Press-fit Concept In ACL Reconstruction

Essay
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M.B., B.ch

For the fulfillment of Master degree In
Orthopedic Surgery

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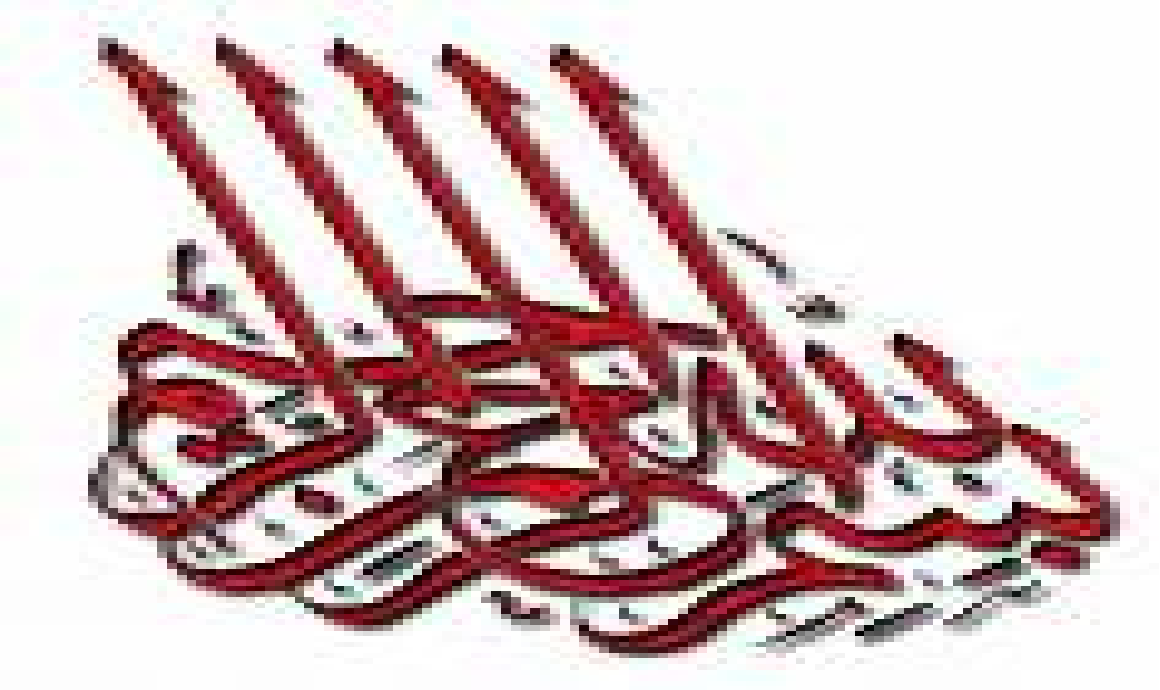
2010



ABSTRACT

The tibia head is big enough to harvest another one. Especially in the case of very osteoporotic bone quality it may be necessary to take a second tibial cylinder for press fit fixation in femur.

Press-fit ACL reconstruction avoids the disadvantages associated with hardware fixation, such as graft damage during screw driving divergence between the bone plug and the screw, bio-incompatibility, biodegradability or allergic reactions, and technical problems

KAY WORDS
Press _ concept_ reconstructiom

CONTENT

Acknowledgments

First of all, praise to ALLAH, the master of the world, the most gracious and the most merciful.

For this work and for my debut and hopefully continuing practice, I am indebted to a person who was more a father than supervising professor. **Prof. Dr. Abdel Aziz M. Al Singergy** Professor of orthopedic surgery, Faculty of Medicine, Cairo University.

I am also deeply so much obliged and can hardly express my hardless and limitless thanks to **Prof. Dr. Ahmed Mahmoud Atia** Professor of orthopedic surgery, Faculty of Medicine, Cairo University. For his precious remarks, assistance comments, kind encouragement, moral support, continuous advice and sincere assistance for completion of this work.

I would like also to thank **Dr.Magdy M. Hefny (M.D.)**, **Dr. Osama Alarabi (F.R.C.S.) and Dr. Osama Abdel Hameed (M.D.) for** their support, kind advice and for helping me so much in my orthopedic practice.

A fruit does not thank the tree for bearing it, but I must express a tiny bit of gratitude to the very reason of my existence. To **my family**, I hope that I was able to fulfill a fraction of their expectations.

Medhat Sdeek

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Abbreviations

ACL: Anterior cruciate ligament

A.M.: anteromedial

P.L.: posterolateral

BTB: bone-tendon-bone

BPTB: bone-patellar tendon-bone

SDI: surgical diamond instruments

N: Newton

BTT: Bottom to top fixation

MC: mineralized cartilage

FC: Fibrocartilage

FIZ: Fibrous interstitial zone

BPLA: Bone-plug ligament angle

IFS: Interference screw

IDKC: International knee documentation committee

QTPB: Quadriceps tendon patellar bone

BFB: bovine femoral bone

CKC: closed kinetic chain

OKC: open kinetic chain

ROM: Range of motion

Aim of the Work

This study aims to review the literature about press-fit Concept in ACL reconstruction (which is a method of graft fixation using harvested bone dowels without using hardware), and to clarify and identify its benefits and drawbacks.

Introduction

Introduction

The surgical treatment of the ACL-deficient knee has been controversial among orthopedic surgeons. The success of the surgery depends on several factors including the timing of the surgery, graft choice, tunnel placement, graft tensioning, graft fixation methods, and postoperative rehabilitation protocol. Orthopedic surgeons use bone–patellar tendon–bone or hamstring tendon grafts most frequently. Secure graft fixation is an important factor, especially in the early postoperative period. There are many different fixation methods, such as metal and biodegradable interference screws, staples, buttons, press-fit.

Nowadays, interference screw fixation is one of the most popular methods for the fixation of the graft. However, there are some known disadvantages of this technique. The graft may be damaged during the insertion of the screw, which may result in a decrease of the ultimate tensile strength of the graft. Divergence between the bone block and the screw may also cause significant decrease in fixation strength. Furthermore, chronic synovitis may occur because the bioabsorbable screw is placed next to the joint line. In cases of reinjury, the screw may inhibit magnetic resonance scanning for the diagnosis, and it may cause difficulties for the surgeon in removing it.

Therefore, press-fit fixation method can be a good alternative in ACL surgery. It is a simple technique and many surgeons successfully use it. The biomechanical properties of this press-fit fixation have been tested, and its satisfactory tensile strength and stiffness have been shown (38).

The Press-Fit technique is based on graft harvest with an oscillating hollow saw, which allows collection of cylindrical bone blocks and Femoral and tibial fixation using the bone cylinders removed previously. Several biomechanical studies compared the press fit fixation with commonly used hardware fixations. The press fit fixation has been shown

to have a similar pullout strength and stiffness compared to fixation with interference screws in animal models.

It is difficult to decide which of the methods currently available for ACL reconstruction is the best because most of them give satisfactory results. In the future, assessments of knee ligament reconstruction techniques should look at long-term stability combined with low complication rates. Ease of revision surgery and low cost should also be taken into consideration (13).

Structural and mechanical properties

Structural and mechanical properties

- **LOAD-ELONGATION CURVE AND STRESS-STRAIN CURVE:**

The kinetic response of a joint to internal and external loads is governed by bone geometry as well as the location, morphology, and chemical composition of ligaments and other connective tissues contained within or around the joint. To understand the contribution of an individual ligament to joint kinetics, the transfer of load through a ligament's insertion, midsubstance to the opposing insertion must be considered. Physiologically, these bone-ligament complexes have been designed to transfer load uniaxially along the longitudinal direction of the ligament. Thus, tensile testing of a bone-ligament-bone complex is done to determine the structural properties. The resulting load-elongation curve reveals non-linear, concave, upward behavior.Parameters obtained from this curve include stiffness, ultimate load, ultimate elongation, and energy absorbed at failure. From the same test, information about the mechanical properties of the ligament substance can also be obtained. This is done by normalizing the force by the cross-sectional area of the ligament and the change in elongation by the initial length of a defined region of the ligament midsubstance, defined as stress and strain, respectively. From the stress-strain curve, the elastic modulus, ultimate tensile strength, ultimate strain, and strain energy density of the ligament substance can be determined (32).

The load-elongation curve can be divided into four regions according to the structural properties of the ACL (fig. 1). A first nonlinear region, the so-called 'toe region', is described as collagen fibers, which are arranged in varying degrees of crimp, easily extend under low axial forces. The toe region is followed by a linear region where collagen fibers reversibly deform. The slope of the linear region allows for reproducible determination of ligament stiffness (measured in Newton per millimeter)