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IFSPT International Perspective

Is Knee Osteoarthritis an Inevitable Consequence for Athletes after Anterior Cruciate Ligament Injury?

Alexandre Rambaud, PT, PhD[1,2,3], Grégory Morel, PT, MSc[2,4], Robert Prill, PT, MSc[5], Nicky van Melick, PhD[6], Florian Forelli, PT, PhD[1,3,7,8]

[1] International Sports and Exercise Physiotherapy Association, Switzerland, [2] Physiotherapy School of Saint Etienne, St Michel Campus, Saint Etienne, France, [3] SFMKS Lab, Asnières sur Oise, France, [4] University Hospital of Saint-Étienne, Department of Sports Medicine, Saint-Étienne, France, [5] Center of Orthopaedics and Traumatology, University Hospital Brandenburg/Havel, Brandenburg Medical School Theodor Fontane, Germany, [6] KneeSearch, the Netherlands, [7] Haute-Ecole Arc Santé, HES-SO University of Applied Sciences and Arts Western, Switzerland, Delémont, [8] Orthopaedic Surgery Department, Clinic of Domont, Ramsay Healthcare, @OrthoLab, Domont, France

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Anterior cruciate ligament injury should no longer be considered solely as an acute traumatic event affecting short-term sports participation, but increasingly as the beginning of a long-term knee joint health condition that may lead to post-traumatic knee osteoarthritis. Despite major advances in anterior cruciate ligament surgical reconstruction and rehabilitation, structural and symptomatic features of post-traumatic knee osteoarthritis may emerge within the first 5 years after injury and nearly 40% of individuals may develop radiographic signs of knee osteoarthritis within 10 to 15 years after injury. This international perspective highlights the growing concern surrounding premature knee osteoarthritis in athletes following anterior cruciate ligament injury and emphasizes the expanding role of sports physiotherapists beyond return to sport. Residual instability, neuromuscular deficits, altered knee joint loading, and persistent inflammatory processes may contribute to long-term cartilage degeneration and functional decline. Sports physiotherapists are therefore uniquely positioned to contribute not only to rehabilitation and secondary prevention, but also to long-term knee joint health and activity education, early detection of knee osteoarthritis-related symptoms, individualized load management, and multidisciplinary management strategies. A shift toward lifelong knee health management after anterior cruciate ligament injury appears necessary to better support athletes throughout their sporting careers and beyond.

FROM RETURN TO SPORT TO LIFELONG KNEE JOINT HEALTH

Anterior cruciate ligament (ACL) injuries are among the most investigated injuries in athletes. The rehabilitation process is well-established and widely documented, both in scientific articles and on social media.

For an athlete, it is comforting to watch short videos or vlogs shared by other athletes going through the tough process of rehabilitation[1]; for coaches, staff and family, this injury is often considered to be nothing more than a bad memory. Return to sport is typically approached in a structured manner, with athletes and staff planning for the next season.

Yet behind the technical success of modern ACL surgeries and the effectiveness of “return to sport” protocols lies a reality that the worlds of sports and medicine are only just starting to face: the management of the initial ACL injury with return to sport is not the finish line, but the beginning of a lifelong journey on a different road. The role of sports physiotherapists is crucial at this point. Sports physiotherapists therefore play a key role beyond rehabilitation and return to sport, supporting secondary and tertiary prevention strategies that may help reduce long-term complications after ACL injury, including the development of disabling post-traumatic knee osteoarthritis. Ten, fifteen, or twenty years after the index injury, the verdict is delivered, and is unforgiving: potentially disabling knee osteoarthritis. It is time to take a critical look at what we call “healing” and to view an ACL tear not as an isolated incident, but as the first chapter in a long orthopedic story with an all too often premature outcome: post-traumatic osteoarthritis (PTOA).[2] The science is clear: near 40% of patients who have suffered an ACL tear will develop radiographic signs of knee osteoarthritis within 10 to 15 years of the injury.[3] Therefore, the role of sports physiotherapist extends far beyond return to sport and includes long-term joint health protection.

THE BIOLOGICAL LEGACY OF ANTERIOR CRUCIATE LIGAMENT INJURY

The mechanism leading to an ACL injury induces stress to the joint very often causing bone bruises on the femur and tibia. The inflammatory cascade following ACL injury involves three major joint components: cartilage, bone, and synovial fluid.[4] In the medium to long term, this cascade leads to PTOA. It appears that this very same cascade of events occurs when the joint becomes partially unstable.[5] Even if the ACL is perfectly reconstructed from a technical point of view, the internal biology of the knee may remain altered. This may reduce the joint's capacity to tolerate repeated high loads, making individualized load management essential during rehabilitation, return to sport, and long-term follow-up. By downplaying the severity of the injury, we forget that the reconstructed knee will never be the same as the "original" knee.

THE HIDDEN COST OF ATHLETIC PERFORMANCE

For athletes, an ACL injury often marks the beginning of the end of worry-free living. As ACL injuries occur in increasingly younger athletes, the prospect of developing PTOA as early as one's thirties is becoming a growing concern. While many do return to their previous performance level, there is a price to pay. Their careers are often accompanied by the growing concern that the knee may no longer tolerate the demands of elite sport over time. Any residual knee instability, proprioceptive deficit, or muscular asymmetry following ACL surgery may alter knee joint loading during sport activities that require strength and rapid changes of direction. This reinforces the importance of individualized load management, not only during return to sport, but also throughout the athlete's longer-term sporting pathway. The impact of an ACL injuiry on a career is not measured solely by the time spent off the field, but also by changes in movement confidence, load tolerance, and the ability to repeatedly perform high-demand sport-specific actions. A soccer striker will lose that split second during a pivot or a dribble; a skier loses absolute confidence in the outside edge during a World Cup downhill race, and a Judoka loses the exceptional balance required during complex throwing situations. The phantom of the ACL re-injury looms[6] but above all, it is the onset of pain and functional impairment that erodes ambitions. In some athletes, sporting careers may be shortened not because of lack of talent, but because the knee becomes less able to tolerate repeated high loads, and recurrent effusion, pain, or functional limitations may suggest early signs of premature joint deterioration.

ARE WE NORMALIZING PREMATURE KNEE OSTEOARTHRITIS AND KNEE REPLACEMENT IN ATHLETES?

An ethical and medical question should be asked more often: *Is it appropriate to consider an unicompartmental or total knee replacement surgery as a normal procedure on patients at the age of 50 or even younger, some of whom may have previously sustained an ACL injury or undergone ACL reconstruction*? With life expectancy now approaching 80 years, implanting a prosthesis in a 50-year-old poses a significant surgical management challenge. How will we deal with those patients over their remaining thirty or more years? Although implant survival has improved with advances in materials, implant design, and surgical techniques, it is not infinite, and revision surgeries remain complex, particularly in younger and physically active patients. For someone with a history of sports participation, what activities and level of performance are wise after partial or total knee replacement? The literature offers little guidance.

SPORTS PHYSIOTHERAPISTS BEYOND RETURN TO SPORT

On a more optimistic note, our growing understanding of PTOA and increased awareness among clinicians and researchers, inspired, for example, by programs like GLA:D[7] or OPTIKNEE,[8] may help sports physiotherapists move beyond a purely return-to-sport perspective and more proactively identify early symptoms, recurrent pain and/or effusion, reduced load tolerance, and functional limitations that may signal emerging knee joint health problems.

While prevention of primary ACL injuries offers the most promising approach,[9] post-injury strategy improvements are required, particularly with regard to impairments and activity limitations associated with PTOA. This involves providing better support to athletes during their return to sport (up to return to performance) while integrating health and activity education, including individualized load management, recognition of warning symptoms such as recurrent effusion or persistent pain, and guidance on maintaining long-term knee health beyond the competitive season. The sports physiotherapist must play a central role in this process, working in collaboration with other health and performance professionals. By diagnosing the early signs of PTOA more quickly, rehabilitation programs could be offered through a multidisciplinary approach to be better adapted to each individual athlete. Because each athlete has a unique journey, sports physiotherapists should provide individualized support through rehabilitation, return to performance, and long-term knee health management. Sports physiotherapists can play a key role in detecting the early signs of PTOA, while also contributing substantially to secondary prevention and the long-term management of the athlete through tailored rehabilitation strategies and load management implemented within a multidisciplinary framework. Let's put together the team!

DISCLOSURE STATEMENT

Alexandre Rambaud, Nicky Van Melick, and Robert Prills are members of the ESSKA Rehabilitation Committee. Alexandre Rambaud and Florian Forelli are members of the ISEPA Research Committee.

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