**EDITORIAL**

# Restoring Nature Through Individualized Anatomic Anterior Cruciate Ligament Reconstruction Surgery

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Anterior cruciate ligament (ACL) reconstruction surgery has significantly evolved in recent years, with advances made possible through better understanding of ACL anatomy and function. This has led to development of new technologies that facilitate the diagnosis of ACL injury and the application of state of the art methods for treatment (1). In particular, individualized anatomical ACL reconstruction aims to restore native ACL function by recreating dimensions, collagen orientation, and insertion sites according to the anatomical characteristics of each patient's knee. Preoperatively, a detailed assessment of patient history, clinical exams, and clinical imaging can provide clinicians with insight on the patient's injury pattern (2). Using this approach, treatment is tailored to each patient based on each individual's characteristics. Measuring the size of potential grafts and native ACL insertion sites before and during reconstruction surgery guides the selection of an appropriate graft that will best accommodate the patient's anatomy. During reconstruction surgery, tunnels are made anatomically within the native ACL insertion sites. Subsequently, graft tensioning and fixation are accomplished in a manner respecting the bundle-specific composition and function of the ACL. Individualized treatment continues after ACL reconstruction surgery during the rehabilitation period and return to sporting activities, when factors such as graft type and healing, and patient characteristics are used to customize rehabilitation goals.

Even with these new advancements, many additional factors need to be considered for ideal management of patients with ACL injury. Although the ACL is generally known as the primary antero-posterior and rotary stabilizer of the knee, it is of utmost relevance to consider the multifactoral nature of rotational instability in ACL-injured patients. Injury to other structures, such as the lateral meniscus for example, can lead to high-grade rotational instability and needs to be properly addressed to achieve an optimal outcome. Moreover, other inherent characteristics, such as generalized ligamentous laxity and congruency of bony morphology, also play substantial roles in the rotational instability of ACL-injured patients. In the case of bony morphology, multi-planar motion of the knee joint may vary depending on the skeletal congruency of the tibiofemoral joint. The one-dimensional measurements reported in the majority of published studies do not attempt to capture the complex geometry of the tibia and femur. Therefore, further studies are needed to evaluate how to more effectively assess bony morphology in order to identify its relationship to ACL injury and treatment.

Despite the considerable amount of research exploring the topic of ACL injuries, there still is room for improvement in this field. One of the most important issues in this regard is how to effectively evaluate the long-term outcome of patients after reconstruction surgery. Historically near normal measurements on functional outcome scores were considered satisfactory for patients after ACL reconstruction surgery, thereby allowing for non-anatomic methods of ACL reconstruction to be accepted as sound clinical practice despite residual instability. However, with recent innovations in the field of ACL reconstruction meant to achieve a greater goal of joint stability, there is a need for objective and standardized tools to more accurately measure patient outcomes after surgery. Such new tools on the horizon include computerized methods to quantify the pivot-shift prior to and after ACL reconstruction, providing objective data on knee stability. These outcome tools must be reproducible

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and reliable in order to be utilized in daily practice by both clinicians and researchers alike. In this way, it may ultimately be possible to optimize normal knee function that is lost with ACL injury.

## References

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