

Patella Instability in Children and Adolescents

Description

- Patella Instability is an injury to the kneecap (patella) affecting the joint it forms with the thigh bone (femur)
- Patella Instability can occur as a subluxation or a complete joint dislocation which is a dissociation of the knee cap from the thigh bone
- The patella is a triangular shaped bone that sits in a V-shaped groove (called a trochlea) made by the two bony mounds (condyles) of the femur (thigh bone).
- The patella is connected on top by the quadriceps (front thigh muscle) and below by a tendon that connects to the tibia (shin bone) as well as being supported by various ligamentous structures mainly the medial patellofemoral ligament which is the main restraint to instability (MPFL)

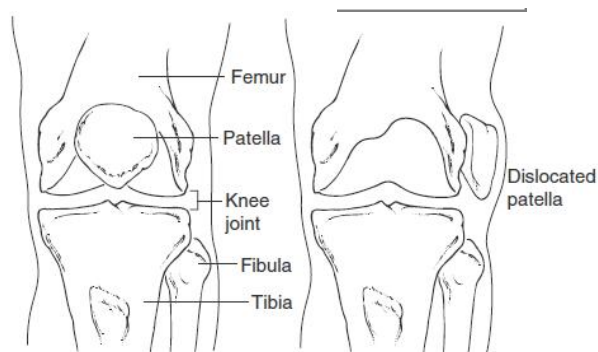
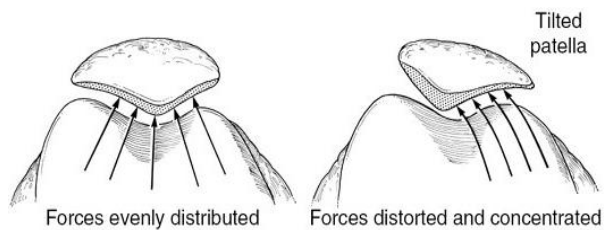
Risk Factors

- Tight and/or weak muscles, particularly the quadriceps, hamstrings, hips and core
- Having a condition referred to as hyper laxity where the ligaments stabilizing the joints are looser than typical
- Poor warm-up drills before practice or competition
- Sports that involve running, jumping, or squatting
- Skeletal misalignment/Abnormal leg alignment such as knock knees, a poorly formed trochlea, flat feet, etc
- Prior injury to the knee

Causes

- Although some cases of patella instability occur in association with direct trauma, many can occur from a non contact twisting or pivoting injury to the knee
- Patella instability usually stems from a complex array of underlying issues
- A common underlying cause of patella instability is an imbalance or weakness in the hip and quadricep muscles that results in abnormal movement of the patella on the thighbone. The inner portion of the quadricep muscle may be weaker than the outer portion resulting the patella being pulled to the outer side of the knee
- Similarly, if the individual's leg has poor alignment, this can also cause the patella to move abnormally
- This imbalance results in over-stretching of the supporting ligaments and irritation of the femur and patellar undersurface, resulting in pain

- If the support structures of the patella become very weak, the patella can subluxate or dislocate.



Signs and Symptoms

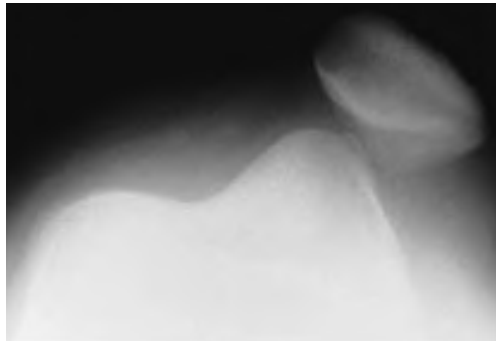
- Diffuse ache-like knee pain, although it may be concentrated in one area or sharp in nature
- Pain with jumping, squatting, or kneeling
- Apprehension and sensations that the knee will give way
- In instances of dislocation a sudden pop, crack and/or tearing sensation may be felt followed by swelling
- Swelling of the knee can range from minimal to large
- A dislocation may spontaneously reduce however there are times where the reduction has to be done by a medical professional

Prevention

- A warm up with stretches before and after practice or competition
- Maintaining appropriate muscle strength, endurance, and flexibility
- Use of proper athletic shoes, arch supports (Superfeet®), and a prophylactic patella stabilizing knee brace

Diagnosis

- The diagnosis of patella maltracking/ instability is typically made by clinical history and physical exam. X-rays are indicated and may reveal a dislocation and/or associated fracture



X-ray of a dislocated patella (knee-cap)

- An analysis of gait and muscle strength is important to evaluate bony alignment and muscle imbalance
- Advanced Imaging MRI / CT scan may be indicated to evaluate the structures of the knee to check for bony abnormalities or signs of injury and concomitant fracture

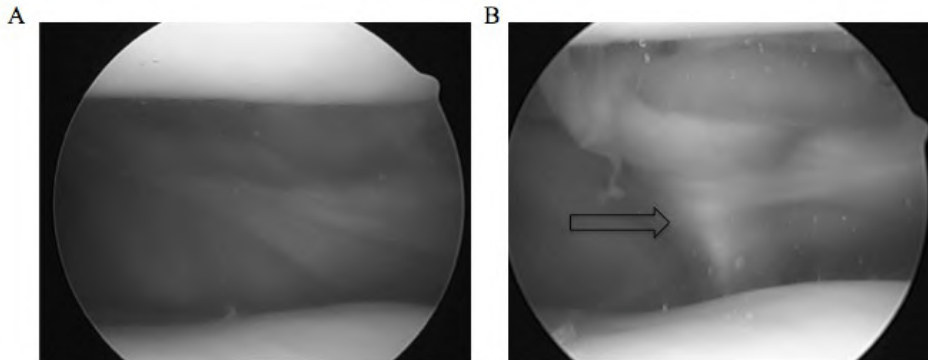
Treatment

- Following reduction of a dislocation initial treatment consists of pain medications such as nonsteroidal anti-inflammatory medications like ibuprofen or naproxen, along with ice bracing and rest
- A proper age and sport specific physical therapy program that typically will take 4-6 weeks and transitioning to a home exercise program that is performed indefinitely
- Stretching and strengthening exercises carried out at home are very important in improving this condition. These exercises can be found at the end of this document and/or discussed with a physical therapist
- Ice should be applied for 10 to 15 minutes every 2 to 3 hours to decrease pain and inflammation. The application of heat may be beneficial prior to stretching or strength training activities
- Proper shoes, arch supports, and a **neoprene patella stabilizing knee sleeve** (see figure below) are beneficial

A brace (DonJoy® Tru-Pull Lite shown) that is worn as directed on the skin not over pants will typically leave an imprint, which is a sign of good patient compliance and proper fit

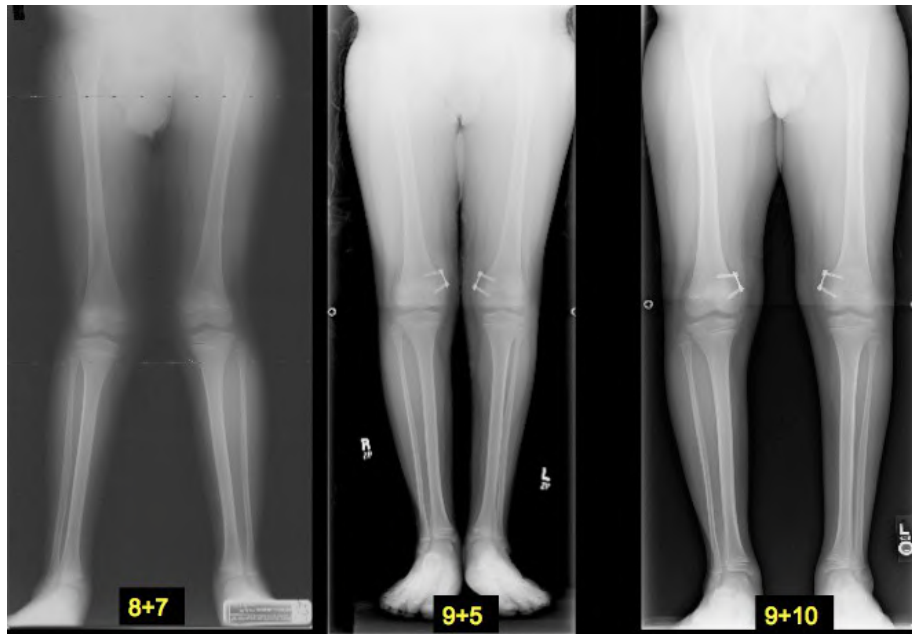


- Surgery is indicated if the individual fails to progress with adequate physical therapy and a home exercise program has multiple episodes of patella instability and/or dislocations or has a concomitant injury / fracture of the bone or cartilage.
- Surgery may entail primary repair of the injured structures or replacement/reconstruction of the torn MPFL with either autogenous hamstring tissue from the patient or allograft tissue from a donor.



Arthroscopic photos pre (A) and post (B) augmentation of the MPFL (arrow).

- Occasionally skeletal re-alignment surgery and /or repair of fractured cartilage may be indicated.



Correction of an 8 year old with genu valgum (knock knees) and patella instability corrected with a growth modulating implant to straighten the legs improving patella stability

- Please contact our office if the following develop:
 - Worsening or persistence of symptoms in 6 to 8 weeks despite adequate treatment
 - Pain, numbness, coldness, or discoloration of the foot
 - Irreducible dislocations
 - Fever, swelling, redness, or bleeding of the involved area
 - New or unexplained symptoms

Range of Motion and Stretching Exercises

These are some of the **initial** exercises you may start your rehabilitation program with until you see your physician, physical therapist, or athletic trainer again or until your symptoms are resolved. If any of these exercises causes pain or discomfort stop them and consult your physician, physical therapist, or athletic trainer. Please remember:

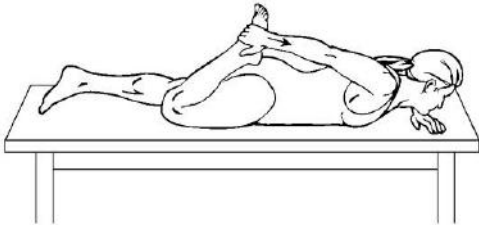
- Flexible tissue is more tolerant of the stresses placed on it during activities.
- Each stretch should be held for 20 to 30 seconds.
- A **gentle** stretching sensation should be felt.

| Prone Quadriceps Stretch (fig. 1) | |
|--|---|
| 1. | Lie on your stomach as shown. |
| 2. | Bend your knee, grasping your toes, foot, or ankle. If you are too "tight" to do this, loop a belt or towel around your ankle and grasp that. |
| 3. | Pull your heel toward your buttock until you feel a stretching sensation in the front of your thigh. |
| 4. | Keep your knees together. |
| 5. | Hold this position for 30 seconds. |

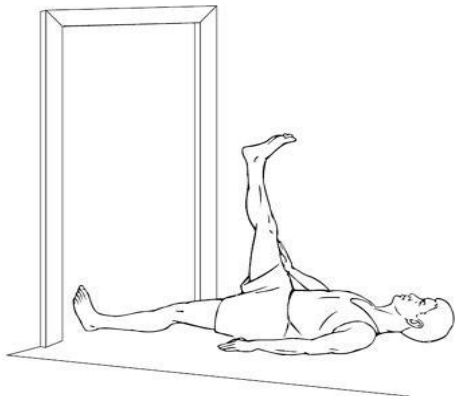
Strengthening Exercises for Patella Instability. These are some of the

initial exercises you may start your rehabilitation program with until you see your physician, physical therapist, or athletic trainer again or until your symptoms are resolved. Please remember:

- Strong muscles with good endurance tolerate stress better.
- Do the exercises as **initially** prescribed by your physician, physical therapist, or athletic trainer. Progress



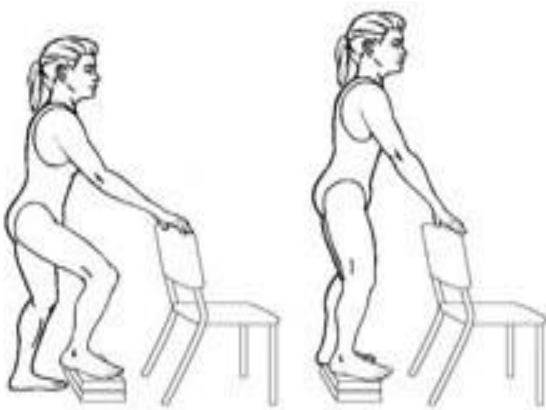
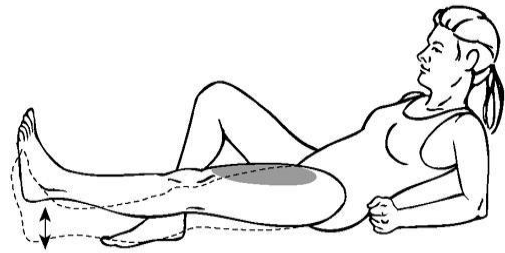
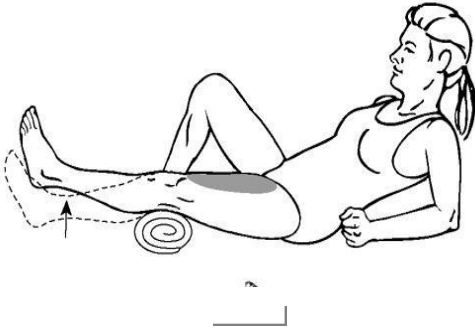
| Hamstring Ballet Stretch (fig. 2) | |
|--|--|
| 1. | Stand and prop the leg you are stretching on a chair, table, or other stable object. |
| 2. | Place both hands on the outside of the leg you are stretching. |
| 3. | Make sure that your hips/pelvis are also facing the leg you are stretching. |
| 4. | Slide your hands down the outside of your leg. |
| 5. | Lead with your chest/breast bone. Keep your chest upright and back straight. Do not hunch over at the shoulders. Keep your toes pointing up. |
| 6. | You should feel a stretch in the back of your thigh. |
| 7. | Hold this position for 30 seconds. |



| Hamstring Doorway Stretch (fig. 3) | |
|---|---|
| 1. | Lie on your back near the edge of a doorway as shown. |
| 2. | Place the leg you are stretching up the wall keeping your knee straight. |
| 3. | Your buttock should be as close to the wall as possible and the other leg should be kept flat on the floor. |
| 4. | You should feel a stretch in the back of your thigh. |
| 5. | Hold this position for 30 seconds. |
| 6. | Repeat exercise 2 times, 2 times per day. |

slowly with each exercise, gradually increasing the number of repetitions and weight used under their guidance.

- *Only do your exercises in a pain-free range of motion. If the exercises that involve bending your knees while bearing weight cause pain, stop them and consult your physician, physical therapist, or athletic trainer.*



Strengthening Exercises

| Quadriceps Wall Slide (fig. 7) | |
|---------------------------------------|---|
| 1. | Stand with your back against the wall. Your feet should be shoulder-width apart and approximately 18 to 24 inches away from the wall. Your kneecaps should be in line with the tip of your shoes or your second toe. |
| 2. | Slowly slide down the wall so that there is a ____ degree bend in your knees. <i>(Your physician, physical therapist, or athletic trainer will instruct you how to progress the amount of bend based on your symptoms and diagnosis.)</i> |
| 3. | Hold this position for 30 seconds. Stand up and rest for 30 seconds |
| 4. | Repeat exercise 3 times, 3 times per day |
| 6. | Tighten |
| 7. | Relax |
| 8. | Repeat |

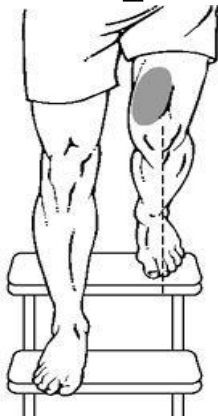


Figure 7

| Quadriceps Short Arcs (fig. 4) | |
|---------------------------------------|---|
| 1. | Lie flat or sit with your leg straight. |
| 2. | Place a ____ inch roll under your knee, |
| 3. | |
| 4. | |
| 5. | |
| | |
| | |

Figure 5

Figure 7

| Quadriceps Kneels (fig. 8) | |
|-----------------------------------|---|
| 1. | Stand on the edge of a step/stair. Make sure your kneecap is in line with your second toe. |
| 2. | Slowly step down and touch the heel of your opposite leg on the stair below you. Return to the starting position. |
| 3. | Do not go into a painful range. Stop short of the step if necessary to avoid any pain. |
| 4. | Use your stair rails for balance as needed. |
| 5. | Repeat exercise 3 times, 3 times per day. |

| Quadriceps Squats (fig. 9) | |
|-----------------------------------|--|
| 1. | Stand with your feet shoulder-width apart and place equal weight on both legs. |
| 2. | Keep your kneecaps in line with your toes. |
| 3. | Slowly bend both knees, keeping equal weight on both legs, and return to a standing position. |
| 4. | Do not bend your knees more than 90 degrees. |
| 5. | You may use the edge of a table or counter for balance if needed. |
| 6. | Repeat exercise 3 times, 3 times per day. |

