MENISCAL ALLOGRAFT TRANSPLANTATION (MAT)

Introduction

The meniscus is a ‘C’ shaped structure that acts as a cushion to protect the smooth joint surfaces of the knee joint. Often known as the footballers cartilage it can be easily injured.

There are two of these structures – one on each side of the knee joint - and if removed at an operation following injury then there is less protection of the bearing surfaces such that the joint will wear out sooner.

Usually only a small part is removed and the risk of later problems is low. Symptoms will include pain and swelling of the knee after activity and limitation in tolerance of impact type sports. Symptoms may gradually get worse over the years as the joint slowly wears.

Options after tearing the meniscus

After a meniscus tear there are 5 options:

• Leave alone and allow symptoms to settle reducing activity levels – safe if this results in no pain and no swelling in the knee

• Arthroscopic surgery to remove the torn fragment – a very common and successful procedure

• Arthroscopic surgery to repair the torn fragment – performed when the torn fragment is large and the tear extends to the edge of the meniscus where there is a good blood supply to help it heal

• Replacement of part of the meniscus using synthetic implant (Menaflex or Actifit) as a scaffold for the body to regenerate new tissue. This is indicated for partial loss

• Meniscal transplantation to replace the whole meniscus

Meniscal Transplantation

Meniscal Allograft Transplantation involves implanting a donor graft (allograft) supplied from a tissue bank in the UK or from the USA. The remnants of the old meniscus are trimmed back to make a fresh bed for the new meniscus which is then inserted by keyhole surgery (arthroscopy) and stitched to the original bed. It then heals to the bed on the side capsule of the knee joint so that it can provide cushioning for the smooth articulating surfaces.

Grafts are donated rather like heart transplant donors and are very carefully prepared by the regulated tissue banks to ensure that the tissue is as free of disease risk as is possible. This process has been highly regulated and advances in testing for infections such as Hepatitis and HIV has meant that the risk of contracting severe infections through the grafting operation are now extremely small. Though difficult to fully quantify, the risk is less than that from a blood transfusion – something that is of course frequently carried out. Grafts are decontaminated and then cryopreserved (very cold) until required.
Unfortunately the strict requirements to have such ideal grafts combined with the need to have the meniscus exactly matched for size based on x-ray measurements, has meant that there is often a delay in obtaining an appropriate graft. Matching can sometimes take many months.

**Indications for the operation**

The procedure is indicated when there is no effective rim of meniscus remaining to support the joint surfaces. This occurs when there has been a large tear and when it was not possible for the surgeon to salvage the meniscus by repairing it. Not everyone needs a transplant but if there is progressive pain and symptoms limiting activity then the procedure may be indicated.

There is often a feeling that it is necessary to always replace the meniscus if it is removed, based on the argument that it will prevent or delay the onset of later arthritis. This is a difficult issue, but because the rehabilitation period is long and because the operation is not without risks, meniscal transplantation is usually only performed when symptoms of pain on activity begin to cause interference with quality of life.

**What can be expected after surgery**

The quality of the result of the operation is a key factor in deciding the indications as the replacement tissue is, after all, a donor graft that may not be as strong as the original and it takes time for it to fully integrate into the knee. Having invested a year of time in getting it right after surgery the thought of going back to full contact sports such as football and rugby could be considered ill-advised!

Recent research looking at the outcome by the leading surgeons in the US and in Europe would indicate that at 10 – 13 years approximately 70% of patients still have good function and have not had further surgery. Most have been able to do light sports. The occasional professional athlete may report being able to get back to high level but it should be remembered that professional athletes may have different goals.

Following surgery the rehabilitation process involves using a knee brace for the first 6 weeks while the new meniscus heals in place. The rehabilitation regime is given below.

**Results at Coventry**

Over 140 procedures have now been undertaken and University Hospital Coventry and Warwickshire NHS Trust remains the leading referral centre for the UK. Mr Spalding and Mr Thompson now have over 10 years’ experience of the technique and through continued analysis and lecturing internationally the team is one of the leading centres in the world.

9 out of 10 procedures have been successful with patients experiencing less pain feeling more active. Only 1.5% have failed when the joint is not significantly worn but some patients have had minor problems of swelling or pain from the stitches holding the meniscus in place resulting in the need for further minor surgery.

When Meniscal Transplantation is performed as part of a biological treatment program for patients with advanced wear in the knee then the risk of re-tearing the graft is higher. Each patient is carefully considered and a treatment program is individualised in this situation.
**Additional Treatment Procedures**

Additional procedures can treat problems of the joint surface damage, joint instability or when the leg is out of alignment. When the transplantation operation is performed in conjunction with other procedures the rehabilitation program may change.

The procedure possibilities include:

- Surgical procedures to repair the joint surface such as microfracture or autologous chondrocyte implantation (MACI procedure or ChondroCelect Implantation)

- If the joint is failing because the leg is out of alignment (bow-legged or knock-kneed) then osteotomy or realignment corrective surgery is needed.

- If the knee is unstable due to a ligament injury then transplantation can be combined with anterior cruciate or posterior cruciate ligament reconstruction.

**Being part of the evaluation program following Meniscal Allograft Transplantation**

Evaluating the benefit of the surgery is important benefitting patients now and in the future. All patients undergoing the operation are asked to be part of an ongoing outcome assessment project, completing short questionnaires assessing symptom and activity levels before and after the surgery.

Only by knowing results in detail can the service be improved – for the benefit of more patients

At Coventry only 1 patient so far has refused to cooperate in this important process.

**Summary**

Overall meniscal transplant is an exciting option for the damaged knee allowing for substantial improvement in the quality of life.

Though a challenging procedure with a long rehabilitation program, the technique alone or when combined with other surgery, provides a realistic biological option for knees, hopefully avoiding, or at least delaying, the need for metal and plastic knee replacement operations.
Meniscal Allograft Transplantation: Post op Rehabilitation

Outline

Post-operative treatment following allograft meniscal transplantation is similar to regimes following meniscal repair surgery. Progress is slow, because of the requirement for protecting the transplanted meniscus from higher loads while it heals fully in the joint, which may already have early wear changes.

Results show that the risk to the meniscus for re-tearing is in the first 15 months – this is why the rehabilitation process is slow.

0-6 Weeks

- Range of movement: restricted to 0-90° flexion, initially using a hinged knee brace. The meniscus is known to show little movement from 0-60 degrees of flexion, but beyond 90 degrees flexion the meniscus is compressed and moves backwards (posteriorly), pulling on the attachment points.

- Knee brace: applied immediately following surgery to hold the knee still. This should be worn day and night for the first 2 weeks providing protection to the knee. The hinges are locked holding the knee in full extension when walking but can be released when sitting or resting.

- After 2 weeks it is safe to move around without the brace staying touch weight bearing but still not bending beyond 90°. The brace may still be worn for comfort if required.

- Weight bearing: Touch Weight bearing on crutches for 6 weeks to avoid damage to the healing meniscal rim and anchor points during the initial healing phase.

- Exercises to push full extension are avoided for the first 4 weeks as forced extension compresses the meniscus and pulls on the attachment points. At 4 weeks extension exercises can be started.

- Isometric exercises are encouraged. Inner range quads (terminal extension) are avoided as these put high sheer forces on the meniscus.

6-12 Weeks

- At 6 weeks the new meniscus should have healed well enough to allow full bending of the knee – but not by loading the knee in flexion, just by heel slides and flexion exercises.

- This phase is to work on regaining strength and proprioception, while avoiding forced flexion and pivoting activities (for at least 6 months).

- Closed kinetic chain exercises can be begun with full weight bearing.

- Cycling is allowed from 6 weeks building up strength.

- Cross trainer from 8 weeks so long as swelling has resolved or is not made worse by exercise.

- Wall slide exercises must be avoided as this puts excessive force on the healing meniscus.

3-6 Months and then beyond

- Rehabilitation can proceed similar to ACL reconstruction and meniscal repair, but at a slower timescale allowing running at the earliest at 6 months and the introduction of pivoting and sport training if appropriate at 6 months.

- Full rehabilitation takes up to 9 months and any decision to return to high impact sports should be taken by discussion with the consultant.

- At 12 months An MRI scan is usually performed to evaluate the healing and follow-up outcome scores are collected either by email or in person.