

ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION PROCEDURES

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INFORMATION AND PROTOCOLS

PREAMBLE

The anterior cruciate ligament is a complex and vital central structure to the stability and function of the knee joint in both sports and the activities of daily living. Breakage of this ligament may lead to instability of the knee, preventing sports participation and pivoting movements. Long term instability with giving way of the joint has been associated with premature wear and tear changes or osteo-arthritic change in the joint. Over the last 8 years, significant advances in the technique and surgery of the anterior cruciate has allowed effective reconstruction of this ligament with encouraging successful results in the hands of the specialist surgeons. What follows is information on the anterior cruciate ligament, its structure and function and an over view of the surgery and important rehabilitation points for patients undergoing anterior cruciate ligament (ACL) reconstruction.

ANATOMY

The anterior cruciate ligament arises from the mid portion of the tibia at its upper surface and then passes diagonally backwards to the most rear aspect of the femur. Its fibres are orientated in a complex spiral fashion and the ligament itself receives an excellent blood and nerve supply from both the femur and tibia. The nerve supply to the anterior cruciate ligament is important in allowing the co-ordination centres of the brain to plan and execute complex knee movements. It is these movements that are vital in pivoting and twisting that occur in sports activities.

FUNCTION

The knee joint is capable of flexion and extension, rotation and a degree of gliding back and forth. During these complex compound movements the femur and tibia are held together by the anterior cruciate ligament which is the most important or primary restraint to the knee under these conditions.

Other ligaments around the knee aid in stability, but they are of less or secondary importance to knee joint stability.

A loss of the anterior cruciate ligament therefore allows the femur to move in an unnatural and unrestrained way on the top of the tibia during movement. As a result under certain circumstances, the femur can slip off the top of the tibia and a partial knee dislocation or “giving way” results. This has two sequelae: collapse of the knee and failure to function and secondarily, abnormal movement of the knee may cause further cartilage injury. This, in the long term, is associated with degenerative change or osteoarthritis in the knee at a later stage.

Reconstruction of a symptomatic knee therefore is aimed in the short term at restoring function and pivoting ability to the joint and in the long term by stabilisation of the knee, preventing any early wear and tear changes or subsequent cartilage damage.

RECONSTRUCTION

The anterior cruciate ligament breaks under tremendous stress. The ligament fails catastrophically and patients are sometimes aware of a “crack” as the ligament fails. Although surgeons in the past have attempted to repair the torn ligament, there is very good research evidence that simple suture of the ligament is not strong enough to restore normal function to the joint. A replacement structure must be used to take the place of the anterior cruciate ligament. Some years ago artificial fibres such as gortex and carbon fibre were used to reconstruct the anterior cruciate ligament but all artificial fibres failed two years post surgery and these reconstructions were not successful.

Currently, other ligaments around the knee with the same strength as the original anterior cruciate ligament are employed as a ligament reconstruction. Use of the patient’s own ligaments as donor tissue is attractive because there is no fear of graft rejection nor any of the attendant problems of using artificial materials within the human body.

The two donor tendons are used for anterior cruciate reconstruction, depending on the build of the patient, sporting activities and condition of the knee. One third of the patellar tendon may be used as a donor ligament and published research indicates that over a long follow up period, this is a successful and safe ACL reconstruction. An alternative donor tissue are hamstring tendons which are harvested from the same knee on the inner aspect. These tendons are more suitable for certain types of patient and both procedures involve a small scar over the front part of the knee and currently there is no difference in published research regarding different donor tissues, they both seem to give identical long term results.

OPERATION

The operation for anterior cruciate ligament reconstruction is performed predominantly arthroscopically, excepting graft harvest which must be performed through a small incision over the front part of the knee. At the time of surgery a complete arthroscopy is carried out

of the knee inspecting the articular surface of the femur, tibia and rear surface of the patella and examining the two meniscal cartilages in the knee as well as preparing the middle part of the joint for anterior cruciate ligament grafting. Under normal conditions, this part of the procedure is video taped for the patients information and understanding.

The graft is then harvested, being patellar tendon or hamstrings as explained above. The graft is then prepared from the donor ligament tissue and small tunnels made in both the femur and tibia to allow passage and securing of the new ligament tissue. Patellar tendon grafts are secured by specially designed titanium screws and hamstring tendons are secured by alternative devices allowing soft tissue stability.

The position of the graft is all important in the stability and considerable expertise and care is required to correctly orientate the graft and establish the stability. This will be complete at the end of the operation.

RECOVERY

Operation Day

Following the surgery, you will be returned to the ward and there will be a dressing and a cryocuff will be applied to the knee. This is a blue water jacket full of iced water with a function of cooling the knee, reducing inflammation and swelling. Iced water within the jacket is changed on a regular basis using a fluid reservoir. There may be discomfort in the joint following surgery and appropriate pain killers and anti-inflammatory tablets will be available at your request. Please do not tolerate pain as this will prevent you actively undergoing physiotherapy in the subsequent days and reduce the range of movement in the joint.

Day One

On the first morning, post operative X-rays are performed to check the position of the fixation devices and graft situation. At this point the physiotherapist will visit and there will be an opportunity of discussing and viewing the video tape of surgery. In the afternoon the continuous passive motion (CPM) machine is employed to allow early movement of the knee without muscular effort. This is important in regaining flexion after surgery. Because of the surgical technique and methods of graft fixation, full weight bearing is possible at this time, although this will be under the supervision of a nurse or physiotherapist and crutches will be used for stability. Patients are encouraged to walk as they wish and from the first day are encouraged for exercise and mobilisation and visits to the toilet.

Day Two/Four

During this period aims are to increase flexion to 90° (a right angle), obtain full extension of the knee at the same time as reducing inflammation and swelling and controlling discomfort with taking tablets and anti-inflammatory drugs. The CPM machine will be in use

extensively during this period and at regular intervals the leg will be removed from the CPM and full extension will be encouraged. Rehabilitation at this time is intensive and you are encouraged to maximise your time and effort with the physiotherapist. Use of pain killing tablets and anti-inflammatories will allow you to gain the most from physiotherapy exercises. These are available on request from the nursing staff. Later during this period increasing walking distance will be encouraged, initially with crutches, and before home discharge you will be encouraged to climb and descend stairs. Most patients achieve these targets in 4 days.

Upon discharge you will be fully weight bearing and some patients prefer to stabilise themselves with a crutch or stick for confidence.

REHABILITATION AND PHYSIOTHERAPY

Importantly car insurance companies will not allow driving for five weeks from the procedure. This may be waived if the left knee is reconstructed and the car has an automatic gearbox.

Physiotherapy and a home based programme of activities are required to achieve good joint movement, promote feelings of stability and allow a normal return to sport. Expert rehabilitation is a vital part in recovery of knee function after ACL reconstruction.

Commonly due to the involvement of small neural fibres around the incision, most people note a numbness in the skin outside the incision. Over the months this will improve although some patients are left with an area of altered sensation around the scar.

ACL grafting technique using ligaments from the patient's knees do not incur the risk of rejection and initially tendon structures are of a strength equivalent to that of the original ACL. New methods of fixation allow immediate mobilisation and full weight bearing without the use of a knee brace or plaster of Paris techniques that were previously employed.

However, the donor tendons mature and change their structure slightly to resemble more the ligament they replace over the months following surgery. The strength characteristics change and for this reason physiotherapy is divided up into 3 different stages.

Stage One

The donor tendons, whilst alive and vital, have been removed from their normal blood supply during surgery. Initially, as strong as the normal anterior cruciate ligament, over the following 10 weeks after surgery the strength of the ACL graft decreases slightly due to reduction in the blood supply the ligament experiences. For this reason physiotherapy exercises are not strength dominated but are focused on a range of movement exercises, agility and co-ordination drills. Rehabilitation is conducted on cycle and rowing machines and exercises with weights, not properly supervised, may damage the graft at this point. Whilst normal activities are possible throughout this period many patients feel that with

their new gained stability and feelings of security they may do extra and can “push” the knee to achieve function and strength in advance of the physiotherapy programme. It is important not to exceed physiotherapy instructions during this stage as graft stretching or rupture may occur if the patient takes on too much muscle strengthening exercises at this point. The most terrible wrath of the surgeon and supervising physiotherapist will descend upon any patient trying to force the pace of rehabilitation at this stage.

Stage Two

From 10 weeks onwards the blood supply now begins to grow into the ligament from the tibial and femoral ends, strengthening and revitalising the ligament tissue as it does so. During stage 2 physiotherapy visits to the gym will become less frequent and more home based activities will be encouraged. For a patient having achieved a level of confidence, it is possible to undertake gentle and social racket sports, jogging and certain types of running and sprinting exercises. These are of an approved and non competitive nature only as muscle strength is gradually improved in a staged fashion. However, during this stage exercises are focused on recovering muscle strength in the quadriceps and social non contact sport may be contemplated for those who wish.

Stage Three

Following 12 weeks of stage 2 and 10 weeks of stage 1, the patient is now approximately 6 months from surgery. At this point sports specific drills may be entertained such as non contact football skills, more aggressive non contact sport and specific muscle draining drills which will involve using weights in a more effective manner to build muscle bulk and strength. Visits to the physiotherapy gym are only occasional and often for advice and assessment only. Evidence indicates that in most cases full revascularisation and return of strength in the graft occurs by 10 months post surgery, perhaps earlier in some cases. At this point, should the patient so wish, return to full contact sports is permissible. At this point there are no surgical restrictions to the activity undertaken by the knee and the patient may perform any sport or recreational occupation they may wish.

COMPLICATIONS

ACL reconstruction is demanding soft tissue surgery and both the physiotherapist and the surgeon should be aware of the possibility of soft tissue healing problems during the 10 month rehabilitation period. Occasional patients suffer problems with bleeding post surgery which may cause swelling in the knee joint. Whilst this may slow the progress of physiotherapy in the first few weeks published results show that by 12 weeks there is no significant difference between patients who suffer some bleeding post surgery and those who have an uncomplicated recovery. Some patients progress faster along the rehabilitation programme than others but this is a function of the individual biology. Occasionally scarring after surgery may require a small arthroscopic procedure to loosen the healing tissue and allow full movement of the joint. This may be undertaken as a day case and occurs in my practice in less than 5% of patients.

Some patients suffer some discomfort around the front of the knee during the first stages of physiotherapy, this whilst troublesome, requires some diminution of certain types of physiotherapy exercises and is a result of the donor site healing and maturing. Evidence indicates that this is a transient discomfort and disappears after the donor site has fully settled. During this period patients may notice some roughness or “clicking” over the knee cap. This relates to the scar tissue filling the defect left by the donor tendon and initially this scar tissue is quite rough and inflamed. As the scar tissue however matures and smoothes these symptoms subside, although some patients notice their knee is slightly “noisy” during stressful activities and crouching.

FOLLOW-UP

Following discharge I routinely review patients 6 weeks post surgery to ensure that the intensive rehabilitation during stage one is going well. I then review the patients at 12 weeks post surgery at the end of stage one to commence stage 2 exercises. Further review occurs at the end of stage 2 at 6 months post surgery to commence stage 3 rehabilitation.

HELP AND ADVICE

Should you have any queries regarding ACL surgery or be concerned as regards pain or swelling in the post operative period following discharge please feel free to contact the personnel on any of the numbers listed below:

Nursing Unit 2	02380 775544 Ext 372
Physiotherapy Department	02380 775544 Ext 348
Bernice Allison, Mr Barrett’s Secretary	02380 776877