RECONSTRUCTIVE SURGERY OF CRUCIATE LIGAMENTS

THESIS

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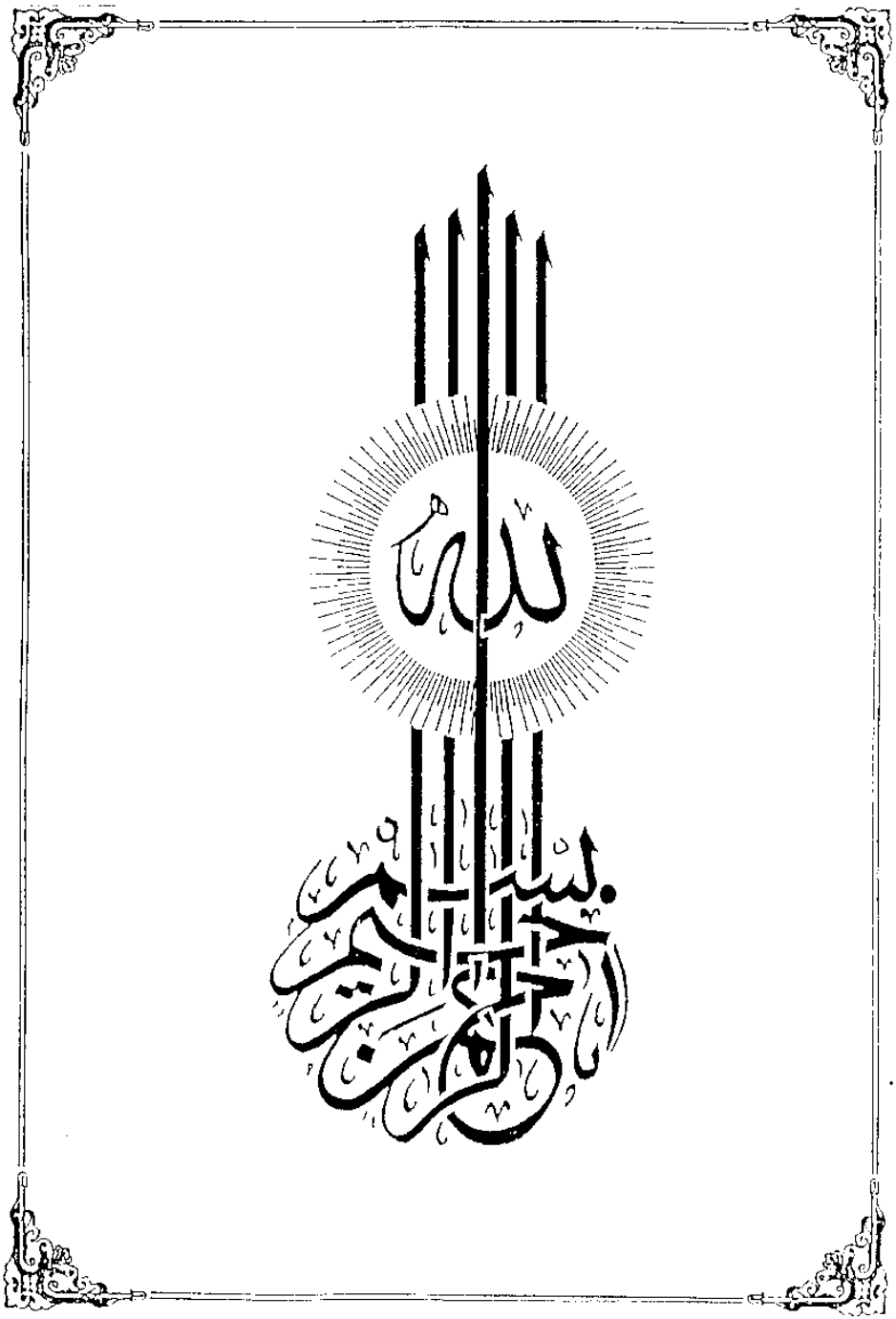


C O N T E N T S

ANATOMY

ANATOMY OF ANTERIOR CRUCIATE LIGAMENT

The anterior cruciate ligament has long been a topic of interest among orthopaedic surgeons. In recent years, basic science investigations of the anterior. Cruciate ligament has provided significant insight into its role within the knee.

Much of this work has centered around the identification of the structural anatomy of the anterior. Cruciate ligament, and its releationship to joint function.

Knowledge of this anatomy is a prerequisite for any discussion of anterior. Cruciate ligament Function, injury or repair.

Anatomy of the lower end of the femur:

The lower extremity of the femur carries the two condyles, seperated behind by an intercondylar notch but joined in front by a trochleer surface for the patella.

The lateral condyle projects further forward than the medial, thus helping to stabilize the patella.

The articular surface of the trochlea, covered with hyaline cartilage, extends higher above the knee on the lateral than on the medial condyle.

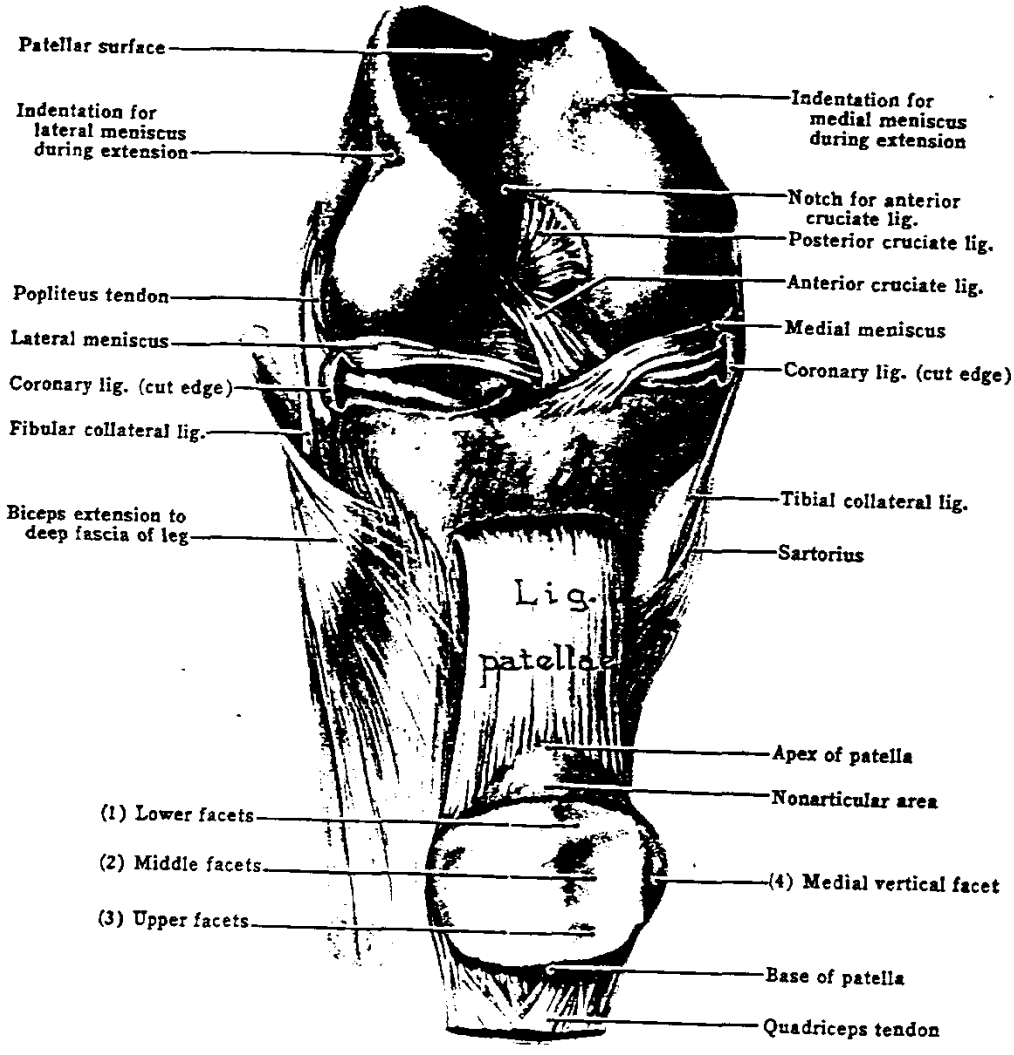
At the distal surface the lateral condyle is broad straight, the medial condyleis narrow and curved. Both are almost flat anteroposteriorly, but curved on their posterior convexities. They are joined, below the popliteal surface of the shaft by an inter-condylar ridge that incloses the intercondylar fossa. Just above the ridge the capsule and oblique popliteal ligament of the knee are attached.

The intercondylar fossa:

In the fossa, the cruciate ligaments are attached to smooth areas, the anterior cruciate ligament far back on the lateral condyle along the articular surface. The posterior cruciate ligament is far forward on the medial condyle alongside the articular margin.

The medial condyle shows on its convex non articular medial surface a shallow pit, the buttom of which is smooth for the tibial collateral ligament, this is the epicondyle. Above it lies the adductor tubercle at the lower end of the medial supracondylar line.

On the posterior surface, between the adductor tubercle and the articular margin, is a smooth area for tendinous fibres of the medial gasterocnemius. Above

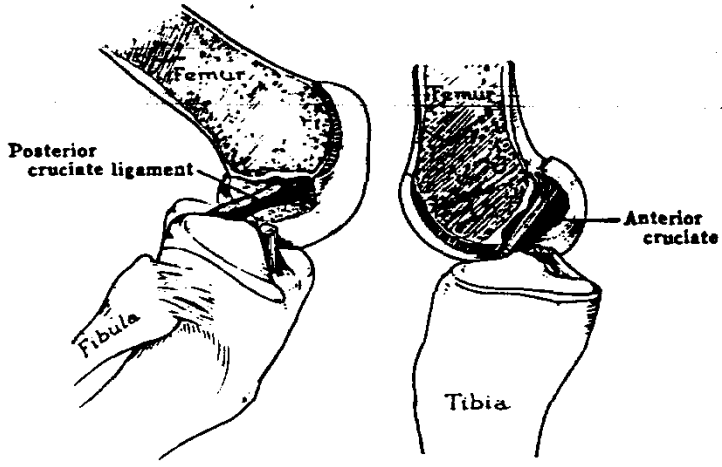


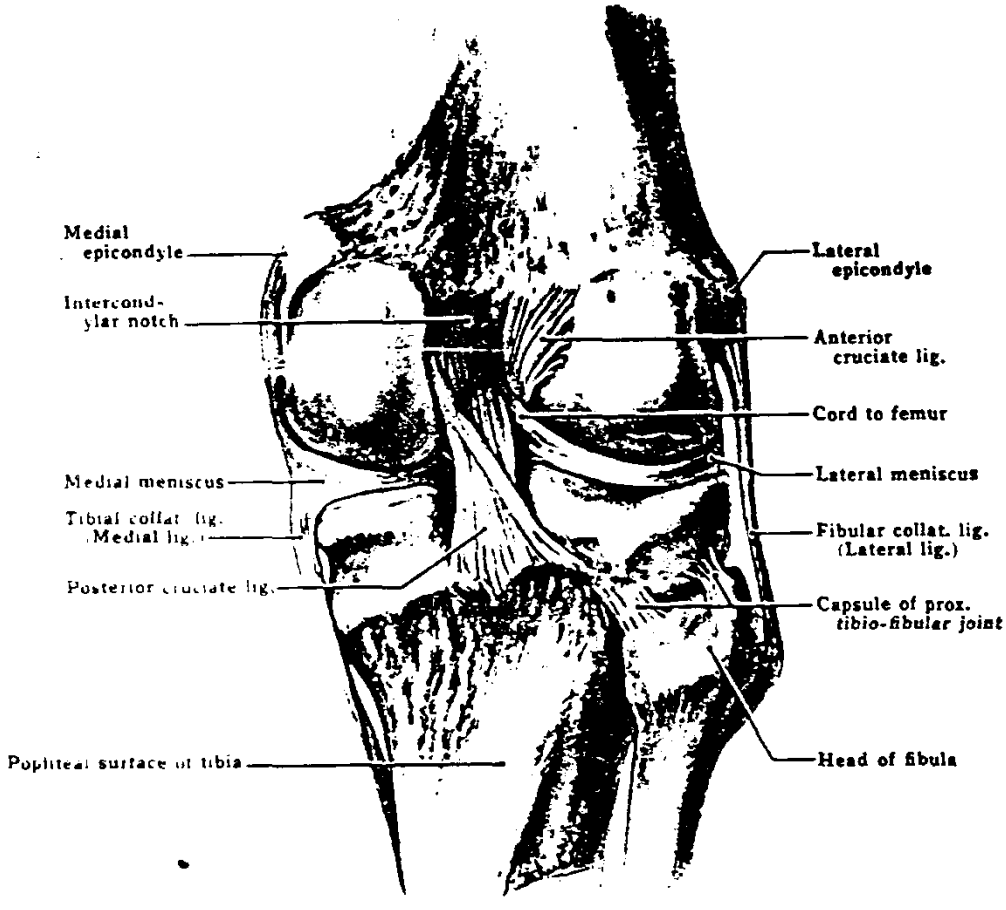
Cruciate Ligaments

In each illustration one half of the femur is removed with the proximal part of the corresponding cruciate ligament.

Observe.

1. The posterior cruciate ligament, which prevents forward sliding of the femur, particularly when the knee is flexed.
2. The anterior cruciate ligament, which prevents backward sliding of the femur and hyperextension of the knee, and limits medial rotation of the femur when the foot is on the ground—i.e., when the leg is fixed





Ligaments of the Knee Joint, from behind

this a rough area is raised on the popliteal surface of the shaft by the muscular fibres of gasterocnemius.

The lateral condyle shows, towards the back of its non articular lateral surface, a vertical arrangement of three smooth floored pits. The upper pit is for the tendinous fibres of the lateral head of gastrocnemius The muscular fibres of the lateral gastrocnemius arise in continuity from the lower half inch of the lateral supracondylar line, which ends at the pit. Above this, plantaris arises from the line.

The central pit is at the prominence of the convexity of this surface, called the lateral epicondyle; the fibular collateral ligament is attached to the pit.

The lowermost pit receives the popliteus tendon, a groove behind the pit runs up to the articular margin for lodging the popliteus tendon when the knee is flexed.

The capsule attached to the articular margin except at two places. It is attached posteriorly to the intercondylar ridge, to imprisons the cruciate ligaments and it is attached laterally above the pit and groove for the popliteus, to imprison the tendon within the knee joint. Its attachment across the trochlea is a

very narrow flange, because here the capsule is widely perforated for communication of the synovial membrane with the supra patellar pouch.

Anatomy of the tibial plateau:

It is the knee joint surface of the tibia and shows a pair of gently concave condylar articular surfaces for articulation with the menisci and the condyles of the femur.

The tibial plateau is composed of condylar surfaces (the medial and lateral condylar surface), the spine (intercondylar eminence) and the non articular area in front and behind the spine.

1) The medial condylar surface:

It is an oval surface (long axis anteroposterior) in conformity with the medial femoral condyle and meniscus. It does not extend beyond the margin of the plateau.

2) The lateral condylar surface:

It is more nearly circular, in conformity with the lateral femoral condyle and meniscus. It curves down over the margin to the posterior surface of the lateral condyle (this is for movement of the lateral meniscus).

3) The intercondylar eminence (the spine):

The tibial plateau is elevated between the condylar surfaces to form the spine. It is grooved anteroposteriorly between ridges on to which the articular surfaces rise.

These little ridges on the spine are called the medial and lateral intercondylar tubercles to which nothing is attached.

4) The non articular areas in front and behind the spine:

They show well marked facets for attachment of the horns of the menisci and the cruciate ligament.

a- In front of the spine:

There is a large smooth area for attachement of the anterior cruciate ligament. The lateral margin of this area receives the anterior horn of the lateral meniscus, just in front of the lateral intercondylar tubercle. Further forward, at the margin of the tibial plateau, is a round smooth facet for the anterior horn of the medial meniscus.

b- Behind the spine:

There is a smooth area sloping down to an oblique ridge between the posterior convexlities of the condyles. The posterior cruciate ligament is attached to that ridge

and to the smooth slope above it. The posterior horn of the medial meniscus is attached to a deep slit behind the medial intercondylar tubercle. The posterior horn of the lateral meniscus is attached, in front of the posterior cruciate ligament, just behind the lateral intercondylar tubercle.

The Capsule:

Is attached to the circumference of the tibial plateau except in two places. Where the tendon of popliteus crosses the margin of the tibia the capsule extends down to the head of the fibula. Between the condyles posteriorly the capsule is attached not to the margin of the plateau but to the ridge below the groove for the post. Curciate lig. Between the menisci and the tibial plataau the capsule is often referred to as the "coranary ligament".

The Synovial membrane:

It is attached to each articular surface, following the condylar margins alongside the spine to be dropped over the attachment of the anterior cruciate ligament.

GROSS ANATOMY OF ANTERIOR CRUCIATE LIGAMENT (ACL)

Femoral attachment:

It is attached to a fossa on the posterior aspect of the medial surface of the lateral femoral condyle. The femoral attachment is in the form of a segment of a circle, with its anterior border straight and its posterior border convex.

Its long axis is tilted slightly forward from the vertical, and the posterior convexity is parallel to the posterior articular margin of the lateral femoral condyle.

Tibial attachment:

The anterior cruciate ligament is attached to a fossa in front of and lateral to the anterior tibial spine. At this attachment the ligament passes beneath the transverse meniscal ligament, and a few fascicles of the ligament may blend with the anterior attachment of the lateral meniscus.

In some instances, fascicles from the posterior aspect of the tibial attachment of the ligament may extend to, and blend with, the posterior attachment of the lateral meniscus. The tibial attachment of the ligament is somewhat wider and stronger than the femoral attachment.

Spatial Orientation:

The anterior Cruciate ligament Courses anteriorly, medially and distally across the joint as it passes from the femur to the tibia. As it does, it turns on itself in a slight outward (lateral) spiral. This is due to the orientation of its bony attachment. The Orientation of the femoral attachment of the ACL, with regard to joint position (flexion, extension), is also responsible for the releative tension of the ligament throught the range of motion.

The Anterior Cruciate ligament (ACL) is attached to the femur and tibia, not as a singular cord, but rather as a collection of individual fascicles that fan out over a brood flattend area. These fascicles have been summarily divided into two groups the anteromedial band (AMB), those fascicles originating at the proximal aspect of the femoral attachment and inserting at the anteromedial aspect of the tibial attachment, and the posterolateral bulk (PLB), the remaining bulk of fascicles, which are inserted at the postero lateral aspect of the tibial attachment.

When the knee is extended the PLB is tight, while the AMB is moderatly lax. However, as the knee is flexed, the femoral attachment of the ACL assumes