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ANTERIOR 'NOT CRUCIAL' LIGAMENT: WHY WE SHOULD START MANAGING SUSPECTED ACL TEARS LIKE ANKLE SPRAINS

HIGH-QUALITY RESEARCH AFFIRMS THE EFFECTIVENESS OF CONSERVATIVE CARE IMMEDIATELY FOLLOWING ANTERIOR CRUCIATE LIGAMENT (ACL) INJURY IN COMPARISON TO RECONSTRUCTION PROCEDURES. **KIERAN RICHARDSON**, FACP, SHINES A LIGHT ON THE CULTURAL TRENDS RELATING TO ACL INJURIES AND THE POSITIVE IMPACT PHYSIOTHERAPY CAN MAKE IN THIS AREA.

Anterior cruciate ligament (ACL) tears are regularly described in the general media and in scientific literature as 'devastating' to the patient suffering the injury, in part due to the almost-requisite decision for surgical reconstruction and the minimum 9–12 months' rehabilitation period often deemed necessary to attempt to return to sport (Magnussen et al 2015, Walczak et al 2017, Comisar 2017, Ryan 2016, Hardy et al 2017).

Recreational and elite athletes are often reported as having had multiple surgeries (up to five ACL reconstructions, and 12 surgeries in some instances) to restore 'stability' to the knee (Curley 2017, Okoroha et al 2017, Smith et al 2014), juxtaposed against the considerable side-effects of recurrent soft tissue injuries and structural damage associated with the technique (Hardy et al 2017, Konrath et al 2016, Ohori et al 2017, Thomas et al 2013, Xergia et al 2011).

Benefit from these surgeries is also unclear when there are reports of some elite sportspeople who are asymptomatic with partial and full-thickness ACL tears for years (Peebles 2014, Weiler 2015), although some still decide to undergo operative care upon receiving the diagnosis via routine imaging (Sutton 2017).

A dramatic change in thinking

Recent high-quality research has challenged the catastrophic impact of these injuries, giving hope for a paradigm shift in initial management and a rehabilitation revolution (Frobell et al 2013, Monk et al 2016, Smith et al 2014). If the ACL is torn, is there an unequivocal need for a counterfeit 'ligament' to be surgically inserted to prevent aggressive arthritis, restore functional stability and facilitate a return to pivoting sports?

Current literature would suggest that an ACL injury doesn't mean that the individual cannot return to high-level activity, or that, structurally, their knee will be any better off in terms of deterioration long-term if they opt for a reconstruction (Peebles 2014, Weiler et al 2015, Frobell et al 2013, Myklebust et al 2003, Øiestad et al 2009).

Could suspected ACL tears be managed in a manner not dissimilar to an acutely sprained ankle? Systematic reviews state that the majority of lateral ankle ligament ruptures can be managed without surgery (Petersen et al 2013, Dubin et al 2011, Kerkhoffs et al 2007). Although they are anatomically different joints with unique functions, there are many similarities in the pathophysiology of knee and ankle ligamentous injuries (Manunta et al 2014, Pasanen et al 2017).

First and foremost, in both instances, acute management should be based on judiciously clearing for a fracture using clinical decision rules such as the Ottawa knee or ankle rules, or the Pittsburgh decision rules for

the knee (McGovern & Martin 2016, Gould et al 2014). Ligamentous injuries to the knee or the ankle can both result in an acutely painful swollen joint, potential for other soft tissue structures to be involved, clinical tests such as the anterior drawer for the knee and ankle to assess for ligament damage and laxity, and concern on the part of the patient about when they may be able to get back to sporting activity or normal living (Manunta et al 2014, Longo et al 2013, Kostov et al 2014, Frobell et al 2010, Fong et al 2009).

The facts

Understanding of ACL injury and management has changed considerably in the past 20–30 years. Surgical interventions to repair or reconstruct ACL injuries have been available for approximately the past 120 years (Davarinos et al 2014, Murray 2013). However, in the 1950s through to the 1980s many professional athletes who'd sustained an ACL tear underwent rehabilitation and returned to the elite level without an operation, with some receiving the highest accolades achievable (Peebles 2014, McDaniel & Dameron 1983).

In response to the dogma that restoration of structural stability to the knee was essential post-ACL injury, imaging investigations and reconstructions have become the standard treatment for most patients, regardless of age or level of activity, resulting in a multibillion-dollar industry in the Western world, with literally millions of surgeries performed every year (Scillia et al 2016, Kemp et al 2011, Raines et al 2017, Thomas et al 2007). In Australia, surgical ACL reconstructions rates are among the highest in the world and this tendency is increasing (Janssen et al 2012, Medew 2016).

There have been hundreds of studies comparing the various surgical techniques to reconstruct the ACL (Anderson et al 2016). Nevertheless, the highest-quality trials comparing ACL reconstruction versus conservative management including physiotherapy and exercise have showed no significant differences between the groups (Monk et al 2016, Smith et al 2014).

Currently, there is only one low-risk-of-bias randomised controlled trial (RCT) comparing these two intervention arms (the Knee Anterior Cruciate Ligament, Nonsurgical versus Surgical Treatment [KANON] Study) which unambiguously has shown no difference in pain, symptoms, function in sports and recreation, return to pre-injury activity level, radiographic osteoarthritis (OA) and meniscus surgery between the groups (Frobell 2013).

Prognostic analysis from this study showed probable deleterious long-term effects with early surgical management in terms of greater levels of pain and worse functional outcome (Filbay et al 2017). Specifically, early arthroscopic surgery post the initial trauma of the injury has been

described as a ‘second trauma’, with double the amount of inflammatory markers being present in the knee joint at five-year follow-up (Larsson et al 2017).

It is fascinating to note that poor physical performance at the end of rehabilitation in this study predicted worse patient-reported outcomes at two and five years, regardless of treatment, further stressing the importance of exercise as key in the management of these injuries (Ericsson et al 2013).

Further myth-busting

There are a number of key areas with regards to ACL tear management in which the available scientific literature doesn’t support assumptions:

Impact of complete ACL tear on return to pivoting and landing sports

Recent studies comparing surgical and conservative treatments confirm that ACL reconstruction is not the prerequisite for returning to sporting activities (Delincé & Ghafil 2013). Non-operated patients can return to high-level activities without symptom complaints or episodes of instability (Hurd et al 2009), including jumping and cutting athletic pursuits (Grindem et al 2012).

In a case series, McDaniel and Dameron (1983) reported that 37 out of a group of 49 patients with untreated ACL tears returned to strenuous sports, with overall decreasing incidences of ‘giving way’ after 14 years of follow-up (McDaniel & Dameron 1983).

Many high-profile professional athletes have successfully participated long-term with an ACL-deficient knee in sports such as American football, basketball, handball and soccer (Myklebust et al 2003, Peebles 2014, Weiler et al 2015). Remarkably, an English Premier League soccer player has returned to play eight weeks after tearing his ACL, and has gone on to play multiple seasons without incident (Weiler et al 2015, Weiler 2016).

The association between ligament tests and functional joint stability

As with ankle sprain, clinical tests for joint laxity are often used to determine the extent to which the ACL has been damaged in an injury. Tests such as the Anterior Drawer or Pivot Shift tests are often seen performed on the sidelines following a classic ACL mechanism of injury (Kostov et al 2014).

However, the amount of anterior tibial translation is not predictive of functional abilities (Weiler et al 2015, Hurd et al 2009), with patients’ muscle strength, motor control and co-ordination often adequately compensating for this loss of ligament integrity (Smith et al 2014). The severity of damage to the ACL, as seen on magnetic resonance imaging (MRI), has been shown to not correlate with function or laxity

(Van Dyck et al 2012). Consequently, there is poor correlation between a positive clinical test for laxity and the capacity of an athlete to perform cutting and pivoting movements.

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The association between ACL reconstruction and knee OA

Following a full-thickness ACL tear, research typically shows acceleration in changes associated with knee osteoarthritis (Øiestad et al 2009). However, the KANON trial found no radiographic differences among patients who had undergone early ACL reconstruction, delayed ACL reconstruction or no ACL reconstruction (rehabilitation alone) after five years’ follow-up (Harris et al 2015). Conversely, there is some evidence that undergoing ACL surgery actually places the individual at greater risk of developing OA (Frobell et al 2013, Ajuied et al 2013, Kessler et al 2008, Li et al 2011, Luc et al 2014).

Expectations about ACL graft healing times

Classically, rehabilitation following an ACL reconstruction continues for up to a year prior to return to full sporting activity, based on the assumption that the inserted tendon graft requires lengthy remodelling as it attempts to bind within the surgically drilled bony tunnels in the femur and tibia (Paulos et al 1991). Some researchers suggest that athletes should take pointedly longer to return to play—up to 19 months or, in some cases, longer than two years—to respect the maturation of the implant (Nagelli & Hewett 2017).

However, the overall cell density of the grafts, including myofibroblasts and blood vessels, are significantly decreased and are not expected to reach the levels of a normal ACL, nor are the properties ever fully restored, even 48 months after the ACL reconstruction (Pauzenberger et al 2013, Sánchez 2010, Janssen et al 2011). Unsurprisingly, re-rupture rates are notably high following reconstruction techniques (Magnussen

2015, Kraeutler et al 2013).

The long-term outcome of ACL rupture

Possibly most astonishingly are recent studies reporting outcomes of the ligament itself, when conservative management occurs due to postponed operative intervention for ACL rupture. MRI and clinical tests performed at follow-up between two and three years’ post-onset demonstrated complete healing of the ligament, with most patients reporting return to their pre-existing athletic level (Costa-Paz 2012, Fujimoto et al 2002, Ihara et al 1996). Ironically, in one of the papers where 14 patients had this natural ligament resolution with conservative care, 462 patients had reconstructions, highlighting the existing absolute prejudice towards early surgical involvement (Costa-Paz 2012).

Where to from here? The acute presentation

An important factor in translating this research to clinical practice is the nature of the acute presentation. Using knee decision rules, we are able to increase the efficacy with which knee injuries are evaluated and reduce healthcare costs without leading to an increase in missed fractures (Gould et al 2014, Tuite 2015, Cheung et al 2013, Seaberg & Jackson 1994). Knowledge of the mechanism of injury, as determined by the history of presenting complaint and physical examination, can be helpful in deciding if a decision rule should be applied.

The most common mechanisms for knee injury are a direct blow, a fall, or twisting (Stiell 1995, Weber et al 1995). Pivoting injuries are responsible for 75 per cent of all knee injuries; however, 86 per cent of all knee fractures result from blunt trauma (Stiell 1995, Weber 1995). If there has not been a history of blunt trauma or fall, the patient is not under 12 or over 55 years of age, and they can weight-bear fully for four steps, then there would be meaningfully reduced clinical indication to send for knee radiography, unless an occult or second fracture is suspected (Cheung 2013, Diagnostic Imaging Pathways 2017).

MRI has been recommended by some authors for best evaluating for a suspected meniscus or ligament tear (Tuite 2015, Felli et al 2016). However, serious consideration needs to be given to avoiding early request for high-powered imaging to rule out ACL tears in patients, given comprehensive history taking with a complete physical examination delivering similar levels of diagnostic accuracy (Felli et al 2016, Dhillon 2015, Tornbjerg et al 2017). In fact, detection of an intact ACL may be possible on available plain radiographs without necessity for additional means such as MRI, which may cause increase costs and loss of time in patient care (Altinel et al 2015).

Because the morphology of the injured ACL fibres are often obscured by the initial post-trauma haemorrhage and edema, exactly locating and grading a tear is frequently not possible on MRI (Van Dyck 2017). MRI

Common myths surrounding ACL tears debunked by research studies:

- having a torn ACL means you can’t return to pivoting and landing sports
- positive ligament tests mean your knee is functionally ‘unstable’
- having a reconstruction means your knee will have less OA and meniscal damage
- your ACL graft will be fully healed within 9–12 months
- once your ACL is torn, it’s torn for good (ie, it cannot reattach/repair itself)—same goes for menisci

or CT scan can always be ordered prudently at a later time, if there are any noteworthy further causes for concern.

Meniscal tears of varying types often occur concurrently with an ACL tears (Hagino et al 2015). However, clinicians should really focus on the interpretation of the patient’s signs and symptoms, bearing in mind the aforesaid capacity of the ACL to heal without interference, as well as being cognisant of the ability of acute meniscus injuries to also heal in time (Ihara et al 1996, Beaufils & Pujol 2017), with three months minimum being suggested for a conservative approach (Beaufils et al 2017).

Recent literature has promoted the avoidance of surgical approaches to meniscal tears, given their occurrence in asymptomatic patients and the poor correlation of specific menisci injury to pain and function (Tornbjerg et al 2017, Beaufils & Pujol 2017, Boks et al 2006).

No high-quality studies demonstrate that reconstruction of the ACL reduces the risk of subsequent meniscal tears, nor that non-operative management increases the prevalence of meniscal tears (Frobell et al 2013, Dhillon 2015). Debates exist regarding various imaging techniques for diverse grades of chondral lesion, with low sensitivity in diagnosing cartilage defects (Felli et al 2016, Smith et al 2012). Even if osteochondral injury is identified on imaging, recent systematic reviews suggest that this does not adversely affect clinical outcomes (Walczak et al 2017).

Avoiding unnecessary interventions makes such practical sense for patients, because almost all treatments and investigations have the potential to do harm (Godlee 2009). Classic advice to clinicians is to always consider the interpretation of the patient’s presenting condition, with a view to ordering diagnostic imaging only if it is likely to bring about a change in the client’s management plan (Khan et al 1998).

Practical tips to assess and manage an acute suspected ACL tear:

- clear for a fracture via thorough history taking and physical exam, incorporating Ottawa and Pittsburgh decision-making rules
- avoid early referral for high-powered imaging such as MRI or CT scan
- discuss best available research with patients and recommend conservative management as best practice
- encourage patient to commit to a comprehensive rehabilitation program under the guidance of an experienced physiotherapist

Shared decision-making and rehabilitation

If an ACL tear is suspected (with or without a concomitant injury), and a fracture has been ruled out, the recommendations for management based on current research and guidelines need to be discussed openly with patients. This shared decision-making process cannot be hurried, as it requires careful explanations and comparisons of potential outcomes from the treatment option, and dialogue surrounding potential risks or harms weighed up against proposed benefits (Culvenor 2017, Elwy et al 2017).

Importantly, in one study, unwillingness to undergo surgery is the most common reason (56 per cent) for individuals not consenting to participate in RCTs concerning ACL tear management (Frobell et al 2007), with treatment preferences tending to reside with physiotherapy, not surgical intervention (Mitchell & Hurley 2008).

Best available research evidence recommends that all patients should commence with conservative management including physiotherapy and exercise as the first treatment arm, with education aiming to allay fears and encourage the start of rehabilitation as soon as possible (Smith et al 2014, Delincé & Ghafil 2013, Hurd et al 2009, Luc et al 2014, Failla et al 2015, Engebretsen 2014, Filbay et al 2015).

Conservative rehabilitation, involving physiotherapy and exercise rather than early surgery, has the same goals and outcomes as a typical post-operative protocol, including an expectation of a return to high-level function. However, timelines to recovery could be expected to be shorter given there is no requirement to protect a transplanted graft, with non-surgical rehabilitation based on the patient's functional impairments and progression, as well as symptoms such as pain and reported episodes of giving way.

Manual therapy techniques applied early have been shown to have a positive effect on pain, range of motion, muscle length and function (Ofner 2014, Courtney 2011, Richardson 2016). Functional exercises can be given early without cues for co-contraction to promote use of more unconscious and automatic mechanisms (to assist motor learning efficacy), reduce fear of movement, reduce muscle rigidity and improve landing mechanics (with plyometric exercise) (Hurd et al 2009, Bien & Dubuque 2015).

Clear guidelines for the initial, mid and end-stage rehabilitation phases to return to pain-free function and sport are freely available to download online, with scope for the supervising physiotherapist to add individualised autonomous exercises and education as the patient progresses (Weiler et al 2015, Frobell et al 2013, Frobell et al 2010, Eitzen et al 2010). Research-based screening questionnaires and outcome measures regarding return to play should also be utilised to ensure a comprehensive approach to end phase management (Arden et al 2014, Forsdyke et al 2017, Ross et al 2017).

Conclusion

ACL injuries have become the most feared injury of many recreational and professional athletes in our society, with this anxiety propagated by media outlets, medical journals, clinicians and society at large. Surgical procedures to 'reconstruct' this knee ligament are frequently used and have been assumed to be the gold standard approach for returning to pre-injury function. No credible, unbiased scientific evidence has proven that early reconstruction is superior to conservative management including commencing physiotherapy and exercises.

If ACL injuries were viewed and managed more like acute ankle sprains, hospital wait lists, emergency department triage, cost to governments, private insurance companies, tax payers, and return to work and sport outcomes, could all be radically improved.

For references, email ngeeditor@physiotherapy.asn.au.

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