



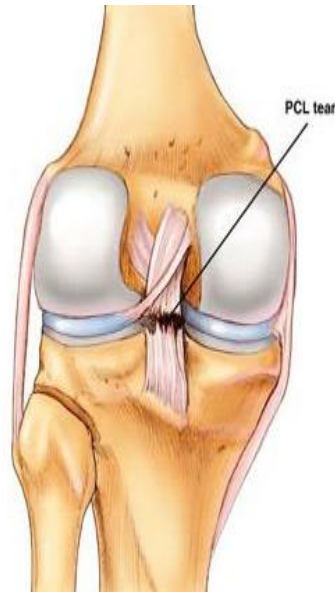
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Posterior Cruciate Ligament (PCL) Reconstruction

Patient information

Introduction

Posterior cruciate ligament reconstruction is an operation to replace your torn Posterior Cruciate Ligament (PCL) and restore stability to your knee joint. The PCL is the largest ligament in the knee – twice as thick and strong as the ACL - and stops the shin bone from moving too far backwards. It is estimated to occur in 2 per 100,000 people per annum which is 30-40 times LESS common than Anterior Cruciate Ligament (ACL) rupture.



Posterior view of knee

It is commonly injured by a blow to the front of the knee/upper shin. Most 'sports' PCL injuries occur during a fall onto the flexed knee. Hyperextension ('over straightening') and hyperflexion ('bending too far') of the knee can also cause a PCL injury and the PCL is often involved when there is injury to multiple ligaments in a knee dislocation.

Not everyone who has a PCL injury will require surgery as some isolated tears (no other ligaments involved) can heal with the early application of an appropriate splint/brace and subsequent rehabilitation (strengthening). If the initial diagnosis is not appreciated or the ligament does not heal, some people may notice 'looseness' and an occasional feeling of giving way. This requires a reconstruction (replacement) operation. Those people who have injured more than one ligament in their knee usually require reconstructive surgery.

What is the Posterior Cruciate Ligament (PCL)?

The knee is a 'complex hinge' joint supported by four main ligaments. A ligament is a structure that holds bones together and helps to control excessive joint movement. The ligaments on either side of the knee are called the medial (inside) and lateral (outside) collateral ligaments. The two ligaments that cross deep in the centre of the knee are called *the anterior (ACL) and posterior (PCL) cruciate ligaments*. During activity the PCL is the major restraint to how far forward the tibia can "slide backwards" relative to the femur. While some degree of motion or sliding is normal - and is essential for normal knee function - too much movement in any particular direction can damage structures within the knee. If the tibia is forced backwards or extends too far ('hyperextends') the PCL can rupture or tear from its bony attachment. Damage to the ligament can result in a feeling of instability in the knee, especially if the injury involves other ligaments.

The PCL does have a good blood supply and if an early diagnosis of a tear can be made it often heals well if supported by splinting/bracing for a few months.

How is a tear of the PCL diagnosed?

A tear of the PCL can be diagnosed by a physician – usually a knee surgeon - through a thorough history and physical examination. The examination can specifically assess the amount of knee motion present and determine if the PCL is torn as well as checking for any other associated injuries.

X-rays are taken to look for the presence of any bony injury. On occasion the PCL can rip off (avulse) a piece of bone from the back of the knee which can be fixed back in place with good results.



In most patients a magnetic resonance imaging scan (MRI) of the knee will be ordered. The MRI can usually clarify the question of an acute PCL tear if the history and examination are inconclusive although it is less effective for chronic injuries. The MRI is also useful for evaluating the integrity of both articular cartilage (joint surface) and mobile shock absorbing meniscal cartilages in the knee.

In a few cases an examination under anaesthetic (EUA) and arthroscopy may be required to make the definitive diagnosis if there is a question about what is causing your knee problem. The vast majority of PCL tears are diagnosed without resorting to surgery.

What are the options if I have a PCL tear?

The treatment options following an PCL tear are tailored for each patient depending on age, activity level, time from injury and the presence or absence of injury to other structures within the knee. In general, surgery is not initially recommended for acute, isolated injuries as these respond well to non-operative therapy (bracing).

If an initial non-operative approach has failed for an isolated injury or there are other ligaments involved reconstructive surgery may be suggested. The main reason to have surgery is to restore stability to the knee.

Reasons for not operating

An operation is not recommended if there is any active infection in or around the knee or when there is a lot of other disease such as arthritis within the joint.

Reconstructing the PCL is not going to cure arthritis or necessarily make it feel more comfortable, unless there is a very pronounced instability component to the problem.

A period of 'pre-operative rehabilitation' may also be recommended, which can help to restore a full range of movement and some muscle strength and confidence.

Alternatives to surgery

If we do not recommend reconstructive surgery, stability of the knee can be significantly improved with intensive physiotherapy exercises - not just for strengthening the muscles (quadriceps especially) but equally importantly for improving balance and ability to "hold on to your knee". Some people seem to gain more benefit from physiotherapy than others.

Bracing is also a way of stabilising the knee without surgery and there are purpose-made PCL braces which protect the joint and can be very valuable during certain sports. However the braces are rather cumbersome to wear day to day and in some contact sports the braces are banned for obvious reasons. But in sports such as tennis and squash and for skiing and snowboarding, they can be particularly useful if these are the occasions that the knee tends to give out. Wearing a brace does not appear to weaken the knee. The use of slim Neoprene sleeves appears to improve patients balancing skills very slightly and some people use them but their benefit is very difficult to actually measure.

Surgical Treatment

Following a PCL rupture, unless a large bony fragment has been pulled off surgical 'repair' of the ligament has not been shown to be effective in the long term. Far better results are obtained if the PCL is surgically replaced (or reconstructed) using a 'graft' (another tendon) harvested from around the knee. There are a number of potential grafts ('tendons to use') and also different methods of fixation for reconstructing the PCL. The exact procedure done may vary depending on the surgeon's preference as well as factors unique to the individual patient.

Following anaesthesia a tight inflatable band (tourniquet) is wrapped around your thigh which restricts bleeding into and around the knee during the operation. A telescope with a camera (arthroscope) is then introduced into your knee through 2 small anterior incisions (approximately 1cm long). This then allows a thorough examination of the joint and probing of all the structures.

In the typical surgical reconstruction, the torn ends of the PCL must first be removed and any meniscal tears addressed. A torn meniscus can be either repaired or trimmed (*meniscectomy*). Once this has been done, the type of **graft** to be used is 'harvested'. One of the common tendons used for the graft is the middle part of the patellar tendon which connects the kneecap (patella) to the lower leg bone (tibia). Another common graft is to combine two of the hamstring muscle tendons that attach to the tibia just below the knee joint. Studies have shown that these two tendons can be removed without significantly affecting the strength of the leg. There are other, much stronger hamstring muscles that compensate for the two tendons that are removed. The surgeon will usually harvest the graft from same leg that is being operated on but if the quality of the graft is poor he may use your other leg for the graft. Alternatively, if these options have been used at previous surgeries an allograft (donated from another patient) can be used with similar outcome.

Tunnels are drilled into both the tibia and femur using specialized jigs and the graft is threaded along these tunnels, across the knee in the position of the original PCL. The graft is then secured in this position, most commonly by "wedging" a screw between the side of the graft and the tunnel. Alternatively, the graft can be secured by other techniques (staples, sutures, buttons, etc.). These screws and/or staples are left in place permanently. The skin is closed with stitches.

It is not possible to reproduce the normal anatomy of the PCL completely but, the surgery along with intensive physiotherapy rehabilitation is aimed to produce a functionally stable knee for both activities of daily life and sport.

What should I expect from the surgery?

'Isolated' PCL reconstruction is done far less commonly (20 times less) than Anterior Cruciate Ligament (ACL) reconstruction. The rehabilitation protocols are very different from ACL reconstruction and the outcomes are less good. 90% of ACL reconstruction patients have a 'successful' reconstruction, whereas only about 60-70% of patients will feel similarly satisfied after PCL reconstruction. The surgical and rehabilitation techniques continue to improve but it is certainly not an operation for the 'occasional' surgeon. The aim of the surgery is to prevent the knee giving way and allow individuals to return to sports with a stable knee. However often the patients sporting aspirations have changed by the end of the rehabilitation and they return to their particular sport at a lower level or a different sport.

The new ligament is no weaker than the original and but there is a chance of re-rupture of the graft. Instability symptoms will be reduced and patient's ability to get back to more vigorous activities enhanced. However the 'posterior sag' (when the lower leg drops back), which is often present pre-operatively sometimes recurs to a lesser extent due to 'stretching' of the graft. It is therefore common that although there will be an improvement, it may not feel quite as good as it was before the injury. 10% of people fail to get significant benefit from the operation for a variety of reasons. Sometimes, this is due to a complication such as infection or other problem that leads to stiffening of the knee, although this is extremely unusual. The long-term outcome in terms of the risk of degenerative arthritis and the factors which predispose to it are still being clarified.

Risks and potential complications of PCL surgery

Common (1-5%)

- **Pain**

Some discomfort is to be expected following every type of surgery. You will be given medication to control the pain both post-operatively and on discharge.

Patients occasionally complain of some pain at the front of the knee (anterior knee pain) on kneeling, squatting etc. This may be more commonly seen with a 'patella tendon graft'. Your physiotherapist will try techniques to reduce this pain which should not affect your participation in sport.
- **Blood clots (Deep Vein Thrombosis)**

These can occur in the lower legs following such surgery - although are unusual in the younger more athletic patients. If such a clot forms, it can occasionally enlarge and move through the blood stream to the lungs (pulmonary embolus) making it difficult to breath (rare). The risk of clotting may be reduced by 'blood thinning' medication but this must be balanced by the risk of bleeding (and bruising) from the bony surfaces post operatively.
- **Swelling / Bleeding into the knee**

Post operatively blood can collect in the knee joint. In most cases it will be absorbed by the joint itself. Occasionally excess fluid / blood may require an operation to drain the joint.
- **Numbness**

You may experience some mild numbness on the anterior of your shin close to your scars following surgery.
- **Infection**

The wound sites may become infected but this usually settles with antibiotics. Antibiotics are given at the time of the surgery and 'deep' infection within the knee joint is rare. If this occurs a further operation will be required to wash out the joint.
- **Loss of balance / proprioception**

Despite it being functionally stable, the knee may feel different for quite sometime. Regular balance exercises and a tubigrip may reduce this feeling.
- **Stiff knee**

Stiffness may occur following surgery. In some patients a manipulation and arthroscopy may be required to break down scar tissue and restore knee movement.

Rare (<1%)

- **Unightly scarring of the skin**

Most wounds heal to a neat scar but thickened, red and painful scars may occur especially in patients with darker skin tones.
- **Damage to the bigger nerves and blood vessels at the back of the knee**

Making the tunnel in the tibia for PCL reconstruction involves drilling guide wires to and through the back of the knee. Although we have instruments to protect the important structures, there is still the potential risk of damage occurring. If the blood vessel is damaged

it will require urgent surgical intervention and if the nerve is damaged it could lead to permanent numbness or weakness of the lower leg. It must be stressed that this occurs rarely.

- **Compartment syndrome**

This is a build up of pressure with the lower leg due to bleeding. It causes significant pain, muscle damage, nerve damage and interruption to the blood supply. If this occurs it requires an emergency operation to release the pressure and prevent further damage.

- **Severe pain**

Pain, stiffness and loss of use of the knee (complex regional pain syndrome) is rare and the cause is unknown. If this happens you may need further treatment including painkillers and physiotherapy. The knee can take months or years to fully recover.

If you have any queries regarding surgery please ask your consultant before the surgery.

Post-operative physiotherapy / rehabilitation

This should start within the first 1/2 weeks following surgery and should be arranged before discharge. This is the basic protocol and will differ according to the individual and the complexity of the injury. You will be given exercises to do for the initial period between discharge and physiotherapy starting. **You are expected to actively participate in your rehabilitation.** The home exercises you are given are performed several times a day.

Day 1 (Day of surgery)

You will return to the ward with a bandage and a splint on the knee. This splint will be replaced at 2 weeks for a dynamic, specialized PCL brace. You will have some splint or brace on for 3 months after the reconstruction. You will be visited by your physiotherapist and taught some exercises.

Regular icing will reduce pain and swelling and you should take regular painkillers in order to complete your initial exercises. The physio will get you up on crutches.

Prior to discharge from hospital you should:

- Have adequate pain control
- Be able to achieve a straight leg raise
- Have a home exercise programme to continue with until seen in the outpatients department.
- Be able to walk competently with 2 crutches (manage stairs if required)
- Have an appointment for outpatient physiotherapy later in the week and an appointment with your consultant (6 weeks post-operatively)

Guidelines for recovery

These 'timelines' are not absolute. Progression through rehabilitation will be guided by your performance at each stage. Do not start any of the exercises discussed until shown by your physiotherapist.

Weeks 0 - 2

- Goals:**
- Protect fixation and mobilise surrounding soft tissues
 - Reduce swelling / inflammation
 - Maintain PCL splint in full extension (No hyperextension)
 - All exercises to be completed in the splint & splint / brace to be worn for sleep
 - Regain active quadriceps
 - Restore knee cap movement
 - Touch weight bearing (with splint on)

Week 2: Clinic appointment for change of splint to dynamic MEDI PCL brace (with restricted range of movement, 0-60 degrees only).

Week 2 - 6

Goals: Prevent scar adhesions / symptoms of anterior knee pain
Improve strength, power and endurance.
Be able to perform straight leg raise with no lag (knee bend)
PCL brace should be left on for 6 weeks and only removed for washing
(Pillow to be placed under knee when resting to support lower leg)
Passive knee bending (0-60°) is allowed with the brace on. Do not actively bend your knee without assistance.
Increase to full weight bearing (as swelling, quads strength and confidence allows).
Restore balance reactions and control.

Week 6: Knee Injury Clinic appointment (x-ray on arrival)

Week 6 - 12

Goals: Continue to wear MEDI PCL brace (full range of movement)
Wean from / remove brace at 12 weeks post operatively.
Normal gait pattern. Wean from crutches if no quads lag, full knee straightening and knee bend 90- 100°.
Eliminate any joint swelling which occurs.
Prevent any graft site or scar adhesions.
Full pain free hyperextension and flexion to 100 degrees
Improve balance reactions and control.
Enhance muscular power and endurance.
Weights above the knee may be used to progress exercises as strength permits (be guided by your physiotherapist).
Static bike – no resistance. Saddle needs to be set high so knee not fully straight as push down. Place instep on pedal to decrease hamstring action.
Return to driving when 'safe' to do so.

Week 12: Knee Injury Clinic appointment (check appropriate progress)

Weeks 12-16

Goals: Wean from / remove brace at 12 weeks post operatively.
Normal gait pattern with full knee straightening.

Full knee flexion
Start walking on the treadmill and progress to light jogging.
No anterior knee pain.
Start open chain hamstring strengthening (i.e. without foot being fixed).
Strengthening exercises can be progressed
Progress muscular strength, power and endurance of hamstrings and quadriceps (quadriceps should be good to normal).
Start agility and early plyometric work (quick movements of the leg to strengthen it).
May start swimming but no breaststroke.
Return to work.

Week 24: Knee Injury Clinic appointment (KOOS questionnaire)

Weeks 24 - 36

Goals: Enhance lower limb confidence and function.
Start harder agility work.
Maintenance of strength and endurance through home exercises.
Start sports specific training (no pivoting sport for at least 6 months).
Preparation for return to full sport / activity. Able to return to pivoting sports, e.g. basketball, football, skiing from 9 months.
It is advised that 3 months training be completed to regain confidence and skill acquisition prior to first competitive game i.e. return to play at 12 months

Week 36+

Goals: Quadriceps strength 90% of uninvolved leg.
No significant knee cap or soft tissue irritation.
Patient demonstrates a clear understanding of their possible limitations.
Unrestricted confident function.

Week 52: Knee Injury Clinic appointment (KOOS questionnaire)

NB. It is advised that the strengthening programme you have been taught by your physiotherapist should be completed on a regular basis for 1-2 years following surgery to maximise any benefits.

Return to work

As a guide you can expect to return to office work about 6/8 weeks after surgery when discomfort and travel to and from work allows. If you have a physical job but are able to carry out light duties that involve limited walking, you may return to work at 4/6 weeks. If your job is more physically active than this, it may take anything up to 3 months to return to work, particularly if it involves squatting or heavy lifting.

Return to Sport

It should be remembered that full return to unrestricted sporting activity is progressive with your rehabilitation, not an isolated event. It is advisable to complete 3 to 4 months of training to rebuild skill acquisition prior to your first competitive game. This training period will allow you to gradually rebuild your confidence in returning to sporting activities.

Return to contact sports is dictated by type of sport, ability, fitness and confidence. Minimum of 9-12 months off.

Driving

Because of the splint/brace you will have on there will be restrictions and this will depend on which leg is involved. You can begin driving short distances between 2-4 weeks provided your rehabilitation is progressing well. Discuss this with your surgeon. You must be able to perform an emergency stop. Also it is advised to check that you are covered by your insurance before starting to drive again.