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Management of Patellofemoral Pain

David Nolan, PT, DPT, MS, OCS, SCS, CSCS

CONTINUED

Learning Outcomes

After this course, participants will be able to:

- List three contributing factors associated with developing anterior knee pain.
- Identify at least two proximal mechanical influences contributing to Patellofemoral Pain Syndrome.
- Design an evidence-based rehabilitation program for the patient with patellofemoral pain syndrome.

CONTINUED

Overview

- Most common knee disorder
  - 25% of all knee diagnoses
- Females > Males (Boling MC et al. *Scand J Med Sci Sports*, 2010)
- Common complaint following ACL or meniscal injury
- Most frequent injury in runners (Taunton JE. *BJSM*, 2002)

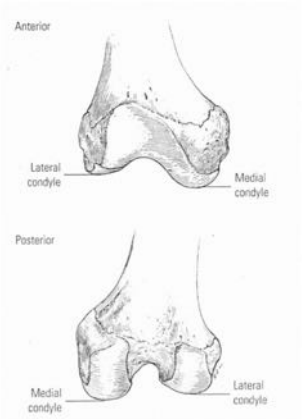
CONTINUED

Etiology

- PFPS Associated with repetitive micro trauma
  - Posture & Alignment
    - Q-Angle, foot pronation
  - LE Biomechanics
    - Hip IR, knee valgus, PFJ stress
  - Neuromuscular Factors
    - Gluteal strength, quadriceps timing

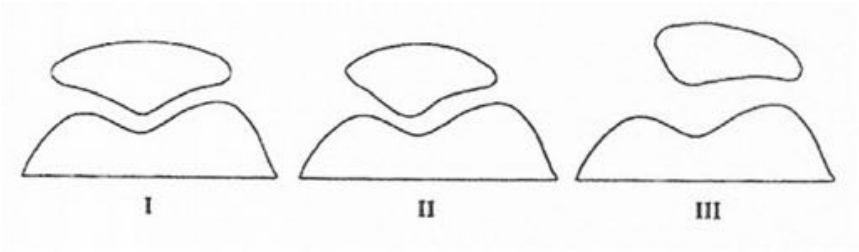
Anatomy

- Bony
  - Lateral femoral condyle provides buttress
  - Trochlear groove more shallow proximally
    - ↓ bony stability in extension



Anatomy

- Patellar Shape
  - Wiberg Classification



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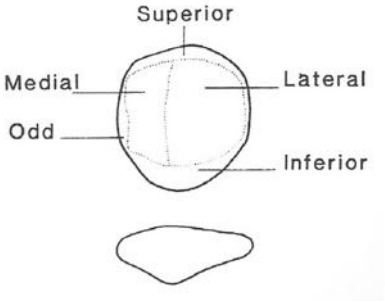
Anatomy

- Patellofemoral contact surface
  - Covered with hyaline cartilage
  - Medial facet
    - Superior
    - Middle
    - Inferior
    - Odd
  - Lateral facet
    - Superior
    - Middle
    - Inferior



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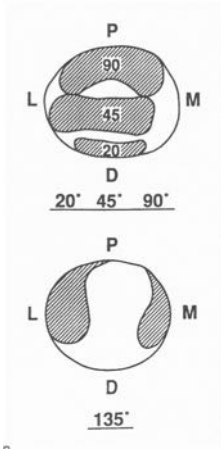
Anatomy

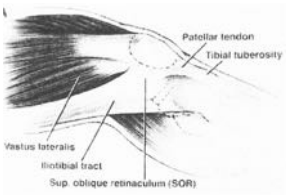
- Patellofemoral contact surface
  - 0° = minimal contact
    - Supratrochlear fossa
  - 20° = 1.5cm²
  - 30° = 2.0cm²
  - 60° = 3.1cm²
  - 90° = 4.7cm²

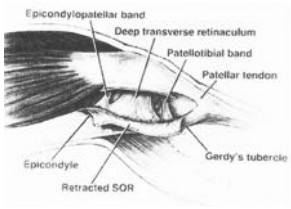


Anatomy

- Patellofemoral Alignment
  - Hochreiter B et al. Knee Surg Sports Traumatol Arthrosc. 2019
    - Systematic review of 15 studies examining 6 alignment measures
      - Sulcus angle (118.7° ±7 - 168°)
      - Femoral trochlear depth (3.4mm ±1.1 – 7.1mm)
      - Patellar tilt angle (0.7° ±4.99 – 17.05° ±4.3)
      - Lateral patellofemoral angle (6.26° ±4.1 – 11.1° ±4.0)
      - Lateral Femoral trochlear inclination (16.3° ±2.8 – 22.1° ± 1.9)
      - Tibial tubercle – trochlear groove distance (9.8mm ±4.6 – 17.3mm ±5.3)
    - "Patellofemoral alignment in the healthy knee is extremely variable"

Anatomy

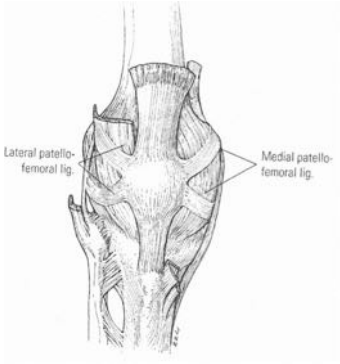




- Soft Tissue
  - Passive stabilizers
    - Patellar tendon
      - Lateral orientation proximal to distal
    - Lateral Capsule
      - Superficial oblique
        - Thin
        - ITB to patella
      - Deep transverse
        - Originates from ITB

CONTINUED

Anatomy



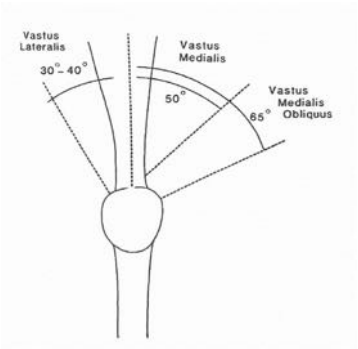
- Soft Tissue
  - Passive stabilizers
    - Medial Capsule (Conlan et al *JBJS* 1993)
      - Medial PF ligament 53%
      - Medial mensicopatellar ligament 22%
      - Medial retinaculum 11%
      - Medial patellotibial ligament 5%

CONTINUED

Anatomy

- Soft Tissue
  - Active stabilizers
    - Quadriceps
      - Rectus femoris
      - Vastus lateralis
        - VLO (Hallisey et al)
      - Vastus medialis
        - VMO
      - Intermedius
    - Faher H et al. *JBJS* 1988
      - 20-30 ml of effusion will inhibit quad

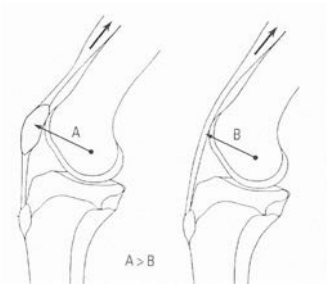
Anatomy



- Soft Tissue
  - Active stabilizers
    - VMO
      - Originate from adductor magnus
      - Inserts at angle of 45°-65°

Biomechanics

- Primary function of patella is to facilitate knee extension
- Patella increases functional lever arm of extensor mechanism
- Increases force of extensor mechanism by as much as 50%



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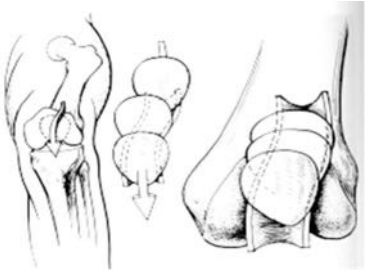
Normal Kinematics

- Normal tracking is in a form of a lateral "C"
- Glide
  - Slightly lateral throughout ROM
  - Medially from 45°-18°
  - Laterally from 18°-0°
- Tilt
  - Slightly lateral at rest
  - Medially 5° as knee extends



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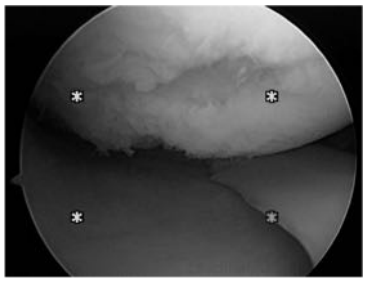
Pathomechanics



- ↑ Joint stresses & subsequent articular cartilage wear
  - Cartilage innervated?
  - Aneural so why is there pain?
- Traumatic or acquired
  - Think bilateral in absence of trauma

CONTINUED

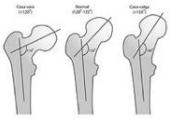
Predisposing Factors

- Gender
  - 13% women 18-35 yo (Roush JR, Curtis Bay R, Int J Sports Phys Ther. 2012)
- Body weight
- Activity level
- Activity itself
- Biomechanical alignment

CONTINUED

Patellofemoral Syndrome

- Risk Factors
  - Excessive Foot Pronation (Barton CJ et al *JOSPT* 2010)
    - Tibial IR leads to femoral IR (Tiberio D. *JOSPT*. 1987)
    - Increases contact pressure on lateral facets of patella
  - Muscle Imbalances
    - VMO & VL weakness (Lin F et al. *Med Sci Sports Exerc*. 2004)
      - Dynamic stabilizers of knee
    - Hip Abduction & ER weakness (Powers CM. *JOSPT*. 2003)
      - Valgus angle increases lateral compressive forces
  - Decreased Knee Flexion Angles (Crossley K et al. *J Orthop Res*. 2004)
    - Decreased contact area of patella (Powers CM et al. *Clin Biomech*. 1999)



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Risk Factors

- Noehren B et al. Med Sci Sports Exerc 2013
  - Prospective study
  - 3-D motion analysis of female runners
  - Followed for 2 years
  - Group that developed PFPS
    - 4° more peak hip adduction compared to
    - matched controls

CONTINUED

Risk Factors

- Hip Muscle Imbalances
  - Cichanowski HR. et al. Med Sci Sports Exerc, 2007
  - Bolga LA. et al. JOSPT, 2008
  - Robinson RL. & Nee RJ. JOSPT, 2007
  - Ireland et al. JOSPT, 2003
    - 26% less hip abductor & 36% less hip ER strength in females
  - Kendall et al. J Athl Train, 2007
    - 90% of PFPS group ↓ hip ER, Abduction & flexor strength

CONTINUED

Risk Factors

- Boling MC. et al. *AJSM* 2009
  - 1597 USNA Midshipmen
  - Risk factors for development of PFPS:
    - Decreased knee flexion angle
    - Increased hip IR during jump-landing task
    - Decreased quad strength (12% less in PFPS group)
    - Hip abductor weakness was ***not*** predictive (3% less in PFPS group)
    - Increased navicular drop
    - Hip ER strength was a predictor of PFPS
      - Compensation to control excessive hip IR ROM
- Conclusion:
  - Multiple modifiable risk factors for PFPS exist and should be addressed with prevention programs

CONTINUED

Risk Factors

- Dierks TA. et al. *JOSPT* 2008.
  - 20 runners with PFPS & 20 matched uninjured runners
  - Variables
    - Hip abduction & ER strength pre/post run
    - Arch height index pre run
    - LE kinematic data beginning & end of run
  - Results
    - Both groups displayed diminished strength at end of run
    - PFPS group had significantly less hip abduction strength
    - Hip abduction weakness was associated with greater peak hip adduction angle
    - Arch height did not differ between groups
  - Conclusion
    - Runners with PFPS displayed weaker hip abductor muscles which became more pronounced at the end of a run

continued

Risk Factors

- Souza RB. & Powers CM. *AJSM*, 2009
  - 19 females with PFPS & 19 pain-free controls
  - PFPS group
    - ↑ Hip IR
      - (8.2° ± 6.6° vs. 0.3° ± 3.6°; $p<.001$)
    - ↓ Hip strength
      - 21% deficit in muscle performance overall
      - 49% less hip extension repetitions
      - 40% less pelvic drop repetitions
    - ↑ Femoral inclination
      - (132.8° ± 5.2° vs. 128.4° ± 5.0°; $p=.011$)

continued

Risk Factors

- Hoglund LT et al. IJSPT. 2018
  - (-) Hip Abductor
  - (-) Hip ER
  - (+) Hip Extensor

DO MALES WITH PATELLOFEMORAL PAIN HAVE POSTERIORLATERAL HIP MUSCLE WEAKNESS?

continued

CONTINUED

Risk Factors

- Neal BS et al. BJSM. 2018
  - Review of 18 studies (4818 participants)
  - Risk factors to develop future PFP:
    - (+) Quad weakness in military population
    - (-) Age, height, weight, BMI, body fat, Q angle
    - (-) hip weakness

Risk Factors for Patellofemoral Pain: A Systematic Review and Meta-analysis

Does every patient with gluteal weakness develop PFP?

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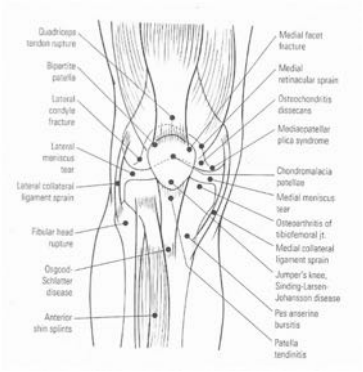
Presentation

- Females > Males
- Insidious onset
- Peripatellar pain
- Limited function
- Quad / VMO weakness

CONTINUED

Presentation



- Diffuse anterior knee pain
- Pain with prolonged sitting (54%)
  - Collins NJ et al. *JOSPT* 2016
- Increased pain with stairs and rising from chair
- Joint crepitus
- Pseudo giving way
- Mild swelling

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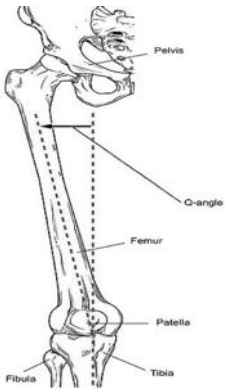
Examination Findings



- ↑ Q angle
  - Aglietti et al
    - Male = 14°
    - Female = 17°
    - >20° abnormal
  - Genu valgum
  - Femoral anteversion
  - Tibial torsion
  - Lateral tibial tubercle
- Consider changes in Q-angle during dynamic activities

CONTINUED

Examination Findings

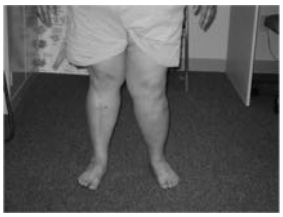
- Tight musculature
  - Witvrouw E et al. *AJSM* 2000
- Decreased quad strength
  - Lankhorst NE et al. *JOSPT* 2012
- Delayed VMO firing
  - Van Tiggelen D et al. *AJSM* 2009

CONTINUED

Examination Findings

- Barton CJ et al. JOSPT 2010
  - PFPS group
    - ↑ pronation
    - ↑ foot mobility

Foot and Ankle Characteristics in Patellofemoral Pain Syndrome: A Case Control and Reliability Study



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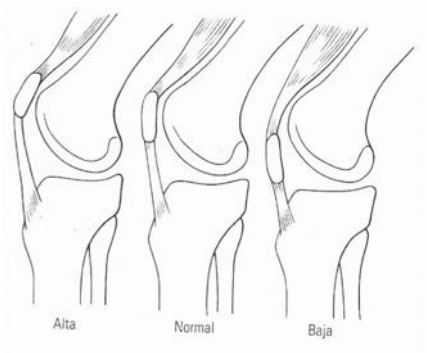
Examination Findings



- Patella Alta
  - High
  - Unstable
  - <0.8
- Patella baja
  - Low
  - Compressive
  - >1.2

CONTINUED

Differential Diagnosis

- Tendinitis / Tendinosis
  - Both activity induced
  - Palpation is key
- Osgood-Schlatters Disease
  - Bony deformity at tibial tubercle
- ITB friction syndrome
  - Snapping as ITB crosses Gerdy's tubercle at 30° flexion thought to be crepitus
- Meniscal or ligament pathology
  - R/O with special testing
- Referred pain L3-L4
  - Vague lateral thigh pain

CONTINUED

Patellar Tendinopathy

- Overuse Tendinitis
  - NSAIDs, Ionto, Ice
  - Restore ROM
  - Restore flexibility
  - Improve strength
- Overuse Tendinosis
  - Active warm-up
  - Friction massage
  - Stretch quad
  - Eccentric strengthening

CONTINUED

Osgood-Schlatters Disease

- Anterior knee pain
- Increased running / jumping activity
- Adolescents
  - Boys > Girls

CONTINUED

Iliotibial Band Syndrome

- Primary Functions
  - Stabilize lateral hip & knee
  - Resist hip adduction & knee IR
  - Femoral & tibial attachments
    - Atypical hip & foot mechanics potential causes of ITBS
- Common cause of lateral knee pain in runners & cyclists
  - Hip Abductor weakness
    - Frederickson, M. et al. *Clin J Sports Med.* 2000
  - Increased weekly mileage
    - Messier, SP. *Med Sci Sports Exerc.* 1995

CONTINUED

Iliotibial Band Syndrome

- Noehren, B. et al. *Clin Biomech*. 2007
  - Compared running mechanics of females with ITBS with healthy females
    - ITBS group exhibited significantly greater hip adduction & knee internal rotation
    - Result in increased ITB strain & compression against lateral femoral condyle
    - Treatment should focus on controlling secondary plane motions
- Ferber, R et al. *JOSPT* 2010
  - ITBS group significantly greater hip adduction angle & knee IR angle

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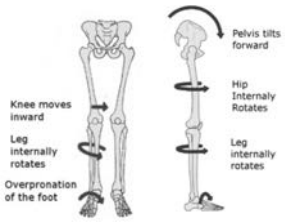
Iliotibial Band Syndrome



- Distal Mechanism
  - Greater rearfoot inversion angle at heel strike
    - Miller, RH. et al. *Gait Posture* 2007
  - Greater tibial IR throughout stance phase
    - Ferber R, et al. *JOSPT* 2010
  - Increased peak rearfoot eversion
    - Messier, SP. et al. *Med Sci Sports Exer*. 1995
  - Decreased peak rearfoot eversion
    - Noehren, B. et al. *Med Sci Sports Exer.* 2006
  - Noehren, B. et al. *Clin Biomech*. 2007
    - Decreased eversion in ITBS group as whole
    - Subgroup of subjects exhibited excessive eversion as well as high tibial and knee internal rotation

CONTINUED

Location of Pain

- Superior
  - Quad tendinitis
- Inferior
  - Infrapatellar fat pad
  - Patellar tendinitis
- Lateral
  - Shortening of lateral retinaculum
  - Tight lateral musculature
- Medial
  - Excessive stretching of medial retinaculum
- Retro
  - Chondromalacia patella
  - Subchondral bone stress

continued

Treatment Considerations for Patellofemoral Pain Syndrome

continued

Treatment

- Conservative Interventions
  - Exercise
  - Bracing
  - Taping
  - Orthotic Therapy
  - Stretching
  - Soft tissue mobilization
  - Activity modification
- Keys to Success
  - Must treat the CAUSE not the SYMPTOMS
  - Accurate diagnosis
  - Controlled activity
  - Education

CONTINUED

Treatment

- Comprehensive Approach
  - Strengthening
    - Quad balance
    - VMO:VL ratio
      - Van Tiggelen D et al. AJSM 2009

CONTINUED

Treatment

- Comprehensive Approach
  - VMO Exercise?
    - Cerny Phys Ther 1995
      - Higher VMO activity with QS than any other OKC exercise
    - Soderberg et al Phys Ther 1983 & Karst et al Phys Ther 1993
      - VMO activity during QS > SLR
    - Simoneau et al Phys Ther 1993
      - Lateral step-up performed in neutral and with ER in normals
      - No significant difference in VMO:VL ratio
    - Wilk et al Phys Ther 1992
      - VMO:VL ratio during squat, leg press & knee extension with and without simultaneous hip adduction
      - No significant difference noted

CONTINUED

Treatment

- Comprehensive Approach
  - Stretching
    - Rectus femoris
    - ITB
      - Tensions lateral retinaculum
    - Hamstrings
      - Knee flexion
      - Patella engaged in trochlea
      - Articular cartilage wear
    - Gastroc-Soleus
      - Compensatory pronation

CONTINUED

Treatment

- Comprehensive Approach
  - Biofeedback
    - Improve VMO / VL balance
  - Bracing / Orthotics
    - Breg PTO
    - Control pronation

CONTINUED

Treatment

- Lake DA & Wofford NH. Sports Health 2011
  - Ice, US, Phono, Ionto, EMG Biofeedback, NMES, E-Stim, Laser
  - 12 RCT met criteria
  - "None of the therapeutic modalities reviewed has sound scientific justification for the treatment of PFPS when used alone"

Effect of Therapeutic Modalities on Patients with Patellofemoral Pain Syndrome: A Systematic Review

CONTINUED

Treatment

- Lumbopelvic Manipulation
  - 50 subjects 18-45 yo (26 m; 24 f)
  - 45% had successful outcome
    - Hip IR ROM asymmetry >14° (Success improved to 80%)

Lumbopelvic Manipulation for the Treatment of Patients With Patellofemoral Pain Syndrome: Development of a Clinical Prediction Rule

CONTINUED

Patellar Taping

- Individual approach
- Correct worst symptom first
- Taping should improve symptoms immediately

CONTINUED

Patellar Taping

- Patellar taping
  - Larsen et al AJSM 1995
    - Radiographs to determine impact of tape on patellar position
    - X-Rays prior to tape, post tape & post exercise
    - Significant medialization of patella seen
    - Position was not maintained post exercise
  - Bockrath et al Med Sci Sports Exerc 1993
    - No change in patellar congruency post taping
    - Patients did note a 50% reduction in pain with taping

CONTINUED

Patellar Taping

- Kowall et al AJSM 1996
  - Group one: standardized exercise program
  - Group two: exercise and taping
  - Variables
    - Isokinetic torque
    - EMG activity
    - Severity of pain
  - Both groups improved
  - No significant difference between groups

CONTINUED

Patellar Taping

- Leshner JD et al. *JOSPT* 2006
  - Which patients with PFPS will benefit from taping?
  - Medial glide technique performed
  - Immediate 50% reduction in pain or moderate improvement on a global rating of change questionnaire was considered a success
  - Two exam items predicted success with taping
    - (+) Patellar Tilt Test (mobility of lateral retinaculum)
    - Tibial Varum > 5°
  - Application of CPR improved probability of success from 52% to 83%

CONTINUED

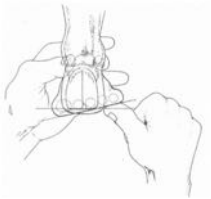
Treatment

- Foot Orthoses
  - Saxena A et al. J Am Podiatr Med Assoc. 2003
    - 102 subjects diagnosed with PFPS
    - Custom orthoses fabricated with appropriate rearfoot and/or forefoot posting determined by exam
    - Foot orthoses effective in relieving symptoms of PFPS in young people
  - Johnston LB et al. JOSPT. 2004
    - 16 subjects with >9° calcaneal eversion in bilateral weight bearing
    - Custom foot orthoses with 2 week and 3 month F/U
    - Significant improvement in pain, stiffness and physical function for patients with PFPS that demonstrate excessive pronation

CONTINUED

Foot Orthoses

- Sutlive TG et al. Phys Ther. 2004
  - Which patients with PFPS will benefit from off-the-shelf foot orthosis
  - 50% reduction in pain was considered a success
  - Best Predictors of Improvement
    - Forefoot Valgus >/= 2°
    - Great Toe Extension </= 78°
    - Navicular Drop </= 3 mm



Proximal Considerations for Patellofemoral Pain Syndrome

Proximal Strength

- Magalhaes E et al. JOSPT, 2010

A Comparison of Hip Strength Between Sedentary Females With and Without Patellofemoral Pain Syndrome

Muscle	Control (50)	Unilateral PFPS (21)	Bilateral PFPS (29)
Abductors	14.6± 2.9	11.7± 4.2	9.6± 2.8
Adductors	15.1± 3.7	14.1± 5.7	11.4± 3.3
Extensors	21.8± 5.6	19.1± 10.0	15.8± 9.0
Flexors	19.4± 4.3	16.3± 6.0	14.9± 4.3
Lateral Rot	14.5± 3.5	12.7± 4.1	12.1± 3.9
Medial Rot	14.3± 3.1	13.6± 4.4	12.7± 3.8

CONTINUED

Proximal Strength

- Fukuda TY et al. JOSPT, 2012
  - Added hip strengthening exercises to knee strengthening & stretching
    - Improved function (LEFS)
    - Decreased pain

Hip Posterolateral Musculature Strengthening in Sedentary Women with Patellofemoral Pain Syndrome: A Randomized Controlled Clinical Trial With 1-Year Follow-Up

CONTINUED

Strengthening

- Earl JE & Hoch AZ. AJSM 2011
  - 8 week rehab program hip and core strength
  - Significant improvements in pain, functional ability, ER and Abduction strength

continued

Strengthening

- Khayambashi K et al. JOSPT 2012
  - 28 women with PFPS
  - Exercise or no exercise control group
  - B Hip Abductor & ER strength 3x/week for 8 weeks
    - Decreased pain
    - Improved health status (WOMAC)
    - Increased B hip strength (HHD)

continued

Strengthening

- Boren K. et al. IJSPT. 2011
  - Gluteus Medius

Exercise	%MVIC Glut Medius	Rank Gluteus Medius
Side Plank Abd (DL Down)	103.11	1
Side Plank Abd (DL Up)	88.82	2
Single Limb Squat	82.26	3

continued

Strengthening

- Boren K. et al. IJSPT. 2011
  - Gluteus Medius
    - Hip Extension

Clamshell Exercise	%MVIC Gluteus Medius	Rank Gluteus Medius
Standard	47.23	18
Reverse	62.45	8
In Abduction	67.63	6
In Abduction/Extension	76.88	4

continued

Strengthening

- Boren K. et al. IJSPT. 2011
  - Gluteus Maximus

Exercise	% MVIC Gluteus Maximus	Rank Gluteus Maximus
Front Plank-Hip Ext	106.22	1
Gluteal Squeeze	80.72	2
Side Plank Abd (DL Up)	72.87	3
Side Plank Abd (DL Down)	70.96	4
Single Limb Squat	70.74	5

continued

continued

Strengthening

- Boren K. et al. IJSPT. 2011

Exercise	%MVIC Gluteus Medius	%MVIC Gluteus Maximus
Front Plank-Hip Ext	75.13	106.22
Side Plank Abd (DL Up)	88.82	72.87
Side Plank Abd (DL Down)	103.11	70.96
Single Limb Squat	82.26	70.74

continued

Strengthening

- Selkowitz DM et al. JOSPT 2013
  - Activate gluteus medius and superior gluteus maximus while minimizing TFL
  - Fine-wire EMG
  - 11 exercises
  - 20 healthy subjects
  - Calculated Gluteal to TFL Index for each exercise
    - Not simply looking at EMG values

continued

continued

Strengthening

- Selkowitz DM et al. JOSPT 2013

Exercise	Gluteal-to-TFL Activation Index
Clam (resistance)	115
Sidestep (resistance)	64
Unilateral Bridge	59
Qped Hip Ext-Knee Ext	50
Qped Hip Ext-Knee Flexed	50

continued

Strengthening

- Selkowitz DM. et al. JOSPT 2013

Exercise	TFL	Glut Med	Sup Glut Max
SL Hip Abd	32.3± 13.31	43.5± 14.7	23.7± 15.3
Hip Hike	31.4± 14.4	37.3± 15.1	17.7± 15.2

continued

Strengthening

- Selkowitz DM et al. JOSPT 2013
  - Limitations
    - Healthy subjects
    - CLAM & SIDESTEP used elastic resistance
      - Likely increased EMG amplitudes and GTA Index
    - Did not include gluteus minimus
      - 20% of abductor cross sectional area

continued

Clamshell Exercise

- Willcox EL & Burden AM. JOSPT 2013
  - 17 healthy subjects
  - Surface EMG
  - ↑ Glut in PNeutral
  - ↑ Gmed in 60° flex
  - TFL activation low

continued

Clamshell Exercise

- Bishop BN et al. IJSPT 2018
  - Best Gluteal to TFL Muscle Activation (GTA)

Exercise	Glut Max	Glut Med	TFL	GTA Index
Clam with resistance	42.03 ± 19.31	30.48 ± 16.66	13.54 ± 6.32	99.54
Clam without resistance	36.32 ± 14.62	25.35 ± 10.39	11.16 ± 5.34	87.89

continued

Strengthening

- Proximal strength
  - Cambridge ED et al Clin Biomech 2012
    - Forefoot resistance:↑ gluteals vs. TFL
    - Likely due to ER of hips

CONTINUED

Posture Matters

- Berry JW et al. JOSPT. 2015
  - Resisted side stepping upright & squat positions
  - EMG of Gmed, Gmax & TFL
  - EMG > in stance limb (p≤.001)
  - Glut activity > TFL activity in squat position (p≤.001)

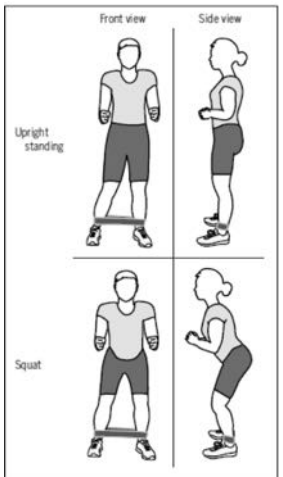


FIGURE. Participant side stepping to the right in the upright standing posture and the squat posture.

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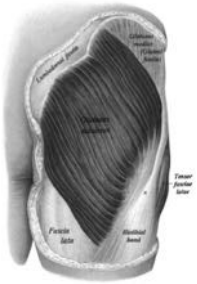
Strengthening

- MacAskill MJ et al *IJSPT* 2014
  - Surface EMG (Gmax & Gmed)
  - Weightbearing
    - Forward Step-Up
    - Lateral Step-Up
  - Non-Weightbearing
    - 10RM
    - Prone Hip Extension
    - Sidelying Hip Abduction

CONTINUED

Clinical Pearls

- Do the ***Correct*** exercises the ***Correct*** way
  - Kang SY et al. *Manual Ther* 2013
    - As angle of hip abduction increases from zero degrees to 30 degrees
      - Glute max activation increases
      - Hamstring activation decreases



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Strengthening

- Nascimento LR et al. JOSPT. 2018
  - Hip strengthening with/without knee strengthening
  - Systematic Review with Meta Analysis
    - Randomized and/or controlled trials were included
    - 14 trials (673 participants)
    - Hip & Knee strengthening effective & superior to knee strengthening
      - ↓ Pain & Improved Activity
      - **No concurrent change in strength**

Motor Control

CONTINUED

Blood Flow Restriction

- Giles L et al. Br J Sports Med. 2017
  - Double-Blind RCT; 69 subjects (standard = 34; BFR = 35)
  - 8 weeks of leg press & leg extension
    - Standard: 70% 1RM; BFR: 30% 1RM
  - BFR 93% greater ↓ pain with ADLS (p=0.02) @ 8 weeks
  - Similar improvement between groups with VAS "worst pain" & Kujala Patellofemoral score
  - **No difference between interventions @ 6mo

CONTINUED

Summary

- Gluteal strengthening shown to be critical in lower extremity function
- Consider the quality of tissue, phase of healing and baseline strength
- What muscle should be activated and what muscle activation should be minimized
- Unknown if findings would be similar for patients presenting with pain / pathology

CONTINUED

Treatment Summary

- (+) Hip and knee focused exercise
- (+) Foot Orthoses
- (-) Electrophysical agents in isolation
- (-) PF, Knee or lumbar mobilization is isolation
- (?) Taping, bracing, dry needling, STM, BFR

2018 Consensus statement on exercise therapy and physical interventions (orthoses, taping, and manual therapy) to treat patellofemoral pain: recommendations from the 5th International Patellofemoral Pain Research Retreat, Gold Coast, Australia, 2017 by Natalie J Collins, Christian J Barton, Marienke van Middelkoop, Michael J Callaghan, Micael Skovdal Rathleff, Bill T Vicenzino, Irene S Davis, Christoper M Powers, Erin M Macri, Harvi F Hart, Danilo de Oliveira Silva, Kay M Crossley in the British Journal of Sports Medicine

CONTINUED

Treatment

- Acute Phase
  - Decrease swelling
    - 20-30ml fluid impacts muscle function
  - Stop inhibition of VMO
    - Avoid fatigue

CONTINUED

Treatment

- Sub-Acute Phase
  - Patellar mobilizations
    - creep
  - Stretch lateral structures
    - ITB
  - Strengthening
    - Avoid deep flexion
  - Biofeedback
  - Endurance training

CONTINUED

Treatment

- Chronic Phase
  - PREs
    - Hip and quad
  - Closed chain
  - Motor Control

CONTINUED

Summary

- Determine cause of symptoms
- Activity modification
- Utilize specific and individual treatment approach
- Correct faulty biomechanics

CONTINUED

Surgical Considerations for Patellofemoral Pain

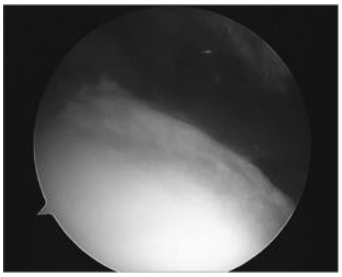
CONTINUED

Surgical Options

- Lateral Release
- Distal Realignment
  - Medialization (Trillat 1964)
  - Anteriorization (Maquet)
  - Anteromedialization (AMZ, Fulkerson 1983)
- MPFL Reconstruction
- Patellofemoral Arthroplasty
- Patellectomy

CONTINUED

Lateral Release



- Procedure for pain
  - Indications
    - Anterior knee pain 2° ELPS
    - Evidence of lateral tilt
    - Failure of non-surgical management
  - Contraindications
    - Hypermobile patella
    - Should NOT be done in isololation for recurrent lateral patellar dislocations; studies show deterioration of results over time
  - Rehabilitation
    - Within 2 days post-op

CONTINUED

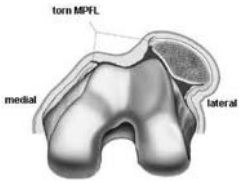
Distal Realignment

- Indications
  - Patellar instability due to increased Q angle or tibial tubercle malalignment
  - Patellar tilt and subluxation that cannot be corrected by MPFL alone
- Advantages
  - Corrects subluxation & tilt radiographically
  - More aggressive rehab
    - Immediate, full ROM
- Disadvantages
  - Does not address MPFL
  - Not performed prior to skeletal maturity

CONTINUED

MPFL Reconstruction

- Indications
  - Lateral patellar instability due to laxity of proximal medial restraints
  - Procedure for instability
- Contraindications
  - Not performed for malalignment, arthrosis or pain



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MPFL Reconstruction

- Zaman S et al. *Am J Sports Med*. 2018
  - Systematic Review of Return to Play Guidelines
  - 53 studies met inclusion criteria were reviewed
    - WB restrictions (90.6%)
    - ROM restrictions (84.9%)
    - Timeline for RTP or return to full activity (66.0%)
    - Subjective or objective criteria to determine return to activity (18.9%)

continued

Patellofemoral Pain Case Study

Case Study

- 15 year old female basketball player
- 4 teams
- Recent onset of B anterior knee pain
- Worse with basketball & stairs
- Father reports “worried about how she runs”

Case Study

- Walking Gait Video

CONTINUED

Case Study

- Examination
  - Limited muscle length
    - Iliopsoas, quad, gastroc-soleus, hamstrings
  - Limited strength
    - Quad & hamstrings: 4/5 B
    - Gluteus medius & maximus: 3+/5 B

CONTINUED

Case Study

- Running Gait Videos

CONTINUED

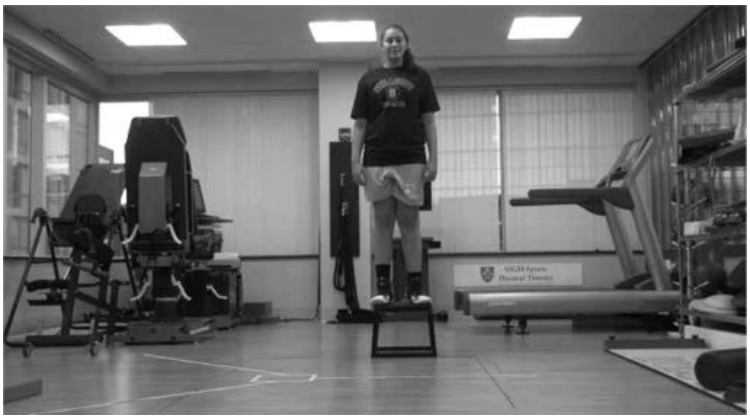
Case Study

- Running Gait Videos

CONTINUED

Case Study

- Drop Jump Task Videos



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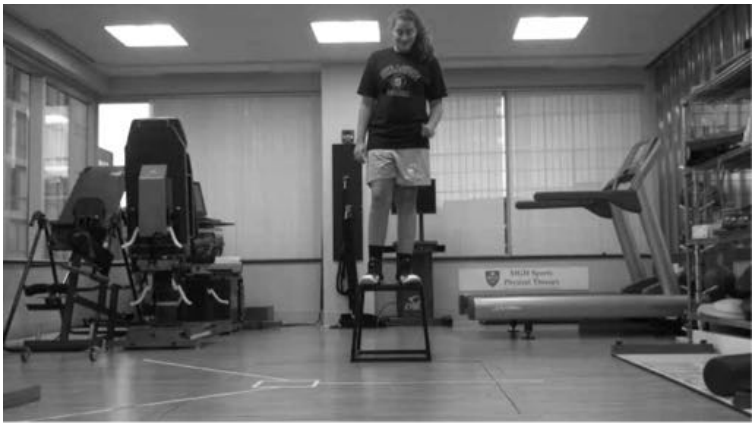
Case Study

- Drop Jump Task Videos



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Case Study

- Treatment
  - LE flexibility
    - Hip flexors critical
  - Gluteal activation exercises
    - Significant compensation
    - HS for glut max
    - TFL for glut med
  - Proprioception / Neuro Re-ed
    - Static → Dynamic

continued

Summary

- PFP is a multifactorial condition requiring an individually tailored multimodal approach
- Immediate pain relief should be a priority to gain patient trust
- Patient empowerment by emphasizing active over passive interventions is important
- Good patient education and activity modification is essential

The 'Best Practice Guide to Conservative Management of Patellofemoral Pain': incorporating level 1 evidence with expert clinical reasoning by Christian John Barton, Simon Lack, Steph Hemmings, Saad Tufail, Dylan Morrissey in the British Journal of Sports Medicine.

continued

Thank You

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