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Practical, evidence-based advice for clinicians managing anterior cruciate ligament tears non-surgically can help shift the culture, thinking and practice of treating these injuries, writes **Kieran Richardson.**

No ACL? No worries

Sports Medicine and rehabilitation experts were sent into a frenzy in 2015 when it was revealed an English Premier League soccer player defied conventions after fully rupturing his anterior cruciate ligament (ACL) (Short 2018). Not only did he not have surgery, but he returned to the first team in eight weeks, remained asymptomatic long-term, and was able to renegotiate another contract (Zbrojkiewicz 2018).

This case study challenges to the core our inherent cognitive biases around the understanding, and current industry trends, of ACL ruptures. It also flies in the face of the avalanche of ACL reconstructions (ACLR) being performed in Australia, with our rates now the highest in the world (Zbrojkiewicz & Grayson 2018). This is despite current world best practice being to undergo an initial structured, intense physical rehabilitation program for at least three months before even contemplating a surgical opinion, and no high-quality trials showing superiority of reconstruction over physiotherapy and exercise (Rooney 2018, Frobell et al 2013, Smith et al 2014).

This is incredible news for the physiotherapy profession. We can be leaders in shifting culture, thinking and practice with the management of these injuries inter-professionally and with the general public. However, in my experience, almost all the physiotherapists that I interact with are simply unaware of the lack of scientific evidence to continue blanket reconstructions to any patient following an ACL tear (Delince & Ghafil 2013), let alone have the confidence to carry out a comprehensive rehabilitation to return-to-sport.

My special interest in managing these injuries was sparked after managing two very distinctively juxtaposing cases almost simultaneously during my musculoskeletal specialisation training. The first was a female patient in her mid-30s who presented to me on a four-wheeled walker, in distress and in agony, approximately four years after her original ACL tear, having undergone five surgeries at that point.

A patient of similar demographics requested my opinion four days after a non-contact mechanism playing sports, without having yet undertaken high-powered imaging. She was adamant that no matter what the scan showed, she was opting for non-surgical management due to friends having poor outcomes from knee surgery—an MRI later confirmed a full thickness tear. We outlined a plan for management, she vigilantly completed her prescribed home exercise program and returned to field hockey in four months—and has remained symptom-free.

These patients kick-started me on an investigative journey into the available scientific data, having now also interviewed many world expert researchers in the field including Richard Frobell, Ewa Roos, Stephanie Filbay, APAM, Hege Grindem,

Grethe Myklebust and Clare Ardern, to name a few. My confidence grew based on the recommendations outlined in the literature, and I believe this information can positively empower patients and clinicians to commence this approach as best practice.

Questioning presuppositions

Before examining the research in detail there were a number of assumptions that I held as gospel truth, which I now realise were inaccurate or untrue. This is just some of the information that gives me assurance to offer any patient with an ACL injury non-surgical care, whether at the elite or general population level.

You cannot return to pivoting sports without an ACL reconstruction—FALSE

There is in fact not a single study, at a group-level, which shows you cannot return to pivoting sports without an ACL (Myklebust et al 2003, Grindem et al 2012).

High-quality studies show increased rates of osteoarthritis (OA) and meniscal damage without an ACL—FALSE

ACLR does not reduce OA long-term. This was not shown in the KANON trial (the only level 1 study available), nor has it been shown in any large studies with longitudinal follow-up, with suggestions the technique could possibly increase the risk of OA (Rooney 2018, Frobell et al 2013). It also doesn't reduce the incidence of meniscal tears—the KANON trial showed no differences in meniscal surgery rates between non-operated and operated groups, with other trials that conclude increased meniscal tears and subsequent surgeries in an ACL-deficient knee being of poor methodological design; comparing early reconstruction and supervised, controlled rehabilitation to no treatment or unknown treatment (Frobell et al 2013, Sanders et al 2016, Gupta et al 2016, Filbay 2018).

There are no iatrogenic side-effects or risks of having an ACLR—FALSE

There is significantly increased radiographic OA with a patella tendon ACLR, whether performed early or delayed, with postop shortening of the patella tendon leading to altered biomechanical loading of patellofemoral joint (PFJ), increased risk of patella fracture, patella tendon rupture and pain on kneeling (Frobell et al 2013, Jarvela & Jarvinen 2001, Neuman et al 2001).

Hamstring reconstruction leads to postop donor muscle atrophy, proximal retraction of the musculo-tendinous junction and the properties of semi-tendinosis and gracilis substantially altered after harvesting, reducing their length—all culminating in reduced knee flexion strength (Konrath et al 2016, Thomas et al 2013).

The ACL cannot heal—FALSE

Although almost a moot point, as patients can obviously cope long-term without the ligament, there are a good number of studies now revealing if left, the intervening ends of the ACL can re-attach (Costa-Paz et al 2013, van Meer et al 2014, Fujimoto et al 2002).

The initial consultation

Really, the keystone of organising a comprehensive, long-term structured rehabilitation program for any patient with this injury begins at the initial consultation. Given our cultural tendencies, it is imperative the therapist is cognisant of, and confident in, the aforementioned facts, as patients will more than likely be of the opinion that surgery is a 'quick-fix.' We need to help them see that irrespective of their end goal, they need to commit to a purposeful rehabilitation program, as this is a key factor in the determinant of successful outcome (Ericsson et al 2013, Eitzen et al 2010).

When the patient is booked in for their first session, I ensure the clinic customer service team gives them questionnaires such as the IKDC and KOOS (Collins et al 2011, van Meer 2013) for baseline assessment of their knee function, and the short form of the Örebro Musculoskeletal Pain Screening Questionnaire (Linton et al 2011) to screen for psychological risk, even for private patients, or the Tampa Scale of Kinesiophobia (Miller et al 1991) to analyse for the presence of fear-avoidance. Given the change in thinking and understanding around these injuries, the more formal data we can collect and track as a society the better, with patients' cases potentially able to be written up in scientific journals.

As a priority, I like to use the subjective exam/interview to get a feel for the patient's beliefs, expectations and goals around the injury, with the best research showing it is these elements that determine whether a patient chooses surgery, or not (Smith et al 2014). Here are some simple questions you could use to get the ball rolling:

- What do you understand the best research-evidence says about the management of ACL tears?
- Would you be pleased to know that for many patients, physiotherapy and exercise actually becomes their treatment?
- Would you be happy to hear you can return to sports without an ACL through intense strength, coordination and balance training?

- How long do you think it will take to get back to your desired level of activity?

Some of the questions can be specifically targeted around fear of using the knee:

- Are you worried about using your knee again?
- Do you believe that if you feel pain you are causing damage?
- If you feel an increase in your knee pain during an activity, do you stop or carry-on? Why/why not?

Other questions may allude more specifically to a patient's self-efficacy, motivation and likelihood of keeping up with their exercise regimen and their confidence to return to play (Ardern et al 2015, Hall et al 2012):

- Do you believe you can get back to your pre-injury level?
- On a scale of 0–10, with zero being not committed and 10 being highly-committed, how likely are you to engage in an exercise program we review and aim to progress on a regular basis?
- Do you believe you can get back to sports? If not, why not?
- How motivated are you to return to play?
- How fearful are you of re-injuring your knee?

Patients with acute ACL tears often exhibit fear-avoidant strategies such as co-contraction, bracing and a stiff-knee, or grimacing and breath-holding with excessive upper limb use through their unaffected limb legitimately due to pain, or due to fear of re-injury (Hurd et al 2008, Hartigan et al 2013).

Having identified a series of functional limitations in the patient interview, I then like to attempt to show a patient that often their pain can quickly be modified a la Jeremy Lewis' functional modification method, or the Peter O'Sullivan cognitive functional therapy approach (Lewis 2009, Vibe Fersum 2013, Lehman 2018). This can be as simple as supporting the painful site, for example the PFJ, with a Jenny McConnell-style glide, re-correcting the foot position to change the knee angle or de-threatening the patient's pain through repeated relaxed movements (Crossley 2016).

I'm yet to see a patient, including physiotherapists and doctors, who have injured their ACL, who have not been surprised at how quickly their resting pain and pain with functional tasks can be considerably abolished with simple strategies like this, which diminishes a reductionist focus on the ligament as being the sole cause of their pain.

At the first session I like to conclude by recorrecting any aforementioned aberrant functional movement patterns, and I then use these as the initial building blocks of an exercise program. They might include repetition and practice at home of a relaxed sit-to stand, two-legged squats or baby lunge tasks within pain tolerable limits.

Controlled, high-quality, supervised rehabilitation over time

Generally, by the end of the first or second consult, I like to talk about prognosis in terms of time frames with patients. Clinical guidelines and the best trials of non-surgical management for this injury recommend three to six months for returning to pre-injury activity, although time frames can be quicker or longer than this (Rooney 2018, Frobell et al 2010). I generally outline to patients verbally three key, fluid phases, with approximate time frames and key focuses of management included:

1. Weeks 0–4, symptom relief: Manual therapy techniques, active range of motion exercises, balance/proprioception exercises, restoring normal functional movement patterns, 2- and 1-legged exercises as able, cycling and normal gait with graded walking programs
2. Weeks 5–13, progression of functional exercises and strengthening: Advancing 2- and 1-legged functional exercises, then stationary plyometrics, jogging/running/sprinting
3. Weeks 14–28 and beyond, return-to-sports progressions and assessments: Dynamic plyometrics, cutting/agility drills, sports-specific drills, psychological readiness, prevention/performance enhancing exercises.

I document this shared decision for management in the form of a written treatment plan, with short and long-term goals outlined in detail (Holopainen et al 2018, Grindem et al 2018), which I give to the patient and the customer service team.

The next few sessions over the ensuing weeks should focus on symptom reduction and impairment resolution, which is also known as obtaining a 'quiet knee' (Failla 2015). Manual therapy can be used judiciously, with some authors describing mobilisation of the patella and restoration of the active and passive range of motion as critical to long-term outcome (Delince & Ghafil 2013, Myklebust et al 2003).

There is evidence that proprioceptive and balance exercises improve outcomes in individuals with ACL-deficient knees, therefore despite being less 'appealing' than other exercise forms, they should be prescribed routinely at least two to three times per week, up to 50–60 minutes in total (Cooper et al 2005). Protocols by Weiller et al 2015, Eitzen et al 2010 and Frobell et al 2010 are great examples of recommended exercises and progressions

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that are freely downloadable, which clinicians can use as a guide, although programs should be individualised with additional exercises being able to be added to a patient's program as required. Towards the later stages of the program, I like to include exercises that purposefully challenge valgus and potential pivot-shift stresses at the knee (Harrington 2018).

Given the tendency for patients to present with kinesiophobia and concurrent over-protection of their knee, I intentionally don't use commands for quadricep and hamstring co-contraction. During rehabilitation I use verbal cues to assist with my exercise prescription such as 'relax your knee', 'trust your knee', 'your knee is getting stronger' and 'your knee is stable'. This practice promotes more unconscious, relaxed and automatic mechanisms, reduced fear of movement, reduced muscle rigidity and co-contraction and improved landing mechanics (Grindem et al 2012, Sanders et al 2016).

In the advanced stages of the program, when hopping and plyometric drills are a greater proportion of the program, testing of the classic 'hop test battery' by Noyes is considered a bare minimum requirement (Noyes et al 1991). Normalising patients' strength and movement quality are also vital, the same as if the patient had undergone an ACLR (van Melick et al 2016).

Psychological readiness to return to play can also be formally assessed using easy-to-administer tools, such as the ACL Return to Sport After Injury Scale (Webster & Feller 2018). During this formal rehabilitation process, I repeat my original outcome measures every six weeks or so to assess for clinical meaningful important differences. I also deliberately book future 'booster' sessions with patients after a successful return to sport, to ensure continued compliance with preventative exercises, often describing maintenance of these to them as 'performance enhancing' (Skou et al 2018, Fleig et al 2013, Nessler et al 2017).

Changing culture

In order to see a reduction in the widespread panic and fast-tracking to reconstruction associated with ACL tears in Australia, physiotherapists must have confidence that their treatment and management is in many ways superior to other more invasive measures: it is less costly, patient empowering, most contemporary evidence-based, gives the generalised benefits of exercise, has none of the side-effects of surgery and comes with a quicker return-to-normal activity with no confirmed greater risks.

All the researchers I've spoken to believe the clinicians on the frontline need to be empowered with the latest evidence, so we can all work together to change the narrative around this injury. This article is part of a comprehensive, long-term mission of mine to shift thinking and practice around ACL tears at all levels of society.

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