

Structural Properties of the Anterolateral Complex and Their Clinical Implications

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KEYWORDS

• Anterolateral structures of the knee • Anterolateral ligament • Anterolateral capsule

KEY POINTS

- The entire anterolateral complex has an impact on rotatory and translational stability of the knee.
- Reconstruction methods need to be adapted based on pattern of injury and amount of rotatory knee instability.
- Further biomechanical analysis of the anterolateral complex would potentially help physicians determine precise surgical indication for individualized surgical treatment and improve patient surgical outcomes.

INTRODUCTION

Advances in understanding of rotatory knee instability have been largely driven by the anterior cruciate ligament (ACL) injury and reconstruction.^{1–3} The anterolateral complex works together with the ACL to control rotation of the knee and is a secondary restraint to internal tibial rotation. In most typical descriptions, the anterolateral complex contains the superficial and deep iliotibial band (ITB), the capsulo-osseous layer of the ITB, and the anterolateral capsule (**Fig. 1**). Due to the debate on the anterolateral complex and its potential role in rotatory knee stability, the structural properties of the

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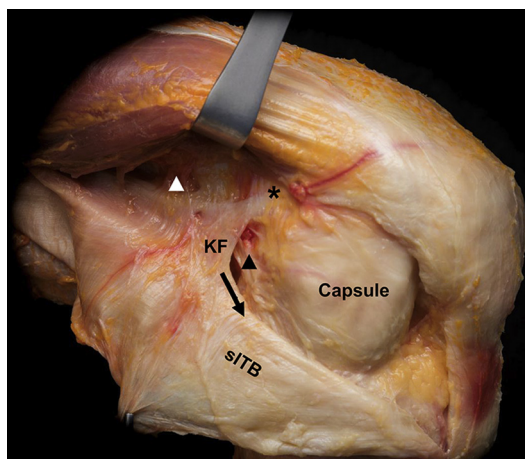


Fig. 1. The anterolateral complex of the knee and its key features. sITB, superficial ITB; KF, Kaplan fibers; *asterisk*, the accessory fiber bundles of the Kaplan fibers that insert on the lateral superior condyle; black triangle, capsulo-osseous layer of the ITB; white triangle, branch of the superior genicular artery; and black arrow, direction of the deep ITB, which merges to the sITB. (From Herbst E, Albers M, Burnham JM, et al. The anterolateral complex of the knee: a pictorial essay. *Knee Surg Sports Traumatol Arthrosc* 2017;25[4]:1011; with permission Springer.)

anterolateral complex as well as its role in providing joint stability have recently been examined.⁴⁻⁶ For clarification, the term, *anterolateral ligament*, in this article is used as a term describing a thickening of the anterolateral complex, as described by previous research studies.⁴⁻⁷

Evidence of the involvement of the anterolateral complex in knee rotatory stability emerged from biomechanical studies, which showed increased rotatory knee instability due to injury of the anterolateral structures in ACL-deficient knees.^{1,8-10} The determination of the synergistic roles of the anterolateral complex and the ACL in controlling rotatory knee instability has great clinical implications. Several extra-articular procedures have been developed to supplement ACL reconstruction and improve rotatory knee stability.¹¹⁻¹⁴ Furthermore, the thorough understanding of the structural properties of the anterolateral complex of the knee would benefit patients with residual rotatory knee instability after ACL reconstruction. Understanding of the structural properties of the anterolateral complex of the knee provides an assessment of how the overall tissue complex behaves, whereas the mechanical properties of the anterolateral complex describe the quality of the tissue itself independent of the geometry. Clinically, the structural properties of grafts used for reconstruction procedures should be comparable to the native tissue.

The aim of this article is to provide a summary on the evidence regarding the structural properties of the anterolateral complex of the knee, its components, and their implications in rotatory knee stability in the clinical setting.

STRUCTURAL PROPERTIES OF THE ANTEROLATERAL COMPLEX

The anterolateral structures of the knee have been the focus of several investigations that characterize the structural properties of the anterolateral complex.^{6,7,15} The key structural properties of the anterolateral complex that were investigated are ultimate load (the highest load a tissue can withstand before failure) and stiffness (force

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