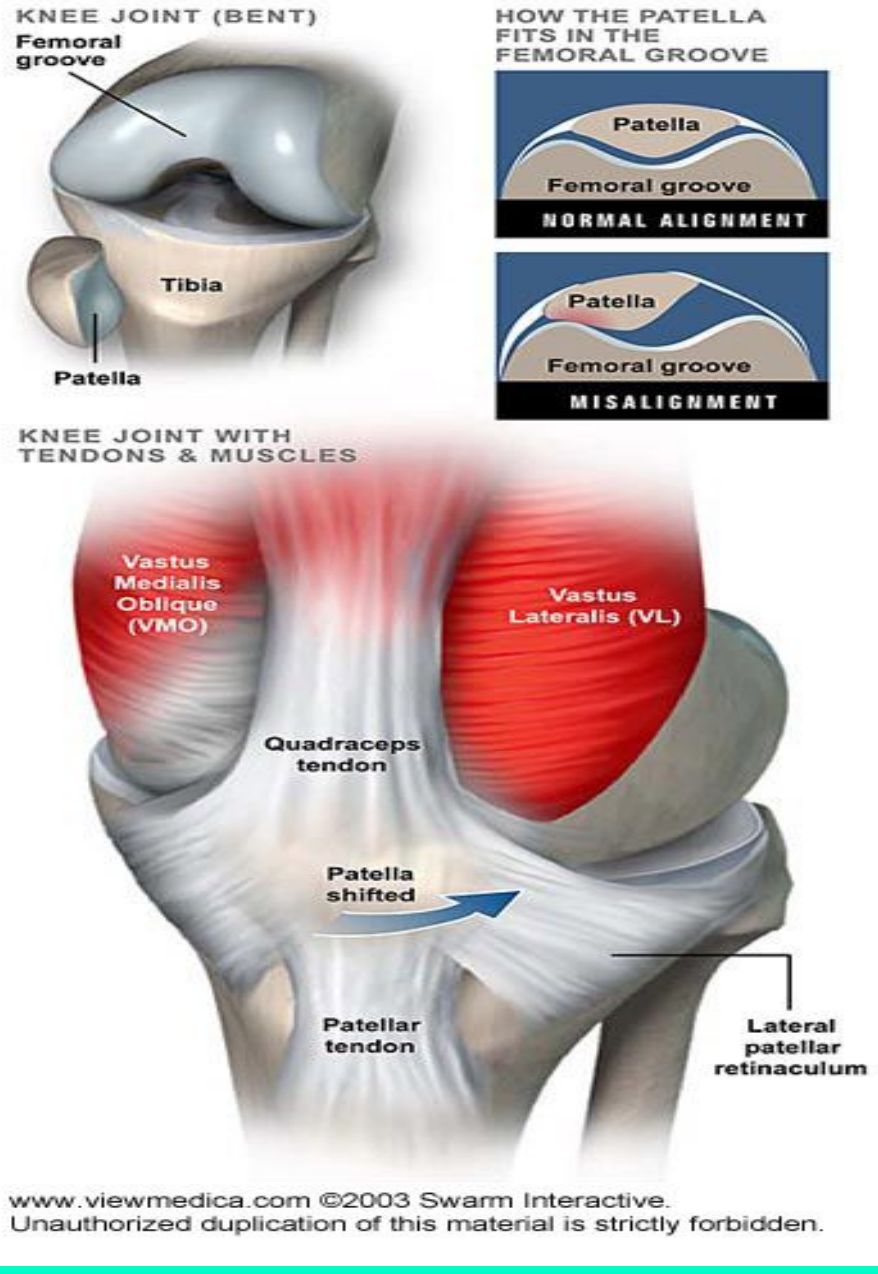
The Knee
Pg. 769



Exercise Guidelines for Knee Instabilities

Biomechanical faults and neuromuscular imbalances in the trunk and lower extremities need to be improved.

Restore muscle length and strength with concentric and eccentric foot, calf, thigh and gluteal work. Ensure that Vastus Medialis is firing properly to ensure that the patella is tracking during knee motion in both weight-bearing and non-weight bearing activities.

Training Dynamic Stability:

To train dynamic stability and help prevent or recover from ligament injuries, neuromuscular control must be repetitively challenged.

Training programs utilizing an unstable base of support have had considerable success at returning athletes with anterior cruciate ligament deficiencies to high level activities. It is also important to train proper landing techniques if required.

Variables of predictability, direction, speed and intensity should be introduced into the training program for extra dynamic challenge when the knee is ready for it.

Wobble Board Squats

Exercises on an unstable surface can help re-educate the reflex response of nerves and muscles, helping to establish or re-establish normal proprioceptive and neuromuscular response to stimuli.

Agility Training

Agility training, with special attention to sport specific movements is important for improving knee dynamic stability. Bosu balls, stability balls, foam pads or rotational disks all have an unstable base of support and therefore require dynamic stability of the lower extremities. Drills using an unstable base of support should start at 50% effort and build towards greater effort.

Anyone with ligamentous insufficiency should wear a knee brace while performing these types of advanced exercises.

Clients with ligamentous knee injuries should avoid postures that strain the knee area, such as

Single Leg Squats on a cushion

Something as simple as a cushion can be used as an unstable surface if a bosu
or wobble board is unavailable to a client. They can also purchase thick pieces of foam from fabric or upholstery stores to use. In that case, they may also need a wooden board on top so they don’t sink in.

Ligamentous Sprain Grades 1-3

- Often occur from a fall, blow or sudden start/stop
- Severe sprains may require bracing or surgery
- Follow principles of tissue healing and rehabilitation and any medical recommendations

Anterior Cruciate Ligament Tears

- Physiotherapy treatments likely required to control symptoms
- Emphasize neutral control
- Adding resistance should progress as able and according to medical advice
- Emphasize heel slides, hip & knee flexion in supine and standing as able.

Anterior Cruciate Ligament (ACL) Injury Rehabilitation Exercises

Heel slide

Quad Sets

Passive knee extension

Wall squat with a ball

Balance and reach exercise A

Balance and reach exercise B

Straight leg raise

Knee stabilization: A

Knee stabilization: B

Knee stabilization: C

Knee stabilization: D

Resisted terminal knee extension

Posterior Cruciate Tears

- Usually occur from hyperextension injuries
- Generally managed conservatively by medical professionals
- Exercises should address quadriceps strengthening

Posterior Cruciate Ligament Sprain Rehabilitation Exercises

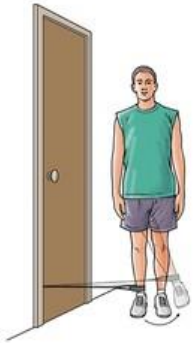
Quad sets

Seated quad sets

Knee stabilization: A

Knee stabilization: B

Knee stabilization: C



Knee stabilization: D

Straight leg raise

Wall squat with a ball

Step-up

Collateral Ligament Tears

- Managed conservatively
- Within first 3 months, knee may need to be wrapped or braced depending on severity
- Focus on maintaining neutral control of knee through knee and body movements, as the joint will have lost medial or lateral stability, depending on the collateral ligament that is damaged

Medial/Lateral Collateral Ligament Rehabilitation Exercises

Passive knee extension

Heel slide

Straight leg raise

Clam exercise

Prone hip extension

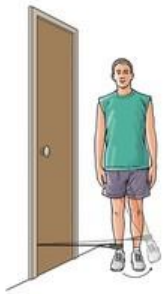
Wall squat

Step-up

Knee stabilization: A

Knee stabilization: B

Knee stabilization: C



Knee stabilization: D

Meniscal Tears

- May or may not require arthroscopic surgery
- Knee needs to be rehabilitated to full function before returning to intense activity
- Follow normal rehabilitation guidelines and increase tolerance to weightbearing

- How a meniscal tear is treated is dependent on the severity of the tear. In terms of exercises, work within medical advice and focus on strengthening the quads, the hamstrings, calves and hips. Exercises should only be done if they can be done relatively pain-free
- The list below contains specific exercises that are helpful in recovering from meniscal tears:

    - Heel Slides
    - Straight Leg raises supine
    - Prone Leg extension
    - Hamstring curls
    - Bridging
    - Standing Knee bends or Wall Slides

Patellofemoral Pains

- Most often due to biomechanical abnormalities, overuse or growth changes
- Patella excursion, (path of the kneecap in flexing and extending,) is controlled by the quadricep muscle group, particularly by vastus medialis and vastus lateralis. Some research has surmised the vastus medialis needs to fire earlier to overcome the abnormal tracking pattern.

Patellofemoral Pains

- Abnormal foot biomechanics should be corrected
- Tightness in lateral retinaculum needs to be stretched. Since it is difficult to target this area, you can get a secondary stretch by focusing on stretching quadriceps, hamstrings and ITB.
- The **lateral retinaculum** is the fibrous tissue on the **lateral** side of the patella. The kneecap has both a medial and a **lateral retinaculum**, and these help to support the kneecap in its position in relation to the femur bone underneath it.

Patellofemoral Pains

- All muscle imbalances need to be corrected
- Strength & coordination of vasti muscles should be assessed in weightbearing to see its true function
- Restore hip flexibility, as restrictions in hip impair control of posterior fibers of gluteus medius to stabilize the lateral pelvis & control external hip rotation, which directly affects the patello-femoral joint.
- Vastus medialis coordination can be improved using closed chain exercises

Patellofemoral Pains

- When attempting to increase range of motion and strength, mechanics of tibio-femoral joint and patello-femoral joints must be respected
- Heavy resistance against quads in open chain or with knees at greater than 30 degrees of flexion should be avoided to prevent compressive forces to patellar cartilage until healing is complete.
- Muscle training is specific to limb positioning
- Add weightbearing exercises slowly as tolerated and with pelvic control

Patello-Femoral Instability

- A lateral instability that allows the patella to slip laterally in certain movements.
- May require bracing or even crutches if severe
- Treatment and exercise is similar to those for patellofemoral pains.

Patellar subluxation

-Resulting from lateral instability

Patellar Tendinopathy

- Anterior knee pain aggravated by jumping, hopping, leaping or bounding activities. (Also known as Jumper's knee.)
- All biomechanical problems and muscle imbalances in pelvis and lower extremities need to be addressed.
- Common to find calf weakness and quadricep and/or hamstring tightness
- There may be increased neural tension that needs to be relieved

Patellar Tendinopathy

- The calf muscle must be able to accept the load when landing a jump. Ensure your client is doing a forefoot landing, as opposed to a flat foot landing as this reduces ground reaction forces substantially.
- Graduate to single leg exercises eventually to avoid unloading forces on to the unaffected tendon when working the legs bilaterally
- Progress load, speed and height only after a lengthy rehabilitation period

Quadriceps Tendinopathy

- Pain occurs on quadriceps tendon where it attaches to the patella
- There will be pain and tenderness on resisted quadricep contraction
- Approach to recovery is similar to patellar tendinopathy

Knee Bursitis

- Most commonly affected is prepatellar bursa (housemaid's knee)
- Superficial swelling of anterior aspect of knee
- Correct all abnormal biomechanics, muscle imbalances and reduce training that may make it worse
- Avoid kneeling or forceful weightbearing activities such as running or walking/standing for long periods
- Focus on lateral hip stabilizer strengthening

Osteoarthritis

- Generally seen in 50+ population
- May have history of acute ligament injury that predisposed knee to OA due to cartilage damage causing bone to rub on bone
- Pain, muscle weakness and joint limitations increase over time
- Modify activities to decrease stress on joint, ie. Reduce amount of stair climbing, avoid sitting in low chairs

Osteoarthritis

- As a rule, avoid any and all kneeling exercises
- Mobilize the knee to 90 degrees flexion before proceeding to resistance exercises
- Strengthen hamstrings and quadriceps
- Client may be required to lose weight to reduce forces on the knee joint

ITB Friction Syndrome

- Causes pain in lateral knee with repeated flexion and extension, as in running where ITB rubs against lateral epicondyle of the femur
- Pain, aching, swelling on the lateral aspect of the knee and popping may occur
- Vastus lateralis may be overdeveloped, placing increase load on the ITB
- Excessive pronation causes internal rotation of tibia, which places stress on the ITB

ITB Friction Syndrome

- Release ITB with foam rolling
- Stretch shortened TFL and gluteus maximus

Exercise techniques to increase flexibility and ROM

Increase knee extension

Page 830

PNF stretching techniques

Gravity-assisted passive stretching techniques

- Prone hang
- Supine heel prop

Self-stretching technique

Increase knee flexion

Page 831

PNF stretching techniques

Gravity-assisted passive stretching technique

Self-stretching techniques

- Gravity-assisted supine wall slides
- Self-stretching with uninvolved leg
- Rocking forward on a step
- Sitting

Increase mobility of the ITB at the knee

Page 832

Foam roller fascial release

Exercises to develop and improve muscle performance and functional control

Open-chain exercises

Page 833

To develop control and strength of knee extension (quadriceps femoris)

- Quadriceps setting (quad sets)
- Straight leg raise
- straight -leg lowering
- Multiple-angle isometric exercises
- Short-arc terminal knee extension
- Full-arc extension

Cont…. Page 835

To develop control and strength of knee flexion (hamstrings)

- Hamstring setting (hamstring sets)
- Multiple-angle isometric exercises
- Hamstring curls

Closed-chain exercises

Page 836

Closed-chain isometric exercises

- Setting exercises for co-contraction
- Alternating isometrics and rhythmic stabilization
- Closed-chain isometrics against elastic resistance

Cont... page 837

Closed-chain dynamic exercises

- Scooting on a wheeled stool
- Unilateral closed-chain terminal knee extension
- Partial squats, minisquats, and short-arc training
- Standing wall slides
- Forward, backward, and lateral step-ups and step-downs
- Partial and full lunges

Independent learning activities pg 840 due next class

References

- http://www.health.harvard.edu
- http://www.physioworks.com.au
- Injuries & Special Populations Support Material. Toronto: Merrithew Corp., 2009
- Dawson, Anne. Injuries and Special Populations Resource Guide. Toronto: Merrithew Corp., 2003.