

## Total knee reconstruction without posterior stabilization in rheumatoid arthritis patients

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### Abstract

**Objectives:** to present the results with posterior cruciate ligament-retaining total knee arthroplasty in rheumatoid arthritis (RA) patients. **Background:** Total knee replacement in RA patients has many particularities. One of them is the difficulty of obtaining a proper ligamentous balance. **Methods:** 24 RA patients were followed for a 5-year period after posterior cruciate ligament-retaining total knee arthroplasty. Clinical assessments analyzed general health status by using Hospital for Special Surgery Knee Evaluation Form (HSSKEF) and mediolateral and anteroposterior ligament stability by using varus-valgus and posterior drawer tests. Radiological assessments evaluated axial alignment, size and position of components, radiolucent lines in anteroposterior and lateral standard views, integrity of the posterior cruciate ligament on lateral view X-ray at 45 degrees of flexion. **Results:** the mean HSSKEF score increased from 32 to 84 points at the end of follow-up. Preoperative mean range of motion was 60 degrees; postoperative mean range of motion was of 105 degrees, with significant statistical difference ( $p < 0.05$ ). The mean femoral component axial deviation was 6 degrees. The tibial component had a mean axial deviation of 1 degree of varus. There were no radiolucency lines of more than 1mm. 21 patients had excellent results. None of the knees was unstable. **Conclusion:** posterior cruciate ligament-retaining total knee arthroplasty can be used in RA patients without excessive valgus deformity (over 15 degrees), providing thus sufficient stabilization. The outcomes are similar to those patients who followed a posterior stabilized endoprosthesis.

**Keywords:** rheumatoid arthritis, posterior cruciate ligament, total knee replacement, rehabilitation.

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## Rezumat

**Obiective:** prezentarea rezultatelor artroplastiei totale de genunchi cu conservarea ligamentului încrucișat posterior în poliartrita reumatoidă. **Premize:** artroplastia totală de genunchi are multe particularități la pacientul cu poliartrită reumatoidă. Una dintre acestea este dificultatea obținerii unui echilibru ligamentar eficient. **Metodă:** 24 de pacienți cu poliartrită reumatoidă au fost urmăriti la 5 ani după artroplastia totală de genunchi cu conservarea ligamentului încrucișat posterior. Evaluarea clinică s-a realizat prin analiza stării generale de sănătate prin utilizarea chestionarului Hospital for Special Surgery Knee Evaluation Form (HSSKEF) și a stabilității ligamentare medio-laterale și antero-posterioare prin folosirea testului sertarului posterior și a celui pentru varus-valgus. Evaluarea radiologică a urmărit aliniamentul axial, mărimea și poziția componentelor, radiotransparența în incidențele standard antero-posterioară și laterală, integritatea ligamentului încrucișat posterior în incidență laterală, la 45° flexie. **Rezultate:** scorul HSSKEF mediu a crescut de la 32 la 84 de puncte la sfârșitul perioadei monitorizate. Mobilitatea preoperatorie medie a fost de 60°; mobilitatea postoperatorie medie a fost de 105°, cu o diferență statistic semnificativă ( $p < 0.05$ ). Media deviației componente axiale femurale a fost de 6°. Media deviației componente axiale tibiale a fost de 1° în varus. Nu s-au găsit linii de radiotransparență mai mari de 1 mm. 21 de pacienți au prezentat rezultate excelente. Niciunul din genunchii operați nu a fost instabil. **Concluzie:** Artroplastia totală de genunchi cu conservarea ligamentului încrucișat posterior poate fi folosită în cazul pacienților cu poliartrită reumatoidă fără o deformitate exagerată în valgus (peste 15°), rezultând astfel o stabilizare suficientă. Rezultatele au fost similare celor obținute la pacienții care au beneficiat de endoproteză stabilizată posterior.

**Cuvinte-cheie:** poliartrită reumatoidă, ligament încrucișat posterior, artroplatie totală de genunchi, reabilitare.

## Introduction

Knee reconstruction is available and applicable to patients with degenerative osteoarthritis and joint disease due to rheumatoid arthritis (RA) [1, 2]. In the literature review we found the majority of outcomes for this procedure to be excellent. Nevertheless, there are considerations regarding bone stock and quality, ligamentous balance and higher infection rate, which show there is room for improvement [3-5].

Ligamentous balance and prosthesis stability rely on the implant design and on the ligamentous status [6-9]. That is why the use of posterior stabilized or no posterior stabilized prostheses can be subject for controversy even though recent studies show similar results for the two types of endoprostheses regarding freedom of movement, aseptic loosening, polyethylene residue, infection and stability.

However, older studies show secondary posterior instability after a few years [10-16].

## Methods

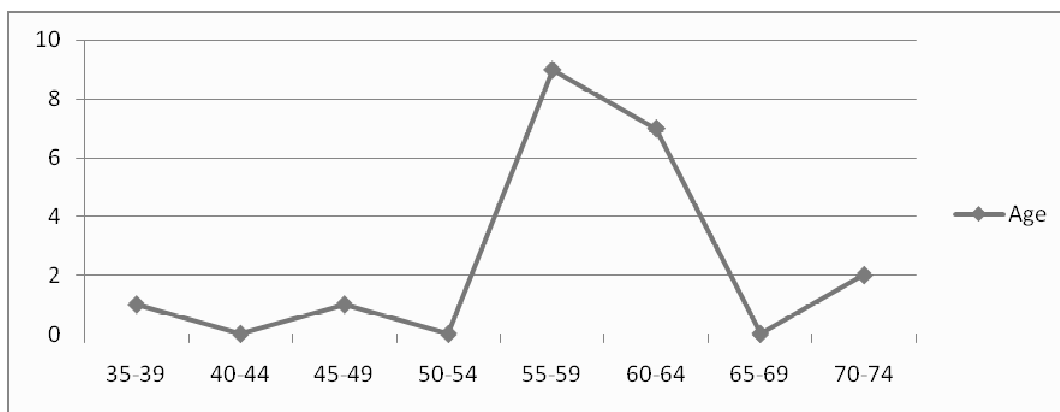
From January 1999 to December 2004 we made 24 total knee replacements (TKR) in patients with RA. 19 of the patients were females. Patients were between 35 and 74 years old (Fig. 1). Mean age at time of surgery was 59.

ACG – Biomet endoprosthesis without posterior stabilization (posterior cruciate ligament-retaining total knee arthroplasty) was used. Patellar resurfacing was performed in only 11 cases. Standard approach with medial parapatellar capsulotomy was applied. To preserve the posterior cruciate ligament (PCL) insertion when we did the tibial osteotomy, we kept a small bone prominence.

The tibial cut was done free hand or using extramedullary guide with 10 degrees of posterior slope. Femoral cut was done in 5-7 degrees of valgus.

Postoperatively the patients were mobilized 24-48 hours after removing the drain. All patients received antibiotics for 48 hours and low molecular weight heparin for 21 days postoperatively. A special rehabilitation program was applied. At first, a daily complex programme was carried out for 21 days for

the in-patients (Fig. 2-5). Later on, the out-patients attended the same programme 3 times per week for a 6 week period in a medical rehabilitation unit (Fig. 6-7). They also attended a home adapted kinetotherapy once a week. The activities of daily living were performed daily [17, 18]. Swimming and cycling were the main sports training. Walking devices were used postoperatively and at home in special cases.



**Figure 1.** Age distribution of rheumatoid arthritis patients who needed a total knee replacement



**Figures 2 and 3.**  
Early inpatient rehabilitation  
(autopassive knee mobilization;  
assisted device walking)

**Figures 4 and 5.**

Early inpatient rehabilitation (electric stimulation of the affected limb quadriceps muscle; walking by using crutches and short term protective external prosthesis)



**Figures 6 and 7.**

Outpatient rehabilitation programme (improving range of motion of the operated knee)



Clinical and radiological assessment was done using Hospital for Special Surgery Knee Evaluation Form (HSSKEF) at 6 weeks, 6 months and then annually up to 5 years. Ligamentous stability mediolateral and anteroposterior was tested using clinical assessment (varus-valgus test, posterior drawer).

Radiological assessment was done annually using 2 standard views: anteroposterior and lateral. We analyzed axial alignment, size and position of components, radiolucent lines (osteolysis). To determine the integrity of the PCL we also used radiological assessment. The tibiofemoral contact point is defined as the point of contact between the femoral and the polyethylene tibial component on

lateral view X-ray at 45 degrees of flexion (Fig. 11). The distance between the posterior tibial margin and the tibiofemoral contact point was evaluated as a percentage from the anteroposterior tibial component. The result is compared to the first postoperative X-ray.

At the beginning of the study, all subjects read and signed an informed consent form.

## Results

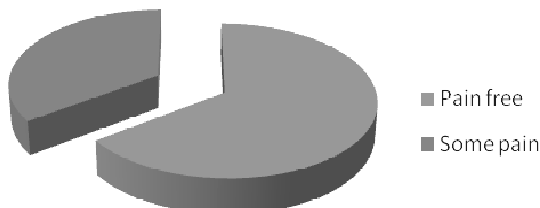
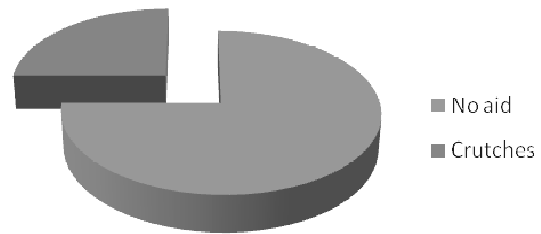
5 patients were excluded from the study after 2 years of follow-up. The mean HSSKEF score increased from 32 to 84 points at the end of follow-up (Table 1).

**Table I.** HSSKEF scores and mean tibiofemoral contact point during the assessments

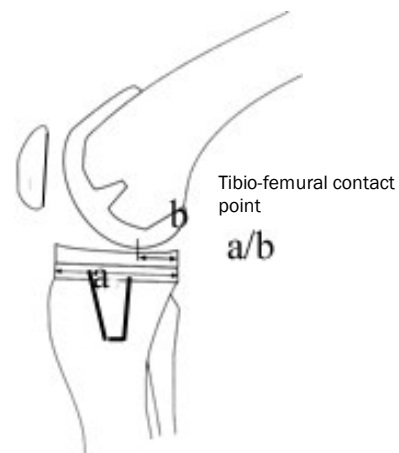
Evaluation	6 weeks	6 months	1 year	2 years	3 years	4 years	5 years
HSSKEF score	32	74	75	79	80	83	84
Mean tibio-femoral contact point	44	42	44	43	45	46	44

One sample t-test shows statistical significant improvement. The two-tailed P value equals 0.0071. The hypothetical mean is 100.00. The actual mean is 72.43. The difference between these two values is -27.57. The 95% confidence interval of this difference was of -44.41 up to -10.73.

60% of patients had excellent results, 35% had good and 5% poor results (Fig. 8). 65% of patients are pain free and 35% have some pain at walking (Fig. 9). 75% of patients walk without aid and 25% walk by using crutches (Fig. 10).


**Figure 8.** Patients' general health status at final assessment

**Figure 9.** Pain at final assessment

**Figure 10.** Walking at final assessment

At clinical examination two patients presented instability (4mm of varus, 10mm posterior drawer). The mean preoperative range of motion was 100 degrees (standard deviation 14.45). The mean postoperative range of motion was 105 (standard deviation 14.45). There is no significant statistical difference. The two-tailed P value equals 0.2367. 95% confidence interval of this difference was of -13.39 up to 3.39.


**Figure 11.** a/b = Femurotibial and contact point of ACG - Biomet endoprosthesis

We had 2 revisions for patellar loosening.

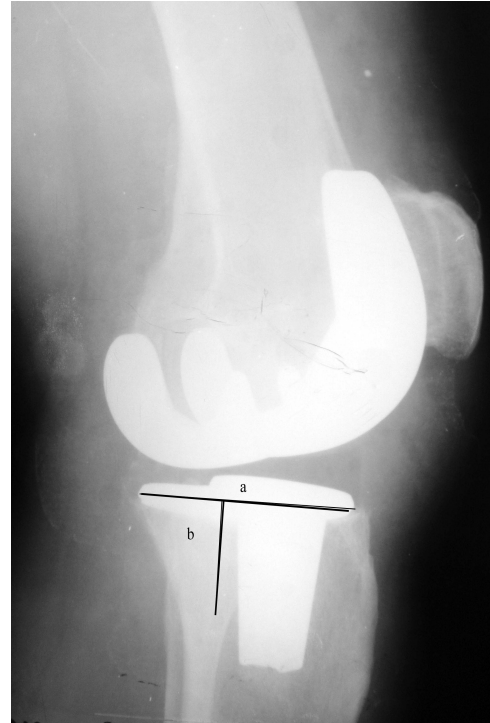
We evaluated axial deviation. The mean femoral component axial deviation was 6 degrees (ranging between 3 and 8 degrees). The tibial component had a mean axial deviation of 1 degree of varus (3 varus-1 valgus). Regarding the posterior slope the mean value was 7 degrees (ranging between 2 and 12 degrees). We had no radiolucency lines of more than 1mm in any case. The mean tibiofemoral

contact point was 44 (ranging between 25 and 59) (Table 1) at postoperative X-rays (Fig. 14, 15).

One sample t-test shows no statistical significant changes. The two-tailed P value equals 1.0000. The hypothetical mean is 44.00. The actual mean is 44.00. The difference between these two values is 0.00. The 95% confidence interval of this difference was of -1.19 up to 1.19.



**Figures 12 and 13.** X-ray (Knee: anteroposterior and lateral incidence): preoperative views



**Figures 14 and 15.** X-ray (Knee: anteroposterior and lateral incidence): postoperative views

## Discussion

Many articles show a good stability in knees with posterior cruciate ligament-retaining total knee arthroplasty. Nevertheless, there is concern regarding the risk of instability with time. Even though the follow-up is limited (5 years), the percentage of good results is very high and comparable with posterior stabilized prosthesis.

In our patients the most common cause of failure is the patellar component which required revision in two cases. Probably one cause for this can be femoral-patellar misalignment due to epiphysis deformation from RA. This misalignment leads to malfunctioning extensor mechanism traction which includes the patella and increases the pressure on the patellar component and thus to its loosening [19-21].

The radiographic study demonstrates a tibiofemoral contact point displaced previously in 18% of the

cases, confirmed by the clinical examination which finds anteroposterior drawer. We had no cases of instability increase at the end of follow-up. The articles published on this subject have variable results concerning secondary instability from 0 to 50%. Probably this is due to implant design, surgical technique and bone defects [22, 23].

## Conclusion

Posterior cruciate ligament-retaining total knee arthroplasty can be used in RA patients without excessive valgus deformity (over 15 degrees) providing thus sufficient stabilization. The outcomes are similar to those patients who followed a posterior stabilized endoprosthesis with reduced risk of developing secondary anteroposterior instability.

This study adds new information on the approach of the RA patients with severely disabling knee involvement who needs an endoprosthesis. The posterior cruciate ligament-retaining total knee arthroplasty is one important option in RA patients taking into account the risk of developing future knee instability.

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