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Editorial

The anterior cruciate ligament: Chronicles of a legend



The anterior cruciate ligament (ACL) has remained an enigma for the past 100 years. Despite much research and discussion, opinions about this tiny structure continue to be divided and generate controversy. This issue of JISAKOS was conceived by the ISAKOS Knee Sports and Preservation Committee as a glimpse into the current understanding of ACL surgery philosophy and is dedicated to Professor Freddie Fu, who devoted his life to studying the ligament.

The concept of “anatomic” ACL reconstruction (ACLR) pioneered by professor Fu is now widely accepted. The idea behind anatomic reconstruction is that the graft must be placed at the native anatomic insertion sites, have adequate collagen content and orientation to replicate kinematics, and preserve long-term knee health [1]. This concept was later refined to introduce the “individualized” ACL philosophy, which involves customising each ACLR regarding graft selection and diameter based on the patient’s ACL footprint size, activity level, and lifestyle [2]. However, the branding of all single-bundle ACL reconstructions as “anatomic” in all cases has been criticised, as the graft can still be placed at multiple locations within the anatomic boundaries of the footprint on the femur and tibia [3]. As a result, a one-size-fits-all approach has not been effective in ACL surgery and is no longer the standard of care. However, the “individualized anatomic” approach has also not yielded remarkable results, as evidenced by high rates of graft re-tear and poor rates of return to previous levels of sports or activity [4].

Double-bundle ACLR was once thought to be a solution to the shortcomings of a single-bundle ACLR in terms of rotational stability and functional outcomes [5]. However, this technique was ultimately found suitable and applicable only to a select group of patients [6]. Extra-articular anterolateral procedures, such as an iliotibial band tenodesis or anterolateral ligament reconstruction, are now the new trend for select acute and chronic instability cases. Anterolateral complex injuries have been reported to occur in almost two-thirds of apparently isolated ACL tears [7]. The two-year results of the STABILITY trial, which studied the effect of lateral extra-articular tenodesis (LET) on

single-bundle hamstrings ACLR, yielded encouraging results. Those who underwent a LET had significantly lower graft re-tear rates and persistent rotatory laxity [8]. Therefore, it is important to pay closer attention to this philosophy and technique, as it might impact ACL practice and research shortly.

Besides anatomy, the role of biology in ACL surgery has also been a focus in recent years. Preserving the remnant during an ACLR has resulted in improved stability, although patient-reported outcomes are not superior [9]. Another “blast from the past” besides the LET is the renewed interest in repairing femoral ACL tears with a dynamic augmentation device or a suture tape [10]. A significant limitation of this approach is that the practice currently is limited to a small number of authors and institutions, primarily confined to developed countries [11]. The best of both worlds is where the ACL remnant can be repaired while providing a biological augmentation using a small diameter graft [12]. Such a technique would preserve the native biology without relying entirely on suture repair, optimise cost, employ a more proven method for treating an ACL injury, and apply to a larger variety of tears.

The use of technology in ACL surgery includes computerised navigation assistance and 3D printed templates and has been used to help place tunnels in the femur and tibia [13,14]. The use of wearable technology and intelligent knee braces promises to improve knee rehabilitation by enhancing compliance and targeting therapy based on specific deficits [15,16]. However, such technology is still nascent and requires validation with currently accepted clinical criteria. Artificial intelligence (AI) can potentially be used for ACL injury prediction, diagnosis, intra-operative application and rehabilitation [17]. This is an enormous opportunity, the scale of which has yet to be fully understood. The ACL is indeed a living legend, that has espoused tremendous interest and is likely to hog the limelight in the foreseeable future.

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Conflict of interest

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