

It has been an eventful winter for us here at Tokyo Physio. We established a winter clinic in Niseko ([www.NisekoPhysio.com](http://www.NisekoPhysio.com)) servicing the recent tidal wave of Aussie tourists, ski bums and entrepreneurs. As this was this was our first year of the clinic, as the eldest employee I felt it was my solemn duty to make the sacrifice & spend the winter in Niseko to ~~snowboard every day~~ establish the business. I have an interest in knees and while I was in Niseko I decided to begin an extended research program into the biomechanics of snowboarding and the strength of the knee ligaments. As part of this study, I decided to further test the ability of the anterior cruciate (ACL) and the medial co-lateral ligament (MCL) to withstand a blunt force blow (delivered by a tree) to the lateral aspect of the shin while traveling at somewhere over 30km/h. As I suspected in my hypothesis; the ACL and MCL were unable to withstand this force. I will now continue my research in Sydney with Dr. Justin Roe ([www.nsosmc.com.au/roe\\_site/abouttjpr.htm](http://www.nsosmc.com.au/roe_site/abouttjpr.htm)) – this kind fellow will assist me with the reconstructive component of my research. With this wealth of new knowledge, I thought it might be nice to pass on some information on the dreaded ACL tear.



Everyone knows someone who has torn an ACL. In fact about 5% of the population will suffer one at some stage in their life. The ACL is a fibrous band of tissue in the centre of the joint that is its main supporting link. This ligament can tear when the knee is twisted at an awkward angle during sports or even during seemingly innocuous activities. Although many people may have been diagnosed with a partially torn ACL, I would contest that many more people have been diagnosed with partial tears than actually have one. Experienced knee surgeons know that tearing an ACL is virtually like being pregnant: you've either done it or you haven't (and it generally involves a lot of pain). When the ligament is torn the knee joint is unstable, and people often complaining of having a “wobbly knee.”

When it comes to ACL ruptures, women are indeed the weaker sex. Research shows women are between two and seven times more likely to suffer an ACL tear as men. The width of the female pelvis results in a sharper angle at the knee (known as the “Q” angle). The larger the Q angle, the greater the stress is placed on the knee. Recent research has shown that fluctuations in hormonal concentrations may be the most important predisposing factor. High estrogen levels cause ligaments and other supporting structures to be more lax and unstable. Interestingly, one study indicated that taking the contraceptive pill decreased the incidence of knee injuries among female athletes – thereby preventing ruptured ACL pain and labor pains – a wonder drug indeed!

If an ACL tear is suspected an MRI is usually performed. If the ACL has been torn it has no ability to heal itself, so patients need to decide whether to have an operation or not. If you don't need to twist, you don't need an ACL. Most active people under 55 opt for a knee reconstruction to replace the ligament. It involves harvesting a tendon or ligament from another source and inserting it into the joint to replace the torn ACL.

There are three main sources that surgeons have for the new ligament: the patella tendon (the tendon between the kneecap and the shin); the hamstring tendon (the rope-like tendon behind the knee); and an allograft (either Achilles or patella tendon) from a cadaver. The pros and cons of each technique are numerous and orthopedic surgeons are renowned for heated exchanges over which procedure is the best. In the past 5-10 years hamstring tendons seem to be increasing in popularity and patella tendon decreasing somewhat. In the U.S the allograft has become popular.

Many experts consider the patella tendon to be the strongest graft because it is less elastic and the graft includes bone plugs on either end from the knee cap and the shin bone. The scar for this graft is in a sensitive location on the front of the knee and some ongoing anterior knee pain is not an uncommon side effect. Smaller people may not have the substance in the patella tendon to supply the graft without compromising the knee. Some patients may have some difficulty being able to fully straighten or bend the knee long after the operation.

The hamstring tendon is more flexible and hence may take more time to change its structure to that of the original ACL. Follow up studies suggest the knee is slightly looser with the hamstring than with the patella tendon, although there seems to be no difference in re-rupture rates. The location of the major scar is to the side of the knee and tends to cause less trouble. The flexibility in the knee generally returns to preoperative levels, so sitting in the Japanese *seza* position is usually possible. The loss of substance in the hamstring requires rehabilitation akin to that of a hamstring tear, but the tendon generally has enough volume to withstand the loss of the graft without undue side effects.

The allograft (from a cadaver) is used extensively in the US but has yet to be approved in most other countries. The obvious advantage of this procedure is that there is no additional injury to the body. Although some people have concerns with introducing another person's body part into their system, rejection of the donated tendon is virtually unheard of. There is a risk (reportedly one in one million) of receiving an infection from the donor. The freezing of the ligament and time out of the body may result in it not being as healthy as a ligament that has been harvested immediately before the procedure. Let's hope we never see live ACL donors become a growth market in the transplant tourism business.. Initial studies show a higher failure rate than autografts (a patient's own tissue). This procedure is usually reserved for athletes with a special event looming (the Olympics) or relatively sedentary & busy individuals who wish to have minimal time off work and minimum pain. The operation is faster for the surgeon due to the harvesting time being deleted.

Synthetic ACL replacements were pioneered in Japan and used for some time, but due to unacceptable failure rates they have been virtually abandoned.

Most expatriates in Tokyo have the operation done in their home country and return to Japan for the rehabilitation. The procedure is generally day surgery in western countries. Japanese hospitals tend to insist on 10 days hospitalization. Don't ask me why.

Although choosing a surgeon and hospital you are comfortable with is important, the key to the success of the procedure is how much effort you put into the extended rehabilitation that can take up to 12 months after the operation. Preoperative strengthening (prehabilitation) is important for function in the early stages after the operation. Most clients we see begin their rehabilitation with great gusto, but some experience rehab "burnout" about three months post-op or are too busy to put the time into the rehab. They may never regain full knee function. I've always thought that going through an ACL rehab is a measure of self discipline; as someone that needs several presses of the snooze button to get out of bed in the morning - I've got my fingers crossed.

Prevention of ACL injuries is difficult. Stretching is not effective and general knee braces do not work . Some motocross riders and extreme skiers find a special brace helps with prevention but it is quite bulky and expensive (\$1500). Strengthening the hip- and knee-stabilizing muscles will help. Make sure your ski bindings release quickly and of course, try not to hit a tree.

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