



Anterior cruciate ligament surgery and rehabilitation: does anybody really know what time it is?

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An index anterior cruciate ligament (ACL) injury occurs at the instant of tissue failure as the athlete suddenly feels a pop, shift, buckle, or giving-way event. This defining moment occurs in the lives of many primary, secondary, and college athletes every year [13]. At onset and thereafter, the memory of this life-changing event may influence future career, education, vocation, and life sporting activity choices. Memory of this event often becomes a recurring discussion topic for the remainder of a person's life.

When the index ACL injury involves a contact or collision mechanism, the athlete's knee is more likely to

immediately transition from a purely pre-morbid to a suddenly morbid condition. During a non-contact knee injury event, however, additional factors should be considered. Might the sudden tissue failure have been related to an unrelenting series of high-intensity sports maneuvers and practice sessions often combined with supplemental strength and conditioning training with limited or no dedicated time for active recovery, remodeling, regeneration, or healing? Or, given the restrictions associated with the COVID-19 pandemic, might it have been related to severe under-training? While it is unlikely that a single event in this context was the sole causative factor that prompted sudden tissue failure, somewhere in the milieu of aggregate life activities lies the answer to this puzzle. How best should the ratio of active recovery and training be managed or “periodized” [10]?

Knee surgeons place considerable value on “time zero” or time of surgery information such as the selected surgical approach (repair, reconstruction, or a combination of both), lesion characteristics, graft and fixation type, tunnel or socket locations and dimensions, etc. Information gleaned from pre-operative clinical evaluation and imaging studies [1], and the index surgery often helps guide patient

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care decisions over the ensuing weeks and months post-surgery. We know from *in vitro* biomechanical studies, however, that this information has little or no bearing on tissue healing, neuromuscular function recovery, patient perceptions of function, fear, and pain, return to sports readiness, or many other essential outcome factors [6, 7].

Return to sports timing is another widely discussed key recovery topic. What does this even mean? Does it mean that the athlete is dressed in team uniform and stands on the sidelines at games? Does it mean that they participate in low-intensity practices without restrictions? Or, does it mean that they participate in full, unrestricted competitions at a reduced performance level? Could it mean that they display evidence of full pre-injury performance capability? If so, what evidence-based criteria or decision-making algorithm was followed to make this determination? If performance level is deemed an essential component of successful return to sports, should it not include factors such as total minutes played, plays made, goals scored (or prevented), the total number of stressful opponent encounters, or intense directional changes that are successfully accomplished?

A time-honored orthopedic surgery adage is that “nothing ruins good results like long-term patient follow-up”. Standard practice is that patient outcomes measured at 2-year post-surgery represent short-term outcomes, those measured at 5-year post-surgery represent medium-term outcomes, and those measured at 10-year or longer post-surgery represent long-term outcomes [5]. One has to ask why these particular time periods are used. Upon what construct or model are they based? Should these time periods be the same for all patients following every ACL surgical procedure?

As surgeons and rehabilitation clinicians, we seem to be constantly looking at our watches. Why do we focus so much on time? In writing the lyrics for a song called “Time” Roger Waters of the band Pink Floyd once stated that “no one told you when to run, you missed the starting gun” [4]. Knowing when to run and when not to run is indeed an important factor during ACL injury recovery. In the same song, he later wrote “the tolling of the iron bell calls the faithful to their knees to hear the softly spoken magic spell”. In contemporary orthopedic practice, this “magic spell” might represent one of a plethora of biological joint preservation or synthetic joint replacement treatment options that patients discover through numerous media sources in hopes of restoring knee joint homeostasis, soft-tissue healing, or pain reduction [3, 10, 12, 14]. Patients often besiege healthcare providers with questions about information obtained from sources of wide-ranging credibility in hopes of discovering how best to navigate their condition. Based on the Bible book of Ecclesiastes, the musician Pete Seeger crafted a song stating that “to everything there is a season and a time for every purpose under heaven” [2]. No matter what the patient’s age, this statement certainly has importance. Much of healing and

recovery needs to integrate balanced training and recovery in a periodized fashion that prompts functionally competent tissue remodeling. For indeed, “there is a time to build up and a time to break down” [2]! Do knee surgeons, rehabilitation clinicians and patients use this time appropriately? We suggest that it could be used more wisely; however, many time-sensitive healthcare decisions reside with insurance companies, not surgeons or physiotherapists.

We continue to frame questions with no answers. For this, we apologize. Perhaps, the most poignant mention of time comes from a song written by Robert Lamm of the band Chicago [9]. In the song “25 or 6 to 4” he asks “does anybody really know what time it is.....does anybody really care?” We strongly believe that knee surgeons and rehabilitation clinicians care [11]. However, we also propose that we do not really know what time it is regarding ACL injury recovery [8]. We continue to place too much emphasis on time zero surgical properties, and too often make decisions based solely on time post-surgery. To more effectively navigate patient recovery, we need to develop better patient-centered criteria and decision-making algorithms using timely physical, physiological, and psychological information obtained from qualified interprofessional sources [5]. Current practices are often fraught with misperceptions and fallacies. What time do you have?

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