

## **Knee Pain in Children and Adolescents**

### **Description**

- Pain in the knee can occur from various causes but is usually from increased pressure on the kneecap (patella) or abnormal motion. Softening of the cartilage can occur and this is termed chondromalacia.
- The patella 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 (retinaculum)

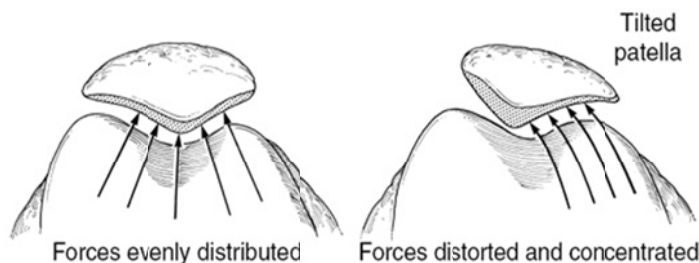


### **Risk Factors**

- Tight and/or weak muscles of the legs, particularly the quadriceps, hamstrings, or calf
- Poor warm-up drills before practice or competition
- Sports that involve running, jumping, or squatting
- Abnormal leg alignment such as knock knees, a poorly formed trochlea, flat feet, etc
- Prior injury to the knee

### **Causes**

- Although some cases of knee pain occur in association with trauma, most children do not recall an injury to the knee
- The most common cause of chondromalacia is an imbalance or weakness in the 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 worsens upon sitting for long periods, standing from a seated position, going up or down the stairs, or wearing shoes with heels
- Pain with jumping, squatting, or kneeling
- Swelling of the knee is minimal or absent

### 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, and knee pads

### Diagnosis

- The diagnosis of chondromalacia patella and/or patella maltracking is typically made by clinical history and physical exam.
- An analysis of gait and muscle strength is important to evaluate bony alignment and muscle imbalance
- The pain caused by the condition can be reproduced by pressing down on the patella and instructing the individual to contract his or her quadriceps muscles
- Radiographic imaging may be indicated to evaluate the structures of the knee to check for bony abnormalities or signs of injury

### Treatment

- Initial treatment consists of pain medications such as nonsteroidal anti-inflammatory medications like ibuprofen or naproxen, along with ice and rest
- 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 in some instances an elastic open patella knee sleeve, or patella tendon strap (see figure) are beneficial
- Surgery is only indicated if the individual fails to progress with adequate physical therapy and a home exercise program.
- 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
  - 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.

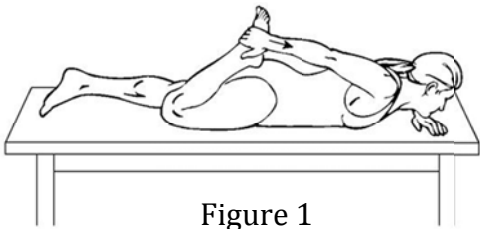


Figure 1

<b>Prone Quadriceps Stretch (fig. 1)</b>	
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 <b>30</b> seconds.
6.	Repeat exercise <b>2</b> times, <b>2</b> times per day.

<b>Hamstring Ballet Stretch (fig. 2)</b>	
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 <b>30</b> seconds.
8.	Repeat exercise <b>2</b> times, <b>2</b> times per day.

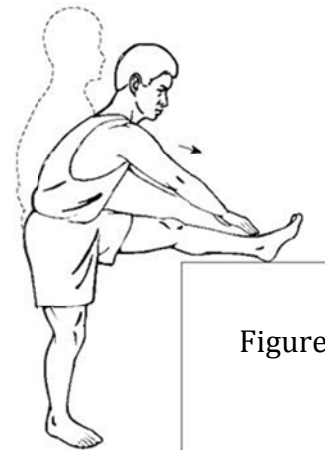


Figure 2

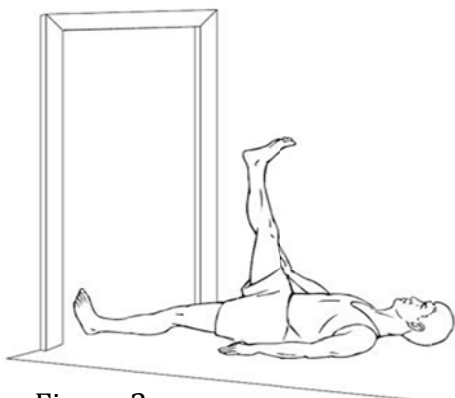


Figure 3

<b>Hamstring Doorway Stretch (fig. 3)</b>	
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 <b>30</b> seconds.
6.	Repeat exercise <b>2</b> times, <b>2</b> times per day.

**Strengthening Exercises** for Excessive Lateral Patellar Compression Syndrome. 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 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.*

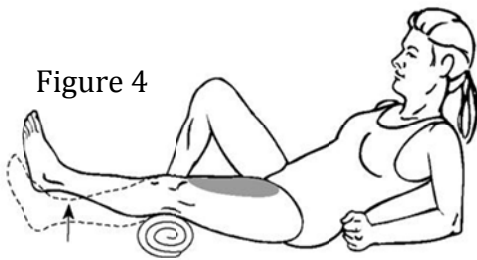


Figure 4

<b>Quadriceps Short Arcs (fig. 4)</b>	
1.	Lie flat or sit with your leg straight.
2.	Place a ____ inch roll under your knee, allowing it to bend.
3.	Tighten the muscle in the front of your knee as much as you can, and lift your heel off the floor.
4.	Hold this position for <b>30</b> seconds.
5.	Repeat exercise <b>2</b> times, <b>2</b> times per day.
<b>If okayed by your physician, physical therapist, or athletic trainer, a ____ pound weight may be placed around your ankle for additional weight.</b>	

<b>Quadriceps Leg Lift (fig. 5)</b>	
1.	Tighten the muscle in front of your thigh as much as you can, pushing the back of your knee flat against the floor.
2.	Tighten this muscle <b>harder</b> .
3.	Lift your leg/heel 4 to 6 inches off the floor.
4.	Tighten this muscle <b>harder again</b> .
5.	Lower your leg/heel back to the floor. Keep the muscle in front of your thigh as tight as possible.
6.	Tighten this muscle <b>harder again</b> .
7.	Relax.
8.	Repeat exercise <b>3</b> times, <b>2</b> times per day.

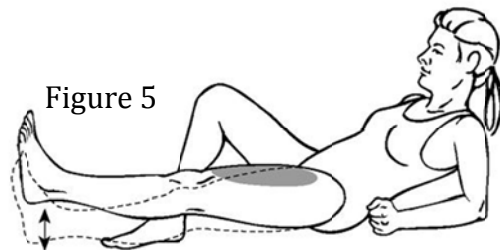


Figure 5

<b>Quadriceps Step-Up (fig. 6)</b>	
1.	Use a step or books.
2.	Place your foot on the step or books approximately <b>6</b> inches in height. <b>Make sure that your kneecap is in line with the tip of your shoe or your second toe.</b>
3.	Hold on to a handrail, chair, wall, or another object for balance if needed.
4.	Slowly step up and down. Make sure that the kneecap is always in line with the tip of your shoe or your second toe. Lightly touch the heel of the opposite leg to the floor and return to the starting position.
5.	Repeat exercise <b>10</b> times, <b>3</b> times per day.

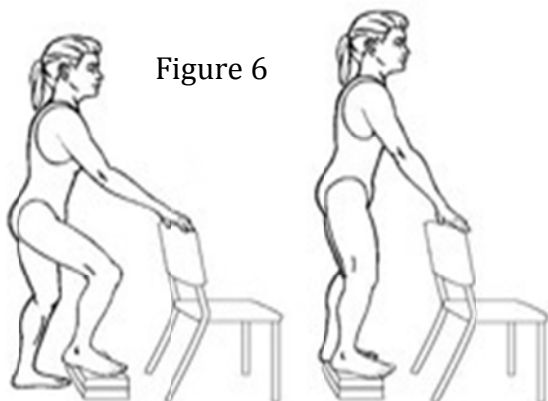


Figure 6

**Strengthening Exercises** for Excessive Lateral Patellar Compression Syndrome,  
 Continued:

<b>Quadriceps Wall Slide (fig. 7)</b>	
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 <b>30</b> seconds. Stand up and rest for <b>30</b> seconds
4.	Repeat exercise <b>3</b> times, <b>3</b> times per day.

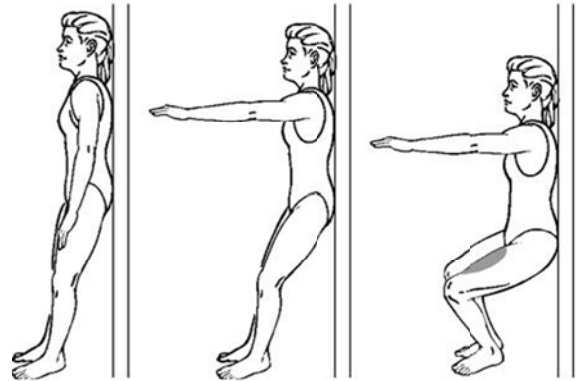


Figure 7



Figure 8

<b>Quadriceps Kneels (fig. 8)</b>	
1.	Stand on the edge of a step/stair. <b>Make sure your kneecap is in line with your second toe.</b>
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 <b>3</b> times, <b>3</b> times per day.

<b>Quadriceps Squats (fig. 9)</b>	
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 <b>equal weight</b> on both legs, and return to a standing position.
4.	<b>Do not bend your knees more than 90 degrees.</b>
5.	You may use the edge of a table or counter for balance if needed.
6.	Repeat exercise <b>3</b> times, <b>3</b> times per day.

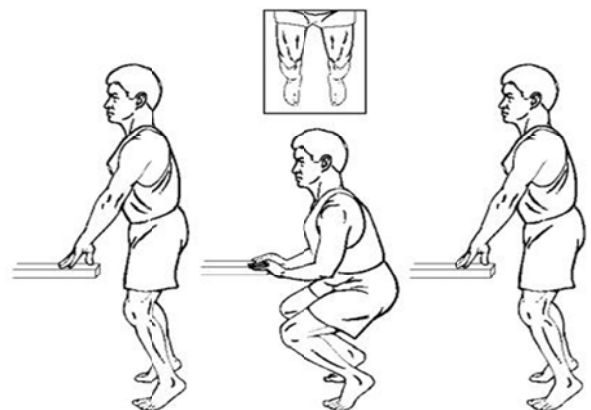


Figure 9