Why do we remove PCL in TKA?

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Disclosures: Nothing to declare

MINHO UNIVERSITY
3B's Research Group

ISAKOS approved teaching center

ESSKA approved teaching center

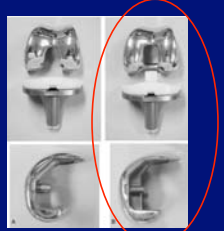
David *vs* Goliath!

Frederik Almqvist *vs* Hélder Pereira

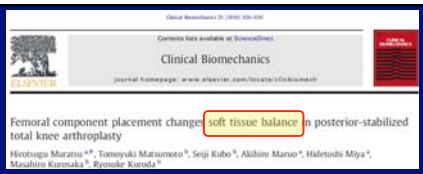
Personal experience…

And… at least in my hands…

In my regular patient's profile

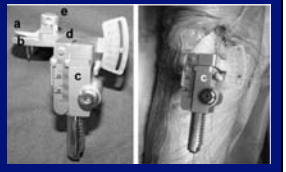


It's easier…
"learning curve"



PCL status in severe osteoathritic patients:

Degenerative status
Shorter
Stiffer
Function?...



Authors suggest intraoperative balance with reduced patella

Reliable soft-tissue balance even in great deformities

The Journal of Arthroplasty Vol. 26 No. 8 2011

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

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Seiji Kubo, MD,* Takehiko Matsushita, MD,*
Masahiro Kurosaka, MD,* and Ryosuke Kuroda, MD*

Abstract: Using a tensor for total knee arthroplasty (TKA) enabling soft tissue balance measurements with a reduced patellofemoral joint and femoral component in place, we examined the influence of preoperative deformity on intraoperative soft tissue balance during posterior-stabilized TKA at 0°, 10°, 45°, 90°, and 135° of flexion in 60 varus-type osteoarthritic patients. Despite more than 20° of preoperative varus deformity influencing intraoperative ligament balance in varus, joint gap showed no significant difference regardless of the amount of preoperative varus deformity. Accordingly, even in preoperative severe varus deformed knees, gap balancing can be adjusted during PS TKA. **Keywords:** total knee arthroplasty, preoperative deformity, soft tissue balance, kinematics, patellofemoral joint, posterior stabilized.

PS TKA – Better range of motion

resected PCL display a greater postoperative range of motion

Maruyama S, Yoshiya S, Matsui N, et al. Functional comparison of posterior cruciate-retaining versus posterior stabilized total knee arthroplasty. J Arthroplasty 2004; 19:349.

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

Udomkiat P, Meng BJ, Dorr LD, et al. Functional comparison of posterior cruciate retention and substitution knee replacement. Clin Orthop Relat Res 2000; 378:192.

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 outcome, they may overlook and consequently fail to report this phenomenon.

Bertin KC, Komistek RD, Dennis DA, et al.
In vivo determination of posterior femoral rollback for subjects having a Nexgen posterior cruciate-retaining total knee arthroplasty.
J Arthroplasty 2002;17:1040.

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

The Journal of Arthroplasty Vol. 00 No. 0 2011

High-flex Posterior Cruciate-Retaining vs Posterior Cruciate-Substituting Designs in Simultaneous Bilateral Total Knee Arthroplasty

A Prospective, Randomized Study

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Young-Jin Ju, MD, PhD, Toshiyuki Morito, MD PhD,
Junya Yamazaki, MD, PhD, and Ichiro Sekiya, MD, PhD

Abstract: The superiority between the posterior cruciate-retaining and the posterior cruciate-substituting designs still remains controversial. We performed a prospective, randomized control study for evaluation of the superiority of these designs. This study investigated 58 knees in 29 patients with simultaneous bilateral total knee arthroplasty, in which the high-flex CR design was randomly implanted in one knee and the high-flex PS design was implanted in the other knee. The follow-up duration averaged 5.0 years, with a minimum duration of 3 years. Postoperatively, Knee Score and pain points in Knee Score resulted in no significant differences between the 2 designs. However, postoperative arc of range of motion, patient satisfaction, and posterior knee pain at passive flexion in the PS design were significantly superior to that of the CR design. **Keywords:** total knee arthroplasty, posterior cruciate-substituting design, posterior cruciate-retaining design, simultaneous bilateral surgery.

Midterm comparison of posterior cruciate-retaining versus -substituting total knee arthroplasty using the Genesis II prosthesis
A multicenter prospective randomized clinical trial

Kengo Harato [a,b,*], Robert B. Bourne [a,*], Jan Victor [c], Mark Snyder [d], John Hart [e], Michael D. Ries [f]

Abstract

The purpose of the current study was to compare midterm outcomes of posterior cruciate-retaining (CR) versus posterior cruciate-substituting (PS) procedures using the Genesis II total knee arthroplasty (TKA) system (Smith and Nephew, Memphis, TN). Ninety-nine (99) CR and 93 PS TKA's were analyzed in this prospective, randomized clinical trial. Surgeries were performed at seven medical centers by participating surgeons. Clinical outcomes (Knee Society Score, Range of Motion, WOMAC, SF-12, and Radiographic Findings), in addition to postoperative complications, were evaluated with a minimum follow-up of 5 years. Following data analysis, there were no significant differences in patient demographics or preoperative clinical measures between the two groups. At the latest follow-up interval, no significant differences were found between the CR and PS groups with regards to functional assessment, patient satisfaction, or postoperative complication. However, the PS group did display statistically significant improvements in range of motion when compared with the CR group. The results of this investigation would suggest that, while comparable in regards to supporting good clinical outcomes, the PS Genesis II design does appear to support significantly improved postoperative range of motion when compared with the CR design.

The Knee 15 (2008) 217–221

The Journal of Arthroplasty Vol. 19 No. 3 2004

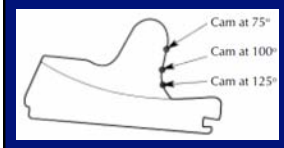
Functional Comparison of Posterior Cruciate-Retaining Versus Posterior Stabilized Total Knee Arthroplasty

Shigeki Maruyama, MD, Shinichi Yoshiya, MD, Nobuzo Matsui, MD,
Ryosuke Kuroda, MD, and Masahiro Kurosaka, MD

Abstract: A prospective, randomized comparison of posterior cruciate-retaining (PCR) and posterior stabilized (PS) total knee arthroplasties (TKAs) was conducted in 20 patients who underwent bilateral TKAs for osteoarthritis. All procedures were performed by a single surgeon. One knee was implanted with a PCR TKA, and a contralateral knee with a PS TKA. Both prosthetic designs were of the same TKA series, with comparable surface geometries. Patients had a clinical and radiographic evaluation at a mean of 31.7 months for PCR TKAs and 30.6 months for PS TKAs postoperatively. There were no significant differences between the PCR and PS TKAs in postoperative knee scores. However, postoperative improvement in range of motion was significantly superior in the PS group. **Key words:** total knee arthroplasty, posterior cruciate-retaining, posterior stabilized, knee score, range of motion.

- 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-stabilised NexGen Legacy total knee arthroplasty

Journal of Orthopaedic Surgery 2003; 11(1): 38–42

Proprioception Following Total Knee Arthroplasty With and Without the Posterior Cruciate Ligament

Scott Simmons, MD,* Scott Lephart, PhD,† Harry Rubash, MD,‡ Paul Borsa, MS,† and Robert L. Barrack, MD*

Abstract: Proprioception was measured in two groups of patients following successful total knee arthroplasty (TKA). In one group, the posterior cruciate ligament was retained and an unconstrained 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 proprioception. The degree of preoperative arthritis was objectively classified according to Resnick and Niwoyama. There was no difference in threshold to detection of passive motion in cruciate-retaining versus cruciate-substituting TKA. In patients with a moderate grade of arthritis before surgery, the postoperative scores were virtually identical. When the grade of preoperative arthritis was severe, patients with cruciate-substituting TKAs performed significantly better than those with cruciate-retaining TKAs. **Key words:** proprioception, total knee arthroplasty, posterior cruciate ligament, threshold to detection of passive motion.

The Journal of Arthroplasty Vol. 11 No. 7 1996

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.
J Arthoplasty 2**002**;17:206.

Joint line preservation? Femoral condylar offset?

joint line and posterior femoral condylar offset can be restored in the majority of computer-assisted, cruciate-substituting TKAs to within 5 mm of their preoperative value.

The Journal of Arthroplasty Vol. 13 No. 8 1998

A Comparison of Isokinetic Strength Testing and Gait Analysis in Patients With Posterior Cruciate–Retaining and Substituting Knee Arthroplasties

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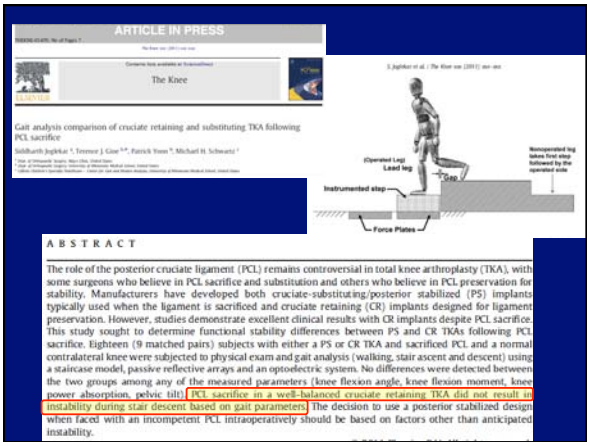
No differences were noted between the cruciate-retaining and the posterior stabilized knees with respect to isokinetic muscle testing parameters (peak torque, endurance, angle of peak torque, and torque acceleration energy) for bothquadriceps and hamstrings.

No significant differences were found between the cruciate-retaining and the posterior-stabilized knees with regard to gait 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.



ABSTRACT

The role of the posterior cruciate ligament (PCL) remains controversial in total knee arthroplasty (TKA), with some surgeons who believe in PCL sacrifice and substitution and others who believe in PCL preservation for stability. Manufacturers have developed both cruciate-substituting/posterior stabilized (PS) implants typically used when the ligament is sacrificed and cruciate retaining (CR) implants designed for ligament preservation. However, studies demonstrate excellent clinical results with CR implants despite PCL sacrifice. This study sought to determine functional stability differences between PS and CR TKAs following PCL sacrifice. Eighteen (9 matched pairs) subjects with either a PS or CR TKA and sacrificed PCL and a normal contralateral knee were subjected to physical exam and gait analysis (walking, stair ascent and descent) using a staircase model, passive reflective arrays and an optoelectric system. No differences were detected between the two groups among any of the measured parameters (knee flexion angle, knee flexion moment, knee power absorption, pelvic tilt). PCL sacrifice in a well-balanced cruciate retaining TKA did not result in instability during stair descent based on gait parameters. The decision to use a posterior stabilized design when faced with an incompetent PCL intraoperatively should be based on factors other than anticipated instability.

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 High-Flexion 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 ressection is possible
   - Not restricted
   - Stronger host bone in minimal ressection
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