EVALUATION OF THE RESULTS OF EARLY ARTHROSCOPIC ACL RECONSTRUCTION USING THE ANATOMIC (CENTRAL TO CENTRAL) SINGLE BUNDLE TECHNIQUE USING THE HAMSTRING GRAFT

Thesis

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ABSTRACT

Anatomic anterior cruciate ligament (ACL) reconstruction has become popular during the last decade. This procedure is designed to reconstruct the anatomic insertion of the ACL footprint. Previous biomechanical basic studies and clinical results have demonstrated the advantages of this procedure compared with conventional ACL reconstruction technique .

The aim of study is to evaluate the results of early arthroscopic ACL reconstructions using single bundle anatomic central to central technique using the semi-tendinosus and gracilis autografts which were fixed by end button on the femoral side and biodegradable interference screws on the tibial side .

thirty patients with a primary diagnosis of acute Anterior Cruciate Ligament tear seen in the clinic were evaluated and prepared for early arthroscopic ACL reconstructions. All the patients had a post operative accelerated rehabilitation program similar to that designed by (K. Donald Shelbourne and Christine Klotz ,2007) was used for the patients.

Evaluation was done by the use of International Knee Documentation Committee (IKDC) evaluation form (subjective and objective).

this study suggests that early arthroscopic ACL reconstructions using single bundle anatomic central to central technique gives good functional results with no increased incidence of ROM loss .

(Key Words: anatomic ACL reconstruction, timing,accelerated rehabilitation,arthrofibrosis)

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List of Abbreviation

ACL	**:**	Anterior cruciate ligament
ALL	**:**	Anterolateral ligament
AMB	**:**	Anteromedial bundle
BFT	**:**	Biceps femoris tendon
BPTB	**:**	Bone patellar tendon bone
CkC	**:**	Closed kinetic chain
DVT	**:**	Deep vein thrombosis
FH	**:**	Fibular head
GT	**:**	Gerdy's tubercle
IKDC	**:**	International Knee Documentation Committee
IMB	**:**	Intermediate bundle
ITB	**:**	Iliotibial Band
JC	**:**	Joint capsule
KOOS	**:**	Knee Osteoarthritis Outcome Score
LCL	**:**	Lateral collateral ligament
LFC	**:**	lateral femoral condyle
LFE	**:**	Lateral femoral epicondyle
MFG	**:**	Medial femoral condyle
MRI	**:**	Magnetic Resonance Imaging
OKC	**:**	Open kinetic chain
PCL	**:**	Posterior cruciate ligament
PLB	**:**	Posterolateral bundle
PT	**:**	popliteus tendon
ROM	**:**	Range-of-motion
SLR	**:**	Straight leg raising
VEGF	**:**	Vascular endothelial growth factor

INTRODUCTION

Currently, a large number of ACL reconstructions are performed each year around the world, therefore, the ACL has been one of the most frequently studied structures of the musculoskeletal system during the last decades.

Biomechanics of the intact and ACL replacement graft, different types of grafts, mechanism of failure, treatment, surgical techniques, and postoperative rehabilitation protocols have been intensively studied.(1)

Since 1895 when Mayo Robson of Leeds Royal Infirmary performed the first ACL repair, the treatment of ACL injuries has occupied many orthopaedic minds, with debates raging between extraarticular versus intra-articular reconstruction, open versus arthroscopic technique and more recently, anatomical reconstruction.(2)

Fu and Karlsson (3) described anatomic ACL reconstruction as 'the functional restoration of the ACL to its native dimensions, collagen orientation and insertion sites'. It is a detailed and meticulous procedure that involves visualization of the native ACL insertion site, measuring ACL and knee dimensions, appropriate graft tensioning and evaluation of graft and tunnel position. It encompasses single and double bundle reconstruction and can be applied to primary, revision and augmentation surgery. The development of the anatomic technique has made us take a closer look at the ACL anatomy.(3)

Early surgical intervention during the initial 6 weeks post-injury weeks have suggested that restoring tibiofemoral stability may minimise the risk of further meniscal and chondral injury which may be associated with degenerative joint changes. Early surgery may also facilitates rapid return to sporting and occupational pursuits with considerable economic consequences.(4)

Delayed ACL reconstruction may be associated with increase in muscle atrophy and reduced strength which may delay early rehabilitation. Conversely, delaying surgical intervention allows optimisation of pre-operative knee range of motion and recovery of surrounding soft tissues from the initial injury and potentially reducing the incidence of post-operative arthrofibrosis and wound complications.(4)

The aim of this study is to evaluate the clinical outcome of early single bundle ACL reconstruction using anatomic central to central technique using the quadrupled hamstring tendon.

ANATOMY OF ACL

The knee joint starts its formation from vascular mesenchyme between femur and tibia in the fourth week of gestation between the blastoma of femur and tibia. A distinct amount of ACL fibers appear in approximately the 8th week after gestation. At this time, the fibroblasts within the ligament are already aligned to the axis of strain of the ACL.[5]

By 9 weeks, the cruciate ligaments are composed of numerous immature fibroblasts having scanty cytoplasm and fusiform nuclei. Over the next weeks, the major change in addition to growth, is the increase in vascularity. During this time the fusiform fibroblasts express high amounts of the angiogenic vascular endothelial growth factor.[6] (Fig. 1)

The expression of vascular endothelial growth factor is largely downregulated after birth, but this factor is strongly re-expressed during the remodeling of autologous tendon grafts used for ACL reconstruction. After week 20, the remaining development consists of marked growth with little change in form.[6] Two distinct bundles of the ACL are present at 16 weeks of gestation.[7] (Fig. 2)

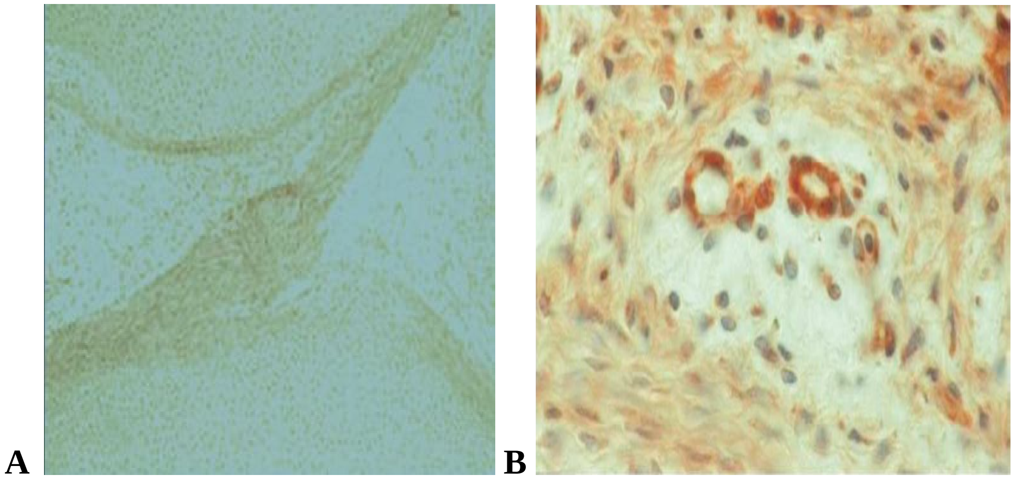

Fig. (1): (A) Fetal ACL,10th week after gestation. Note the early organization of the ACL between femur and tibia. (B) Vascular endothelial immunostaining, fetal ACL 22 weeks after gestation [1].

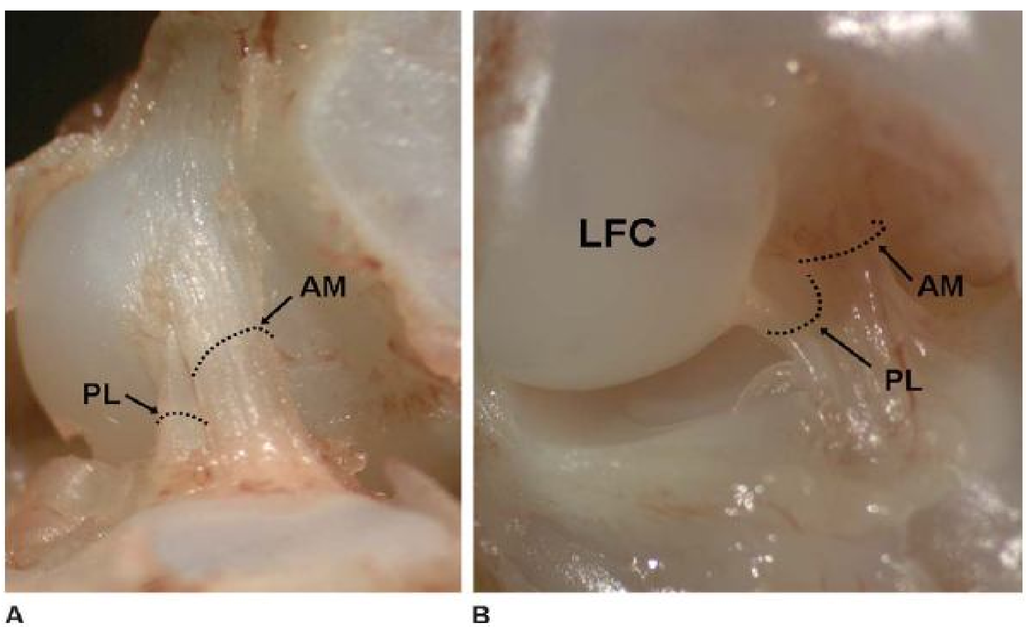

Fig.(2): 16-week fetus demonstrating two bundles of the anterior cruciate ligament with the knee in extension (A, sagittal view with medial femoral condyle removed) and flexion (B, frontal view). AM, Anteromedial; LFC, lateral femoral condyle; PL, posterolateral [7].

Gross Anatomy:

The ACL is a band of dense connective tissue that connects the femur and the tibia. It is enveloped into the synovial membrane of the human knee joint, which by definition places the ligament intraarticular but extra-synovial. However, from a surgical standpoint, the ACL must be regarded only as an intraarticular structure because it can be reconstructed only intraarticularly and cannot be exteriorized from the articular space. [(5)]

The ligament originates at the medial side of the lateral femoral condyle and runs an oblique course through the intercondylar fossa distal–anterior– medial to the insertion at the medial tibial eminence. The axis of the long diameter of the ACL is tilted 26° ± 6° forward from the vertical. When the knee is flexed, as during surgery, the ligament seems to turn itself in a lateral spiral. [(5)]

This external rotation is approximately 90° as the fibers approach the tibial surface. The twist of the fibers of the ACL is a result of the orientation of its bony attachments. The femoral attachment is oriented primarily in the longitudinal axis of the femur, whereas the tibial attachment is in the anteroposterior axis of the tibia.[(5)] (Fig. 3)

The ACL length ranges from 22 to 41 mm (mean, 32 mm) and its width from 7 to 12 mm, mean length of the AM bundle is 33 mm and is 18 mm for the PL bundle.[(8,9)]

The narrowest diameter of the ACL occurs in the midsubstance which is oval in shape with an area of 36 mm^2 and 44 mm^2 for females and males, respectively. The insertion areas of the ACL (tibial and femoral