

Surgical Aspects Influencing Return to and Maintaining Sporting Activity

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Introduction

A successful return to play and maintenance of that state of course represents an interaction between choosing the appropriate patient for surgery, choosing the appropriate operation type (including graft choice), ensuring appropriate rehabilitation with compliance from the patient, waiting the appropriate amount of time and achieving the minimum requirements for return to play. Surgery is a small part in this but nevertheless, without a good operation the patient stands no chance!

Choosing the Right Patient

Although for most young and active sporting patients reconstruction of the anterior cruciate ligament is appropriate, there are some groups in whom it is not. Put simply, not all patients with an ACL rupture require ACL reconstruction. Particularly in a younger group and with an avulsion type injury, ACL repair may have an increasing role given new techniques. Furthermore, patients who are not actually that involved in sport may not require reconstruction. A classic patient in the UK is one who has a ski-related injury but in reality the only sport they undertake in a year is a ski trip. They may go to the gym and undertake 'in line' activities but they do not necessarily need an early operation. A trial of non-surgical treatment may be appropriate here.

Choosing the Right Time

There is never a rush for ACL reconstruction. It is only safe to proceed to surgery once the inflammatory response has quietened and there is not only full passive extension but full active extension too. In this situation flexion is usually comfortably over 100 degrees.

Choosing the Right Operation

In my opinion there is no place for synthetic ACL reconstruction. I am also not keen at all on the use of Allograft. There are multiple publications showing a many fold increased risk of graft re-rupture. This fact is reflected by the reduction in usage of Allograft for ACL reconstruction in surgeons who have previously used high volume Allograft. I am strongly in favour of the use of Autograft; my practice involves the use of either mid-third patellar tendon or hamstring graft. Quadriceps tendon is an excellent alternative and I am sure will have an increasing role to play in the future. The vast majority of hamstring grafts I use are tripled semitendinosus and gracilis.

The positioning of the graft is important. There has been recent popularity following the double bundle experience to place the femoral tunnel through the ACL in the centre of the ACL footprint on the lateral wall of the intercondylar notch – the so called ‘anatomic’ position. In my practice, when I changed to this position in elite footballers I noted a marked rise in graft re-rupture (see table) with a doubling of re-ruptures with patellar tendon graft and a 2.5 times increase in four-strand hamstrings. I have therefore reverted to using the anteromedial bundle position on the femoral footprint of my femoral tunnel. I have maintained a central tibial tunnel position. Although I frequently view the lateral intercondylar notch via the anteromedial portal, I do not personally use an accessory anteromedial portal to view drilling.

	Quadrupled ST/G	B-PT-B
Overall Re-rupture	14 of 125 = 11%	7 of 81 = 8.6%
AMB	5 of 72 = 6.9%	1 of 22 = 4.5%
Central ‘anatomic’	9 of 53 = 17%	6 of 59 = 10.2%

When one considers the factors involved in ACL graft re-rupture, one of the factors is failure to address other lesions at the time of the primary operation. Great attention should therefore be taken to deal with meniscal lesions (such as a Ramp lesion or meniscal root avulsions). In addition the soft tissue envelope including collateral ligament complexes need to be carefully preoperatively and under anaesthetic prior to the operation. Noyes stated that the most common cause of a good ACL reconstruction failing was unaddressed posterolateral corner insufficiency. These days most significant posterolateral corner injuries are detected and treated and other more subtle laxities have a bigger role in ACL re-rupture. These include subtle medial laxities as well as failure of the anterolateral restraints. Concomitant lateral procedures such as lateral tenodeses are on the increase. Obviously these should only be used if appropriate as they add increased surgical trauma.

Whilst there has been considerable interest in the ‘anterolateral ligament’, our laboratory work has shown that the most important restraint to anterolateral rotatory instability with the ACL is the iliotibial band with its attachment to the distal

lateral femur via Kaplan's fibres. This is the reason I use a tenodesis and not an anterolateral ligament reconstruction.

Avoiding Surgical Complications

There are common problems and rare serious complications that will affect the ability of a patient to return to sport and their maintenance of sporting status. Perhaps the most feared complication is infection. Surgical infection patterns are changing however. Whereas previously staphylococcus aureus was the most common culprit, coagulase negative staphylococcus is much more common. A staphylococcus aureus diagnosis was not difficult due to the patient being extremely unwell, they would have a very hot and painful knee that would not move and they would also have a high CRP and ESR. The situation is harder with coagulase negative staphylococcus since the patient is not particularly unwell, they present with a persisting effusion and often range of movement, restriction and pain are not obvious. CRP and ESR are often in the mid-range. It is for this reason that occasionally such cases have a delayed diagnosis. A high index of suspicion is therefore required. Furthermore it is often not possible to culture the responsible organism and this too adds to the difficulty. An aggressive surgical approach is required rather than relying on antibiotics alone. My practice is to undertake a subtotal arthroscopic synovectomy, removing as much synovium as I can possibly achieve, then two to three days later this will be followed by a further arthroscopic washout and removal of blood clot whilst giving appropriate high dose intravenous antibiotics for a week. This is followed by oral therapy.

Of course prevention is better than cure and since changing our antibiotic prophylaxis from cefuroxime alone to a combination of gentamycin and flucloxacillin or Teicloplanin and cefuroxime plus wrapping our grafts in a vancomycin-soaked swab, our infection rate has been minimised.

Fixed flexion deformity is the most common significant complication from the injury and surgery. This can be avoided by appropriate tibial tunnel positioning, scrupulous removal of bony and soft tissue debris from drilling of tunnels and not using excessively large graft. Furthermore it should be noted that some patients do require a notchplasty if they have

an abnormally narrow intercondylar notch despite the current trend for suggesting that notchplasty is unnecessary. Another cause of fixed flexion deformity in the absence of any mechanical cause is failure of the patient to get their knee straight immediately after surgery. This can usually be avoided by good physiotherapy. In these cases fat pad contracture is the usual cause and is often related to poor pain relief, lack of patellar mobilisations, poor quadriceps activation and lack of passive stretches. Even a few degrees of fixed flexion is usually problematic.

Persisting synovitis is an issue, particularly with elite athletes who tend to be rushed through their rehab program. I have no doubt that there is a genetic predisposition to this as some patients seem to have luck on their side and have very little swelling

whereas others do swell and have problems in producing muscle therefore tending to have less knee control and they end up with looser grafts. They also develop chondral lesions during their rehabilitation period. Abnormal swelling must not be tolerated and often requires a surgeon to intervene to advise a slowing down of progression of rehabilitation and loading. Various joint injections can be helpful. Repeat arthroscopy is sometimes required.

Engagement with Rehabilitation

When it is the rehabilitation that can 'make or break' a good operation, why would a surgeon not wish to engage with the rehabilitation team? Regarding professional athletes this involves good communication with their team medics and physiotherapists. For non-professional athletes it equally involves engagement with the physiotherapist concerned. Frequently these individuals can make the surgeon look good but occasionally the reverse can be true. Communication and involvement from the surgeon is therefore key.

Appropriate Criteria for Return to Play

I feel it is important for the surgeon to be involved in this process. My criteria involve the patient being aerobically fit otherwise they will fatigue on the pitch and potentially re-rupture due to poor muscle control. They should have a dry knee without effusion. They need a minimum of six to nine months out from surgery. For juveniles I elongate this to one year due to the high re-rupture rate in this group. In addition the patient must also have confidence, which is not as straight-forward as one may think. Many athletes can prepare themselves mentally to get over problems so their confidence is not something one can necessarily trust. On the other hand, a lack of confidence is a sign there is a problem and the patient should therefore not return to play.

The final concept involves the restoration of 'symmetry'. There should be a symmetric appearance of the limbs in terms of muscle shape and bulk, functional testing such as hop heights/hop distances and isokinetic testing should be within 10% or less of the other limb. The player should not feel that they favour the uninjured side.

Summary

For all of the reasons above, a surgeon has a critical role in determining the ability of a person to get back to sport and to maintain this status.