Why do we remove PCL in TKR?

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Disclosures: Nothing to declare

ISAKOS approved teaching center
ESSKA approved teaching center

David vs Goliath!
Frederik Almqvist vs Hélder Pereira

Leave PCL alone!
I always remove it!

Personal experience...

And... at least in my hands...
In my regular patient’s profile

It’s easier... “learning curve”

PCL status in severe osteoarthritic patients:
Degenerative status
Shorter
Stiffer
Function?...

Authors suggest intraoperative balance with reduced patella
Reliable soft-tissue balance even in great deformities

The Influence of Preoperative Deformity on Intraoperative Soft Tissue Balance in Posterior-Stabilized Total Knee Arthroplasty

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Abstract: Using a tensor for total knee arthroplasty (TKA) enabling total soft tissue balance (TTSB) after arthroplasty surgery while allowing gradual deformity correction. The purpose of this study was the influence of preoperative deformity on intraoperative soft tissue balance during posterior-stabilized TKA in 12 patients having severe deformities. The authors evaluated the relationship between deformity and TTSB at the time of surgery. The results showed that the deformity significantly influenced the range of motion. The authors concluded that TTSB can be obtained if the deformity can be corrected while allowing gradual deformity correction.

PS TKA – Better range of motion

Resected PCL display a greater postoperative range of motion


unable to show a difference in clinical outcome between both types of knees


Increases posterior femoral rollback

PS TKA, the cam engages the post, pushing both condyles posteriorly with flexion, achieving greater PFR but reducing axial rotation in deep flexion ranges.

CR design is aided by the PCL attached to the medial condyle, allowing the lateral condyle to rotate with respect to the medial condyle, which is further enabled by the asymmetry of the condylar designs in this TKA. Because traditional knee scoring systems do not include activities that require tibiofemoral rotation in deep flexion when measuring clinical outcomes, they may overlook and consequently fail to report this phenomenon.


Midterm comparison of posterior cruciate-retaining versus substituting total knee arthroplasty using the Genesis II prosthesis

A multicenter prospective randomized clinical trial

Kerger Harato *,**, Robert B. Brems ***, Jan Vicier ***, Mark Snyder ***, John Hutt *, Michael D. Rice **

Abstract: The primary objective of this multicenter, randomized, controlled trial was to compare the clinical outcomes of posterior cruciate-retaining (CR) and posterior cruciate-substituting (PS) total knee arthroplasty (TKA) in patients with severe deformities. The study was conducted at 12 centers across the United States and Canada. The primary outcome measures were Knee Society Score and Range of Motion at 2 years, with a minimum follow-up of 1 year. The results showed that the PS group had a significantly greater range of motion and knee stability compared to the CR group.

Midterm comparison of posterior cruciate-retaining versus substituting total knee arthroplasty using the Genesis II prosthesis

The Knee 15 (2008) 217 – 221

The Journal of Arthroplasty Vol. 15 No. 2 2000

Functional Comparison of Posterior Cruciate-Retaining Versus Posterior Stabilized Total Knee Arthroplasty

Niggl M, Suckfuell, MD, W. P. Whiteley, MD, M. T. Strong, MD, R. Greis, MD, B. S. W. K. R. Steffen, MD, and.-

Abstract: A prospective, randomized comparison of posterior cruciate-retaining (CR) and posterior stabilized (PS) total knee arthroplasty (TKA) was conducted in 29 patients who underwent bilateral TKAs for varus deformities. All procedures were performed by a single surgeon. One knee was implanted with a CR TKA, and the contralateral knee with a PS TKA. Both prosthetic designs were of the same TKM series, with comparable surface geometries. Patients had a clinical and radiographic evaluation at 1 year and a follow-up of 2 years. The results showed that the PS group had a significantly greater range of motion and knee stability compared to the CR group.
Higher congruence – lower wear
Improved designs

Tibial post vs femoral cam contact

"Results from using the new implant were good, probably because of changes in design of the intercondylar box and its associated cam-and-post mechanism, and a more anatomic trochlea surface, so that the trochlea accommodates the natural patella."

Early results of posterior-stabilized NexGen Legacy total knee arthroplasty


PCL removal induces joint line elevation?
It has been theorized that removal of the PCL would result in increased joint line elevation because of the loss of posterior support between the femur and tibia.

"... no statistically significant differences in the joint line elevation between posterior-stabilized and posterior cruciate-retaining designs within the same implant system as measured on lateral radiographs."

M. Snider and S. MacDonald
The influence of the posterior cruciate ligament and component design on joint line position after primary total knee arthroplasty.
The Journal of Arthroplasty Vol. 24 No. 7 2009

Cope MR, O'Brien BS, Nanu AM.
The influence of the posterior cruciate ligament in the maintenance of joint line in primary total knee arthroplasty: a radiologic study.

Joint line preservation?
Femoral condylar offset?

No differences were noted between the cruciate-retaining and the posterior stabilized knees with respect to isokinetic muscle testing parameters (peak torque, endurance, angle of peak torque, and torque acceleration energy) for both quadriceps and hamstrings.

No significant differences were found between the cruciate-retaining and the posterior stabilized knees with regard to joint parameters, knee range of motion, and electromyographic waveforms during level walking and stair climbing. Cruciate-retaining and posterior-stabilized total knee prostheses perform equally well during level gait and stair climbing.

A Comparison of Isokinetic Strength Testing and Gait Analysis in Patients With Posterior Cruciate-Retaining and Substituting Knee Arthroplasties
Alberto A. Bolanos, MD,* Werner A. Colliza, MD,* Peter T. McCarron, MD,* Robert S. Goffin, DO,† Mary E. Wantiez, BS,† Barbara A. Kahn, RN, ONC,* and John W. Rowlst, MD*.

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The Journal of Arthroplasty Vol. 13 No. 6 1998

Abstract: Preeventation was examined in two groups of patients following successful total knee arthroplasty (TKA). In one group, the posterior cruciate ligament was retained and an uninstrumented cruciate-retaining total knee component was used; in the other group, the posterior cruciate ligament was excised and a cruciate-substituting design was implanted. Threshold to detection of passive motion was quantified as a measure of preeventation. The degree of preeventation arthritis was objectively classified according to Mankin and Shirazi. Where no stress difference in threshold to detection of passive motion in cruciate-retaining versus cruciate-substituting TKA in patients with a positive grade of arthritis before surgery, the postoperative scores were virtually identical. When the grade of preoperative arthritis was severe, patients with cruciate-retaining TKA performed significantly better than those with cruciate-substituting TKA, especially at 2 years. No knee arthroplasty, posterior cruciate ligament, threshold to detection of passive motion.

The Journal of Arthroplasty Vol. 11 No. 7 1996

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Does CR provide better kinematics?

Both implant designs showed excellent clinical and fluoroscopic results. In contrast to previous studies, PFR reliably occurs in this CR implant—using asymmetrical femoral condyles—as well as in the PS implant.

Each design type has its merits and its proponents, both the CR and PS implants used in this study demonstrated excellent clinical results and reliable kinematic patterns, successfully achieving their design goals.

Cates et al
In Vivo Comparison of Knee Kinematics for Subjects Having Either a Posterior Stabilized or Cruciate Retaining Total Knee Arthroplasty
The Journal of Arthroplasty Vol. 23 No. 7 2008

Improvement in PS TKA

- risk of dislocation
- Tibial Post wear

PS TKA might suffer dislocation not spontaneously reducible
Dislocation safety factor (eg Gemini SL Link)
Kocmond et al J Arthroplasty 1995

Improved materials and designs lower post-wear
Avoid anterior post-cam impingement
Avoid flexion femoral component
don’t reverse tibial slope
Furman et al CORR 2008

Five reasons to remove PCL in TKA

1. Easier technique
   - Balancing is not complicated by managing "bad" PCLs
2. Minimal tibial resection is possible
   - Not restricted
   - Stronger host bone in minimal resection
3. Allows good Kinematics
   - Femoral rollback
4. Conforming designs lower Poly wear
   - Since TKA has longer survival wear is major issue
5. Easier to correct severe deformities

Let’s hear Goliath!!!

Thank you
Merci
Obrigado