Systematic review for management of Posterolateral corner injuries of the knee

Essay
Submitted for partial fulfillment of Master Degree
in Orthopedic surgery

By

Ahmed Kamal Mohamed Meselhy

M.B., B. Ch. (Ain Shams University)

Under Supervision of

Prof. Dr. Ahmed Mohamed El Saeed

Professor of Orthopedic Surgery

Faculty of Medicine – Ain Shams University

Dr. Amr Ahmed AbdelRahman

Assistant Professor of orthopedic surgery

Faculty of Medicine – Ain Shams University

Orthopedic department – Faculty of Medicine

Ain-Shams University

2017

Acknoledgment

First of all, I'd like to thank Allah for all his gifts throughout my life.

I'd like to express my deepest gratitude to **Prof. Dr. Ahmed Elsaeed** Professor of Orthopedics, Faculty of Medicine, Ain Shams University, for his guidance, support, and continuous encouragement throughout this work.

I'd like to express my special thanks to **Dr. Amr Abdelrahman**, Assistant professor of Orthopedics, Faculty of Medicine, Ain Shams University for his guidance, fruitful advice, and continuous support offered to me step by step till this essay was finished.

Finally, I owe countless thanks to **My Family**, as they have supported me and taught me how to always strive for excellence.

Ahmed Kamal Meselhy

List of contents

List of abbreviations:

PLC	Posterolateral corner
ACL	Anterior cruciate ligament
PCL	Posterior cruciate ligament
LCL	Lateral collateral ligament
PFL	Popliteo-fibular ligament
FCL	Fibular collateral ligament
IKDC	International knee documentation committee

List of figures:

List of tables:

Abstract

Background: There is a paucity of outcome data to guide the surgical treatment of posterolateral corner knee injuries.
Purpose: To systematically review the literature to compare clinical outcomes of the treatment PLC injuries.
Study Design: Systematic review; Level of evidence, 4.
Methods: A systematic review of the literature including PubMed was performed. The following search terms were used: "posterolateral corner", "chronic PLC injuries" "acute PLC injuries" and "repair of PLC injuries", "reconstruction of PLC". Inclusion criteria were: Human examinations and treatment, measures of functional and clinical outcome included, exclusion criteria were: Non English papers, Non-human trials, Articles with no clinical data.
Results: Eighteen studies with a total of 559 patients were included. When time to surgery was performed within 6 weeks it is considered acute injury while on the other hand more than that was considered chronic injury. Surgical treatment varied between repair and reconstruction there was an overall success rate of repair 75% and failure rate of 25% and overall success rate of reconstruction was 91% and 9% failure rate.
Surgical techniques: 83 patients underwent repair for the PLC while 476 patients underwent reconstruction for the PLC, surgical techniques varied among studies, between repair and reconstruction techniques which was different between studies, including fibular sling using one femoral tunnel or two femoral tunnels, posterolateral capsular shift trying to increase rotational stability, anatomic PLC reconstruction, biceps tenodesis and isometric reconstruction of the FCL and the popliteus with a single graft.
Conclusion: The repair of acute PLC injuries and staged treatment of combined cruciate injuries were associated with a substantially higher postoperative PLC failure rate than reconstruction. Further research is required to identify the reconstruction technique that provides optimal subjective and objective outcomes.

Key word: posterolateral corner, chronic PLC injuries, acute PLC injuries and repair of PLC injuries, reconstruction of PLC.

INTRODUCTION

Posterolateral corner lesions have been estimated to occur in 9.1% of acute knee injuries with haemarthrosis and 16% of all knee ligament injuries, often presenting with concomitant anterior crutiate ligament or posterior crutiate ligament or both, isolated PLC has shown to account for less than 30% of the injuries, failure to detect these injuries has been shown to be an important cause of recurrent instability and failed cruciate ligament reconstructions [1].

The main structures that make up the PLC of the knee are the lateral collateral ligament, popliteus tendon, popliteo-fibular ligament (PFL), and lateral knee capsule [2] (Fig. 1). The popliteus tendon, the PFL, and the LCL are considered the static stabilizers of the PLC whereas dynamic stabilizers to the PLC include the biceps tendon, iliotibial tract, and popliteus muscle-tendon complex [3].

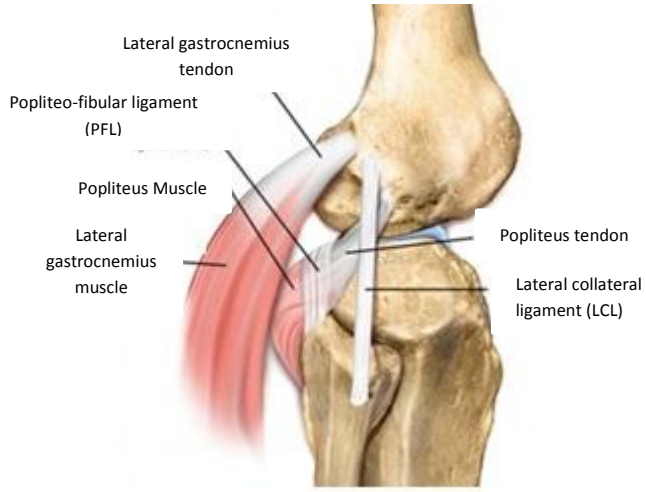

Fig. (1) Illustration demonstrating anatomy and relationships of the FCL, popliteus tendon, PFL, and lateral gastrocnemius tendon (lateral view of a right knee) [4].

The PLC controls the anterolateral and posterolateral tibial rotation relative to the femur, the LCL is the primary structure that resists the excessive varus deformity, whereas the PFL and the popliteal tendon resist excessive external rotation of the tibia [4-6].

Mechanisms resulting in PLC injuries include a posterolateral-directed force to the anteromedial tibia, knee hyperextension, and/or severe tibial external rotation while the knee is partially flexed. The forces involved during injury the will dictate which specific structures are injured [7].

In the past, although also once considered to be the “dark side of the knee”, treatment of lateral side instability has been challenging due to limited data on the anatomy and biomechanics of the PLC structures and under-reporting of clinical outcomes

following non-operative and operative treatment. However, more recently, the anatomy and biomechanics have become well-defined and good outcomes have been reported after PLC operative treatment following anatomic reconstruction principles [8].

A thorough understanding of the anatomy, biomechanics, and healing physiology is essential for the successful treatment and rehabilitation of PLC injuries for patients to return to the highest level of function [7].

Acute PLC injuries were often treated with primary repair, however with studies demonstrating a high failure rate with primary repair and delay in diagnosis due to difficulty in detection as it requires high suspicious index, a trend toward reconstruction has occurred [9].

In *1996 Larson et al* developed a reconstruction technique for PLC injuries utilizing a single femoral tunnel and fibular sling [10] , In *2005 Robert A. Arciero, M.D* developed it into into 2 femoral tunnels with a fibular sling to attempt to add external rotation stability in an operation known as *'modified Larson technique'* [11] (Fig. 2).

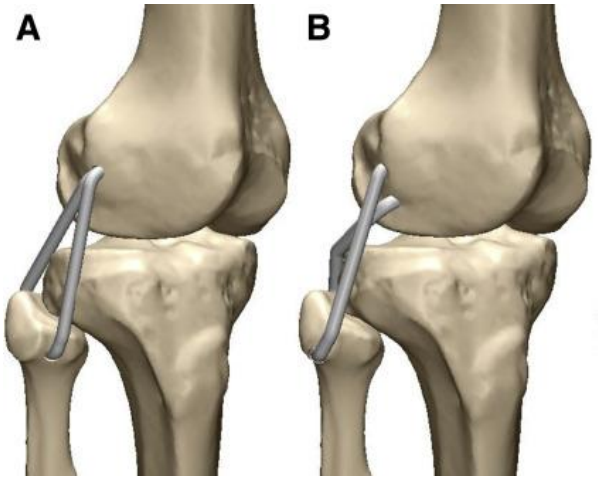

Fig. (2)Fibular sling techniques: (A) 1 femoral tunnel fibular sling technique (Larson technique) and (B) 2 femoral tunnel fibular sling technique (modified Larson technique) [12].

'LaPrade et al 2004' hypothesis was that an anatomic PLC knee reconstruction would improve overall patient function and restore static stabilily in varus and external rotation in knees with a chronic PLC injury[13] (Fig.3).

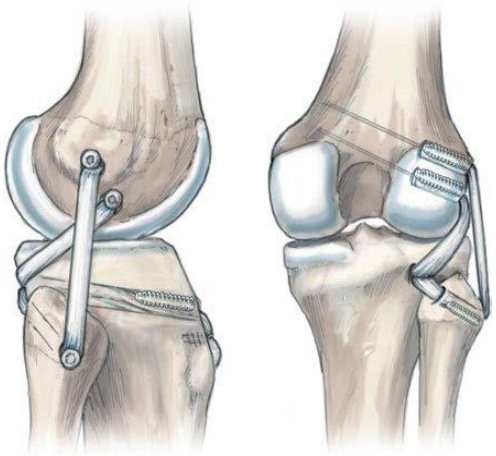

Fig. (3) (A) Lateral and (B) posterior views of anatomic-based posterolateral corner reconstruction with 2 grafts recreating the FCL, popliteus tendon, and PFL.(LaPrade technique) [13].

Kim et al developed the modified biceps rerouting technique, it was developed in 2001 to tighten the arcuate complex and to limit excessive external rotation by rerouting and fixing the biceps tendon at the isometric point, reducing iatrogenic injury to the iliotibial band with a surgical approach through the interval between the iliotibial band and biceps muscle [14]. While this technique is relatively simple and takes less time for a surgeon to perform than other anatomical reconstructions, it is a non-anatomical procedure and sacrifices a normal dynamic knee stabilizer, the anatomical reconstruction of the popliteus tendon and the (LCL) can address PLC insufficiency while preserving the normal dynamic knee stabilizer; however, the procedure is complex, challenging, and time consuming [15] (Fig. 4).

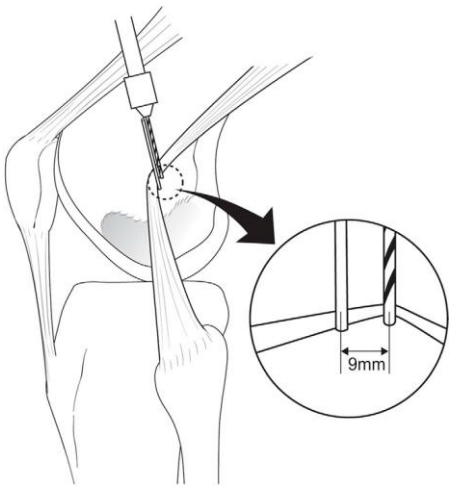

Fig. (4) Modified biceps rerouting tenodesis for posterolateral corner insufficiency [15].

Kim et al 2004 also developed technique for the anatomic reconstruction is the reconstruction with single graft recreating the FCL, popliteus tendon, and PFL [16] (Fig. 5).

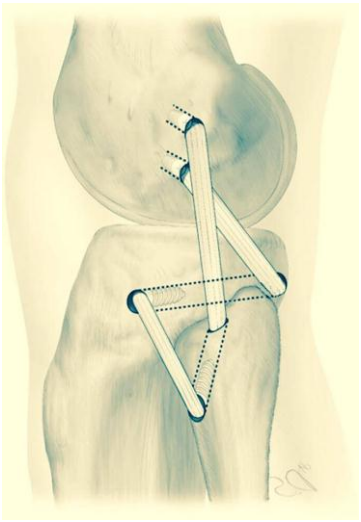

Fig. (5) Posterolateral corner reconstruction with 1 graft recreating the FCL, popliteus tendon, and PFL [17].

Also capsular shift can be done in an attempt to increase rotational stability by attaching the posterolateral capsule to the FCL graft. Studies reported performing capsular shift with different reconstruction techniques: fibular sling and FCL reconstruction [2] (Fig. 6).

Fig. (6) Posterolateral capsular shift with a fibular sling. The capsular shift attempts to increase rotational stability by attaching the posterolateral capsule to the FCL graft [18].

Although there are several operative techniques for management of PLC injuries but none of these techniques has been standardized [9].

Aim of the work

The aim of this study was to systematically review the literature on PLC injuries to determine the optimal surgical technique with regard to objective outcome measures and patient reported subjective outcome scores based on the following supposed questions:

1. Early versus late surgery of damaged structures.
2. Repair versus reconstruction of injuries of ligamentous structure.