

WHICH GRAFT IN ACL RECONSTRUCTION?

The Anterior Cruciate Ligament (ACL) does not heal once ruptured and the tissue cannot be repaired surgically, at least not in a way that results in a functional ACL. Therefore ACL injury is treated by reconstruction that is, making an entirely new ligament. The new ligament is called the graft and in the case of ACL reconstruction is a free graft. A free graft is one that has no blood supply and must obtain one by gradual incorporation.

Types of Grafts

There are 3 broad categories of grafts:

1. Autograft (your own tissue). Autograft has many advantages and is the most widely used graft worldwide, in Australia and by Dr McEwen. Autograft is harvested sterile and goes back in the same way after being soaked in an antibiotic solution. Autograft is 100% biocompatible with the recipient (you). This means that your body knows it's there, knows it belongs to you, predictably goes about giving it a blood supply and maintaining the graft. Autograft is also cheap in that there is no cost involved in obtaining it. The down sides to autograft are the limited control over graft size, the added surgical intrusion involved in harvesting the graft and the loss of function that relates to having your own tissue removed and transplanted. There are three autograft options:
 - a. Gracilis and Semitendinosus (STG hamstring) tendons.
 - b. Bone-Patellar Tendon-Bone (BTB).
 - c. Quadriceps Tendon- Bone (QTB).

Each autograft option provides a satisfactory graft. The hamstrings are considerably less painful to harvest than the extensor mechanism grafts and are associated with a vastly lower incidence of persisting anterior knee pain. They also have distinct advantages with respect to the double bundle technique. The majority of ACL reconstructions done in Australia utilize hamstring autograft. Dr McEwen uses hamstring autograft as the graft of choice for ACL reconstruction.

2. Allograft (someone else's tissue). Allograft also has its pros and cons. Using allograft eliminates donor site morbidity, there is no loss of function related to the harvest and sizing is more flexible. However, allograft is provided by bone and tissue banks and is very expensive. Supply is not guaranteed for obvious reasons. Most importantly, allograft needs to be treated at the tissue bank to ensure it is sterile, preserved and will not be rejected. This can be done in two ways. The most reliable way to treat the graft is by gamma irradiation. The graft is bombarded with a megadose of neutron beams and then frozen. Unfortunately the irradiation has a serious negative effect on the mechanical qualities of the graft and the results of ACL reconstruction with irradiated allograft are poor and as such this type of allograft is not used. The other way of preparing an allograft involves an ultrastereile harvest and immediate freezing. This non-irradiated graft is mechanically much better and

produces similar results to autograft. Non-irradiated allograft does however carry a very small but not zero chance of infection and rejection and for this reason is available only on a case by case basis through the Therapeutic Goods Administration's Special Access Scheme. Happily, The Queensland Bone and Tissue Bank is run under very tight controls and has been a very reliable provider for over two decades. Dr McEwen does use non-irradiated allograft in specific situations such as revision ACL reconstruction, multiligament reconstruction and PCL reconstruction. Hamstring autograft remains his preferred choice for uncomplicated ACL reconstruction.

3. Prosthetic (entirely synthetic). Prosthetic grafts have been around for 30 years. The most recent reincarnation of the prosthetic graft is the LARS which can be used in combination with a hamstring autograft or as the sole graft. Prosthetic grafts are meant to be used as biologic – prosthetic composites. That is the implanted prosthetic graft immediately splints and stabilizes the knee and then the remnants of the native ACL grow through the graft and stabilize the prosthesis. As such the ideal and really the only situation in which a prosthetic ligament should be used is immediately (within 2 weeks) after an acute ACL injury. The prosthesis is passed through the ACL remnant which is then pulled up as a sleeve around the prosthesis as it is seated. There are obvious advantages to a prosthetic graft. No donor site morbidity, no loss of function, no sterility, supply or rejection issues. Sounds great but unfortunately not that simple. The first two weeks after an acute ACL injury is not the ideal time to reconstruct as far as the general health of the knee goes (around 6 weeks is better). The ACL remnant is frequently in very poor condition and cannot reliably be made to cover the prosthesis as a sleeve so the prosthetic – biologic composite premise is unreliable. Prosthetic grafts are designed to work with isometric positioning whereas there is substantial evidence that grafts work best with anatomic placement. Prosthetic grafts are also spectacularly expensive and there is no evidence that this very substantial increase in cost improves the outcome in any way. Dr McEwen does not use prosthetic grafts at this point in time.

Graft Position and Configuration.

1. Anatomic and Isometric. For decades the primary mechanical objective in ACL reconstruction has been isometric graft placement. Isometric means that the distance between graft sockets is the same regardless of knee position with the graft then being under an even tension throughout the range of motion of the knee. Isometric however is not anatomic, meaning that it does not reproduce the native positioning of the ACL. Over the last 5 years there has been a marked swing towards anatomic graft placement. This swing has been a huge step forward in ACL reconstruction and has been driven by a better understanding of the complex anatomy and function of the ACL and a realization that isometric placement does not work well for everyone. For example, people with naturally hyperextensible knees are prone to ACL rupture and it has been persistently challenging for these people to regain their hyperextension range without damaging the graft. Anatomic graft placement, in particular, works better in these people. Anatomic graft placement has also resulted in better rotational as well as translation control of the knee compared to

isometric placement. The key to anatomic placement is being able locate the exact centres of the ACL attachments. This requires some additional work in the knee and an extra keyhole. Dr McEwen uses only anatomic graft positioning.

2. Single and Double Bundle. As mentioned above the swing to anatomic placement was driven by research into the complex anatomy and function of the ACL. This same research has also revealed that the ACL has two distinct bundles, the anteromedial bundle (AMB) and the posterolateral bundle (PLB). It is possible to reconstruct the bundles individually (anatomic double bundle ACL reconstruction) particularly in large knees. Double bundle ACL reconstruction (DBACL) restores the native footprint of the ligament and is definitely superior to isometric ACLR. Whether or not double bundle anatomic is better than single bundle anatomic is as yet undecided. Given the lack of conclusive evidence of superiority and the doubling of implant costs involved with DBACL single bundle anatomic is the procedure of choice at this point in time.

Sunday, 15 April 2012