

A Layered Anatomic Description of the Anterolateral Complex of the Knee

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KEYWORDS

• Anterolateral complex • Knee • Iliotibial band • Capsule • Anterolateral ligament

KEY POINTS

- Variability in anatomic terminology, dissection protocols, and the use of embalmed as opposed to fresh frozen specimens has led to the controversy surrounding the anterolateral structures of the knee.
- The complex anatomy of the anterolateral knee is made up of the many layers of the iliotibial band, the underlying capsule, and its direct attachments to the lateral meniscus.
- The iliotibial band is composed of the superficial, middle, deep, and capsulo-osseous layers.
- Collectively these structures are termed the anterolateral complex of the knee.
- The anterolateral complex of the knee works synergistically with adjacent meniscal tissue and meniscal roots to resist internal tibial rotation.

INTRODUCTION

The goal of improving rotatory knee stability in patients undergoing anterior cruciate ligament (ACL) reconstruction has led to renewed interest in the extra-articular structures of the anterolateral knee and description of the proposed anterolateral ligament (ALL).¹⁻⁴ Although the principal function of the anterolateral knee structures in resisting internal tibial rotation is generally accepted, the exact itemized anatomic structures and their respective contributions to resisting internal tibial rotation remain unclear.⁵

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In examining the ever-expanding body of literature on the topic, differences in anatomic terminology have resulted in inconsistency in the orthopedic literature. Although some experts describe a distinct ligamentous structure at the anterolateral aspect of the knee, other scientific reports show that the observed resistance to internal tibial rotation is secondary to a multitude of anterolateral tissues working synergistically.⁶ This confluence of tissues or anterolateral complex (ALC) of the knee is described in this review.⁷

THE LAYERS OF THE LATERAL ASPECT OF THE KNEE

The lateral structures of the knee conceptually are often grouped into enveloping layers. Seebacher and colleagues⁸ grouped the anatomic structures of the lateral knee into 3 layers, analogous to Warren and Marshall's description of the medial structures of the knee.⁹ In contrast to the medial side, the layered individual structures of the lateral side are more complex and at times difficult to discern.

Layer I consists of the iliotibial band (ITB) and its anterior and posterior expansions.⁸ Layer II anteriorly is represented by the retinaculum of the quadriceps (patellar retinaculum). Posteriorly, layer II is incomplete and is represented by attachments to the lateral intermuscular septum, posterolateral capsule, and lateral head of the gastrocnemius. Layer III is chiefly composed of the tibiofemoral joint capsule, which posterior to the ITB divides into a superficial and deep layer. Housed between the superficial and deep capsular layers is the lateral collateral ligament (LCL), and medial to it, the inferior lateral geniculate artery.⁸ The superficial capsular layer terminates posteriorly when it meets the fabellofibular ligament, and the deep layer forms the coronary ligaments to the lateral meniscus and then blends with the arcuate ligament further posteriorly.^{8,10}

THE ANTEROLATERAL COMPLEX

Anterolaterally from superficial to deep the knee is enveloped by the ITB with its associated deeper layers, and the joint capsule. Collectively, these structures are termed the ALC.⁷ The dominant structure encountered is the ITB and although appearing as a simple thick band of tissue attaching to the Gerdy tubercle, the ITB is in fact complex and composed of a multitude of layers.

THE SUPERFICIAL AND MIDDLE LAYERS OF THE ILIOTIBIAL BAND

The superficial layer of the ITB proximally is firmly adhered to the linea aspera via connections to the lateral intermuscular septum.⁴ Distally, the anterior aspect of the superficial layer is identified by its characteristic curved fibers attaching to the lateral patella and patellar tendon.¹¹ These "arciform fibers," which blend with the fascia of the patella, were first described by Kaplan¹² and run at 70° to 80° compared with fibers heading toward the Gerdy tubercle.⁴ In the literature, the anterior fibers of the superficial layer of the ITB have also been termed the "iliopatellar band" or "superficial oblique retinaculum."^{13,14} The central fibers of the superficial layer distally insert in a fanlike fashion on and around the Gerdy tubercle⁴ (Fig. 1). Further posteriorly, the superficial layer terminates as a fascia that reinforces the biceps femoris.^{8,14}

Immediately deep and directly adherent to the superficial layer is the middle layer of the ITB, which can be identified only with careful sharp dissection and serves to reinforce the structural integrity of the superficial layer.¹⁴ The middle layer can be identified by its characteristic fibers, which run from lateral proximal to medial distal, which is in contrast to the vertical nature of the superficial ITB fibers.¹⁴

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