

Retention versus Sacrifice of the Posterior Cruciate Ligament in Total Knee Replacement

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(وَأَنْزَلَ اللَّهُ عَلَيْكَ الْكِتَابَ وَالْحِكْمَةَ)

وَعَلَّمَكَ مَا لَمْ تَكُن تَعْلَمُ وَكَانَ فَضْلُ اللَّهِ عَلَيْكَ عَظِيمًا)

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List of Abbreviations

6MW: Six-Minute Walk Test.

ACL: Anterior Cruciate Ligament.

AL bundle: Anterolateral bundle.

AP: Antero Posterior.

AS: Ankylosing Spondylitis.

CCK: Constrained condylar knee.

Cm: Centimeter.

CPM: Continuous Passive Motion.

CR: Cruciate Retaining.

CS: Cruciate Sacrificing.

E: Extension.

F: Female.

F: Flexion.

IB II: Insall- Burstein II.

IPJ: Inter Phalangeal Joint.

ICLH: Imperial College London Hospital.

JL: Original joint line.

JL': increase height of new prosthetic joint.

KOS-ADLS: Knee Outcome Survey–Activities of Daily Living Scale.

LCL: Lateral Collateral Ligament.

List of Abbreviations

LCS: Low contact stress.

Lt: Left.

LTC: Lateral Tibial Condyle.

M: Male.

MCL: Medial Collateral Ligament.

MCPJ: Meta Carpo Phalangeal Joint.

MFC: Medial Femoral Condyle.

Mm: Millimeter.

No: Number.

NSAIDs: Non Steroidal Anti-Inflammatory Drugs.

OA: Osteoarthritis.

P: Distance between upper surface of new prosthetic design & lower pole of patella.

PCL: Posterior Cruciate Ligament.

PF: Patello-Femoral.

PM: Posteromedial bundle.

PMFL: Posterior Menisconfemoral Ligament.

Post: posterior.

PS: Posterior Stabilized.

RA: Rheumatoid arthritis.

ROM: Range of motion.

Rt: Right.

List of Abbreviations

SD: Standard Deviation.

SPSS: Statistical Package for the Social Science.

TCPIII: Total Condylar III Prosthesis.

TKA: Total Knee Arthroplasty.

TKSS: Total Knee Society Score.

TUG: Timed Up and Go Test.

UKA: Uni Compartmental Knee Arthroplasty

Introduction

Total knee arthroplasty (TKA) is one of the greatest advances in orthopaedic surgery during the past 30 years. In patients with severe arthritis of the knee, it significantly reduces pain, corrects deformity and improves function and quality of life. In the early 1980 significant debate existed over the best type of prosthetic design for (TKA). With fixed bearing knee designs the controversy was over optimal management of the posterior cruciate ligament (PCL).⁽¹⁾

The role of the posterior cruciate ligament (PCL) in total knee replacement (TKR) is controversial. It has been suggested that it can produce femoral rollback, which increases the range of flexion and prevents posterior translation. This, in theory, reduces loosening and excessive polyethylene wear by decreasing the shear stresses at the fixation surfaces.⁽²⁾

There are four options available to the surgeon. The first is to retain the ligament and to preserve as much possible of the normal anatomy and function of the knee. Preservation of the ligament is thought to enhance stability and allowing femoral rollback to improve knee flexion. This increases the mechanical advantage of the quadriceps muscle and prevents unpredictable cyclical loading patterns which may be transferred to the cement implant and cement bone interfaces.⁽³⁾

Some authors also believe that the ligament retains its proprioceptive properties and should therefore be retained, although this has not been confirmed biomechanically. There is also evidence that the PCL is degenerative in most arthritic knees.⁽³⁾

The second option is to excise the ligament in order to facilitate the correction of any fixed deformities. This allows more accurate and reliable soft tissue balancing resulting in improved fixation of the components and offers the surgeon greater freedom to resect more of the proximal tibia if required. ⁽⁴⁾

The third option is to substitute the ligament with a posterior stabilized tibial insert. These inserts have a central post which can engage on a femoral cam during flexion, mimic femoral rollback and reproduce near normal kinematic profiles. The central post may also allow some stability in the anteroposterior plane and act as a secondary stabilizer to a varus or valgus stress. ⁽⁴⁾

The fourth option is to release the ligament. Some authors believe that this offers a compromise between preservation and excision. Release of a tight ligament may theoretically reduce excessive forces on the patellofemoral joint and postoperative pain, as well as improving knee flexion. ⁽⁵⁾

The factors influencing the choice for sacrificing or retaining are the degenerative status of the PCL, the type of implant used or just the personal preference of the surgeon. Lombardi proposes a decision tree based up on the patient's history, the clinical examination and the intra-operative findings. ⁽²⁾

Aim of the work

To highlight the role of PCL in Total Knee Replacement (essential, beneficial or hinderance????)

ANATOMY OF POSTERIOR CRUCIATE LIGAMENT

The PCL is originated on the posterolateral aspect of medial femoral condyle where its attachment in the form of a segment of a circle. ⁽⁶⁾ Tibial attachment is on the back of the tibial plateau, and is not intra-articular; it is approximately about 1 cm distal to the joint line. ⁽⁷⁾ PCL is named because it's posterior insertion on the tibia ⁽⁸⁾ (fig 1&2).

This ligament has a more posterior attachment to the tibia and a more medial attachment to the femur than the anterior cruciate ligament (ACL); hence the name posteromedial ligament is more suitable. ⁽⁹⁾

The PCL average 38 mm in length and 13 mm in width, whereas the ACL average 38 mm in length and 11 mm in width. So the PCL has been considered the strongest knee ligament. ⁽¹⁰⁾

Other studies indicate that the ACL and PCL are approximately equal in strength. ⁽¹¹⁾

The synovial tissue which is reflected from the posterior capsule covers the ligaments on the medial, lateral and posterior portion of the PCL blend with the posterior capsule and periosteum. Anatomically speaking, the PCL is intra capsular extra synovial. ⁽¹²⁾

The PCL unlike the ACL does not have significant synergistic muscles and ligaments to help counter a posterior drawer force. ⁽¹⁰⁾