Double Bundle Anterior Cruciate Ligament Reconstruction Using Hamstring Tendon Graft.

Protocol of Thesis
Submitted for Partial Fulfillment of the Requirements of Master Degree in **Orthopaedic Surgery**

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List Of Abbreviations

AAM …….....Accessory anteromedial

ACL…….....Anterior cruciate ligament

ADB…….....Anatomic double bundle

AL……....Anterolateral

AM…….....Anteromedial

AMB……....Anteromedial bundle

ASB…….....Anatomic single bundle

DB……Double bundle

DOF…….Degrees of freedom

Gs…….Gracillis

LFC……..Lateral femoral condyle

MFC…….Medial femoral condyle

PCL……..Posterior cruciate ligament

PL…….Posterolateral

PLB……..Posterolateral bundle

PLC……..Posterolateral corner

SB . . . . . .Single bundle

ST. . . . . .Semitendinosus

2D . . . . . Two dimensional

Aim of the work

Comparative study of the Reconstruction of the injured ACL using anatomical single bundle and anatomical double bundle.

Protocol contains

I- Review of literature:

1. Anatomy
2. Biomechanics of ACL.
3. Diagnosis of ACL injury by:
    - History taking.
    - Clinical examination.
    - Imaging.
4. Treatment.
    - Operative.
    - Rehabilitation.

II- Patients and Methods:

The study will include 20 cases of ACL injury subjected to the following:

A- Diagnosis:

a. History and clinical examination.

b. Imaging study**:**

i. (X- Ray).

ii. MRI.

c. Arthroscopic diagnosis.

B- Techniques.

C- Post-operative management and follow up: Where patients will be evaluated clinically and radiologically till final follow up.

D- Results: Patients will be evaluated clinically and radiologically.

E- Complications.

F- Discussion.

G- Summary.

H- Conclusion.

I- References.

J- Summary in Arabic.

Anatomy of ACL

Anatomy of anterior cruciate ligament:

Although the anterior cruciate ligament (ACL) has significant contributions to knee joint stability and kinematics, its anatomic definitions and surgical implications still remain a subject of debate among knee surgeons and researchers worldwide. Currently, it is one of the most frequently studied structures of the musculoskeletal system. This represents a large body of knowledge increasing day by day, With regard to the current anatomical reconstruction concept, reconstruction techniques are essentially aimed at restoring native ACL function. However, to mimic its complete native functions, a thorough knowledge of anatomy is required. (1)

Embryological development of ACL:

The anterior cruciate ligament is believed to be derived from either the homogenous articular inter-zone or the knee joint capsule. (2)

The fetal ACL had a similar appearance to its adult counterpart, but seemed to present a more parallel orientation and have a broader femoral attachment area compared to adult ACL. The bundles were found to be parallel to each other during extension. During flexion, the posterolateral (PL) bundle crossed over the anteromedial (AM) bundle. Histological examination of the fetal ACL tissue revealed a more cellular and vascular composition than that of adult ACL. Also, the presence of a septum separating the two bundles was noted. (3)

Gross anatomy of the ACL:

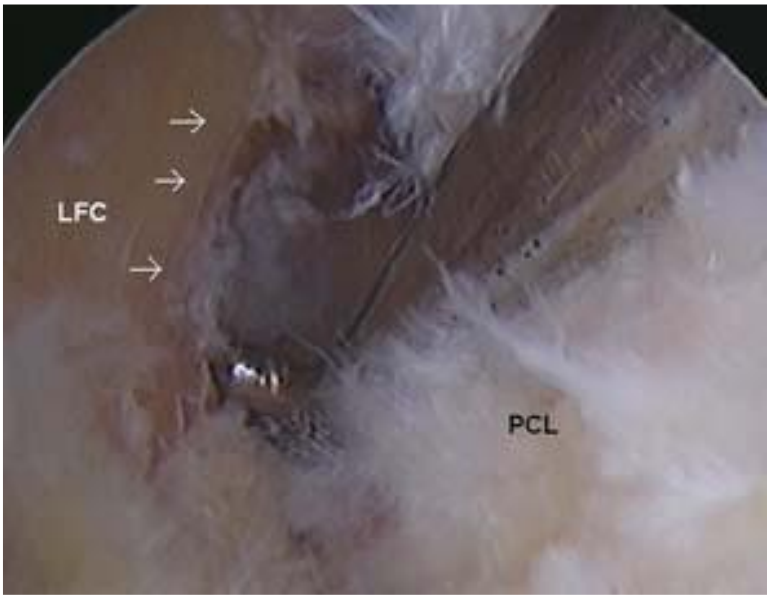
The ACL is an intra-articular but extra-synovial band of dense connective tissue. It is enveloped by the synovium. Proximally, it attaches to a fossa on the posteromedial edge of the lateral femoral condyle. It follows an

oblique course in the anterior-medial-distal direction and distally attaches to the anterior intercondylar fossa on the tibial plateau. It is widely accepted that the ACL is composed of two functional bundles; the anteromedial (AM) bundle and the posterolateral (PL) bundle**.** (4)

Amis and Dawkins identified three bundles during cadaveric knee examinations, named as anteromedial, posterolateral and intermediate bundles**.** (5)

Femoral insertion site:

The femoral origin of ACL begins at the most posteromedial aspect of the lateral femoral condyle. It lies posterior to the Residents' ridge. This thick bony landmark running from a proximal to a distal direction along the entire ACL attachment is of significance because none of its fibers attach anterior to this ridge (Fig. 1).The shape of the femoral attachment site is described anteriorly straight but posteriorly convex following the contours of the posterior articular cartilage. (6)



(Fig.1) Arthroscopic view of a right knee. LFC medial wall of the lateral femoral condyle, PCL posterior cruciate ligament. White arrows indicate Residents' ridge (6)

The femoral attachment site is covered with synovial membrane. (3)

The origin of the AM bundle is located at the proximal and anterior aspects of the femoral insertion site, where as the origin of the PL bundle is at the

posterior and inferior part (Fig. 2). At the femoral attachment site, the orientation of the two bundles alters with the range of motion. During extension, the PL bundle is located posterior and inferior to the AM bundle. During flexion, the PL bundle becomes more shallow and inferior to the AM bundle (Fig. 3a, b). The lateral bifurcate ridge separates the femoral origins of the two bundles. [3]

Proximal to the lateral bifurcate ridge, the insertion site of the AM bundle is present and its surface is concave in shape, whereas the insertion site of the PL bundle is planar. **Harner et al, 1999**[7] demonstrated that both bundles have equal surface are as at the femoral attachment site.

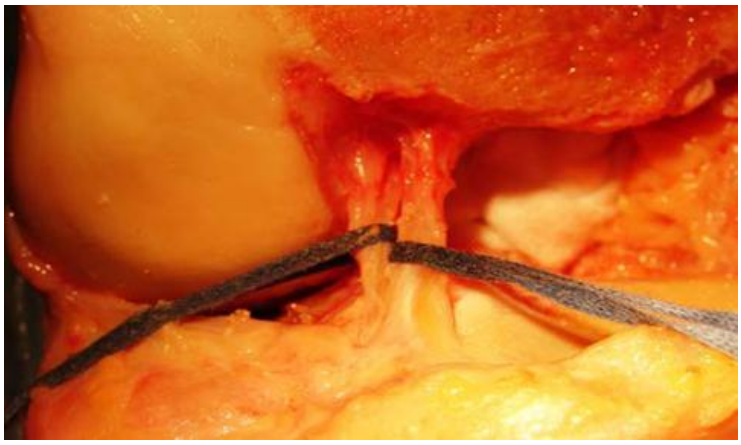


Fig. 2: Oblique view of the medial wall of lateral femoral condyle, right knee. Femoral origins of AM and PL bundles [7]

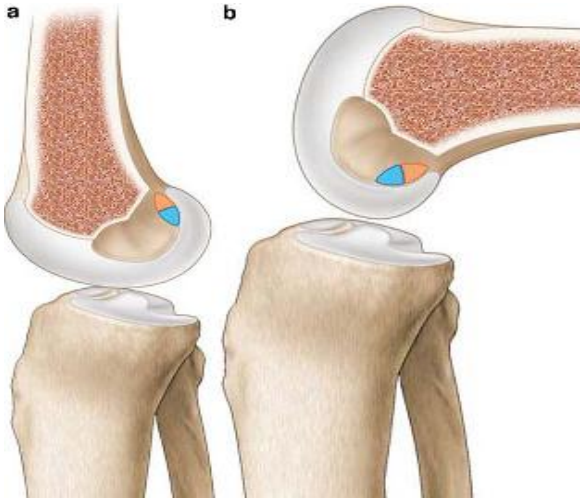


Fig. 3: Schematic drawings of the knee in the sagittal plane. Insertions of AM and PL bundles at the femoral attachment site are shown during extension (a) and 90_ flexion (b) [7]