PATELLOFEMORAL DISORDERS & SURGICAL TREATMENT
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OBJECTIVES:
1. Recognize surgical anatomy and biomechanics of patellofemoral kinetic chain
2. Discuss pertinent history, examination and imaging for surgical decision making
3. Discuss arthroscopic and open patella realignment surgery
4. Discuss cartilage implantation options

Patellofemoral Instability treatment options are NOT the same as Patellofemoral pain evaluation and management.

STRUCTURE & FUNCTION
- PF Joint - increasing surface area contact with flexion to distribute increased loads
- Thickest cartilage in body 5 mm
- Lateral, medial, odd facets articulates in deep flexion

ANATOMIC ISSUES: PRIMARY RESTRAINTS PASSIVE
- MPFL primary soft tissue static restraint to lateral translation
PF BIOMECHANICAL FACTORS

PF KINETIC CHAIN = ANATOMY: PRIMARY RESTRAINTS PASSIVE

MPFL taut full extension, quads contracted
Guides patella into groove early flex, 20°-30°
Once engaged, slope of lateral facet is primary resistance.

EVALUATION 1st TIME
PATELLOFEMORAL PATIENT

CHIEF COMPLAINT
Pain, instability, giving way, weakness

EVALUATION 1st TIME
PATELLOFEMORAL PATIENT

HISTORY
Macro trauma vs. repetitive overload
Acute or chronic
Continuous or intermittent
Alleviates/aggravates
Previous treatment

PHYSICAL EXAM FACTORS

• Account for all the factors contributing to alignment, motion & stability
• Walking, standing, sitting, prone & supine
• Check hips, varus or valgus, ankle, subtalar

PHYSICAL EXAM FACTORS

• J-sign: lateral translation in terminal extension, suggests malalignment & lateral subluxation
• Quadrants = 25% of width of patella (0° M/L restraints, 30°, congruence)
• Tilt = to check lateral retinaculum
• Translation
• Apprehension
PHYSICAL EXAM

- Alignment
- Contours
- Specific tenderness
- Tracking
- Apprehension
- Crepitation
- Concomitant

PF EXAM: BONE
(SKELETON)

- Patella forward
- Varus/valgus
- Foot pronated
- Heel valgus
- Recurvatum
- Prone findings

PF EXAM: CARTILAGE:

Palpation while loaded ROM performed, like squatting.

Crepitation should not be felt in adolescence, unless they have a cartilage injury.

PF EXAM: MUSCLE

Muscle/tendon unit. Strength and flexibility of quad, hamstring, gastro soleus and hip abductors. Lack of prone knee flexion indicates a short quad; tight IT band increases lateral tether

BEST TESTS FOR MPFL

- Patellar translation - with knee flexed to 30, lateral patellar translation > 2 Qs or 10 mm
- Patellar apprehension - when performing MPFL injury (moving test by Ahmad

PATELLOFEMORAL IMAGING

- X-rays: AP, lateral, axial for fracture, loose body.
- AP - bipartite or fracture
- “True” Lateral - alta or baja, trochlear dysplasia
- Axial Laurin or Merchant, congruence & subluxation, tilt
- 30/60/90 bilateral knees to compare patellar tilt or subluxation
- MRI or CT - TT-TG, chondral
PATELLOFEMORAL IMAGING
- Radiographs - AP, true lateral, axial
- Diagnosis of subluxation or dislocation is more of a clinical decision based on physical exam.

IMAGING FOR INSTABILITY
- CT/MRI: TT-TG Distance between trochlear groove & tibial tuberosity (> 15 mm considered abnormal)

Eval & management of Patellar Dislocation in Adolescent Athletes
- Increased incidence due to increased popularity/intensity of sports
- Non op Treatment may be appropriate for 1st time, but must caution that risk of repeat dislocation will be much higher.
- Surgery for acute fixation of displaced osteochondral fracture & for patellar realignment
- Careful surgical planning

Site of MPFL Injury
- MPFL zone of injury after primary patellar dislocation 61% isolated to patellar side
- 12% only femoral, 12% both, 15% multiple or none
- MRI says anatomic insertion is distal to physis in 93% but mostly injured patellar side
**PRIMARY DISLOCATION: NON-OP RX FIRST EXCEPT**

- Osteochondral fracture, loose bodies, complete MPFL, VMO avulsion
- Re-dislocation 17% over next 2-5 years if surgery not performed & not a complete tear
- Better if immobilized for 6 weeks to allow scar formation at injury site for non-op candidates.

**1ST TRAUMATIC DISLOCATION**

**SURGICAL OPTIONS IN INSTABILITY**

- Proximal or Distal
- Open vs. Arthroscopic
- Reconstruction, plication, repair

**SPECTRUM OF SURGICAL TREATMENT**

- MPFL-medial reefing appropriate: mild or moderate instability, arthroscopically or mini-open less invasive, less expensive
- Works because MPFL heals elongated
- Success rate > 90%
- Not intended for dislocation, but great for correcting subluxation.

- MPFL with graft indicated if native MPFL incompetent or trochlear dysplasia
- Potential complications up to 26% including fractures, non-isometric placement with pain, stiffness and medial tracking

**ALGORITHM FOR PROXIMAL PROCEDURES**

<table>
<thead>
<tr>
<th>Arthroscopic Imbrication</th>
<th>MPFL RECONSTRUCTION</th>
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<tbody>
<tr>
<td>Good tissue</td>
<td>Degree of laxity</td>
</tr>
<tr>
<td>Mild</td>
<td>Severe</td>
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Schlupsis 2011 AANA

**MPFL RECONSTRUCTION**

- Indications: 2+ dislocations, severe instability, significant underlying trochlear dysplasia, severe J sign (patella jumps over laterally with active terminal extension), 3-4 quadrant translation
**PATELLOFEMORAL RECURRENT INSTABILITY**

- After 1st dislocation, 50% chance re-dislocate within 2-5 yrs
- Factors:
  - Trochlear dysplasia
  - Patellar height
  - Lateral offset
  - Medial retinacular restraint

*Fithian “Lyon experience” Techniques in Knee Surgery 2007*

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**MPFL RECONSTRUCTION**

- Anatomic reconstruction a free graft

**TECHNIQUE PEARLS**

- Graft options: semitendinosis autograft or allograft, gracilis
- Patella incision: proximal medial border extra-articular between layer 2 & 3 mpfl and capsule
- Use fluoroscopy, especially for femoral tunnel placement.

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**Who is Ideal Candidate for MPFL Reconstruction?**

- **Ideal patient:**
  - Episodic patellar dislocator (EPD) with little or no pain between episodes
  - May report functional impairment when asked, but it is only the occasional dislocations or subluxations that precipitate the consultation
- **Beware of:**
  - Any pain that is not directly caused by those brief, occasional instability episodes
  - Pre-existing arthrosis
  - The permanently dislocated or habitually dislocating patella

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**FIXATION OPTIONS FOR FEMUR & PATELLA**

- Fulkerson sutures to VI
PATELLAR COMPLICATIONS AFTER MPFL RECONSTRUCTION

• By fixation: tunnel, more complications overall but suture, more laxity w or w/o re-dislocation
• 4/429 patients had patella fractures, all had trans-patellar tunnels with 3.2 to 4.5 drills
• 0/125 patellar fractures with docking, anchors or soft tissue attachment

RETURN TO SPORTS AFTER MPFL RECONSTRUCTION

• 72 knees/72 isolated MPFL for recurrent pf instability
• 62/68 did sports pre-op & 100% of those returned post op
• 53% equal/better, 79 % satisfied, 10% persistent instability
• Concluded - safe & effective, most return

Outcomes after MPFL Reconstruction

• Schneider, et al, AJSM, Nov. 2016
• Systemic review and meta-analysis:
• Looked at outcomes, return to sport, post-op instability
• Mean age 24.4, 84% return to sports
• Redislocation rate 1.2%, apprehension, 3.6%, reoperation 3.1%

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Lippacher et al AJSM, July 2014

All-Arthroscopic Proximal Realignment

• Capsular shift for the stretched medial retinaculum
• PDS Sutures
• No bridges burned if MPFL recon necessary
• 5 year results 93% subjectively better.
• Best option in young athletes with open growth plates.

Plication

OPEN
• MULTIPLE STUDIES WITH 80-100% GOOD RESULTS
• POSSIBLE MOTION LOSS, SCARS, PROLONGED REHAB & OVERCORRECTION
• Still has the ability to stretch back out if tissue not good.

ALL ARTHROSCOPIC
• NOT BURNING BRIDGES
• PROTECT VMO
• LESS PAIN
• AVOID OVERTIGHTENING
• LESS SCAR OR STIFFNESS
• EASIER REHAB

Plication: Before

EUA, 30° LEFT KNEE - DISLOCATABLE
PLICATION: AFTER

EXAM AT 30° NO DISLOCATION

WHY PERFORM ARTHROSCOPIC PLICATION?

- Advantages
  - Avoid incision
  - Protect VMO
  - Less post op pain
  - Visualize realignment (fine tune)
  - Avoid over-tightening
  - Lower risk of complications
  - Lower risk of p-op stiffness, scar tissue
  - Easier rehabilitation
  - More cosmetic

CURRENT CONCEPTS, EVIDENCE BASED

1. Medial imbrication of healed, stretched med. Retinaculum for patient with little dysplasia, no lateral tracking
2. Medial tibial tubercle transfer for instability with lateral tracking, balance first

ROLE OF LATERAL RELEASE

- Never for instability
- Also with proximal realignment for tethered lateral retinaculum
- Consider lengthening instead

DISTAL REALIGNMENT

- Indications: TT-TG distance > 15-20 mm, Instability, focal PF chondral defects
- In conjunction with other procedures
- Medialization
- Poorly balanced PFJ

Combined procedures for patellar maltracking and articular cartilage defects.
Cartilage Procedure Options:

2. Carticel – 2 step process where your own cells are replicated & then re-implanted in defect.
4. Biocartilage- developed from allograft cartilage & contains the extracellular matrix this is native to articular cartilage. Long shelf-life.
5. OATS – Auto vs Allo; bone plug with articular cartilage taken from NWB area or from cadaver source.

Denovo Implantation

Cartiform Implant

Final product

Applying fibrin glue after
sutured in place.

Carticel (ACI) & MACI

OATS – 1 plug or multiple
Patellofemoral Arthroplasty:

Potential benefits of Patellofemoral Arthroplasty over Total Knee:

• sparing the remaining healthy knee compartments and associated structures
• inflicting less surgical trauma and blood loss
• minimizing risk of complications
• reducing hospital stay
• supporting an easier overall recovery and return to lifestyle
• possibly serving as a bridging treatment for active younger patients who may one day be candidates for TKA

Patellofemoral Arthroplasty Inclusion & Exclusion Criteria:

Inclusion:
1. Advanced, isolated primary PF arthritis
2. Patellofemoral arthritis with trochlear dysplasia, often with a history of instability
3. Post-traumatic PF arthritis

Exclusion:
1. Moderate or advanced tibiofemoral chondromalacia
2. Severe malalignment/maltracking
3. Inflammatory arthritis
4. Morbid obesity
5. Patella baja

The Ideal Patient should have:

Minimal pain while walking on level surfaces
Isolated anterior retropatellar pain that is exacerbated by:
- Standing from seated position
- Climbing up/down stairs
- Walking on uneven surfaces
- Sitting long periods with knee flexed

Thank You!!

My boys’ 1st Cyclocross Event – lets hope they are able to stay out of my office 😊