THE CAMOGIE ASSOCIATION

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Player Welfare

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Louise Keane
Player Welfare and
Inclusion Coordinator
Email: louise.keane@camogie.ie

ACL INJURIES IN CAMOGIE

Anterior Cruciate Ligament (ACL) injuries are among the most debilitating injuries in sports, especially in activities like Camogie and Ladies Gaelic football. These injuries can have a significant impact on athletes, both physically and psychologically. We will explore the nature of ACL injuries, their mechanisms, current research findings and strategies for risk reduction. We will look at the return-to-play process, and the roles coaches and players can play in injury prevention. We will draw upon evidence-based research to provide detailed insights and recommendations for the prevention and management of ACL injuries in our Camogie athletes. I hope this guide will be simple to understand and allow you to gain insight into an ACL injury and how to overcome the ACL rehabilitation process successfully!

Introduction

We hear a lot about anterior cruciate ligament (ACL) injuries in female sport today. Some of this is actually positive, as some of the increase in ACL injuries can be attributed to an increase in female participation in sport. Camogie is one of the fastest growing sports in Ireland in terms of participation today, but with that, there is also an increase in injury occurrence within the sport.

Females in particular have been shown across multiple studies, to be at a much higher risk of ACL injuries across multiple different sports. We will get into this later on, but it is worth noting that there is also a lot of research to suggest we can substantially lower the risk of incurring an injury by following basic principles and guidelines, both in terms of our readiness for sport (warm up) and also in our preparation for sport (training – both athletic development and sports specific training).

KEY TAKEAWAYS

Females in particular have been shown across multiple studies, to be at a much higher risk of ACL injuries across multiple different sports.

What is an ACL?

The ACL is a ligament located in the knee joint, responsible for providing stability and support during movements such as pivoting, running, jumping, and changing direction. When the ACL is stretched or torn, usually due to sudden deceleration, changes in direction, or direct impact to the knee, it can lead to significant pain, swelling, and functional impairment. Multidirectional field sports place a tremendous demand on structural knee stability and the ACL is one of the main mechanisms of providing this stability.

Understanding ACL Injuries

How do they happen?? Mechanisms of ACL Injury

ACL injuries often occur through contact and non-contact mechanisms. Contact injuries generally involve contact with another player or object directly to the knee. A non-contact mechanism is where the athlete sustains the injury without direct contact from another player or object. Common scenarios include deceleration, landing from a jump, pivoting, or cutting manoeuvres.

When an athlete's base of support (outside their centre of gravity in particular) is challenged in stance (standing on one foot), this can lead to lower limb issues. If the planted knee (knee of the leg on the ground) has excessive direct directional force (extension/flexion/ rotational/knee valgus in particular) applied to it in this position, the athlete will be at risk of a knee ligament injury.

There are a number of factors that often contribute to this, including an externally rotated foot on contact with the ground (foot turned outwards), excessive knee valgus (knee collapsing inwards) or excessive trunk lean where an athlete's centre of mass is outside their base of support. It is often a combination of all 3 of these that can lead to a ligament rupture.

KEY TAKEWAYS:
Common scenarios where ACL injuries occur are non-contact in nature and include deceleration, landing from a jump, pivoting, or cutting manoeuvres.

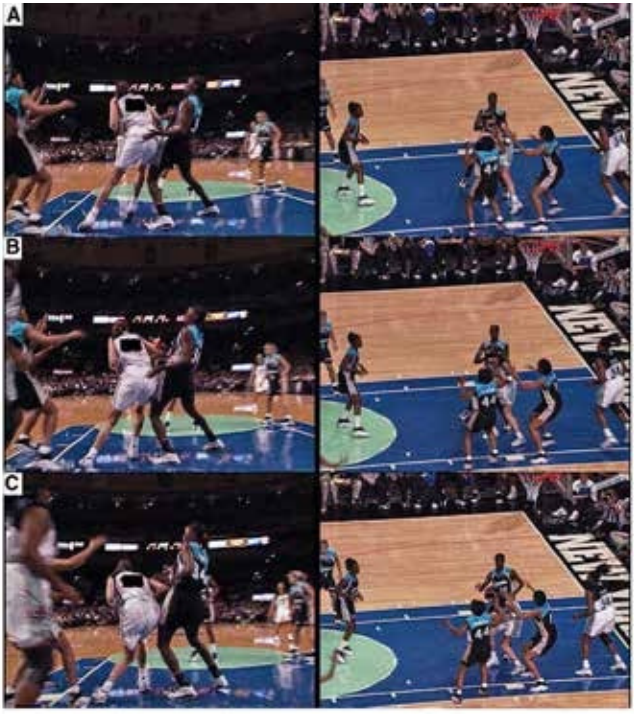

Figure 1. Synchronized video images from a 2-camera sequence with good quality. The injured player is seen in white shorts in the middle of the images at initial contact (A); 33 milliseconds after initial contact, corresponding to the approximate estimated time of rupture (B); and 133 milliseconds after initial contact (C). This situation was classified as a "valgus knee collapse."

Why me?

There are certain non-modifiable risk factors in female athletes associated with ACL injury.

Non-Modifiable Risk	Why?
Gender	Females have consistently been shown to be at a greater risk (Shimokochi et al., 2013)
Anatomy	Wider hips and a smaller knee to hip ratio can lead to knee valgus (Hewett et al, 2015)
Hormonal Influences	Fluctuations in estrogen levels throughout the menstrual cycle can affect ligament laxity and neuromuscular control, particularly during the pre-ovulatory phase when estrogen levels are higher (Hewett et al., 2016). This is an area that is understudied currently and the current evidence is debated.
Age	Skeletally immature athletes have been shown to be at greater risk (Schilaty et al,2016). Younger athletes are almost more at risk as they are more likely to play sport.
Previous Injury	A history of previous ACL injury increases injury risk (Andernord et al,2013). Interestingly contralateral (other side) injury risk also increases.
Genetics	Genetic factors, particularly in collagen composition can affect ACL susceptibility (Posthumus et al, 2009)

Within this, anatomy, gender and hormonal influences disproportionally affect female athletes leading to greater risk of injury.

Modifiable Factors

Research has shown that certain biomechanical factors contribute to increased ACL injury risk, particularly in female athletes. For example, females tend to exhibit greater knee valgus collapse during landing, which places additional stress on the ACL. Studies have also identified neuromuscular control deficits and muscle strength imbalances as contributing factors to ACL injuries in female athletes.

Other factors such as increased hip flexion and knee flexion have been attributed to ACL injuries in basketball (Krosshaug et al, 2006), while the role of tibial (lower leg) rotation relative to the femur (thigh bone) during knee valgus has been shown in handball and basketball.

KEY TAKEAWAYS

Addressing biomechanical factors through athlete development programmes specifically aimed at female risk factors can reduce injury risk

Neuromuscular Control and Strength:

Recent advances in biomechanical analysis and injury prevention research have provided valuable insights into ACL injury mechanisms and risk factors. Research suggests that females may exhibit different muscle activation patterns compared to males, which could affect joint stability and injury risk (Hewett et al., 2015). Relative strength imbalances, particularly weaker hip abductors and external rotators, can contribute to faulty movement patterns and increase susceptibility to injuries such as patellofemoral pain syndrome (anterior knee pain) and ACL tears (Hewett et al., 2016).

Training Load and Recovery:

The menstrual cycle can influence factors such as energy levels, motivation, and recovery capacity, potentially affecting training adaptation and injury risk (Tenforde et al., 2019).

Camogie Specific Considerations

There is a lack of research within Camogie but generally the training age (the amount of time an athlete has been engaged in a specific athletic development programme) is lower in comparison to other sports. These programmes have been shown to be highly effective in reducing injury risk. While younger Camogie players are more likely to be exposed to athlete development programmes today, we still have a gap to bridge to improve this, especially in our Camogie players formative years (13-18 years old).

Injury Reporting and Prevention Considerations:

The majority of injury prevention programmes have been undertaken on male athletes which may potentially overlooking the unique biomechanical and neuromuscular factors contributing to injury risk in females (Myer et al., 2017).

Conservative (Non-Surgical) vs Surgical

The effectiveness of both approaches has been shown in the literature.

Surgical

The surgical approach effectively restores structural knee stability and function in conjunction with a criteria-based rehabilitation programme (Smith et al, 2016). ACL reconstruction may help prevent further damage to the knee joint, such as meniscal tears and cartilage lesions, which are common outcomes of untreated ACL injuries (Sonnery-Cottet et al., 2015).

The graft type is also a factor in outcomes post ACL. Patellar tendon grafts have been shown to reduce re-rupture rates in comparison to hamstring grafts (Marsalli et al., 2019). However, undertaking a patellar tendon graft may not be the most suitable for an individual patient due to factors such as previous ACL injury or skeletal immaturity. Hamstring tendon grafts are associated with less postoperative pain and reduced risk of anterior knee pain compared to patellar tendon grafts but have a higher re-rupture rate (Wang et al., 2017).

Non-Surgical Options

Some studies suggest that conservative management, which typically involves physiotherapy, bracing, and activity modification, can lead to satisfactory outcomes, particularly in individuals with low physical demands or those who are willing to modify their activities to avoid high-risk movements (Frobell et al., 2010).

Sports like Camogie require a high degree of jumping, landing, cutting, deceleration and change of direction which require a stable knee which may lessen the chance of a positive outcome with a non-surgical route.

It is also worth noting that there have been cases on imaging which have shown a healed ACL ligament post rupture. This may be the case on imaging but there is also a need to identify a radiological healing of a ligament versus a highly stable functioning ligament, if making a decision to return to play based on a finding such as this.

Rehabilitation post ACL reconstruction

Having an aligned goal and clear direction from your physiotherapist, surgeon, rehab team and support (manager/family/other players/other backroom team members) teams are the most important aspects of a successful outcome. In the initial stages especially, linking in with your physio regularly to ensure all anatomical factors are taken into consideration in early loading and to also ensure that other aspects such as manual therapy, soft tissue and other modalities are maximised pre and post operatively.

Pre-Op:

Pre operative care can be a hugely advantageous period in a successful ACL outcome. Addressing range of motion and specifically attaining knee extension is an important outcome measure prior to surgery and again in the first number of months post-surgery. Having a quiet knee going into surgery will generally allow for a smoother post operative path. Pre interventions, focusing on muscle strength, neuromuscular control, and proprioception, can optimise outcomes before ACL surgery (King et al., 2019; Silvers, 2018; Myer et al., 2017). These interventions may also include exercises to enhance quadriceps and hamstring strength.

Early Postoperative Phase:

Early rehabilitation after ACL surgery aims to control pain, reduce inflammation, and restore range of motion (King et al., 2019). Evidence supports the use of early weight-bearing and range of motion exercises, along with neuromuscular electrical stimulation, to facilitate faster recovery (King et al., 2019; Silvers, 2018).

Sub-Acute Rehabilitation Phase:

In the sub-acute phase, rehabilitation progresses to focus on progressive strengthening exercises and neuromuscular training (King et al., 2019; Myer et al., 2017). Closed kinetic chain exercises like squats and lunges are incorporated to restore muscle strength and endurance (King et al., 2019). Neuromuscular training, including dynamic balance drills and perturbation training, helps improve proprioception and reduce the risk of secondary ACL injuries (Silvers, 2018; Myer et al., 2017).

Advanced Rehabilitation Phase:

Advanced rehabilitation emphasises sport-specific exercises and activities to prepare for return to play and performance (King et al., 2019). Criteria-based approaches to return to play and performance are recommended, focusing on objective measures of strength, balance, and functional performance (Myer et al., 2017). Rehabilitation programs should be individualised, considering the specific needs and goals of each athlete (King et al., 2019).

Criteria Based Approach

Focusing on a criteria outcomes approach has been shown to be the most effective way of ensuring a good outcome post ACL surgery. Having a time or subjective based criteria for return to play may result in poorer outcomes post-surgery, poorer performance on return to sport and increase the risk of reinjury. Identifying the key aspects of a given sport and working backwards from this will allow your rehabilitation to flow smoothly from start to finish. Your rehab team will guide you on this journey. Equally from a player's perspective, knowing 'the story' of their ACL journey is important. Mapping out clearly defined measurable outcomes in areas such as strength, power, jump-land, cutting and change of direction can guide the process. It is also important

to consider the psychological welfare within a player's journey which often includes frustration, fear, despair, pain and eventually joy and hopefully happiness on return to play. Using questionnaires to map this process as a rehab specialist, can help identify potential roadblocks for return to play and ensure appropriate professional help can be sought after where required.

KEY TAKEAWAY
A Criteria based approach to ACL rehabilitation will maximise post operative outcomes

SPARC Ireland

In our ACL rehab clinic, we use objective tests throughout the rehabilitation process, including isokinetic testing regularly, technology to monitor activities such as jump/land and plyometrics. The use of video analysis of cutting, change of direction, deceleration is also used throughout the process. On top of all of this, we also externally validate our athletes via UPMC SSC testing laboratory where we get independent objective feedback on all the testing. What we do in clinic is to ensure an athlete is maximising their potential for a positive return to performance. Using services such as these will ensure that your criteria-based return to sport is successful.

When Can I Go Back to play?

This question is probably the most asked question on this road to ACL recovery. Much like the rehabilitation process itself, it is a team decision with the player at the very centre. Each person will most likely have different outcomes for successful return to play and all these factors should be considered.

Team member	Looking at
Surgeon	Joint and Ligament stability
Team Manager/Coach	Player performance and ability to compete
Physiotherapist **Rehab Team** **Athletic development Coach**	Criteria based on biomechanical, strength, power, plyometric etc.
Player	Confidence, Pain, Readiness to return

What next?

Ensuring the athlete has a successful return to play is the start of a return to performance. Once back in action it is important for the athlete to stay on top of their outcome measure in each of the key areas. Checking in for objective feedback with your athletic development or rehab team should be a key part of this and also to ensure your contralateral (other) side is up to speed.

Role of Gaelic Games Research

Research specific to Gaelic Games has also contributed to our understanding of ACL injury prevention and management. Studies have examined injury rates, risk factors, and effective prevention strategies within the context of Camogie and Ladies Gaelic Football. For instance, O'Connor et al. (2018) investigated injury patterns in elite Gaelic Football players, providing valuable insights into the prevalence and mechanisms of ACL injuries in this population.

Role of Athletic Development

I am a coach. What can I do to help?

Evidence-based interventions such as neuromuscular training programs have shown promise in reducing ACL injury risk in female athletes. Neuromuscular training focuses on improving movement mechanics, balance, proprioception, and dynamic stability. Programs like the FIFA 11+, GAA15, and Activate warm-ups incorporate exercises targeting these areas and have been associated with reduced injury rates in various sports.

The FIFA 11+

The FIFA 11+ is a comprehensive warm- up program designed to reduce the risk of common soccer injuries, including ACL injuries. It includes exercises targeting strength, balance, agility, and proprioception, with a particular focus on dynamic stability and landing mechanics. Several studies have demonstrated the effectiveness of the FIFA 11+ in reducing injury rates in soccer players, with potential applications in camogie and ladies Gaelic football.

Benefits of an Injury Reduction Programme

50%

FIFA 11+ program decreases ACL injury risk by 50% and overall injury risk by 39% in soccer players, per meta-analysis. Barengo et al. (2014)

FIFA 11+ implementation results in **significant reduction** in overall injury rates among collegiate male soccer players. Grimm et al. (2015)

56%

Meta-analysis confirms FIFA 11+ effectiveness, showing a 56% decrease in ACL injury risk among soccer players. Gomes et al. (2017)

30%

Comprehensive warm-up program reduces ACL injury risk by 30% in young female soccer players. Soligard et al. (2008)

KEY TAKEWAY
Injury reduction programmes can reduce injury risk.

The GAA15 is a warm-up program developed specifically for Gaelic games based on the FIFA 11+, incorporating exercises tailored to the movement patterns and demands of sports like Camogie and Ladies Gaelic Football. The program aims to improve neuromuscular control, lower limb strength, and dynamic stability to reduce injury risk. While research specific to the GAA15's effectiveness in preventing ACL injuries is limited, its inclusion of evidence-based exercises suggests potential benefits for injury reduction.

The Activate Warm-Up developed by Ulster Gaa is a similar programme to the GAA 15. The Activate warm- up are a series of exercises designed to enhance neuromuscular control and reduce injury risk, particularly in youth athletes. These exercises focus on improving movement mechanics, balance, and proprioception through dynamic movements and plyometric exercises. While research on the Activate warm-ups' effectiveness in ACL injury prevention in Gaelic games is limited, their alignment with established injury prevention principles suggests potential benefits for athletes.

Jump Evolution is part of the Athletic Development strand to the Camogie Associations Evolution series. The Evolution Athletic Development Series looks to provide coaches with the cues and exercises associated with the development and support of the Camogie player as an athlete. Jump Evolution provides the viewer with essential patterns in assisting the player in learning the mechanics of jumping and landing. Similarly to the programmes above, Jump Evolution aims to improve movement mechanics, balance, and proprioception through landing and jumping exercises and therefor reduce the risk of injury.

Conclusion

Your ACL story is exactly that. It is a story of an injury that took place and what happens after that is up to you. The centre of this story is the athlete and what they do with their time post injury will essentially determine the outcome. Surrounding yourself with a good team and working really hard to build all of the main building blocks of a successful ACL journey back to Camogie will ensure that your story has a happy ending.

EAMON O REILLY is a lower limb clinical specialist physiotherapist and clinic lead of SPARC Ireland. He has worked with a host of intercounty teams and international teams leading physiotherapy and rehabilitation services. He is on the National Sports Science Workgroup for Gaelic Games. Eamon leads the SPARC ACL rehabilitation programme across all their clinics, where athletes of all levels from elite to recreational undertake specific individualised monitored programmes designed to maximise and guide a successful return to sport. You can find out more about this service here. https://www.sparc.ie/acl-club

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THE CAMOGIE ASSOCIATION
An Cumann Camógaíochta

Player Welfare and Inclusion Resources

Below are some of the resources which can be found on the Camogie Association website.

You can check them out at camogie.ie

- Player Welfare Booklet Vol 1 & 2
- Player Welfare Booklet Vol 3 & 4
- Player Health Check Programme
- Injury Prevention Programme
- Self Care Series
- Player Welfare Podcast
- Player Safety and Helmets
- Concussion Guidelines
- Health and Wellbeing Information
- Camogie Association Disability Inclusion Policy
- Supporting Organisations contact information