



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم

# بسم الله الرحمن الرحيم



**MONA MAGHRABY**



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# شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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# جامعة عين شمس

## التوثيق الإلكتروني والميكروفيلم

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**MONA MAGHRABY**



# **A Systematic Review of Simultaneous Versus Staged Anterior Cruciate Ligament Reconstruction and Opening Wedge High Tibial Osteotomy for Varus Malalignment in Young Patients with Anterior Cruciate Ligament Deficient Knees**

*Submitted for Partial Fulfillment of Master Degree in  
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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سببنا أنك لا تعلم لنا  
إلا ما علمتنا أنك أنت  
العليم العظيم

صدق الله العظيم

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# Dedication

*Words can never express my sincere thanks to **My Family** for their generous emotional support and continuous encouragement, which brought the best out of me. I owe them all every achievement throughout my life.*

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# List of Abbreviations

Abb.	Full term
<b>ACL</b> .....	Anterior Cruciate Ligament
<b>PL</b> .....	Posterolateral bundle
<b>AM</b> .....	Anteromedial bundle
<b>FATC</b> .....	Femur-ACL-tibia complex
<b>CoR</b> .....	Center of rotation
<b>HAMS</b> .....	Hamstring muscle force
<b>GAS</b> .....	Gastrocnemius muscle force
<b>PT</b> .....	Patellar tendon/quadriceps muscle force
<b>CTO</b> .....	Contralateral toe off
<b>GRF</b> .....	Ground reaction force
<b>COM</b> .....	Center of mass
<b>HTO</b> .....	High Tibial Osteotomy
<b>ROM</b> .....	Range of motion
<b>KL</b> .....	Kellgren Lawrence score
<b>AMP</b> .....	Accessory medial portal
<b>MRI</b> .....	Magnetic resonance imaging
<b>EAT</b> .....	Extra-articular tenodesis
<b>ALL</b> .....	Anterolateral ligament
<b>OA</b> .....	Osteoarthritis
<b>JSN</b> .....	Joint space narrowing
<b>WOMAC</b> .....	Western Ontario and McMaster Universities Osteoarthritis Index
<b>IKDC</b> .....	International Knee Documentation Committee
<b>IKDC-SKF</b> .....	International Knee Documentation Committee subjective knee form
<b>BPTB</b> .....	Bone-Patellar Tendon-Bone graft

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## INTRODUCTION

Chronic anterior cruciate ligament (ACL) injury has been proved to be implicated in the development of tibiofemoral osteoarthritis (OA). <sup>(1)</sup>

Regardless of surgical intervention, the risk of loss of cartilage increases by 19 times for the medial femoral condyle 7 to 11 years after injury. <sup>(2)</sup> Furthermore, patients who undergo delayed anterior cruciate ligament reconstruction (ACLR) are more susceptible to an increased incidence of medial meniscal lesion <sup>(3)</sup> which is managed by concomitant meniscectomy or repair. <sup>(4)</sup>

It has been corroborated that meniscectomy is a definite risk factor for the early onset of medial osteoarthritis, with an odds ratio of 3.54. <sup>(5)</sup>

Medial compartment osteoarthritis is also a very common condition in patients with varus malalignment. In addition, meniscectomy aggravates the varus alignment. In the meantime, the varus alignment was observed to potentially compromise the ACL or the ACL graft by increasing the ligament tension. <sup>(6)</sup>

Accordingly, the combination of the 2 pathologies of medial compartment osteoarthritis and ACL injury was one of the “most difficult diagnostic and treatment dilemmas that a clinician may be required to manage.” <sup>(7)</sup>

Commonly occurring in young individuals, acute ACL injuries tend to predispose patients to an early onset of osteoarthritis at the age of 30 to 50 years. Although ACLR provides restoration of anterior knee stability, the development of osteoarthritis after ACLR seems to undergo little intervention.<sup>(8)</sup>

The optimal surgical procedure to address both ACL deficiency and medial compartment OA has been controversial: ACL reconstruction alone, high tibial osteotomy (HTO) alone, staged combined ACL reconstruction and HTO, and a combination of ACL reconstruction and HTO have all been explored.<sup>(9)</sup>

## **AIM OF THE WORK**

The aim of this study was to review the literatures about simultaneous and staged anterior cruciate ligament reconstruction and opening wedge high tibial osteotomy in patient with ACL deficiency and varus malalignment as regard clinical outcomes and complications.



## REVIEW OF LITERATURE

### Anatomy of Anterior Cruciate Ligament

The ACL controls anterior movement of the tibia and inhibits extreme ranges of tibial rotation. The ACL consists of 2 major bundles, the posterolateral bundle (PL) and the anteromedial bundle (AM). The component ACL bundles are named based on their tibial insertion. <sup>(10)</sup>

Both bundles originate on the posteromedial side of the lateral femoral condyle and insert on a region just anterior to the intercondylar tibial eminence (**Figure 1**) <sup>(11)</sup>

The broad ACL tibial insertion point occurs so that there is no physiological impingement on the intercondylar notch in full extension. <sup>(12)</sup> Placement of the ACL graft insertion into the tibia during reconstructive surgery must adhere to this principle. Mean length of the AM bundle is 33 mm and is 18 mm for the PL bundle. <sup>(13)</sup> The width of the ACL in cadavers ranged from 7 to 17 mm, with the average being 11 mm. Average ACL cross-sectional area is 36 and 47 mm<sup>2</sup> for women and men, respectively. <sup>(14)</sup>

The ACL is composed of type I collagen fibers. Dissection by **Giuliani et al.**, <sup>(10)</sup> found that the primary blood supply to the ligament comes from the middle genicular artery, with additional supply coming from the infero-medial and inferolateral genicular arteries. There are also many types of

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