Anterior Knee Pain
Healthshare Information for Guided Patient Management
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What causes anterior knee pain?
Anterior knee pain means pain in the front of the knee. This can also known as “patellofemoral pain syndrome”, which involves pain in the joint between the knee cap and the thigh bone. Patellofemoral pain generally results from physical and biomechanical changes within the joint. The available research literature and most clinical experts suggest that there are multiple causes of patellofemoral pain including biomechanical, muscular and overload/overuse theories.

1. Overuse and overload
Patellofemoral pain is often classified as an overuse or overload injury which can affect both athletes and less active people. Bending the knee increases the pressure between the knee cap and its various points of contact with the thigh bone. Repeated activities which compress your knee cap such as climbing stairs, running and walking on uneven surfaces all tend to increase the pain. Sitting for long periods of time may also increase the pain due to the increased pressure at the patella when the knee is bent.
2. Biomechanical and muscular problems
Many abnormal anatomical features may contribute to patellofemoral pain. Knocked knees, abnormal twisting of the femur and flat feet can all contribute to the onset of anterior knee pain. Your knee cap, or patella, is a mobile, flat, triangular bone within the tendon of the thigh muscles known as the quadriceps. The patella glides through the middle of the groove in the thigh bone. If the thigh bone groove is flat, it may allow the knee cap to move away from the middle. This is known as “patellar mal-alignment” and this imbalance may increase the pressure between the joint surfaces and cause wear and tear. Mal-alignment can also be due to weakness and/or tightness of the muscles controlling the patella, again causing the patella to move away from the middle of the groove. Most commonly, the patella tilts and glides towards the outside of the knee joint. If the thigh bone groove is totally flat it may allow the patella to slip completely out of the joint, which is known as patellar subluxation or dislocation. This may affect your ability to straighten your knee joint. In most cases the patella will relocate itself spontaneously, but in some cases you may need to attend the A&E department to relocate the patella.

3. Plica syndrome
The synovial plica is a normal structure found in many people and is a left-over soft tissue from foetal development. Sometimes the plica can become inflamed and painful with repetitive strain, trauma, meniscal cartilage tears or loose bodies inside the knee. Plica syndrome can present with other problems such as meniscus injury, patellar tendinopathy, Osgood-Schlatter’s disease or Sinding-Larsen-Johansson disease. Common symptoms associated with plica syndrome are anterior or anteromedial knee pain which can be intermittent or episodic. It can also produce mechanical symptoms such as clicking, high-pitched snapping, giving way, a locking sensation (pseudolocking) or catching. Symptoms are generally increased by activities such as stair climbing, prolonged standing, squatting and sitting for long periods of time. X-rays and MRI scans have little or no role in identifying symptomatic plica. The main focus of non-surgical treatment is physiotherapy addressing the patellofemoral alignment as well as treating other associated problems.
4. **Patellar tendinopathy**

Tendinopathy means pathology affecting the tendon. This is a condition affecting the tendon that connects your patella to the bony prominence at the front of lower leg bone (tibia). Most commonly seen in active individuals and with sports activities. “Jumpers knee” refers to tendon changes near to the attachment over the lower end of the patella. Although this is generally considered to be a non-inflammatory condition, it can be very painful. Common symptoms include anterior knee pain, with the pain being well localised at or near the lower border of the knee cap. Treatment includes activity modification, physiotherapy and medication to control pain. Surgery is rarely indicated. Sinding-Larsen-Johansson-Syndrome is a similar patellar tendinopathy commonly seen in adolescents. Patellar tendon problems near the lower attachment to the tibia (with enlargement of the bony prominence) are known as Osgood-Schlatter’s disease.

5. **Prepatellar bursitis**

A bursa is a fluid-filled sac that acts as a cushion between the tendons and bones, usually near a joint. The prepatellar bursa is between the skin and the patella. People who spend lot of time on their knee such as plumbers, carpet layers or gardeners are prone to this condition due to repeated stress. Other causes for prepatellar bursitis include infection, direct impact injury, recurrent minor injuries, gout and inflammatory diseases such as rheumatoid arthritis. When the bursa is inflamed, it fills with fluid causing swelling at the front of your knee. Treatment includes medication including anti-inflammatory and possibly antibiotics and steroid injections. In recurrent cases with significant functional difficulties, surgery may be useful.
6. Chondromalacia patellae
This is weakening and softening of the cartilage on the underside of your kneecap. Chondromalacia is thought to be caused due to poor tracking of the kneecap on your thigh bone. However, some individuals are more prone to chondromalacia. Symptoms include vague discomfort of the inner knee and anterior knee pain associated with sitting for a long time.

What treatments are available?
Non-surgical (or conservative) management is the main option for patellofemoral pain syndrome. Surgery is rarely considered and has less favourable outcomes.

The following conservative management approaches should be tried before thinking about surgery:

| Relative rest | This involves stopping or changing the activities which make your symptoms worse. At first activities should be reduced to allow you to carry on the essential activities required for work or daily living. Stopping painful activity until the pain decreases is important. Avoid “high impact” exercises that compress the patellofemoral joint, such as running and jumping. Instead swimming or other non-impact exercise can be a good. |
| Modalities | Heat or cold therapy can be used to relieve pain. Ice is an excellent form of treatment to reduce inflammation and swelling. Ice after activity is very good as well as at regular intervals throughout the day. Make sure you do not put ice directly on the skin but wrap it in a damp tea towel. |
| Anti-inflammatory medications | If your symptoms are affecting your activities a lot, anti-inflammatory medication could help. Please discuss with a health professional or pharmacist before taking any anti-inflammatory medications if you have any other medical problems. |
| Physiotherapy | Physiotherapy can be helpful in controlling knee pain with manipulation, soft-tissue massage, taping and acupuncture. As the pain decreases the focus will be on improving strength and flexibility to prevent recurrence of your symptoms. Your exercises may be further progressed if you’re planning to return to sports or a physically demanding job. Your physiotherapist may also use specific treatment techniques to speed up your recovery. |
| Exercises | Exercises for patellofemoral pain are designed to increase strength in the quadriceps muscles, especially the inside quadriceps muscle (VMO), which is very important for control of the movement (tracking) and stability of the knee cap. Hip, calf and other leg and pelvic muscle stretching and strengthening exercises may also be important depending on the individual. Continuing with the exercise programme is essential and you should not expect overnight success. |
| Taping the knee | Taping your knee cap into position can encourage the correct movement of the knee cap on the femur. This may offer short-term pain relief in selected patients with anterior knee pain. Your physiotherapists may also teach you self-taping techniques to reduce your pain. |
Footwear

Footwear is important in managing anterior knee pain. The quality and age of footwear is more important than the make of the shoe. Gait (walking) analysis is an important part of the physiotherapy assessment for anterior knee pain and your physiotherapist may refer you on to a podiatrist if you need shoe modification or insoles. Your physiotherapist may also give you shoe supports which can improve the alignment of your lower leg.

Surgery

Surgery for anterior knee pain is considered as a last resort. If you have true Chondromalacia, key hole surgery may be beneficial to smooth out the surface of the knee cap. However, Chondromalacia may return after a period of time causing similar problems, especially if you have not had adequate exercises (physiotherapy) following surgery. Where patellofemoral pain is caused by very poor tracking of the patella to the outside of the joint, surgical lateral release may be beneficial. However, all conservative treatments should be tried before surgery.
What exercises should I do?

1. Stretching exercise
   These exercises help to improve the flexibility of the muscles around your knee, hip and ankle joints and improve the movement of the joints. Stretching exercises to the quadriceps, hamstring, calf muscles, illiotibial band and your hip muscles are important. Stretching exercises also help to improve the range of movement in your joints.

2. Strengthening exercises
   Strengthening the knee and hip muscles are vital in addressing any imbalance in your knee, hip or ankle joints.

3. Functional exercises
   These are focused on returning to your leisure, work or sporting activities.

Stage 1 exercises

- Simple exercises to improve and maintain joint, muscle and soft tissue flexibility.
- Stage 1 exercises are designed for the early stage of your condition (especially the first 2 weeks).
- These exercises should be done gradually.

Stretching exercises

**Hamstrings stretch - Lying**

Lie on your back with one knee bent and the other straight. Slowly raise your knee towards the ceiling until your knee is in a straight line with your hip at a right angle (i.e. 90° to your body).

Clasp your hands behind your knee, straighten the knee and slowly pull your foot downwards.

You should feel the stretch over the back of the leg.

Hold this position for 20 seconds x 5 reps. Repeat 3 times a day.

**Buttocks stretch**

Lie on your back with your right ankle resting on your left knee.

Using your hands, gently pull your left leg towards your chest.

You should feel a stretch in the upper back part of your right leg. Using a towel can help to reach your leg.

Hold this position for 20 seconds x 5 reps.

Repeat 3 times a day.

**Calf stretch**

Lean against the wall keeping your hands flat and keep one foot closer to the wall with your knee bent and the other knee behind with your knee straight.

Now slowly lean towards the wall by bending your elbows and your front knee.

Keep your spine and the back knee straight. Keep your feet straight and flat on the floor.

You should feel the stretch in your calf muscle.

Hold this position for 20 seconds x 5 reps. Repeat 3 times a day.

**Calf stretch 2 (Soleus)**

Keep your hands on the wall and gently lean against the wall.

Keep the back leg slightly bent, with the heel on the floor and foot pointing in a straight line to the wall.

Lean into the wall until a stretch is felt in the lower calf.

Hold this position for 20 seconds.

Repeat 5 times every 2 hours during the day.
**Stretching exercises/continued**

### Quadriceps stretch - Lying
To stretch the right leg lie on the left side. Slowly bend the top leg towards your buttock and pull the leg further with your hand or with a towel wrapped around the ankle. You should feel the stretch at the front of your knee. Remember to keep your hip joint straight. Hold this position for 20 seconds x 5 reps. Repeat 3 times a day.

### Quadriceps stretch - Standing
Stand on one leg next to the wall with one hand supporting you against the wall. Slowly bend the leg to be stretched towards your buttock and pull the leg further by holding your ankle with your hand. You should feel the stretch at the front of your knee. Remember to keep your hip joint straight. Hold this position for 20 seconds x 5 reps. Repeat 3 times a day.

### Hamstring stretch - Standing
Stand on one leg with the affected leg on top of a chair or stool. Keep your back straight and gently lean forward while pulling your toe towards you. Hold this position for 20 seconds x 5. Repeat 3 times a day.

### Illiotibial band stretch
Stand upright with the leg being stretched behind the other leg. Push your hips out towards the side of the leg being stretched. Now slowly bend your body to the opposite direction. Hold this position for 20 seconds x 5 reps. Repeat 3 times a day.

### Strengthening exercises

#### Short-arc quadriceps
Sit on the floor or bed with a rolled towel under the knee. Now slowly lift the heel off the floor and straighten the leg while pushing down with the back of the knee. Hold for 10 seconds and then relax. Repeat 10 times twice a day.

#### Straight leg raises
Lie on your back with one knee bent and the other leg straight. Now slowly raise your straight leg about 20cm off the floor/bed while keeping the knee straight and the toes pointing towards the ceiling. Repeat 10 times x 3 sets twice a day. Repeat this exercise pointing your toes outwards. Make sure that the rotation is from the whole leg. Repeat 10 times x 3 sets twice a day.

#### Static hip adduction and abduction
Lie on your back with your knees bent and place a ball or pillow between your knees. Slowly press your knees together and hold for 10 seconds. Repeat 5 times x 3 set. Now place the ball or pillow between your knee and the wall. Slowly push your knee out for 10 seconds. Repeat 5 times x 3 sets.
### Stage 2 exercises (2 weeks onwards - minimal or no pain)

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<td><strong>Step-ups</strong></td>
<td>Stand on one leg on a step facing up the stairs. Slowly lower yourself by bending your knee. Return to the starting position without pushing off from the ground with the opposite leg. Be careful that your knee and foot do not roll inwards, and that your knee stays in line with your second toe throughout the movement. Only work in a pain free range of movement. 10 x 3 reps.</td>
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<td><strong>Single leg standing</strong></td>
<td>Balance on one leg for 30 seconds and repeat with the other leg. Repeat the above with your eyes closed. Progress the above to standing on an unsteady surface, e.g. a cushion or a narrow piece of wood. Start with 30 seconds and progress this to 1 min.</td>
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<td><strong>Straight leg raises</strong></td>
<td>Repeat as in stage one, but this time change your body position to half sitting, and then to full sitting. Use your arms to support your back in each position. With each change of position, keep the exercise the same. 10 x 3 reps. Twice a day.</td>
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<td><strong>Wall slides</strong></td>
<td>Stand leaning up against a wall with your feet about 30cm away from the wall. Keep your feet shoulder width apart and pointing slightly outwards. Keep your back against the wall throughout the movement. Now slowly lower your body into a seated position and hold this for 5-10 seconds. Repeat 10 times.</td>
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<td><strong>Single leg standing</strong></td>
<td>You will need a weight for this exercise such as a can of beans. Standing on one leg, with your weight on your heel, bend down to pick up a weight with the opposite hand ensuring that your weight stays on your heel, and that your knee goes down in line with your second toe. Also ensure that your knee and not your back does the bending. Repeat 10 times on each leg (up and down is one repetition).</td>
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<td><strong>Hip abduction and adduction</strong></td>
<td>Attach an exercise band around a table leg. Place the leg furthest away in the loop of the band and raise it out to the side away from your body. Keep your knee straight and pelvis stable. Now turn around and bring your leg away from the table towards your midline (the other leg). Make sure you keep your body stable and just use your leg. 10 x 3 reps on each leg.</td>
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**Stage 3 Functional exercises**

**Agility exercises**
Jump from one point to another in the following sequence:
1. Forward and backward
2. Side to side
3. Jump in a square both clockwise and anticlockwise
4. Jump diagonally forwards and backwards across a central imaginary line

Start by jumping with both legs and as you feel strong enough, progress to one legged hopping. Repeat the sequence 10 times on each foot.

These exercises are important to improve functional proprioception (awareness of the body in space), and are essential for an effective return to sport. You can also include shuttle running exercises, including zig-zag running, forward/backward running and fast and slow interval running.

**Lateral step-ups**
Stand on the edge of the step with your foot parallel to the edge. Slowly lower yourself off the step, controlling the movement of your knee, bending as far as you can in control and without pain.

Control on the way up as well ensuring that you don’t push off with the opposite foot.

You can also face down the step and step off forwards, again with control and without pain.

10 x 3 reps.

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