Clinical Evaluation of the Patellofemoral Joint

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Common Condition

• 25-40% of all knee problems presenting to sports medicine centers


Common Terms

• PF Arthrosis: true wear and tear
• PF Chondrosis: wear of the chondrocytes
• PF Arthralgia: PF pain
• Anterior Knee Pain Syndrome
• Excessive Lateral Pressure Syndrome (ELPS): articular cartilage on lateral region causing pain
• Extension subluxation: VMO imbalance
Common Terms

- PF Maltracking
- PF Malalignment
- PF Compression

Non Operative Treatment Successful in 75-90% of Patients

- Busch MT et al., Clin Sports Med, 8:279-290, 1989
- Fulkerson J and Hungerford DS. Disorders of the Patellofemoral Joint, 1990

What About the Other 10-25%?
The Key to Treating PFP is to treat the **CAUSE** not the **SYMPTOM(S)**

Patellofemoral Pain Syndrome is Very Vague!

- There needs to be a classification system for patients with PF problems


Classification System

• Patellar Compressive Syndromes
• Patellar Instability
• Biomechanical Dysfunction
• Direct patella Trauma
• Soft Tissue Lesions
• Overuse Syndromes
• Osteochondritis Dissecans
• Neurologic Disorders

PF Pain Symptoms

• Primary c/o pain
• Complain of giving way, due to reflex inhibition, swelling or weakness
• Crepitus – snap/crackles/pops
• Pain with stairs
• Very slight effusion from synovial response

PAIN

Pain at rest
  Nerve-related pain
  Neuroma
  RSD/CRPS
  Radiculopathy
Tumor
Infection
Stress fracture

Activities that increase loading across the PF joint

- Ascending or descending stairs
- Squatting
- Jumping
- Sitting with knee flexed for long periods of time (+ Movie goers sign)

PF Signs

- Passive patellar hypo mobility (global)
- Passive patellar hypermobility
  - Primarily lateral glide
- Patellar Malposition
  - Patella Alta, patella baja, patellar tilt

VMO Atrophy

- VMO atrophy or dysplasia
  - Measure for VMO atrophy 10cm proximal to joint line
PF Signs

- Patella Alta
  - High riding patella
  - Length of infrapatellar tendon > height of patella
  - Hypermobility
  - Usually a congenital problem
  - Predisposition to subluxation
  - “grasshopper eyes” – sup/lat deviation
  - Rx – lateral subluxation brace
  - VMO rehab

PF Signs

- Patella baja (infera)
  - Congenital or iatrogenically produced secondary to PT autograph ACL reconstruction
  - Scarring down of IPT
  - Hypomobility
  - Development of chondromalicia secondary to increased PFJRF

PF Signs

- Insall and Salvati
- Normal
  - Height of superior pole of patella and length of the IPT should have 1:1 relationship
PF Signs

- Positive Apprehension Test/Fairbanks Sign
- Facet tenderness upon palpation

Facet Tenderness

PF Signs

- Muscular imbalances
  - Flexibility deficits
    - Quadriceps tightness
    - Hamstring Tightness
PF Signs

- Hypertrophied VL
- VL:VMO timing
- LE malalignment

Patellar Compression Test

Clark’s Patellar Grind (Compression) Test
The Diagnostic Value of the Clarke Sign in Assessing Chondromalacia Patellae

Doberstein and Romeyn
- Purpose to evaluate CS ability to detect CP in patients undergoing arthroscopic knee surgery
- 106 patients; none with complaints of PFP
Doberstein and Romeyn

- In 106 patients (36) had + CS; only 23 actually had significant CP
- (27) false positives


Doberstein and Romeyn

- 67.5% specific meaning only (56 of 83) who were tested - actually did not have pathology.
- 9 patients actually had CP, thus 39% (9 of 23) sensitive meaning only 9 patients + CS actually had CP
- Clarke’s Sign is an invalid and unreliable method to detect CP


PF Crepitus

- Grading of crepitus will only evaluate the PF joint
- Position in 90/90
- Grade most severe sounds
- Loudest ROM should be documented
- If present is it painful or painless
  - 1+ Mildly palpable
  - 2+ Moderately palpable
  - 3+ Severely palpable and audible
PF Crepitus

• **Tactile Friction Sound**
  • Grading scale
  • **None**
    – Smooth motion – no sound
  • **Mild**
    – Fine grade sandpaper - no sound
  • **Moderate**
    – Medium grade sandpaper – squeaky floorboard
  • **Severe**
    – Bone-on-bone grinding – popping-cracking-crunching


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PF Crepitus

• 188 consecutive patients with suspected PF joint articular cartilage damage.
• Clinical examination followed by arthroscopic surgery
• **Motion Palpation Test**
  – Patient edge of table, knee at 90º, passively moving knee between 100-0º while applying ~5 lb compression force with index finger distal to inferior patellar pole


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PF Crepitus

• **Motion palpation test:**
  – sensitive (87%)
  – positive predictive value (97%)
  – Accuracy (85%)

PF Crepitus

- **Low in:**
  - Specificity (33%)
  - Negative predictive value (10%)
  - This indicates a large number of people without pathology tested positive
  - **Findings indicate that MPT is only useful as PE tool for identifying PF joint articular cartilage damage when crepitation grade is listed as severe!**


Muscle Flexibility

Specific Flexibility Tests

- **Hamstrings in 90/90**
  - Tight hamstrings may pull tibia posterior
  - Pulls IPT inferior/posterior
  - Increase PF JRF secondary to adaptive shortening of the retinaculum
  - Creates “hamstrung knee”
Specific Flexibility Tests

• Gastrocnemius/Soleus
• Lumbar spine
• Hip flexors
  – Thomas Test

Specific Flexibility Tests

• Quadriceps Femoris
  – Ely’s Test

Specific Flexibility Tests

• ITB/TFL
  – Obers Test (knee extended)
  – Modified Obers (knee flexed) isolates TFL
Specific Flexibility Tests

- Hip IR/ER

The primary goal in treating patients with anterior knee pain is identifying the cause and treating the causative factors.

PF Orientation: Glide Component

- Normal position
PF Orientation: Glide Component

• Lateral glide: midline of the patella is lateral to the midline of the femur.

PF Orientation: Glide Component

• Lateral glide: midline of the patella is lateral to the midline of the femur.

PF Orientation: Glide Component

• Medial glide: midline of the patella is medial to the midline of the femur. Medial glide is very rare and may be present with an over-extensive post-op lateral release.
Passive Mobility of PFJ

• **Has been described in full extension**
  
  

• **And 30° knee flexion.**
  
  

Patellar Passive Mobility

• When done in full extension is more purely a test of peripatellar soft-tissue compliance because there is less resistance from engagement of patella in trochlea

Passive Medial and Lateral Glide Test
Patellar Passive Mobility

- Measurement done by dividing the knee into quadrants
- 3 quadrants of lateral glide suggest incompetent medial restraint
- Medial glide of 1 or less tight lateral retinaculum
- Medial glide greater than 3 quadrants indicates hyper mobility


Patellar Passive Mobility

- Medial translation 9.5 mm
- Lateral translation 5.4 mm
- Ranges for each direction 3-15 mm
- Must therefore examine for bilateral symmetry not just overall mobility


Patellar Passive Mobility

- Lateral passive patellar displacement with 6# force
- 14 +/- 1.8 mm
- Range of 8-20 mm

Patellar Passive Mobility

- 22 females with PFP
- 22 females without PFP
- Measured with special apparatus


Passive Patellar Mobility

- No significant differences in lateral or medial patellar mobility in females with and without PFP

Apprehension Test

Patellar Maltracking

• Continues to be the subject of much debate!
• Usually patella follows a Concave Lateral C-Shaped curve moving from flexion to extension.

PF Orientation: Passive Tracking Component
PF Orientation: Active Tracking Component

Active Resisted Range of Motion

PF Orientation: Active CKC Tracking Component
PF Orientation: Tilt Component

• Normal position  Lateral tilt: lateral border is lower than medial border.

PF Orientation: Tilt Component

• Lateral tilt: lateral border is lower than medial border.

PF Orientation: Tilt Component

• Medial tilt: medial border is lower than lateral border. Rare. Usually only present after post-op lateral release.
Patellar Tilt Test

- Should be done in full extension with quads relaxed so that soft tissues are in their most relaxed position
- Push posteriorly on the medial border of the patella while lifting on the lateral side

PF Orientation: Rotation Component

- Normal position.
PF Orientation: Rotation Component

- External Rotation: inferior pole lateral to superior pole or most medial point is inferior to the most lateral point.

PF Orientation: Rotation Component

- Internal Rotation: inferior pole medial to superior pole or most medial point is superior to the most lateral point.

PF Orientation: Anteroposterior Component

- Normal
PF Orientation: Anteroposterior Component

- Depression: inferior pole to superior pole

PF Orientation: Anteroposterior Component

- Elevation: inferior pole anterior to superior pole.

Leg Length Measurements
Leg Length Differences

- Result in abnormal gait and may be associated with either short or long leg
- Short limb results in pelvic drop on ipsilateral side causing an increased valgus force at knee in terminal swing


Leg Length

- No studies yet have implicated a direct relationship between leg length differences and PF pain
- Clinically seems relevant.

Pelvic Symmetry

- Assess iliac crest height
- ASIS
- PSIS
Supine to Long Sitting Test

• Supine to long sit leg length test

Direct Measurements

• Measure from ASIS to medial malleolus
  • Anatomical
    – Supine non weight bearing
  • Functional
    – Standing weight bearing

Knee Ligament Instability
Knee ligament Instability

• Always rule out each of the four major knee ligaments for instability
• Parolie and Bergfeld reported that 48% of their chronic PCL deficient patients had stiffness following prolonged sitting (+ movie sign).


Knee ligament Instability

• Posterior cruciate ligament tears increase patellofemoral joint reaction forces by posterior displacement of the tibial tuberosity.

Kinetic Chain Exercises

• Need to monitored very carefully.
• Limited ankle dorsiflexion
• Excessive subtalar pronation
• Hip external rotator weakness
Limited Ankle Dorsiflexion

• Tibiofemoral joint required to extend during mid-stance of gait.
• Excessive pronation (causing tibial internal rotation) may prevent knee from fully extending.
• This can ultimately affect patellar tracking.

Lack of Ankle Dorsiflexion

• Squat requires hip and knee flexion and ankle dorsiflexion.
• If dorsiflexion limited the subtalar joint will pronate to compensate for this lack of motion.

Ankle Joint Pronation

• This increased pronation, coupled with internal tibial rotation will increase the functional Q-angle and may contribute to patellofemoral pain.
Hip External Rotator Weakness

- Hip weakness may allow uncontrolled hip internal rotation, allowing excessive foot pronation, both of which contribute to increased Q-angle


Thank You!

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