

Anterior Cruciate Ligament (ACL) Injuries and Reconstruction

INTRODUCTION

This is a document for patients and their relatives to explain what an injury to the anterior cruciate ligament (ACL) means. It also discusses the treatment options, both operative and non-operative, of the injury. It is written to give you an understanding of the subject without discussing the “small print” which you can find elsewhere if you wish.

The document covers the following areas;

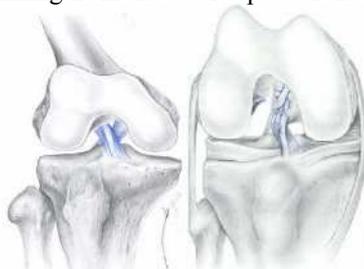
1. The anatomy and function of the ACL.
2. What happens when the ACL is injured
3. The consequences of an ACL injury
4. The decision-making process behind whether an ACL reconstruction is indicated
5. The relationship between ACL reconstruction and knee osteoarthritis
6. Non-operative management of an ACL rupture
7. Graft choices in ACL reconstruction
8. Pre-operative rehabilitation
9. The technical steps involved in an ACL reconstruction
10. Post-operative rehabilitation
11. Complications after ACL reconstruction

If after studying this document you have any further questions please feel free to contact me by e-mail on martin.logan@harleystreetkneeclinic.co.uk and I can answer your outstanding issues.

WHAT IS THE ANTERIOR CRUCIATE LIGAMENT?

The cruciate ligaments are a pair of strong, thick ligaments in the centre of your knee joint. You have an anterior cruciate ligament (ACL) and a posterior cruciate ligament (PCL) and they form a cross, this is where the name of “cruciate” is derived.

The ACL lies in front of the PCL running from the outer aspect of the femur (thigh) to the inner aspect of the tibia (shin).



Intact ACL and PCL, Ruptured ACL

FUNCTIONS OF THE ACL

The primary functions of the ACL are;

- To prevent forward movement of the lower leg (tibia) on the femur (thigh)
- To control outward rotation of the lower leg when the knee is in a flexed (bent) position

- To send sensory feedback to the brain providing information on joint position - so called 'proprioception'

However a good simplification is that the ACL allows you to pivot. If the ACL is not working you will generally find it relatively easy to walk and run in a straight line, cycle and swim. However if you attempt to twist (e.g. side stepping in football/rugby) or land on one leg (e.g. basketball, netball etc.) then the knee can "give way". This is called instability. A knee that has an injured ACL and which is potentially unstable is called "ACL-deficient".

If your knee gives way, there are two main effects.

- Firstly the knee is painful immediately after each episode of instability, with swelling, pain, loss of motion of the knee and a limp - this is usually transient but painful at the time.
- However secondly, and perhaps more importantly, each episode of giving way causes internal damage within the knee. The meniscus ("cartilage") and the articular cartilage (the lining covering the bones) can be damaged by these episodes of giving way, resulting in osteoarthritis in the knee.

ANTERIOR CRUCIATE LIGAMENT INJURY

Your ACL deficiency may be acute (relatively recent) or chronic (relatively old e.g. more than 6-12 months from the injury). Please note that chronic in this sense relates to time and not to the seriousness of the problem).

An ACL can be injured by a non-contact force or by a contact injury.

In a non-contact acute ACL injury, the knee suddenly gives way on attempted twisting. The injury is very painful. A "pop" or "snap" can often be heard by the patient and often by others. Only rarely can the patient resume the sport they were playing and on attempting to do so the knee gives way and feels very unstable. There is usually early marked swelling of the knee, usually within one hour of the injury. It is usually very difficult to walk on the knee in the first few hours of the injury.

In a chronic ACL-deficient knee, the knee gives way in a less dramatic but nonetheless painful fashion. The knee can feel perfectly normal on walking and running but when an attempt is made to pivot the knee suddenly and painfully gives way. This causes swelling and pain in the knee but often in a less marked fashion than the acute injury.

ACL tears can often go undiagnosed as, although the knee is swollen and painful immediately following the injury, this often resolves over 5-10 days. After a period of recovery (e.g. 3-4 weeks) the knee can feel remarkably normal as there is no pain, swelling, limp or instability on linear activities. It is only when an attempt is made to return to pivoting activities that there is a problem with instability.

THE CONSEQUENCES OF INJURY TO THE ANTERIOR CRUCIATE LIGAMENT

It is very important to understand that anyone who has injured their ACL has sustained a very major injury to the knee, and that the knee will never return to completely normal (despite what some might say!). This is not to say that most patients cannot be returned to their sports in which they injured their knee - most can - but their knee will not be completely normal when doing so.

When the ACL is ruptured the knee effectively dislocates and then reduces itself. MRI scanning (please see below) has allowed us to understand that when an ACL is injured there is a great deal of bruising to the bones within the knee, the areas beneath the bones and to the menisci. Even in an "isolated ACL rupture" where there is no major damage visible to other structures in the knee, there is now evidence that there has been a great deal of internal damage from which a full recovery is impossible. When other structures such as the menisci and articular cartilage have been damaged, the outlook is usually worse. This does not mean that the surgeon, the Physiotherapist and the patient together cannot improve the long-term outlook for your knee - you must simply be realistic about what can and what cannot be achieved. Most patients are very happy with the outcome of their ACL treatment plan - they are usually much happier when they have been given realistic expectations.

The treatment plan for your injury should aim to give you as much function that is realistic to your knee and also should aim to minimise further damage within the joint. This treatment should always include non-operative modalities (physiotherapy etc.) but may also involve surgery as well. The non-operative portion can never be ignored and surgery is a disaster when it is. A painful and stiff knee is usually far worse than an unstable knee!

SHOULD I HAVE AN ACL RECONSTRUCTION?

This should be an individual decision made between the patient, their relatives, their sporting partners, the surgeon / physician, the GP and the Physiotherapist. My policy is to explain the pros and cons of reconstruction to patients and let them make the decision for themselves - I can advise but will not tell you what to do!

What I have suggested below relates to isolated ACL injury - where other ligaments are injured as well as the ACL, the decision-making process may be very different.

Before making a decision the following factors should be discussed;

- the age of the patient
- the desire to return to pivoting sports
- the amount of damage within the knee e.g. meniscal and articular cartilage damage
- the willingness or otherwise of the patient to comply with a relatively demanding rehabilitation programme
- realistic expectations from the patient, their relatives, the sporting clubs, the surgeon and the physiotherapist

Not all patients should undergo an ACL reconstruction. Many patients with injuries to their knee that result in moderate (rather than severe) laxity can cope without an ACL if they modify their lifestyle to avoid pivoting sports. Thus if you wish to confine yourself in the future to activities such as walking, light running, swimming, cycling etc, and you are over the age of 30 years, then I personally would not advise you to undergo an ACL reconstruction unless your knee started to give way on these activities, which is unlikely.

If however you wish to pursue pivoting activities in the future (e.g. football, skiing, rugby, tennis, squash, basketball, netball) then I would personally advise that in most cases you would be wise to undergo an ACL reconstruction.

My personal advice for young patients (under 20-25 years of age) and all children is that they should undergo an ACL reconstruction as the demands of youth produce adverse effects on the ACL-deficient knee.

Please note that in some cases I may advise you to undergo an ACL reconstruction (or possibly not) but then go on to advise you to avoid certain sports - this is a very individualised suggestion which I will explain to you. This is usually when the knee has severe damage other than the ACL rupture e.g. major meniscal or articular cartilage injury.

WILL AN ACL RECONSTRUCTION REDUCE MY RISK OF DEVELOPING OSTEOARTHRITIS?

I am sorry to inform you that if you are reading this document your risk of developing osteoarthritis in your injured knee is already markedly increased. When the ACL was injured massive forces went through your knee and caused damage to the structures within the knee which will never return to normal.

What we therefore need to discuss is whether an ACL reconstruction will reduce any further increase in the risk of developing osteoarthritis.

What is very clear is that if your knee continues to regularly give way, there will be further damage every time the knee gives way to the menisci and articular cartilage, and this will definitely produce a significantly increased risk of you developing osteoarthritis and at a younger age than you would have otherwise done so. Thus we must prevent your knee giving way - this in most cases can be effected by either eliminating the activities that cause the knee to give way (e.g. sport) or reconstructing the ACL to stop the knee giving way on sport.

The most effective way of preventing the further increased risk of osteoarthritis is by eliminating the pivoting activities that cause the episodes of giving way. Some patients are so unlucky that their knee gives way on the slightest provocation e.g. twisting to get out of a car or twisting at the bottom of a set of stairs - in these instances an ACL reconstruction is clearly warranted. In the event that only sport causes your knee to give way, you have a choice - give up the sport, wear a protective brace or have a reconstruction.

However it is not that simple!

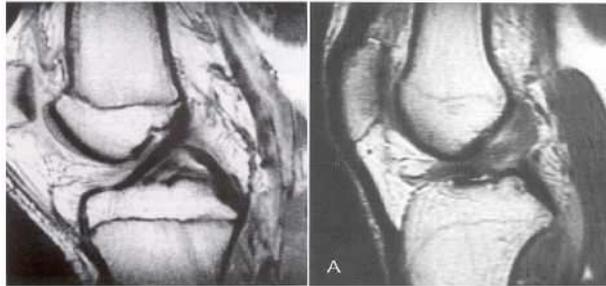
- Firstly, an ACL reconstruction does not restore completely normal characteristics to the knee. If it did, we would probably recommend reconstructing everyone's ACL! Thus even with a successful ACL reconstruction, with an absence of giving way, the knee is not "normal" so that sporting activities can still increase the risk of developing osteoarthritic change.
- Secondly there is some evidence that in reconstructing an ACL, we are allowing an injured joint which should be "rested" to have "a new lease of life". This reconstruction, with the subsequent sport, may actually increase risk the risk of developing osteoarthritis!

Clearly, this is not a simple issue, and the decision to proceed to an ACL reconstruction is a very individualised one and should be made after full discussion with all interested parties. An ACL reconstruction is in some ways a wonderful operation which allows sportspersons to return to sport in a fashion that was not really possible as little as 10-15 years ago. However it is probably also an "over-performed" procedure which in some cases does not really benefit the patient and in some ways may harm them. If you are going to proceed to an ACL reconstruction I want you to be fully informed about all the advantages and disadvantages of the procedure and have the time and information to enable that decision to be made.

DIAGNOSIS OF ACL INJURY

An MRI (magnetic resonance imaging) scan is not absolutely essential to diagnose an acute ACL tear as an accurate and detailed history and clinical examination is more reliable. MRI can however confirm the diagnosis and give additional information on injuries to other ligaments and structures within the knee. Most patients who are suspected of having an ACL injury will therefore have an MRI scan.

On MRI the ACL appears as an uninterrupted dark band. If damaged there is disruption or complete absence of this band. Although there is good general accuracy for diagnosis MRI scanning is not 100% accurate. Occasionally an examination under anaesthetic and arthroscopy (“keyhole surgery”) is necessary to confirm the diagnosis of ACL rupture and, more importantly, assess the extent of injury.



The scan on the left shows an intact ACL on MRI. This is the black structure in the centre of the picture running diagonally upwards from left to right. The scan on the right demonstrates a complete rupture of the ACL.

NON-OPERATIVE TREATMENT OF ACL DEFICIENCY

It may be agreed that, at least initially, your knee should not undergo an ACL reconstruction but instead you should undergo a period of rehabilitation in an attempt to stabilise your knee within the bounds of the activities you wish to pursue. Please note that this is not the same as “doing nothing”!

Even if you subsequently proceed to an ACL reconstruction, a period of good initial rehabilitation greatly helps the post-operative progress.

Your Physiotherapist will explain the details of conservative treatment to you but I will briefly explain what is involved.

In the immediate aftermath of the ACL injury, the main aim is for you to “regain control” of your knee. You should learn to walk normally again and with a normal walking pattern. The knee swelling should be reduced and you should regain a full range of movement. Most importantly it is vital, whether or not you are to have an operation on your knee, that you regain full hyperextension of your knee i.e. your knee should fully straighten as much as your normal knee. If a knee is left in a less than fully extended state for a long period then there is a greatly increased risk of developing osteoarthritic change within that knee.

When the knee regains a full range of movement and the swelling is reduced, you will then need to learn to pivot on the knee, at least in a restrained fashion such that you can pursue your normal daily activities. You will learn to use devices such as a wobble-board, carry out mini-squats and learn to twist and turn again. If you find this difficult it may mean that you will require an ACL reconstruction to stabilise your knee.

Together with your Physiotherapist, I will advise you as to when you can resume sport again.

WHAT IS AN ACL RECONSTRUCTION?

An ACL reconstruction is a procedure in which a tendon or ligament is used to replace the damaged ACL. It is not a repair of a ligament but a replacement.

There are many ways of performing an ACL reconstruction. In the sequence below I will demonstrate one way (which may not exactly be the method you will undergo) of performing an ACL reconstruction. The aim of the sequence below is to give you a general understanding of what an ACL reconstruction involves rather than specific details.

Step 1 - Arthroscopy and removal of the damaged ACL

The first stage of the procedure is to perform an arthroscopy to examine the whole of the knee. This includes the ACL but also the other structures of the knee, including the menisci (“cartilages”) and the articular surfaces of the knee. If these are damaged the various structures can be either resected (removed) or repaired as appropriate.

Once the interior of the knee has been examined, the old or damaged ACL stump is removed with motorised shavers which remove the damaged tissue within minimal damage to the rest of the normal structures of the knee. This is all performed using the two small arthroscopy incisions at the front of the knee.

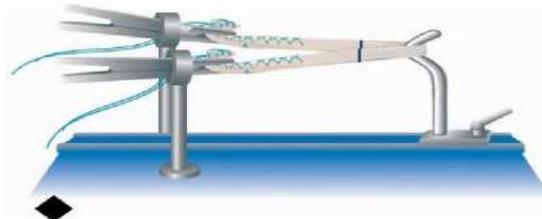
Step 2-Preparation of the hamstring tendons

Nearly always in my practice, I will be using two hamstring tendons to replace (“reconstruct”) the damaged ACL. The tendons can be obtained from the same leg (ipsilateral autograft), the other leg (contralateral autograft) or another person (allograft). Please see the section below on “choice of graft” for more details.

If the tendons are “harvested” from your own body, they are taken via a small incision approximately 4cm long at the front of your leg just below the knee. An incision in your thigh is not necessary. Through this incision an instrument can “strip” two hamstring tendons from the inner aspect of your thigh. This is the same incision that I will use to drill the tibial tunnel (please see below).

If allograft is to be used, then an incision is placed in the same area, but which is slightly smaller, so as to drill the tibial tunnel.

Once the two tendons are obtained (from whatever source), they are cleaned and sutured in preparation for their insertion into the knee. They are doubled-up to form what can be described as a “four-strand hamstring graft”.



The graft now will need to be placed within the knee joint. It will be passed through “tunnels” in the bone below the knee joint (tibia) and the bone above the knee joint (femur). The graft will then be secured in those tunnels by fixation devices, which will allow the ACL graft to remain tensioned - this is called graft fixation.

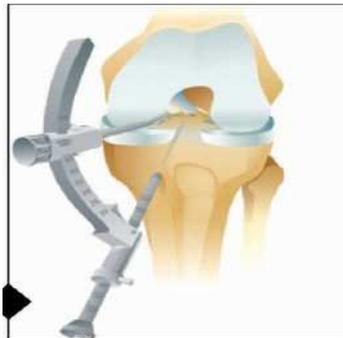
Step 3-Preparing the tibial tunnel

The graft needs to be passed through the tibia through a tibial tunnel.

To make sure that the tunnel is in the correct place and orientation a guidewire is passed using an aiming device placed through one of the arthroscopy portals. The guidewire is passed from the tibia externally through the incision used to harvest the hamstring tendons.

Once the guidewire is passed and checked to be in the optimal position, a cannulated reamer (“drill with a hole in it”) is passed over the guidewire. The reamer is the same diameter as the diameter of the graft, which is usually 7-10mm.

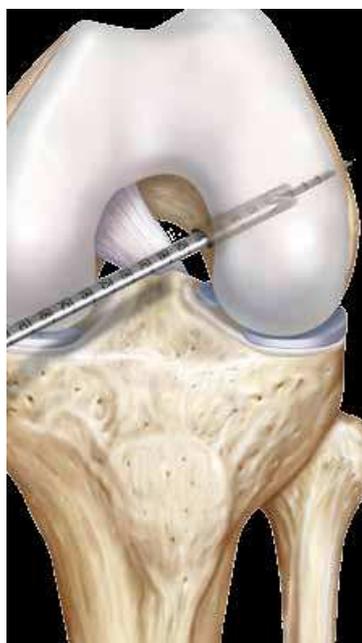
The tunnel is then cleaned and chamfered so that there are no loose edges in preparation for passing the graft.



Step 4-Preparing the femoral tunnel

Through one of the arthroscopy portals, a guidewire is again passed but this time it is placed into the femur to prepare for the correct place for the femoral tunnel.

Once the guidewire is in the correct position, a cannulated reamer is again passed over the guidewire of the same diameter as the graft. This tunnel is “blind-ending” and usually 35mm long.



Step 5 Graft passage into the knee and femoral fixation

The graft is passed through the tibial tunnel into the femoral tunnel using suture techniques and is anchored to the cortex (the outside of the femur) using a suspensory material called a retrobutton. This provides the strongest fixation possible to the femur.



Step 6- Tibial Fixation

I leave the ACL graft attached to the tibia (providing true biological fixation where the hamstring tendons attached to the bone) and secure it in the tibial tunnel using a titanium interference screw. I do not believe in bioabsorbable screws and have published on this subject (see below). There are sutures attached to the end of the grafts at the tibial end. These are tensioned so that graft is tensioned adequately.

An interference screw is then placed into the tibial tunnel from the exterior. This screw, which is made from titanium and is very biocompatible. The interference screw bonds the graft onto the side walls of the tunnel. This is called interference screw fixation.

The ACL graft is now secure at both ends. Final checks are made and the wounds sutured.

At the end of the procedure a Cryocuff (please see below) is placed on the knee to cool it down which aids in pain relief and also reduction of swelling.

ACL RECONSTRUCTION - CHOICE OF GRAFT

The ACL will not heal itself. Therefore, an alternative tissue must be used to replace it.

There are 3 main types of grafts available;

- Using the patient's own tissues (autograft)
- Using another person's tissue (allograft)
- Using artificial material (synthetic) - I mention these largely to dismiss them, as they are now proven not to work effectively in ACL reconstruction.

Autograft choices

The two most frequent choices for autograft tissue are;

- Hamstring tendon graft (the gracilis and semitendinosus tendons)
- Kneecap (patella) tendon graft

My own personal preference is to avoid the use of the patellar tendon graft and would advise the use of the hamstring grafts. Even in 2008, throughout the UK and the USA, there are more patellar tendon grafts inserted than hamstring grafts but I am of the view that the side effects of a hamstring graft are significantly less. Another telling sign is that with each passing year more and more patients are receiving the hamstring graft instead of the patellar tendon graft. Also surgeons who perform more than 50 reconstructions per year tend to use the hamstring graft in preference to the patellar tendon graft.

Please note that this is not to say that the patellar tendon graft is a bad graft - I just am of the view that the hamstring graft is better!

Why do I prefer the hamstring graft over the patellar tendon graft?

- It does not interfere with the extensor mechanism i.e. the structures which extend or straighten the knee
- It is less painful in the post-operative period
- It does not produce the amount of pain on kneeling associated with the patellar tendon graft. Most of my patients who receive a hamstring graft can kneel quite well and painlessly 6-12 months after the procedure - I cannot say that this is the case for the patellar tendon grafts I have seen.
- It is associated with a better range of movement, especially hyperextension (please see below) which I consider to be extremely important after an ACL reconstruction.
- The use of a hamstring graft does not result in any significant loss of function of the hamstrings long-term. You can function perfectly well without the two tendons that are removed, and to some extent they grow back with time.

The hamstring tendons can be removed via a small incision at the front of the knee - please note that I do not have to make an extra incision over the back of the thigh to remove the tendons. The same incision used to remove the tendons is used to place the tunnel for the ACL reconstruction.

Ipsilateral autograft or contralateral autograft?

I can take the hamstring tendons from the same leg as the ruptured ACL (ipsilateral) or the other “good leg” (contralateral).

Ipsilateral hamstring grafts are more common and obviously do not involve surgery to the other knee. However most of the pain and swelling after an ACL reconstruction arises from the graft harvest. If this can be avoided the recovery and rehabilitation for the ACL reconstruction can be quicker and more effective.

For this reason I also offer harvesting the hamstring tendons from the “good leg” and I especially recommend this in high-performance and elite athletes where the best possible outcome for the ACL reconstruction is needed. I have found that the rehabilitation is a little easier and with a better outcome when all the pain and swelling from the harvest is transferred to the other leg. The short and long-term effects on the “good leg” are minimal and nearly all patients I have treated in this way have been happy with the outcome. You will be able to walk freely on the “good leg” and there is only a 2-3cm incision at the front of the leg just below the knee.

I will discuss the issue of ipsilateral vs contralateral harvest sites with you in the clinic.

Allograft choices

Allografts are readily available in the UK now but remain very expensive.

Allograft means donor tissue from another human. The tendons I use are the same hamstring tendons removed in autograft procedures i.e. the semitendinosus and gracilis tendons. The tendons are taken at the time of death from a donor in much the same way as kidneys, livers, hearts etc with the important difference that they are not living grafts. The graft is “dead” in much the same way as the hamstring tendons taken from your own body are when using an autograft. When the graft is placed into your body, the graft really only acts as a structural scaffold in which your own body cells grown into it.

The grafts are removed and are stored at very cold temperatures to maintain their viability. There are very stringent checks on infection of viruses, bacteria etc and the source of the grafts is regulated by the Human Tissue Authority (a UK-regulatory authority).

There is theoretically the risk of disease transmission with allografts but this is now calculated to be extremely small. Such grafts have been used in the USA for many years with only very, very small numbers of cases of disease transmission.

There are two significant disadvantages with allografts - tissue incorporation and cost. Theoretically autograft will incorporate better and more easily than allograft. However with modern methods of sterilisation and our understanding of the biotransformation of grafts I do not view this as now a major issue. Secondly allografts can cost significantly more than your own tissue!

The advantage of allograft over autograft is a guarantee of high quality, strong tendons and also one of pain,cosmesis and convenience. Most of the pain experienced by my patients after ACL reconstruction comes from the donor site rather than the knee. Using an allograft avoids this pain. The skin incision is much smaller when an allograft is used, with the procedure largely being arthroscopic. The short-term recovery is a little quicker. There is not much difference in outcome at 6-12 months post-operation but the allografts are easier to recover from in the first 6 months.

Autograft or allo graft?

This is a choice for you to make, although I am very happy to advise you. There is no “correct” answer.

- In a patient under 40 years old I would recommend a hamstring autograft i.e. your own tissue
- In a patient over 40 years old I would recommend a hamstring allograft

The allografts I have access to are very high quality. The main issue for use is the cost which is prohibitive for some insurance companies.

TIMING OF RECONSTRUCTION

Often patients, especially if sporty, are keen to proceed with reconstructive surgery immediately after injury. They feel this will lead to earlier return of function. Unfortunately this is not so.

The best results of surgery are gained after full rehabilitation of the knee prior to surgery, so as to regain a full range of motion, especially extension, and good quadriceps strength. This brings in an important concept which I will keep referring to in the remainder of this document - SYMMETRY!

Before an ACL reconstruction the ACL-deficient knee should be symmetrical with the good knee other than the fact it is unstable. It should be fully hyperextended (i.e. over-straighten as much as the good knee), fully flex (i.e. bend as much as the good knee) and not be significantly swollen. You should be walking without a limp and have good “control” of the leg with good “core stability”. If this is not the case, and especially if the knee is swollen and does not move fully, the knee can be very stiff after an ACL reconstruction with significant long-term consequences. A stiff stable knee is usually worse than an unstable freely-moving knee!

Thus the knee needs to be symmetrical prior to surgery and should feel “normal” other than the fact that it is potentially unstable. You should almost feel that you should not be having the operation because your knee feels so good - if this is the case you are ready for the operation!

The minimum time from injury to reconstructive surgery is usually 4-6 weeks. In some cases it is shorter, in some longer, especially if other structures are damaged. Over this pre-operative period it is important to understand that although the swelling decreases and movement returns, the ACL will not heal, the knee is unstable and at risk of further damage if high risk sports involving pivoting are attempted. Don't try it!

PRIOR TO YOUR SURGICAL PROCEDURE

Communication

You are very welcome to ring or e-mail me with any questions prior to your procedure. If you use e-mail this is the best way as you can write directly to me at martin.logan@harleystreetkneeclinic.co.uk. I can either e-mail you back or call you as you wish.

No question is too ridiculous to ask!

I will send you a copy of every letter I write to your GP and/or Physiotherapist -these are so you are kept “in the loop” about your condition. If you want any further explanation, please feel free to ask!

If you have an e-mail address please let me have it.

MEDICAL INSURANCE AUTHORISATION

Nearly all UK insurance companies will require your procedure to be authorised. If you have the correct information, this is remarkably easy.

They will need to know the following;

1. The Hospital – The BMI Weymouth or The Princess Margaret Hospital, Windsor
2. The Surgeon - Mr Martin Logan
3. The Anaesthetist - nearly always Dr Jill Pattison. Dr. Pattison charges within UK medical insurance bandings.
4. The name of the procedure - Anterior Cruciate Ligament Reconstruction.
5. The Procedure Code - nearly always W7420
6. Estimated length of stay - usually a one night stay in hospital. If

there are any issues with authorisation, please feel free to contact my office.

Drugs and medications

Please let me know if you are taking any of the following drugs;

1. Warfarin-this must be stopped prior to surgery, and I will advise you of when and how.
2. Aspirin, clopidogrel and other blood thinning agents - I normally ask you to continue to take these up to and including the day of your surgery, but I would like to know about them!
3. The oral contraceptive pill - I normally advise you to stop taking this (if it contains oestrogen) to minimise the risk of deep venous thrombosis (DVT). I will advise you individually about this. Please note that with all forms of oral contraception, they do not work as efficiently around the time of a surgical procedure - please use additional contraception!
4. Hormone replacement therapy (HRT) - it is advisable to stop taking this for 3-4 days before your operation and for 3-4 days afterwards to minimise the risk of DVT.

The day prior to your procedure

On the day prior to your procedure a secretary from my office will call you and give you a specific time to come into hospital on the day of the procedure and what time to stop eating and drinking. The hospital paperwork will give 7am default admission time but the time of your admission could be as late as 2-3pm. Please call my office the week before your procedure if you have a preferred time of admission and we can usually accommodate your request.

The day of the procedure

On the day of the procedure please come to the hospital at the designated time. Your time of admission is normally two hours or so prior to the estimated time of the procedure - this gives you time to become acclimatised to the unit and also for a number of medical personnel to come and see you. Please bring some reading material!

I will always come and see you on the day of your procedure and ask you to sign a Consent Form for the procedure. I will also always put a mark on your leg to ensure that I perform the procedure on the correct leg!

The Anaesthetist, the Nursing Staff and a Physiotherapist will also see you prior to the procedure.

You may be surprised that I recommend you wear a TED stocking (provided by the hospital) on your “good leg” prior to the procedure. The reason for this is to try to prevent you developing a Deep Venous Thrombosis (DVT) in your good leg, which can occasionally happen. Please keep this stocking on the good leg until the day after the procedure, when it can be removed.

You will normally simply walk down to the operating theatre, which is more enjoyable than going down on a trolley! Please bring a pair of slippers / trainers / sandals with you for this.

THE IMMEDIATE PERIOD AFTER SURGERY

You will wake up from the anaesthetic in the recovery area of the operating theatre. The knee will be in a tight bandage and you will have a blue Cryocuff sleeve on top. The Cryocuff contains ice cold water and helps control swelling of the knee in the early post-operative period. On return to the ward, after a couple of hours the nursing staff will reduce the dressings on the knee and you can start to freely move the knee.

I use an anti-inflammatory drip after the procedure which I have found is very effective in minimising pain relief. Opioid medication is avoided if at all possible.

The next day all attachments are taken down i.e. drips etc. The Physiotherapist will instruct you on exercises to gently flex the knee, gain full hyper-extension (straightness) and strengthen your quadriceps. You can walk freely on the knee (only using crutches for balance if you need them) and there is no brace or cast etc. The Cryocuff sleeve remains on while at rest and is removed for exercises and mobilising (you can take this home with you).

You are normally in hospital for one night and discharged when you are safe with crutches and you have a reasonable range of movement of your knee. In this early phase you will continue with the exercises you were taught in hospital. These exercises are vitally important for the best possible results.

You are advised to continue using the Cryocuff at home until you return to clinic approximately 7-10 days after surgery for removal of any sutures.

In this initial 10 day period after surgery it is quite common to experience bruising and swelling in the calf, the front of the shin or inner thigh from the site of your hamstring graft. This can appear quite alarming but is not serious. You may also experience some numbness over the front of the shin or around the scar; this is normal and sensation will usually return over a period of time.

THE FIRST 1-2 WEEKS AFTER YOUR OPERATION

It is vitally important that you rest for the first 1-2 weeks after your operation. I have noted much better results from ACL reconstructions over the last few years where patients thoroughly rest and elevate their leg in the initial period after their operation.

If you mobilise and do too much initially after your ACL reconstruction the knee tends to swell and as a consequence you lose a great deal of your range of motion of the knee.

When you go home (usually the day after your operation) I would strongly advise you to rest as much as you can, almost as if you are in hospital. Although you are resting over this period, you will be advised to move the knee as much as possible -the combination of resting the knee, elevating it and moving it often gives very pleasing results, such that you will be able to walk almost freely and without a limp by 10 days or so after your operation. If you walk around on it too much the knee can swell, the knee loses movement and you can limp for quite some time.

Thus over this period I would suggest that you rest, elevate your knee and move the knee as much as possible. It is in this initial phase that you can gain as much hyperextension of the knee as possible, as well as flexing the knee.

REHABILITATION AND PHYSIOTHERAPY

This is all about achieving SYMMETRY!

I recommend that you start your out-patient physiotherapy three days after your operation. It is useful if this is arranged ahead of your surgery.

Physiotherapy is vitally important if there is to be a successful outcome of the ACL reconstruction. It takes a great deal of effort, commitment and time. If you do not feel you can commit yourself fully, it is probably best not to undergo the operation as you will have a less favourable result.

In general, a brief outline of stages and goals after the reconstruction are;

- Stage 1 (0-6 weeks) : obtain a full range of movement and a symmetrical knee by 6 weeks
- Stage 2 (6 weeks to 4 months) : strengthening the muscles – (quadriceps and hamstrings)
- Stage 3(4-6 months): strengthening and muscle control
- Stage 4 (6-9 months): non-contact sports training
- Stage 5 (9 months to 3 years) : full return to contact sports with continuing proprioceptive input

Progress after the reconstruction is based on the time involved in the formation and maturation of the new ligament and on functional goals. All patients advance at different rates but the time factors are the average basis upon which progression is made. Progression too early may jeopardise your new ligament and cause it to rupture. At all stages you should be guided by me in association with your Physiotherapist. If you have any specific queries about your rehabilitation please feel free to contact either of us.

Please be aware that this protocol relates only to a standard “isolated” ACL reconstruction. If there is other ligament or cartilage damage, the rehabilitation may vary from this protocol.

BRIEF REHABILITATION PROTOCOL

Stage 0- Prior to Surgery

It is crucial that prior to an ACL reconstruction the knee is fully rehabilitated. There should be no significant effusion (swelling of the knee), the muscle tone should be good and there should be a full range of movement including full hyperextension and flexion. The knee should be symmetrical.

Stage 1A (0-2 weeks)

The main objective in the initial two week period after surgery is to reduce swelling, regain muscle control, restore a normal walking pattern and regain the ability to extend and flex the knee. Use of a Cryocuff for cold compression is very useful and beneficial. As indicated above, rest and elevate your leg as much as period.

You will walk (possibly with crutches initially), gradually increasing effective weight bearing on the knee and try to walk without a limp. It is crucially important to be able to fully extend and lock your knee as soon as possible. This helps the quadriceps muscle above the knee pump blood and reduce swelling, as well as enabling a normal walking pattern. Exercises include static contractions of the quadriceps, gentle bending, as well as hamstring and calf stretches.

Please note that you can ruin your reconstruction by not resting your knee in the first 2 weeks after your procedure. You **MUST** rest at home (not at the office) and spend most of the day exercising your knee, with the leg elevated above the level of your heart. Rest the leg on a stool. Move the knee as much as possible - you cannot and will not harm your graft by doing this. If you stand on your leg the knee will swell and it will be impossible to obtain full extension, and you will then have a less than optimal result. I cannot stress how important this is.

Stage 1B (2-6 weeks)

Now is the time to gain confidence and strengthen the knee whilst restoring full movement, especially extension. You can use a static bicycle with no resistance, continue quadriceps strengthening and hamstring curls with no resistance.

Move the knee as much as possible, walk as much as possible but walk properly - I will show you how to do this, as will your physiotherapist. Achieve symmetry!

Stage 2(6 weeks to 4 months)

Up to now the knee has only been bent, straightened and the swelling reduced. The graft fixation has now begun to occur biologically and is thus a little stronger than in the initial six weeks. You will now be able to progress to proprioceptive training to help improve balance and co-ordination.

The importance of this period is for your brain to start to regain control of your knee. All I have achieved in your ACL reconstruction is to place a piece of material in your knee to stop it giving way. You must now ask your brain and spinal cord to learn to control the muscle of your abdomen, back, thigh and calf to achieve fine-tuning of the knee. This is not easy but it is fun and very rewarding. It is this phase, more than any other, which gives you a good and satisfying result.

Stage 3(3-6 months) Proprioception effectively means co-ordination or “joint position sense”. At this stage the exercises will include wobble boards and the mini-trampet. At the gym you can swim, use a static bicycle and the leg press. At the same time progressive quadriceps and hamstring strengthening will continue.

This is the phase where you learn to run again. Please do not try to run before this as you will not have sufficient control over your leg to run properly and in any event I want you to concentrate on your proprioception before this stage.

- initially learn to fast walk at 6km per hour on a treadmill. Make sure you have a perfect gait and that you are symmetrical
- then run on a treadmill in graduated times whilst fast-walking
- once you are happy running on a treadmill, start to run on grass and then on a hard surface

- once you can run in a straight line learn to run and side-step and change direction

By the end of this phase you should be able to run in a straight line, sprint (if you wish) and run with a change of direction.

Stage 4(6-9 months)

Return to sport specific training in a non-contact and non-competitive fashion. Use the 3 months to increase your level of fitness and be in good condition to compete when you able to return to full sports after 9 months.

Stage 5(9-36 months)

Although you should safely be able to return to contact sport activities at 9 months after your reconstruction, it is important to continue with the exercises as outlined above, especially the proprioceptive work. Many professional sports persons note that although they can return to sport at 9 months, they do not feel fully rehabilitated until 24-36 months have passed as they “learn to use the knee” again.

A question often asked by patients is why do they have to wait 9 months before returning to contact sport when professional sports persons return at about 5-6 months. The answer is that the professionals, quite reasonably, are taking a risk as they need to return to their sport as soon as possible for financial or other reasons. Most UK orthopaedic surgeons would agree that it is safest to wait approximately 9 months before returning to contact sport to minimise the risk of re-rupture of the graft, which does not “mature” sufficiently until approximately the 9 month mark. If sport is not your livelihood it is probably wise to wait until 9 months to minimise the risk of a further rupture and starting from day one again.

Naturally the above is only a guide. It is advised you are supervised through your rehabilitation by a Physiotherapist. If you have any other questions relating to your surgery, progress or rehabilitation please do not hesitate to contact me.

POSSIBLE RISKS AND COMPLICATIONS

There is no surgical procedure that is free from complications. ACL reconstruction, especially recently, has a very good record of safety and success, but complications can occur. Such complications can include;

1. Stiffness of the knee. The knee may have difficulty gaining full extension or flexion. This is minimised by early physiotherapy and in addition a great deal of effort on the part of the patient. Sometimes it may be necessary to manipulate the knee under anaesthetic or carry out an arthroscopy to break down adhesions if the knee does become stiff. The best way of avoiding this is to rest as much as possible in the first 2 weeks after your procedure, so that the knee does not swell and lose movement.
2. Persistent pain over the front of the knee - this is largely independent of the ACL reconstruction and largely depends on how much damage there has been to the knee cap before or at the time ACL injury.
3. There may be persistent numbness on the inner aspect of the leg, or the front of the leg, and rarely an area develops tiny 'shocks' when lightly touched. This usually settles but occasionally there can be persistent numbness over a patch on the shin. Very, very rarely treatment is needed for a neuroma, which is a lump on a nerve just below the knee.
4. Persistent swelling of the knee. This is usually only seen in the first few weeks after surgery. However in a small number of cases swelling can persist for several months after surgery, and in some cases an additional arthroscopy is needed to stop this. In my last 500 ACL reconstructions I have had to operate again for this reason on 4 occasions i.e. this is relatively uncommon.
5. Deep venous thrombosis (DVT) or 'blood clots in the veins'. Every attempt is made to minimise this complication, although heparin is not given routinely. Unless the procedure is an emergency, patients should not be taking the oral contraceptive pill prior to surgery. Finish your current pack and take other contraceptive precautions until after your operation. It is also advisable not to be taking HRT at the time of surgery. Please ask for advice if necessary.
6. Infection of the knee. This is a rare but extremely serious complication. Antibiotics are given during and shortly after the operation to minimise the risk. In my last 1000 ACL reconstructions I have experienced 3 deep infections (i.e. into the knee joint, which necessitated surgery) and 13 superficial infections.(i.e. wounds infected only which settled without surgery)
7. Failure of the graft. This denotes failure or rupture of the graft without a history of significant re-injury. This may occur within a short time of operation or after a considerable period.

The 5 year success rate in preventing instability is approximately 90% (this figure has increased considerably in recent years). Over my last 1000 reconstructions I am aware of 14 patients whose graft failed without a significant history of re-injury.

8. Graft re-rupture secondary to further injury. This denotes rupture of a previously successful ACL graft.

If I carry out my operation well and you have successful rehabilitation, you should be at risk of a second rupture of your ACL graft and also rupture of the ACL graft in your other leg. If none of my patients ruptured their ACL again it would mean I would not be restoring them to the ability to play competitive sport again and thus expose themselves to activities which are prone to ACL rupture!

In my last 1000 reconstructions, I know of a 4% ipsilateral re-rupture rate and a 6% contralateral re-rupture rate. Why is it less on the ipsilateral side? Probably because patients neglect to rehabilitate their “normal” knee after an ACL reconstruction!

9. Hardware complications - occasionally the fixation devices that are used to anchor the graft can irritate the soft tissues and need to be removed or trimmed. This can occur in up to 5% of cases.

In general an ACL reconstruction in the modern era is a very successful operation if it is performed well, there is good rehabilitation and if there are realistic expectations all round.

Please contact the hospital at which you underwent surgery if you are at all concerned that there is a problem. In particular, act immediately if you develop a fever, severe pain or significant wound problems.

If you develop a problem after your surgery you do not need to contact your GP (unless you wish to do so). If for any reason I am unavailable, there will always be a Consultant available to see you at short notice - if outside of office hours please contact the Duty Nurse at the Princess Margaret Hospital and they will be able to help you.

CONCLUSION

I hope that this guide has been of use to you. You will have been recommended surgery only if the potential benefits of the operation outweigh the risks. If you have any questions relating to this please direct any questions you have to me.

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