td>
</tr>
<tr>
<td>Henderson Knee 2006</td>
<td>22 isolated 22 w/TTO</td>
<td>29 mos. 26.2 mos.</td>
<td>3.2 2.92</td>
<td>55% G/Exc w/out TTO 86% G/Exc w/TTO, 36.2 IKDC increase</td>
<td>Periosteal patch hypertrophy (9)</td>
</tr>
<tr>
<td>Macmull Int Orthop 2012</td>
<td>25 isolated</td>
<td>45 mos.</td>
<td>4.73</td>
<td>40% Good to Exc</td>
<td>No TTO</td>
</tr>
<tr>
<td>Pascual-Garrido AJSM 2009</td>
<td>11 Isolated 12 AMZ</td>
<td>30 mos. 51.6 mos.</td>
<td>4.3 3.9</td>
<td>54% Good to Exc 83% Good to Exc</td>
<td>7.7% clinical Failures</td>
</tr>
<tr>
<td>Farr CORR 2007</td>
<td>21 Isolated 7 Bipolar 73% AMZ</td>
<td>37 mos.</td>
<td>5.4</td>
<td>80% Good to Exc</td>
<td>ICRS Arthroscopic assessment 1.2 yrs 11/12</td>
</tr>
<tr>
<td>Minas ICRS 2013</td>
<td>30 73% w/TTO</td>
<td>2-10 years</td>
<td>5.5</td>
<td>83%- Good to Exc. 13%- Fair 4%- Poor</td>
<td>Best results seen with good fill rate and surface integrity</td>
</tr>
<tr>
<td>Gillogly AJSM 2014</td>
<td>27 Isolated All had AMTT</td>
<td>5-11 years, Mean 7 years</td>
<td>6.4</td>
<td>83% Good to Exc.; IKDC 42 pre op improved to 75 post op (p&lt;.0001)</td>
<td>Results for diffuse lesions no different than facet lesions; 91% satisfaction</td>
</tr>
<tr>
<td>Gomoll Multi-Center AJSM 2014</td>
<td>110 69% AMZ 27% Both</td>
<td>2-4 yrs</td>
<td>5.26 4.5cm Trochlea Def.</td>
<td>86 % Improved 74% (20 point inc. on IKDC); 9% Failure</td>
<td>High Patient Satisfaction 92%</td>
</tr>
</tbody>
</table>
Medial Patella Fractures

Summary

• Suspect OCF in 1\textsuperscript{st} time patellar dislocations; Radiographs unreliable so get MRI in acute setting

• Evaluate patient for risk factors of recurrent dislocation

  • Osteochondral fracture ("tip of the iceberg")
  • Significant disruption of the medial patellar stabilizers
  • Persistent laterally subluxed patella with normal alignment of the uninvolved knee
  • Recurrence

• Incorporate patellar stabilization into OCF repair

• Address Predisposing Factors upfront, Counsel patient and family
Merci
Molte Grazie
Danke Schön
Thank You