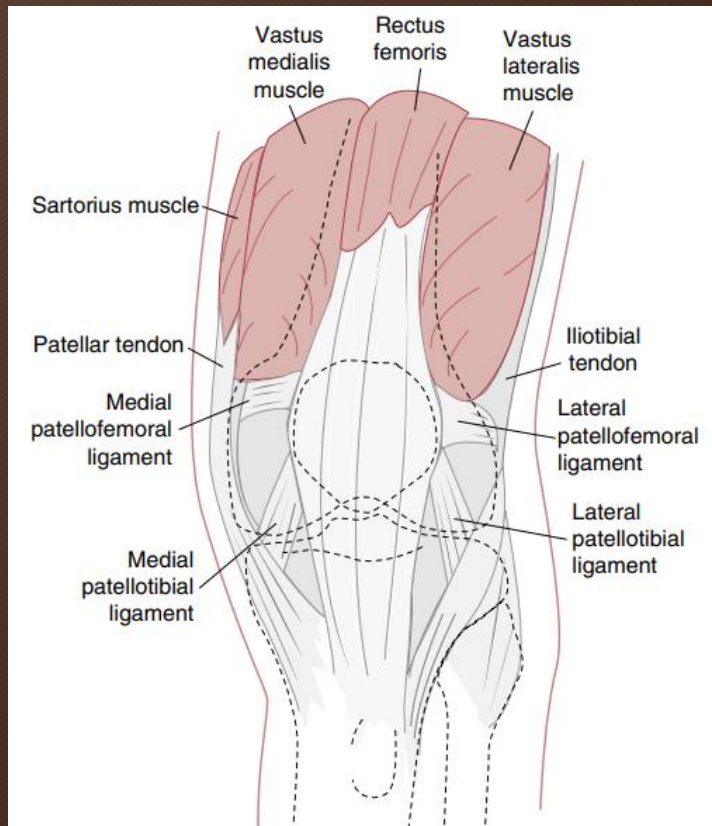
Patellofemoral pain syndrome

Anatomy

Patella

- The patella is a triangular shaped sesamoid bone, the posterior surface of the patella is covered with articular cartilage.
- The articular cartilage of the patella is similar to that of other joints in that it contains a solid phase and a fluid phase that is mostly composed of collagen and glycosaminoglycans. The solid phase is somewhat permeable and when the articular surface is under load, the fluid gradually redistributes itself within the solid matrix. Therefore, the pressure within the fluid is strongly associated with the cushioning effect of the articular cartilage and the low friction coefficient of articular surfaces. Any damage to the articular surfaces causes a loss of pressure within the fluid phase, which subsequently results in higher stresses on the collagen fibers and more vulnerability leading to possible breakdown.



definition

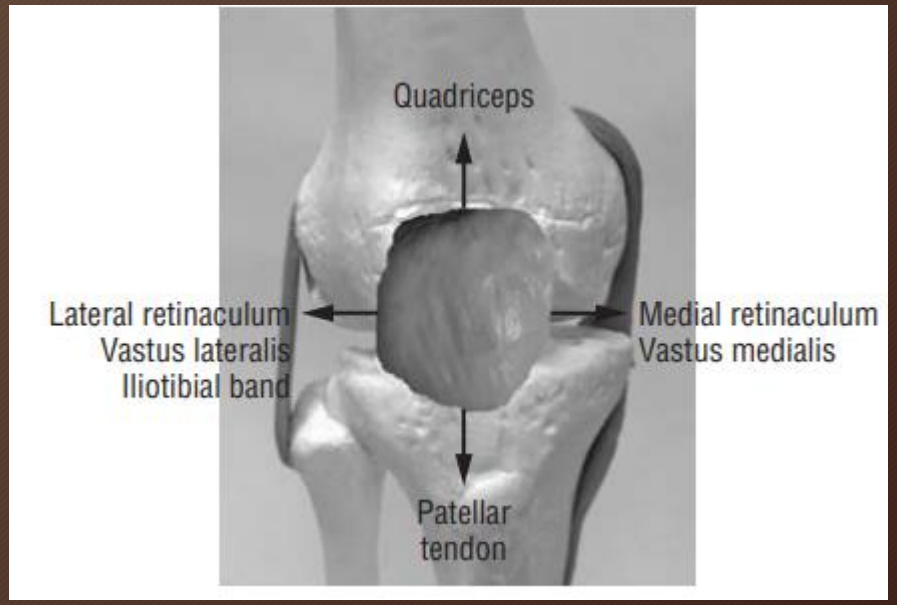
- The patellofemoral joint (PFJ) comprises the articulation between the patella and the trochlear groove of the femur. The patella is a large sesamoid bone embedded in the quadriceps extensor mechanism. The roles of the patella are to increase the moment arm of the quadriceps muscles, provide bony protection to the distal joint surfaces of the femoral condyles when the knee is flexed, and prevent damaging compressive forces on the quadriceps tendon with resisted knee extension.

Pathomechanics

- Patients presenting with patellofemoral pain typically exhibit relatively common symptoms. They complain of nonspecific pain in the anterior portion of the knee. It is difficult to place one finger on a specific spot and be certain that the pain is there. Pain seems to be increased when either ascending or descending stairs or when moving from a squatting to a standing position. Patients also complain of pain when sitting for long periods of time—this has occasionally been referred to as the “moviegoer’s sign.” Reports of the knee “giving away” are likely, although typically no instability is associated with this problem. When evaluating the pathomechanics of the patellofemoral joint, the athletic trainer must assess static alignment, dynamic alignment, and patellar orientation.

Static alignment.

Static stabilizers of the patellofemoral joint act to maintain the appropriate alignment of the patella when no motion is occurring. The superior static stabilizers are the quadriceps muscles (vastus lateralis, vastus intermedius, vastus medialis, rectus femoris). Laterally, static stabilizers include the lateral retinaculum, vastus lateralis, and iliotibial band. Medially, the medial retinaculum and the vastus medialis are the static stabilizers. Inferiorly, the patellar tendon stabilizes the patella.



Dynamic Alignment.

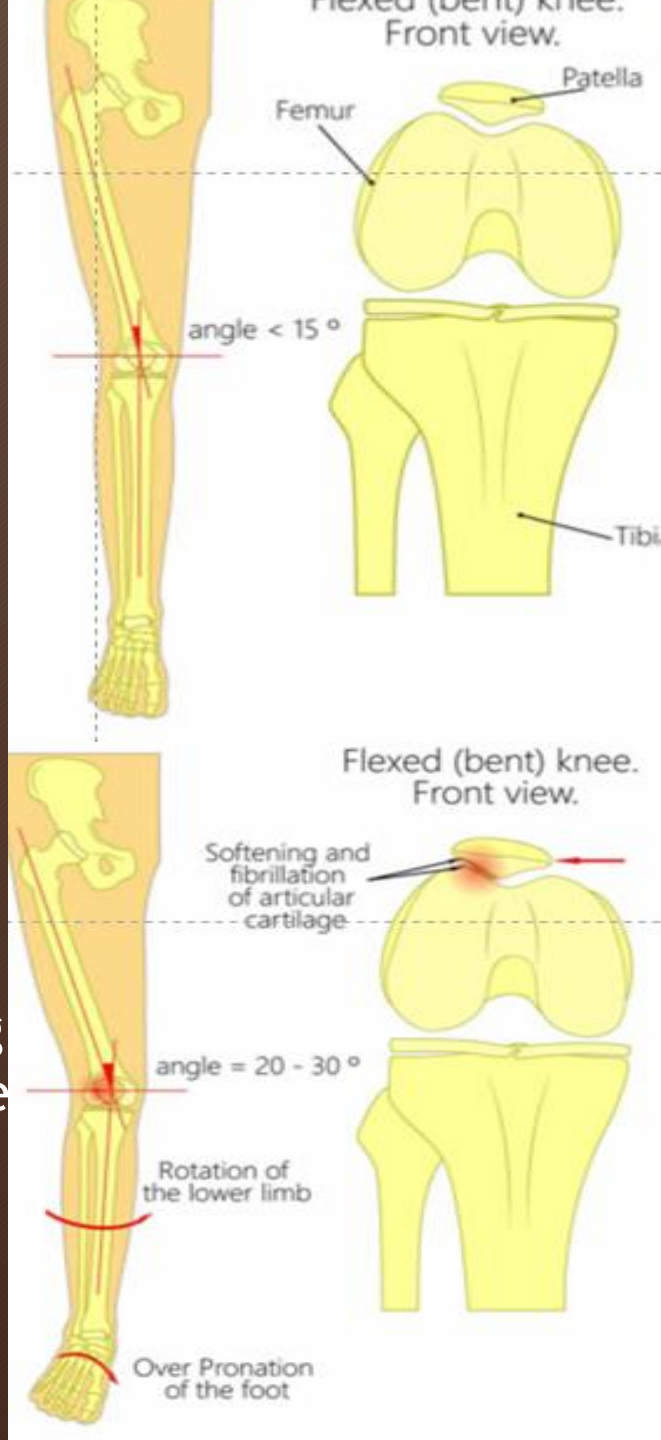
Dynamic alignment of the patella must be assessed during functional activities. It is critical to look at the tracking of the patella from an anterior view during normal gait. Muscle control should be observed while the patient engages in other functional activities, including stepping, bilateral squats, or one-legged squats.

A number of different anatomical factors can affect dynamic alignment. It is essential to understand that both static and dynamic structures must create a balance of forces about the knee. Any change in this balance might produce improper tracking of the patella and patellofemoral pain.

Increased Q-angle.

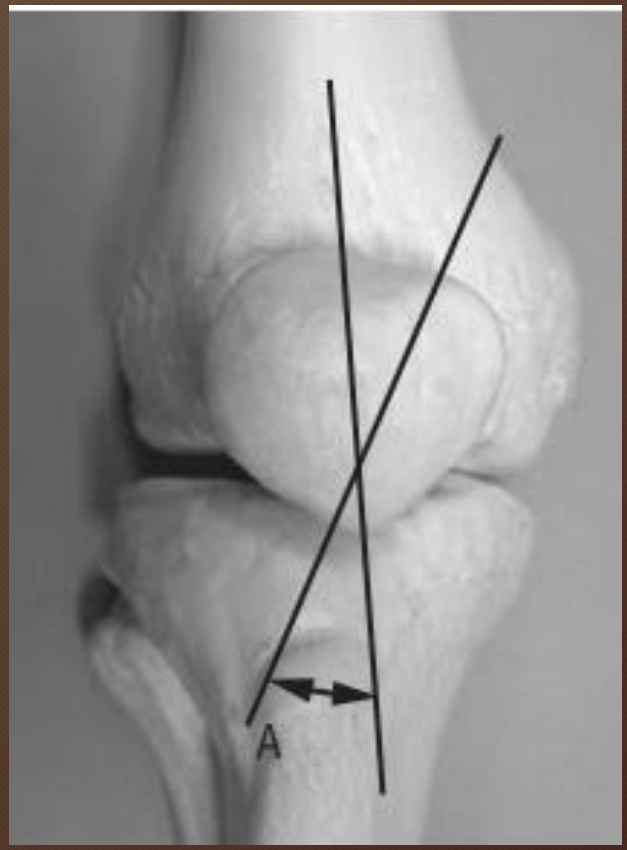
The Q-angle is formed by drawing a line from the anterosuperior iliac spine to the center of the patella. A second line drawn from the tibial tubercle to the center of the patella that intersects the first line forms the Q-angle. A normal Q-angle falls between 10 to 12 degrees in the male and 15 to 17 degrees in the female. Q-angle can be increased by lateral displacement of the tibial tubercle, external tibial torsion, or femoral neck anteversion. The Q-angle is a static measurement and might have no direct correlation with patellofemoral pain. However, dynamically this increased Q-angle may increase the lateral valgus vector force, thus encouraging lateral tracking, resulting in patellofemoral pain.

Dynamic Q-angle may be affected by abnormal biomechanics occurring at the hip and knee. Increased hip adduction and hip internal rotation during functional activities can lead to increased knee valgus, thus increasing the valgus force vector on the patella. This increased hip adduction and internal rotation may be due to weakness of the hip abductors and hip external rotators; therefore, it is imperative to evaluate the hip musculature in individuals with patellofemoral pain.



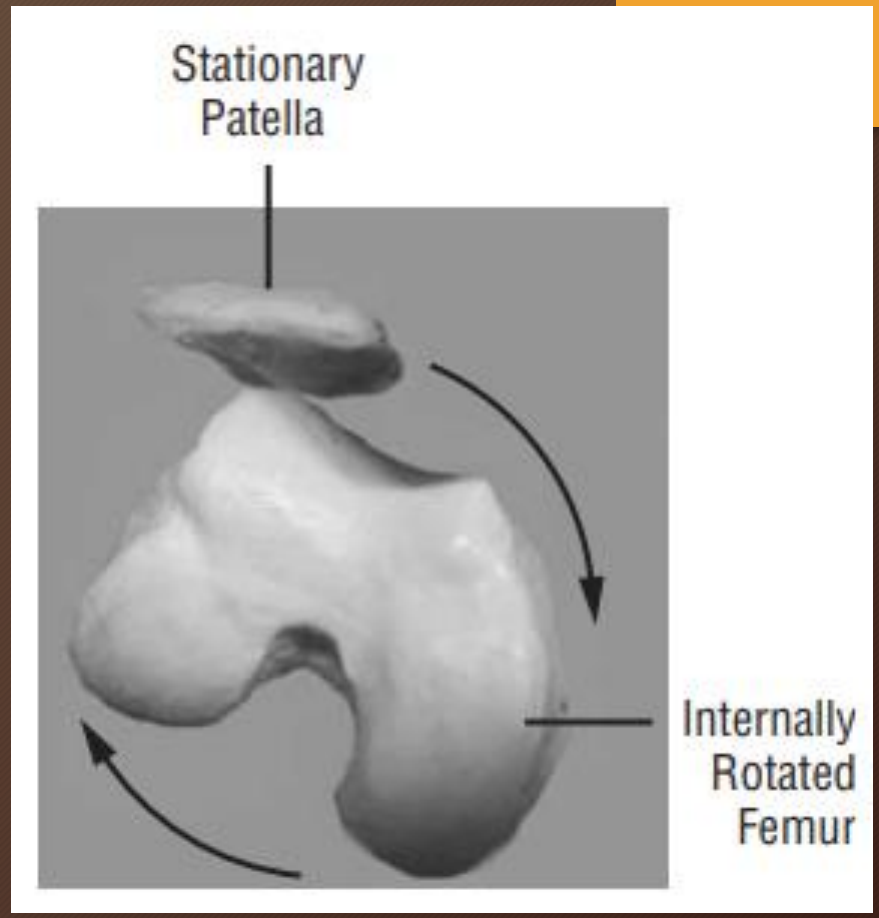
A-angle.

The A-angle measures the patellar orientation to the tibial tubercle. It is created by the intersection of lines drawn bisecting the patella longitudinally and from the tibial tubercle to the apex of the inferior pole of the patella. An angle of 35 degrees or greater has been correlated with patellofemoral pathomechanics, resulting in patellofemoral pain.



Femoral rotation.

Femoral rotation during dynamic tasks has been reported to play a role in patellar malalignment. With the use of magnetic resonance imaging, researchers have determined that the femur can rotate under the patella during weightbearing stance. Therefore, an increase in femoral rotation during dynamic activities may cause the patella to be laterally positioned, leading to improper tracking of the patella and patellofemoral pain



Iliotibial band.

The distal portion of the iliotibial band interdigitates with both the deep transverse retinaculum and the superficial oblique retinaculum. As the knee moves into flexion, the iliotibial band moves posteriorly, causing the patella to tilt and track laterally

Vastus medialis oblique insufficiency.

The vastus medialis oblique (VMO) functions as an active and dynamic stabilizer of the patella. Anatomically it arises from the tendon of the adductor magnus. Normally, the VMO is tonically active electromyographically throughout the range of motion. In individuals with patellofemoral pain, it is phasically active, and it tends to lose fatigue-resistant capabilities. The VMO is innervated by a separate branch of the femoral nerve; therefore it can be activated as a single motor unit. 8 In normal individuals the VMO to vastus lateralis (VL) ratio has been shown to be 1:1. 133 However, in individuals who complain of patellofemoral pain the VMO to VL ratio is less than 1:1.

Vastus lateralis.

The vastus lateralis interdigitates with fibers of the superficial lateral retinaculum. Again, if this retinaculum is tight or if a muscle imbalance exists between the vastus lateralis and the vastus medialis with the lateralis being more active, lateral tilt or tracking of the patella may occur dynamically.

Excessive pronation.

Excessive pronation may result from existing structural deformities in the foot. With overpronation there is excessive subtalar eversion and adduction with an obligatory internal rotation of the tibia, increased internal rotation of the femur, and thus an increased lateral valgus vector force at the knee that encourages lateral tracking

Tight hamstring muscles.

Tight hamstring muscles cause an increase in knee flexion. When the heel strikes the ground, there must be increased dorsiflexion at the talocrural joint. Excessive subtalar joint motion may occur to allow for necessary dorsiflexion. As stated previously this produces excessive pronation with concomitant increased internal tibial rotation and a resultant increase in the lateral valgus vector force.

Tight gastrocnemius muscle.

A tight gastrocnemius muscle will not allow for the 10 degrees of dorsiflexion necessary for normal gait. Once again this produces excessive subtalar motion, increased internal tibial rotation, and increased lateral valgus vector force

Patella alta and baja.

- In patella alta, the ratio of patellar tendon length to the height of the patella is greater than the normal 1:1 ratio. In patella alta the length of the patellar tendon is 20 % greater than the height of the patella. This creates a situation where greater flexion is necessary before the patella assumes a stable position within the trochlear groove, and thus there is an increased tendency toward lateral subluxation.

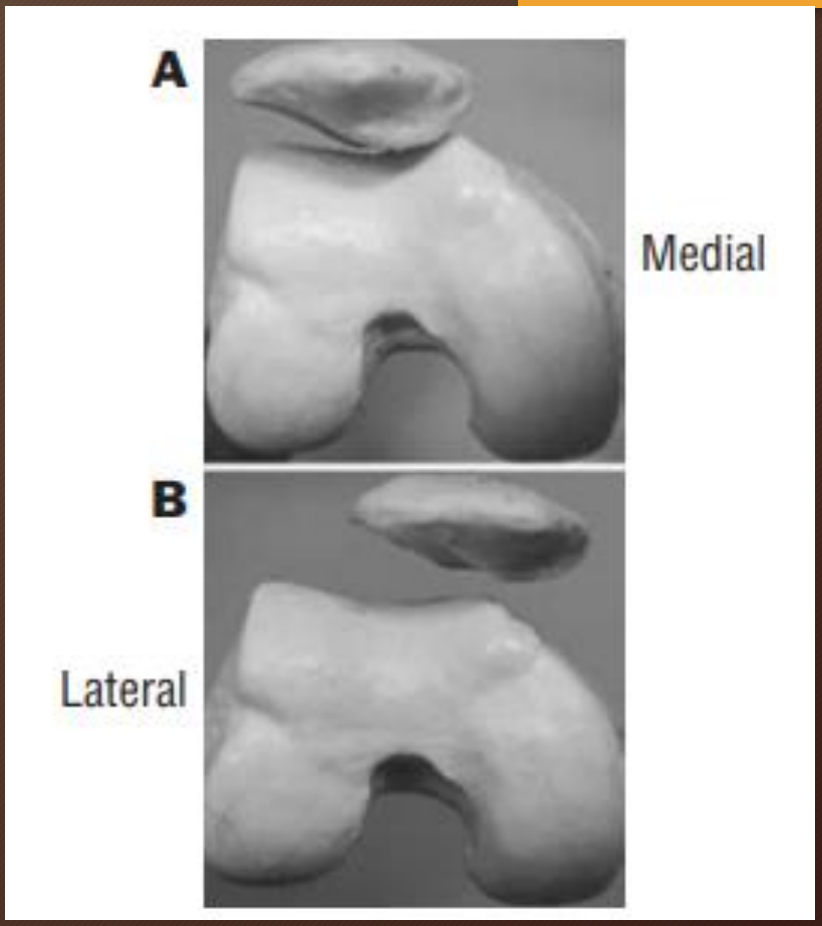
- Patella baja is a condition in which the patella lies inferior to the normal position and may also restrict knee flexion range of motion. Knee injuries (e.g., patellar tendon rupture, ACL reconstructions using quadriceps tendon) may cause a patella baja condition. Aggressive joint mobilization and soft-tissue manipulation is important to prevent these conditions from occurring postinjury. Strengthening exercises are also necessary to establish increased patellar stabilization during ROM

Patellar orientation.

Patellar orientation is the positioning of the patella relative to the tibia. Assessment should be done with the patient in supine position. Four components should be assessed when looking at patellar orientation: glide, tilt, rotation, and anteroposterior tilt.

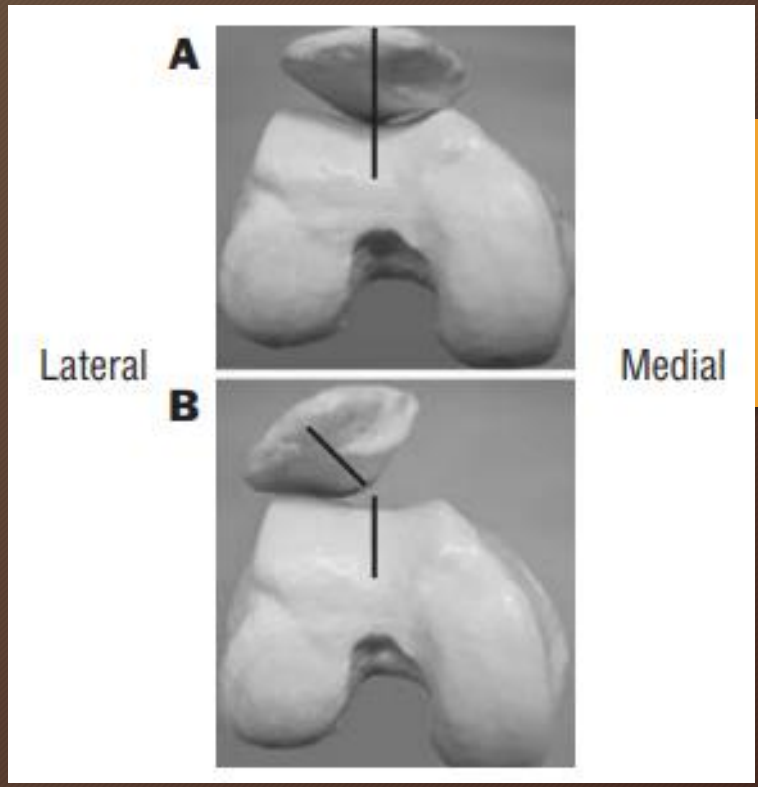
- Glide component.

This component assesses the lateral or medial deviation of the patella relative to the trochlear groove of the femur. Glide should be assessed both statically and dynamically.



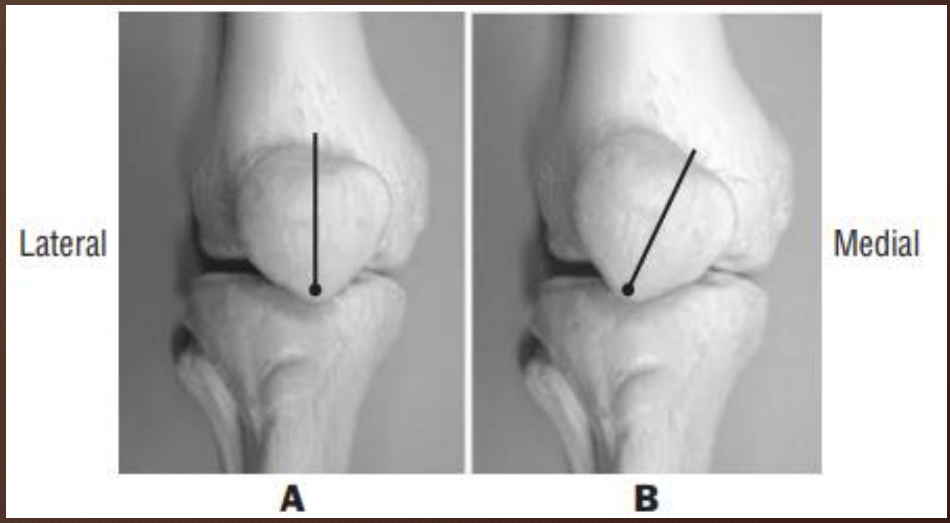
- **Tilt component.**

Tilt is determined by comparing the height of the medial patellar border with the lateral patellar border.



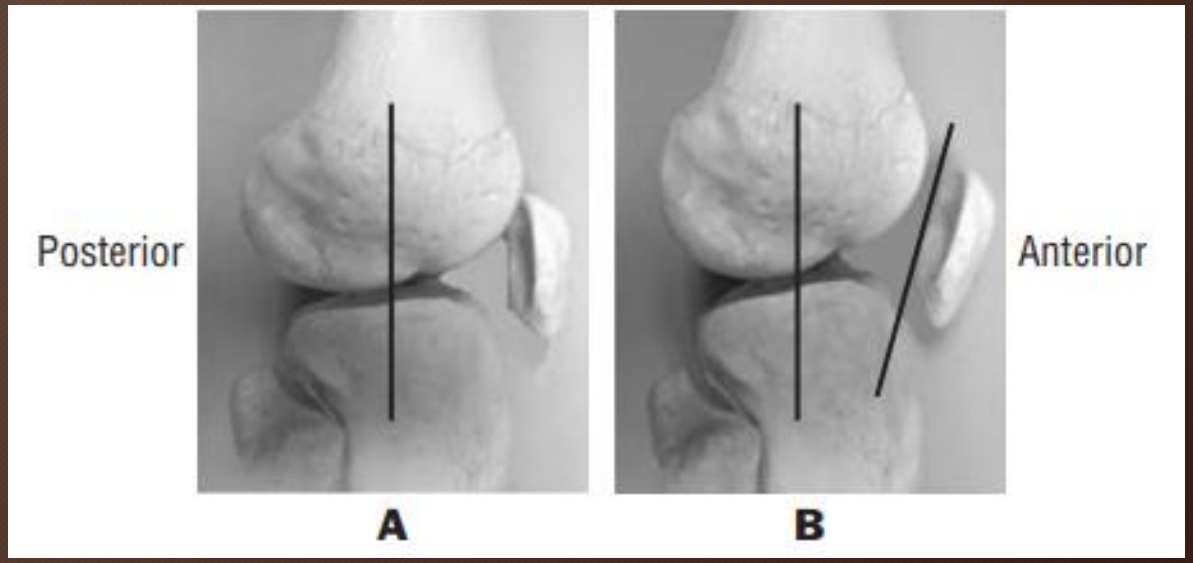
- **Rotational component.**

Rotation is identified by assessing the deviation of the longitudinal axis (a line drawn from superior pole to inferior pole) of the patella relative to the femur. The point of reference is the inferior pole. If the inferior pole is more lateral than the superior pole, a positive external rotation exists



Anteroposterior tilt component.

This must be assessed laterally to determine if a line drawn from the inferior patellar pole to the superior patellar pole is parallel to the long axis of the femur. If the inferior pole is posterior to the superior pole, the patient has a positive anteroposterior tilt component



Factors affecting lateral tracking of the patella

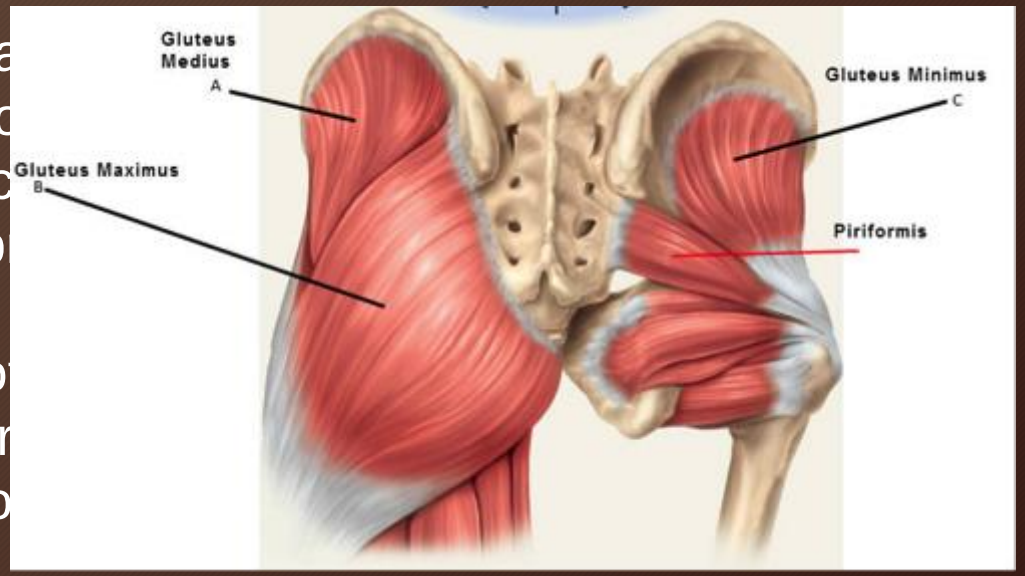
- When the quadriceps muscle contracts it pulls the patella laterally and posteriorly due to the large cross section area and force potential of the vastus lateralis. The measurement of lateral line of pull of the quadriceps relative to the patella is referred to as Q-angle.
- The Q-angle is formed by 2 lines. One line connecting from the anterior superior iliac spine to the middle of the patella and the other connecting from the middle of the patella to the tibial tuberosity. The average measurement of Q-angle is 13-15.
- Also, increased tension in the iliotibial band and lateral patellar retinacular fibers can increase lateral pull on the patella.

Factors that oppose the lateral pull of the patella by the Quadriceps

- The lateral facet of the intercondylar groove is steeper than the media facet, blocking the lateral shift of patella
- The oblique fibers of vastus medialis oblique
- Medial patellofemoral ligament

Strength of hip abductors and external rotators in PFPS

- During ambulation hip abductors and external rotator muscle group act eccentrically to control the motion of hip adduction and hip internal rotation, respectively.
- Weakness in the abductors may allow for excessive femoral adduction and this, in turn, may lead to more abducted, or valgus, position of the knee. Knee valgus is believed to increase the lateral force acting on the patella.
- Weakness of the hip external rotators may allow for excessive femoral internal rotation and this may lead to increased contact pressure between the lateral femoral condyle and the lateral facet of the patella.
- Hip external rotators and abductors are also contributing in pelvic stability and leg alignment by eccentrically controlling femoral internal rotation and influencing hip adduction during weight bearing activities.
- Weakness of these muscles may increase medial femora
  moments, or cause a gluteus medius gait. These deviatio
  adduction/abduction moments at the hip or lead to an inc
  subsequently alter tracking of the patella, increase compr
  patellofemoral joint, and ultimately lead to knee pain.
- Theoretically, weakness of the abductors and external ro
  with poor control of eccentric femoral adduction and inter
  bearing activities, leading to misalignment of patellofemo
  medially rotates underneath the patella



There is also evidence from a review done on patellar alignment and tracking in vivo, which found that when malalignment was detected on imaging, it did not necessarily mean that a successful outcome was correlational with conservative treatment. Through a radiographic examination of asymptomatic controls and those living with PFPS, it has been also found that there was no significant variation in the patellar tilt or displacement when the knee was in flexion at 35 degrees. This finding was presenting in both unloaded and loaded conditions. Changes in alignment that accompany the contraction of the quadriceps femoris muscle did not vary between symptomatic and asymptomatic knees, as determined in an axial computed tomography study

Prevalence

- Prevalence ranges from 3% to 85% for idiopathic anterior knee pain (AKP) or PFP and its associated diagnoses, with a prevalence of 25% being the most frequently cited.
- Patellofemoral pain occurs across the life span, from young children to older sedentary individuals.
- The highest prevalence of PFP appears to be observed in those between 12 and 19 years of age but may be dependent on activity level and environmental context.
- The highest percentage of PFP diagnosis in the 50-to-59-year age group. The discrepancy in prevalence related to age may be due to an environmental context, such as treatment in a sports clinic versus in a general practice office.

Rate of Recurrence of PFP

- PFP is associated with a high rate of chronicity, even after nonsurgical care.
- Followed 54 adolescent girls for 2 to 8 years after diagnosis of PFP. At an average of about 4 years after diagnosis, 94% were still experiencing some form of pain, with less than half (46%) having a decrease in pain severity.
- At a 7-year follow-up of these same individuals, there were few changes in patient-reported and performance-based functions (quadriceps strength, squatting, hopping, duck walking); however, physical signs of pain with patellar compression, Clarke's test, and crepitus during patellar compression increased from 6 months to 7 years. Finally, about a quarter of individuals developed symptoms in the contralateral knee during the 7-year follow-up.

Clinical Presentation

1. Pain:

- Patellofemoral pain is a common musculoskeletal-related condition that is characterized by insidious onset of poorly defined pain quality localized to the anterior retropatellar and/or peripatellar region of the knee.
- The onset of symptoms can be slow or acutely develop, with a worsening of pain with lower-limb loading (eg, squatting, prolonged sitting, ascending/descending stairs, jumping, or running, especially with hills).
- Pain with prolonged sitting had low to moderate diagnostic accuracy in an earlier systematic review.
- AKP produced by functional tasks such as squatting, stair climbing, and sitting with flexed knees is currently the best diagnostic indicator of PFP

2.Night pain.

Pain at night or without relation to activity may imply tumor, advanced arthritis, infection, and the like. Unrelenting pain out of proportion to the injury, hyperesthesia, and so on implies RSDS, neurogenic origin, postoperative neuroma, symptom magnification, and so on.

3. Swelling.

Perceived knee swelling with patellofemoral pain is infrequently a result of an actual effusion, but it is more commonly a result of synovitis and fat pad inflammation. Large effusions are seen after patellar dislocations, but otherwise an effusion should imply other intra-articular pathology.

4. Crepitance.

Crepitance is often a result of underlying articular cartilage damage in the patellofemoral joint, but it may result from soft tissue impingement. Many patients describe asymptomatic crepitance with stair climbing.

5. Aggravating activities.

Painful popping with hill running may indicate only plica or iliotibial band syndrome. Aggravation of symptoms by stair climbing, squatting, kneeling, or rising from sitting to standing (movie theater sign) suggests a patellofemoral articular cartilage or retinacular source (often GPPS or ELPS).

6. Instability.

Often, patients complain of the patella “giving way” during straight-ahead activities or stair climbing (versus instability owing to ACL or PCL injury, which typically is associated with giving way during pivoting or changing directions). Patellar subluxation typically lacks a history of trauma found with ACL-related instability. With frank episodes of patellar dislocation, the patella may spontaneously reduce or reduction may require pushing the patella medially and/or extending the knee. Dislocations typically are followed by a large bloody effusion (versus recurrent patellar subluxation).

2. Decreased Thigh Force Production

- people who develop PFP have weaker quadriceps, as measured by a dynamometer
- Quadriceps atrophy is also a common finding in individuals with PFP, but only when it is evaluated by imaging, not by girth or visual assessment. Quadriceps atrophy is consistent across the vastii musculature (ie, not isolated to the vastus medialis oblique musculature).

3. Decreased Hip Force Production People with PFP have weakness of the hip abductors, extensors, and external rotators.

Risk factors

1. Demographics:

- Female
- adolescents with lower BMI had greater quadriceps strength and reported more bilateral PFP symptoms compared to adults.

2. Local Factors:

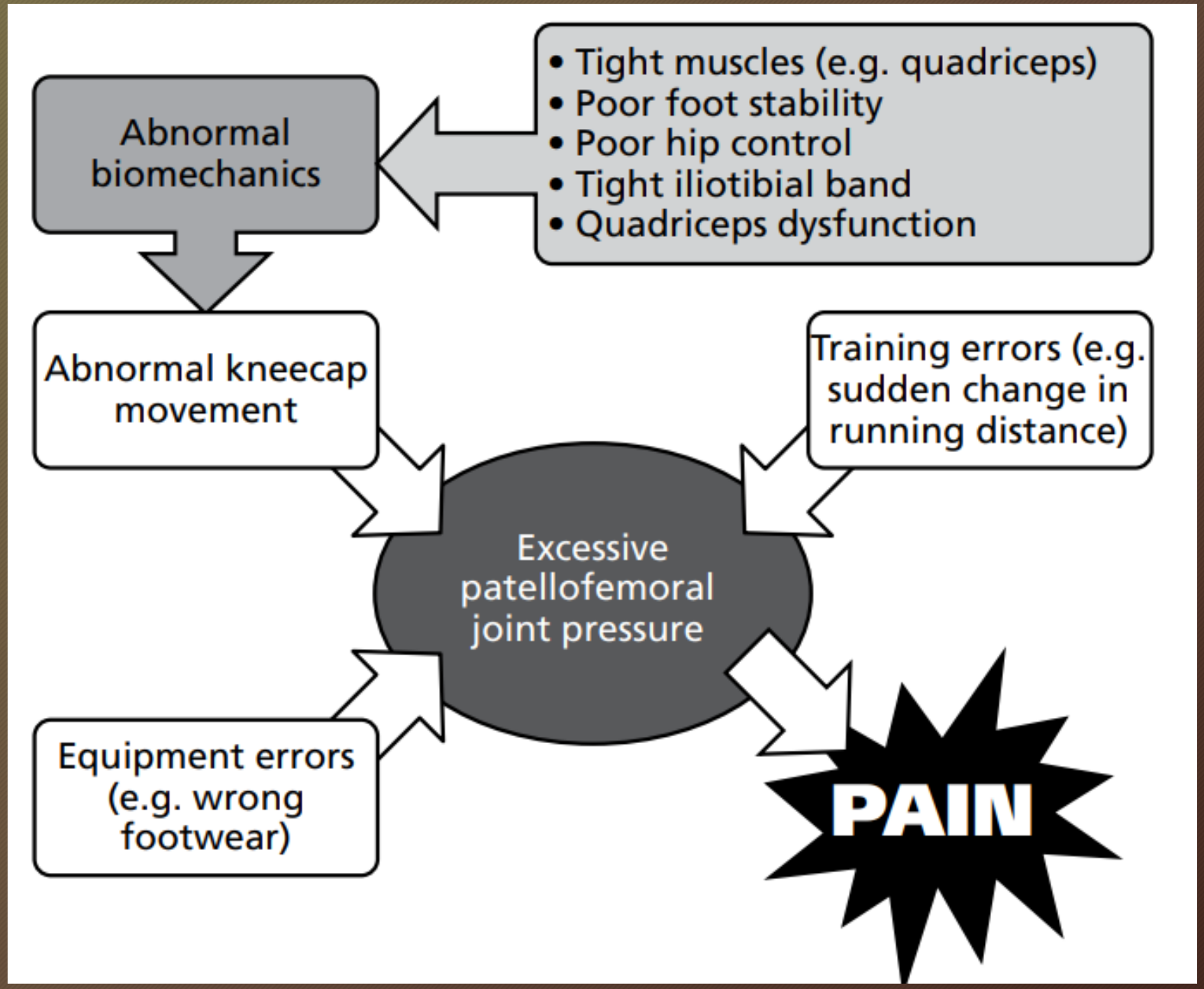
- Low knee extension isometric strength was predictive of the development of PFP
- decreased quadriceps flexibility, shorter reflex response time of the vastus medialis oblique muscle, reduction of vertical jump height, and higher than normal medial patellar mobility with occurrence of PFP.

3. Muscle Strength:

- male military recruits developed PFP after a strenuous military training program (8-12 h/d for 6 weeks).
- Recruits who developed PFP were shorter in height or had lower knee extensor strength compared to those who did not develop PFP.

4. Patellofemoral characteristic:

- participants with PFP had distances between the tibial tubercle and the trochlear groove greater than 15 mm


Abnormal biomechanics
• Tight muscles (e.g. quadriceps)
• Poor foot stability
• Poor hip control
• Tight iliotibial band
• Quadriceps dysfunction
Abnormal kneecap movement
Training errors (e.g. sudden change in running distance)
Excessive patellofemoral joint pressure
Equipment errors (e.g. wrong footwear)
PAIN

5. Proximal Factors:

- **Trunk and hip mechanics** and impairments have been implicated as factors in the development and persistence of PFP
- there is moderate to strong evidence that no association exists between lower isometric strength of the hip abductors, extensors, external rotators, or internal rotators and the risk of developing PFP
- a lower risk for development of PFP in runners with higher eccentric hip abductor strength
- high school runners with the weakest hip abductor strength had a higher incidence of PFP
- deficits in isometric hip abduction, extension, external rotation, and flexion in people with PFP

6. Distal Factors

- Arch height index was not associated with PFP.
- no association between foot alignment (pes cavus or pes planus) and PFP.
- Gastrocnemius tightness was reported in patients with PFP
- slower rate of time to peak rearfoot eversion and a greater amount of rearfoot eversion at initial heel contact during walking were characteristic of patients with PFP. Patients with PFP exhibited less rearfoot eversion motion during running
- no relationship between pronated foot posture and an increased risk of the development of PFP.
- Navicular drop, measured as a continuous variable, was a risk factor for developing PFP
- 2 Greater lateral COP displacement and lower maximal displacement velocity of me-diolateral COP during midstance of walking were demonstrated in people who developed PFP. During running, higher rates of time to peak force in the lateral heel and peak force in the central metatarsal regions were demonstrated in people who developed PFP.

7. Psychological factors:

They reported that mental health (anxiety, depression), cognitive factors (pain catastrophizing), and behavioral factors (fear of movement) may be elevated in participants with PFP, and are likely associated with higher pain and lower function.

Examination

Diagnosis of PFP

- Retropatellar or peripatellar pain
- Reproduction of retropatellar or peripatellar pain with squatting, stair climbing, prolonged sitting, or other functional activities loading the PFJ in a flexed position
- Positive patellar tilt test
- Exclusion of all other possible sources of anterior knee pain

Local Palpation

Palpation also reveals any tenderness that may be present in the soft tissues around the knee. Tenderness along the medial retinacular structures may be the result of injury occurring with patellar dislocation. As the patella dislocates laterally, the medial retinaculum has to tear to allow the lateral displacement of the patella. Lateral pain may be secondary to inflammation in lateral restraints, including the iliotibial band. Joint-line tenderness typically indicates an underlying meniscal tear. Tenderness resulting from tendinitis or apophysitis in the quadriceps or patellar tendon will typically present with distinctly localized point tenderness at the area of involvement. Snapping or painful plicae may be felt, typically along the medial patellar border

Range of Motion (Hip, Knee, and Ankle)

ROM testing should include not only the knee but also the hip, ankle, and subtalar joints. Pathology in the hip may present as referred knee pain, and abnormal mechanics in the foot and ankle can lead to increased stresses in the soft tissue structures of the knee that may present as pain. While ranging the knee, the presence of crepitation and patellar tracking should be assessed. Palpable crepitus may or may not be painful and may or may not indicate significant underlying pathology, although it should raise the suspicion of articular cartilage injury or soft tissue impingement.

- Activity Limitations: Physical Performance Measures
  - Clinicians should administer appropriate clinical or field tests that reproduce anterior knee pain and assess lower limb movement coordination, such as squatting, step-downs, and the SLS. These tests can assess a patient's baseline status relative to pain, function, and disability; global knee function; and changes in the patient's status throughout the course of treatment

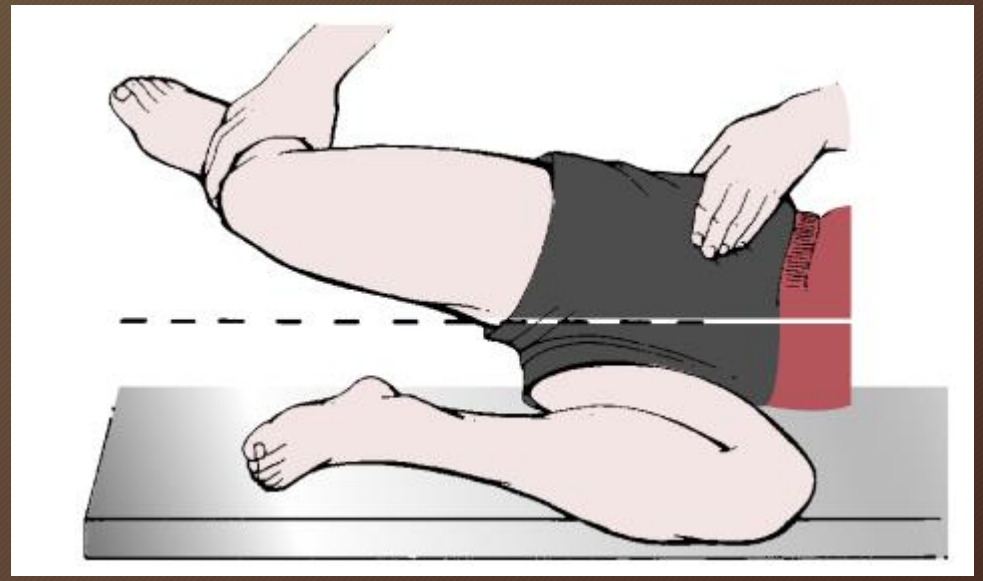
- Physical impairment measures: When evaluating a patient with PFP over an episode of care, clinicians may assess body structure and function, including measures of patellar provocation, patellar mobility, foot position, hip and thigh muscle strength, and muscle length.
  - Patellar Provocation Tests
  - Foot Position Tests
  - Muscle Strength Tests

Flexibility of the Lower Extremity

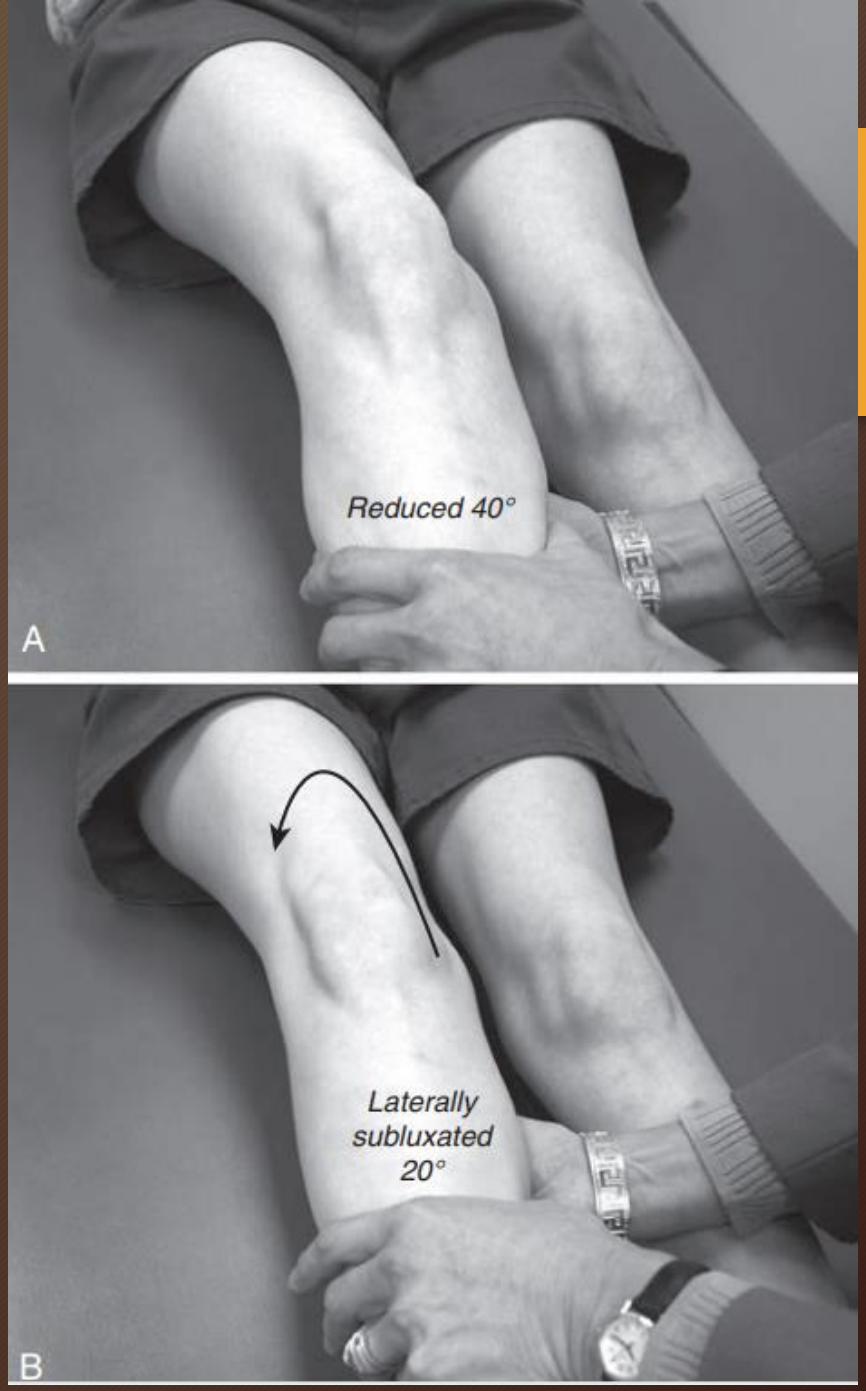
Flexibility of the lower extremity must be evaluated. Quadriceps, hamstring, or IT band tightness may all contribute to patellofemoral symptoms. Quadriceps flexibility may be tested with the patient in a prone or lateral position. The hip is extended and the knee progressively flexed. Limitation of knee flexion or compensatory hip flexion is indicative of quadriceps tightness. Hamstring flexibility should also be tested.

The patellar grind or compression test

Ober test

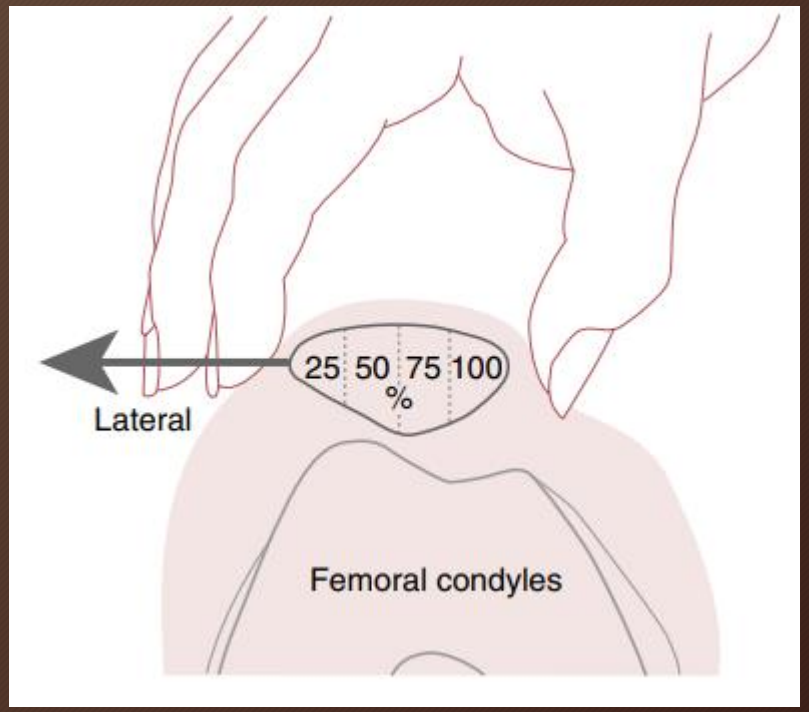


J-Sign

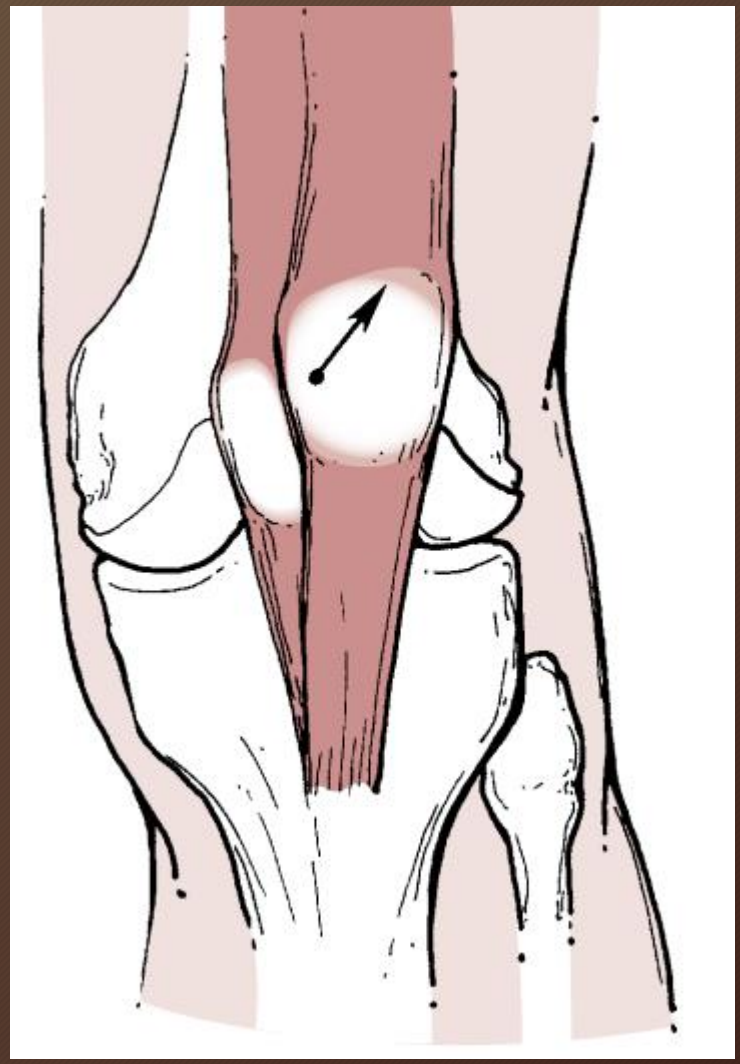


Patellar Glide Test

The patellar glide test is useful to assess the medial and lateral patellar restraints. In full extension, the patella lies above the trochlear groove and should be freely mobile both medially and laterally. As the knee is flexed to 20 degrees, the patella should center in the trochlear groove, providing both bony and soft tissue stability



Lateral Pull Test/Sign



Differential Diagnosis

1. Medical Differential Diagnosis

The following medical conditions, although not intended to be a comprehensive list, should be in the clinician's differential diagnosis for knee pain and require referral to another health care practitioner:

- Tumors
- Dislocation
- Septic arthritis
- Arthrofibrosis
- Deep vein thrombosis
- Neurovascular compromise
- Fracture (local and/or at the hip)
- Slipped capital femoral epiphysis in children or adolescents

2. Musculoskeletal Differential Diagnosis

- Following exclusion of medical conditions that require referral of the patient to a physician, the clinician must rule out other musculoskeletal conditions that may cause AKP. These conditions are appropriate for physical therapy but may require a plan of care that is different from that for the treatment of PFP. The differential diagnosis should consider conditions that are distant but may refer pain to the knee, for example, lumbar radiculopathy, peripheral nerve entrapment, or hip OA.
- The lumbar spine may refer pain to the anterior thigh and knee. Clinicians should perform a lower-quarter screen as part of the examination of a patient with suspected PFP, including examination of the lumbar spine and sacroiliac joint regions. Clinicians should refer to the low back pain CPG published by the Academy of Orthopaedic Physical Therapy, APTA, Inc for guidance on screening for the presence of referred pain from the low back

- Hip OA has been reported to present with a primary complaint of knee pain. Clinicians should refer to the hip pain and mobility deficits—hip OA CPG published by the Academy of Orthopaedic Physical Therapy, APTA, Inc for guidance on the examination procedures and symptoms to determine the presence of hip OA
- The differential diagnosis should also consider conditions local to the knee, for example, ligamentous (cruciate and collateral) injuries, meniscus injuries, articular cartilage injuries, OA, distal iliotibial band syndrome (ITBS), quadriceps and patellar tendinopathies, plica syndrome, patellar (Sinding Larsen-Johansson lesion) and tibial (Osgood-Schlatter lesion) apophysitis, and patellar subluxation or dislocation (instability).

2. Screening for Psychological Factors

Clinicians should screen for the presence of psychological issues that may require referral to a health care practitioner in addition to physical therapy, for example, a clinical psychologist. Psychological factors including pain catastrophizing, kinesiophobia, fear avoidance, anxiety, and depression are considered yellow flags that may affect prognosis and rehabilitation treatment decision making. In addition to potential referral, patients with PFP who exhibit psychological factors may require the therapist to employ specific patient education strategies to optimize outcomes from physical therapy interventions, for example, cognitive behavioral treatment, reassurance, and graded exposure to activity

REHABILITATIONPLAN

MANAGEMENT PLAN

The goal is to reduce pain initially and then identify and correct faulty biomechanics that may collectively contribute to her anterior knee pain.

PHASE ONE ACUTE INFLAMMATORY STAGE

GOALS: Modulate pain and begin appropriate strengthening exercises

Estimated Length of Time (ELT): Day 1 to Day 4

- Use ice and electrical stimulation (Tens) to decrease pain. If there appears to be inflammation, anti-inflammatory medications may be helpful.
- McConnell taping should be used to try to correct any patellar malalignment that may exist. The patient may need to be restricted from practice for a few days; at least reduce the amount of lower-extremity activity, which may be exacerbating her condition.

- An orthotic insert should be constructed to correct any excessive pronation during gait.
- Quadriceps strengthening should begin with isometric exercises using quad setting, short arc motions, and complete range-of-motion exercises from 90 degrees of flexion to full extension.
- None of the isometric exercises should increase her pain level; if they do, they should be eliminated and pain-free exercises should be incorporated.

PHASE TWO FIBROBLASTIC-REPAIR STAGE

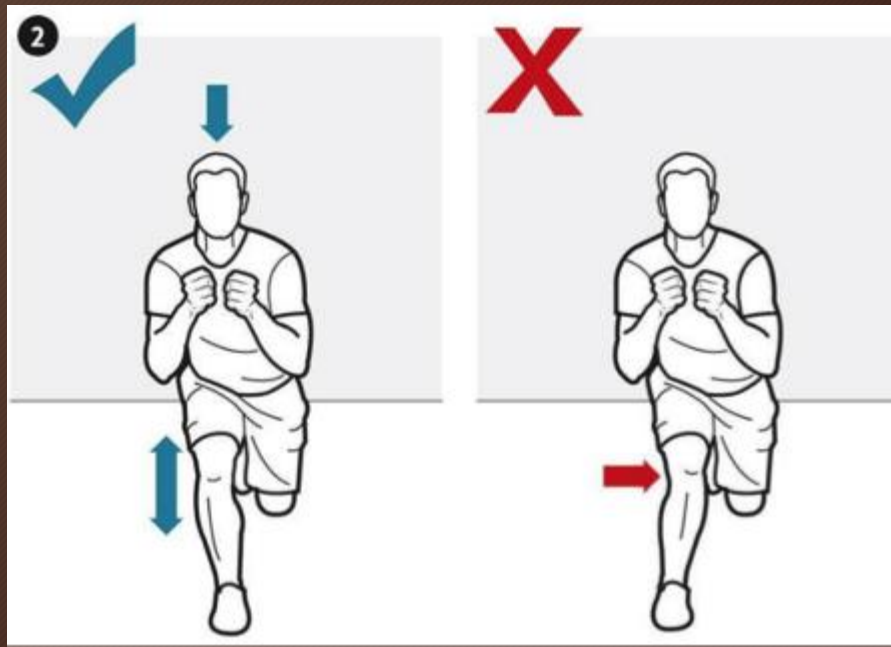
GOALS: Increase VMO strength and improve hamstring flexibility

Estimated Length of Time (ELT): Days 5 to 14

- Ice and electrical stimulation may be continued.
- McConnell taping technique should also be continued with day-to-day reassessment of its effectiveness.
- Biofeedback may help the patient learn to contract the VMO better.
- The effectiveness of the orthotic should be reassessed, and appropriate correction adjustments should be made.

- Aggressive hamstring-stretching, Iliopsoas (hip flexors), Tensor fascia lata, Gastrocnemius exercises should be used.

- Quadriceps strengthening should concentrate on VMO activation and progress from isometrics to full-range isotonics as soon as full-range-of-motion resisted exercise no longer causes pain.
- Closed-kinetic-chain exercises, particularly minisquats and step-ups, should be recommended.



- Functional activities that emphasize core stability (thigh, trunk, and hip musculature) should be emphasized once pain-free activities are conducted.

- The patient may resume practice, but activities that seem to increase pain should be modified or replaced with alternative activities.

- Fitness levels must be maintained using stationary cycling, aquatic exercises, or other nonballistic types of aerobic exercise that do not increase knee pain.

PHASE THREE MATURATION-REMODELING STAGE

GOALS: Complete elimination of pain and full return to activity

Estimated Length of Time (ELT): Week 3 to Full Return

- The patient should be gradually weaned from McConnell taping. It may be helpful for the patient to wear a neoprene sleeve during activity for joint warming and psychological support.
- The patient should be observed and monitored closely prior to full return to play, to evaluate any biomechanical deformities in technique that may contribute to her knee pain.
- The patient must continue her strengthening and flexibility routine, taking into consideration any practice or game demands that may impose too much of an overload.
- The patient should now be fully accustomed to the orthotic insert.

- plyometric exercise

CRITERIA FOR RETURNING TO sport

1. Pain is eliminated in squatting and in ascending or descending stairs.
2. There is good hamstring flexibility.
3. Quadriceps strength is good, especially the VMO.
4. Core stability (thigh, trunk, and hip musculature) strength is good.
5. Biomechanical gait techniques are good.
6. The patient feels ready to return to play and has regained confidence in the injured knee.

Prognosis

- Patients may gradually return to sport or activity over a period of 4-6 weeks
  - Increase activity as symptoms are decreased
- Exercises should be continued at home to prevent regression or return of symptoms
- Unfortunately, about 40% of patients with patellofemoral pain syndrome may have long-term symptoms (>12 months)
  - However, research does not clarify if these recurrent symptoms are constant, intermittent, or seldom
  - Greater chance of recovery sooner if treatment is started soon after initial symptoms are experienced
  - Better prognosis if symptoms are not as severe by the time treatment is initiated
- Key is for early intervention when symptoms are noticed and preventative measures in populations susceptible to PFPS

Thank you