ANTERIOR KNEE PAIN: A CASE STUDY

JESSICA NAPOLEON – JUNE 29, 2016
UVA SPORTS MEDICINE REHABILITATION -
BODY CHART INITIAL HYPOTHESIS

Pain

Current: 0  Best: 0  Worst: 7

- Loose body
- Lateral meniscus tear
- LCL
- ITB Syndrome
- PFPS

stabbing
**SUBJECTIVE EXAM**

- Demographics: 34 y/o female, RN
- PMH: kidney stones, pregnancy

- MOI: history of R *intermittent* knee pain for *6 years* – no known reason. *Two weeks ago,* felt knee “give way” at work

- Mild swelling after incident, not immediate
- No imaging

- Chief complaint: *anterior and lateral knee pain*
  - Denies: clicking, popping
  - Aggravates: squatting, running, sharp turns, bending down, sit to stands, stairs, walking
  - Eases: rest, wrap, brace
SUBJECTIVE EXAM

- Chief Complaint: **instability, weakness**
  - Agg: going down stairs, rising from chair

- Activity level
  - Premorbid: walking 3-4x/week, yoga 1x/week
  - Around incident: work demands increased

- No previous injuries
- **LEFS: 58/80 = 73%**
  - Main limitations: running, squatting, sharp turns
### STRUCTURES IN/REFER TO PAINFUL REGION

<table>
<thead>
<tr>
<th>Joints</th>
<th>Myofascial tissue</th>
<th>Non-contractile tissue</th>
<th>Neural tissue</th>
<th>Other structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patellofemoral joint</td>
<td>Rectus Femoris</td>
<td>Lateral/Medial meniscus</td>
<td>Common fibular nerve</td>
<td></td>
</tr>
<tr>
<td>Tibiofemoral joint</td>
<td>Vastus Lateralis</td>
<td>LCL/MCL</td>
<td>Femoral nerve</td>
<td></td>
</tr>
<tr>
<td>Proximal tibiofibular joint</td>
<td>Vastus Medialis</td>
<td>ACL</td>
<td></td>
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<tr>
<td></td>
<td>Patellar tendon</td>
<td>PCL</td>
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Primary hypothesis after subjective: **Lateral Meniscus**

**Differential list:**
1. Lateral meniscus
2. Loose Body
3. PFPS (patellar maltracking)
4. Infrapatellar Fat Pad (IFP)
5. Patellar tendinopathy
PHYSICAL EXAM

- **Functional Screen:**

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL Balance</td>
<td>WFL</td>
</tr>
<tr>
<td>Squat</td>
<td>Anterior p!</td>
</tr>
<tr>
<td>SL squat</td>
<td>Anterior p!, dynamic knee valgus, decreased motor control, R weaker</td>
</tr>
<tr>
<td>Step down</td>
<td>Decreased motor control, decreased excursion, R weakness</td>
</tr>
</tbody>
</table>

- **Mobility:** hypomobility R patellar glides

- **Gait:** bilateral hip drop, slight knee valgus

- **ROM:** WFL; slight p! hyperextension

- **Special tests:**

<table>
<thead>
<tr>
<th>Test</th>
<th>(+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varus Stress Test</td>
<td>(-)</td>
</tr>
<tr>
<td>Valgus Stress Test</td>
<td>(-)</td>
</tr>
<tr>
<td>Anterior/Posterior Drawer</td>
<td>(-)</td>
</tr>
<tr>
<td>Thessaly’s</td>
<td>(-)</td>
</tr>
<tr>
<td>McMurray’s</td>
<td>(+)</td>
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<tr>
<td>Apley’s compression</td>
<td>(-)</td>
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</tbody>
</table>

- **Flexibility:** decreased in rectus femoris, hip flexors

- **Palpation:** TTP to infrapatellar fat pad, increased girth, fibrotic. No TTP at lateral joint line
ASSESSMENT

Severity

Stage: Subacute
Stability: Fluctuating
Consistency: Yes

Irritability

Recognizable pattern: Anterior knee pain 2/2 irritated infrapatellar fat pad
- Yes: pain around patella tendon, poor quadriceps control, pain with hyperextension, decreased patella mobility, TTP, fibrotic and inflamed IFP
- No: MOI not hyperextension

Risk factors: none
What role does the infrapatellar fat pad play in knee kinematics?

In a 34 year old female c/o anterior knee pain deriving from the IFP, what is the best treatment approach for short-term and long-term pain reduction?
- Highly innervated, pain generator
- Reservoir of mesenchymal stem cells
- Very mobile
- IFP adhesions lead to altered knee mechanics
  - Patellar infera
  - Extension: Altered effectiveness of knee extensor mechanism, patellar maltracking
  - Flexion: potential patellar maltracking
  - Increased tibial translation
- Increased pressure forces

<table>
<thead>
<tr>
<th>Knee flexion</th>
<th>Angle between patella tendon and tibia decreases</th>
<th>IFP moves posteriorly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee extension</td>
<td>Angle between patella tendon and tibia increases</td>
<td>IFP moves anteriorly</td>
</tr>
</tbody>
</table>
“Pain induced by Injection of Hypertonic Saline Into the Infrapatellar Fat Pad and Effect on Coordination of the Quadriceps Muscles” (Hodges, et. al)

Purpose: Effect of infrapatellar fat pad pain on quadriceps motor control

Methods: 10 participants; Assessed EMG activity of vastus medialis (VMO) and vastus lateralis (VL)

Ascending and descending stairs
- No changes in descending between control and pain-induced trials
- Ascending: decreased onset of VMO relative to VL, timing directly related to pain
- Decreased VL amplitude
- Leads to altered PF joint loading

Application: decreasing pain primary goal; emphasis on quadriceps activation
EFFECTS OF IFP PAIN

Impaired anticipatory postural adjustments (APA) due to experimental infrapatellar fat pad pain” (Shiozawa, et al.)

Purpose: Effect of infrapatellar fat pad pain on APAs
Methods: 12 healthy men; Assessed reaction time and magnitude of muscles with two reaction time tasks
Results for bilateral heel raise:
• Task performance not affected
• Delayed motor onset (VM, VL, TA on ipsilateral side)
• Decreased muscle activity (VM, VL, TA on ipsilateral side)
• Both indicate suppression of the APA responses

Application: pain in IFP could be cause of deceased balance, not weakness or poor muscle control
In a 34 year old female c/o anterior knee pain deriving from the IFP, what is the best treatment approach for short-term and long-term reduction of pain?
EFFICACY OF NONSURGICAL INTERVENTIONS FOR ANTERIOR KNEE PAIN: (COLLINS, ET AL.)

- Systematic Review and Meta-Analysis of RCT
- Purpose: inconclusive evidence, outdated information
- Methods:
  - Databases: MEDLINE, EMBASE, CINAHL, pre-CINAHL, PEDro, PubMed, SportDiscus, Web of Science, BIOSIS Previews, full Cochrane Library
  - Included if: insidious AKP, RCT, measured pain, followed pt for at least 2 weeks, low-to-moderate risk of bias
  - Grouped by follow-up time
  - Looking at change from baseline
  - 27 total studies (out of 27,000)

- Treatments:
  Exercise, foot orthoses, taping, manual therapy, electrotherapy, acupuncture

Collins, at al. 2012
CONSERVATIVE TX INTERVENTIONS

Exercise
- Compared to no exercise: significant benefit at all time frames, various exercises
- OKC vs. CKC:
  - Short term: both significantly beneficial, but contrasting evidence
  - Long term: OKC more beneficial
  - Most studies used CKC
- Supervised vs. Unsupervised HEP:
  - No significant difference at any time frame**
- Compared to education alone:
  - Benefit not significant for exercise + education short-term or long-term, both beneficial

Foot Orthoses
- Evidence for short-term use over placebo, but not lasting
- More effective in addition to multimodal physiotherapy short term and long term
- No significant difference compared to no exercise or adding FO in addition to exercise**
  **underpowered

Collins, at al. 2012
Patellar Taping
- Significant, large short-term benefits in combination with exercise
- No significant long term (vs. sham, exercise alone, education alone)

Manual Therapy:
- Medial glides, tilt mobilizations, lateral retinacular massage, knee manipulation
- No significant findings compared to control

Electrotherapy & Acupuncture
- No significant evidence effects

Collins, at al. 2012
MULTIMODAL APPROACH

Meta-Analysis: **Significant benefits for multimodal physiotherapy** (6 weeks)
- Local, proximal and global factors
- Clinically meaningful improvement in pain

RCTs:
- **Significant** moderate effect (12 weeks)
- **Significant** small effect (1 yr.)
- More components, more efficacy
- Timing matters

Collins, at al. 2012
## CONCLUSION

<table>
<thead>
<tr>
<th>Short Term</th>
<th>Long Term</th>
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<tbody>
<tr>
<td>Multimodal approach</td>
<td>Multimodal approach</td>
</tr>
<tr>
<td>Exercise! OKC or CKC</td>
<td>Exercise! (OKC &amp; CKC)</td>
</tr>
<tr>
<td>Patellar taping</td>
<td>Education</td>
</tr>
<tr>
<td>Foot Orthoses</td>
<td></td>
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<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>*Manual therapy</td>
<td></td>
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</tbody>
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Limitations: decreasing pain is not our only goal, not specific to IFP, small sample sizes, longer duration
## MY CASE

<table>
<thead>
<tr>
<th>Impairments</th>
<th>Functional Limitations</th>
<th>Goals</th>
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<tbody>
<tr>
<td>Balance</td>
<td>Running</td>
<td>Run without sx</td>
</tr>
<tr>
<td>Motor function</td>
<td>Sit to stand from chair</td>
<td>Play soccer</td>
</tr>
<tr>
<td>Muscle performance</td>
<td>Ambulate and carry child up or down stairs</td>
<td>Play with child</td>
</tr>
<tr>
<td>Pain</td>
<td>Prolonged, deep squat</td>
<td>Hold child without fear of losing balance down stairs</td>
</tr>
<tr>
<td>Patella mobility</td>
<td>Prolonged walking</td>
<td>Work at hospital without sx</td>
</tr>
<tr>
<td>Soft tissue mobility</td>
<td></td>
<td></td>
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<tr>
<td>Swelling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weakness</td>
<td></td>
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</tbody>
</table>
## TREATMENT PLANNING

| Manual Therapy | Soft tissue mobilization  
<table>
<thead>
<tr>
<th></th>
<th>Patellar mobs: glides and distraction</th>
</tr>
</thead>
</table>
| Exercise       | *Quadriiceps strengthening*: concentric & eccentric; begin CKC  
|                | Squats, wall sits, theraband ECC quad control  
|                | *Proximal*: strengthening in CKC  
|                | Bilateral squats, SL squats, step ups/step downs  
|                | *Stretch*: rectus femoris, anterior hip |
| Education      | Proper standing posture  
|                | Ergonomics for squatting at work |
| Other          | Assessment for foot orthoses  
|                | Patellar taping |

**Reassess:** functional squat, step down, IFP tenderness and fibrosis
Taping techniques (Dragoo, et al.)
- Patellar tilt
- Lateral patellar glide
- “V” tape

“Offloading tape” (Hug, et. al, 2014)
- Unloading tape significantly reduced muscle stress during stretch and contraction
PROGNOSIS AND EXPECTATIONS

• Progress:
  • Wean off tape as needed
  • Self-mobilizations of IFP and patella
  • Progress strengthening to single leg, unstable surface, dynamic exercises
  • Eventually, sport-specific exercises
  • Assess foot alignment for possible orthotic
  • Continue education!

Prognosis: Excellent

• Favorable outcome factors:
  • Young, active, positive attitude, good response to initial treatment, good “buy in”

• Unfavorable factors:
  • Busy (mom, nurse, student)
  • Intermittent pain for 6 years
## FOR THE FUTURE: RECOGNIZING IFP

<table>
<thead>
<tr>
<th>Clinical Pattern</th>
<th>Subjective</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(+) pain surrounding patellar tendon</td>
<td>(+) pain with passive hyperextension</td>
</tr>
<tr>
<td></td>
<td>(+) pain with hyperextension</td>
<td>(+) pain with dynamic extension</td>
</tr>
<tr>
<td></td>
<td>(+) pain with squatting, running, jumping, bending knee</td>
<td>(rising from chair)</td>
</tr>
<tr>
<td></td>
<td>(+) pain with pressure, sitting on knees</td>
<td>Standing with hyperextended knees</td>
</tr>
<tr>
<td></td>
<td>(+) c/o weakness</td>
<td>Poor dynamic quadriceps control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Firm or enlarged IFP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decreased patellar mobility</td>
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<tr>
<td></td>
<td></td>
<td>Patella infera</td>
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REFLECTION

• Have a clear differential dx understanding
• Assess knee position in static posture & ambulation
• Assess foot structures & patellar tilt
• More in-depth assessment and treatment of work postures
• Multimodal approach – whole kinetic chain
• Provide better explanation to patient


MULTIMODAL THERAPY APPROACH

MMP1 vs no treatment
Syme et al.,[44] 2009

MMP2 vs no treatment
Syme et al.,[44] 2009

MMP vs minimal intervention
Collins et al.,[31] 2008
Crossley et al.,[30] 2002

Pooled:

MMP+Ed vs Ed
Clark et al.,[42] 2000

MMP vs FO
Collins et al.,[31] 2008

MMP+FO vs minimal intervention
Collins et al.,[31] 2008

MMP+FO vs FO
Collins et al.,[31] 2008

MMP vs monitored home Ex
Harrison et al.,[43] 1999

MMP vs home Ex
Harrison et al.,[43] 1999

MMP1 vs MMP2
Syme et al.,[44] 2009
MANUAL THERAPY, TAPE, ORTHOSES (FO), ELECTROTHERAPY, ACUPUNCTURE