Patellar Resurfacing in Primary Total Knee Replacement: A Comparative Study at Two Years of Follow-up

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ABSTRACT

Objective: To compare the functional outcomes of total knee replacement (TKR) with and without patellar resurfacing at two years of follow-up. **Materials and Methods:** We carried out a retrospective observational study of patients with osteoarthritis who had undergone TKR with or without patellar resurfacing between January 2014 and December 2016 in two hospitals in Colombia. All patients received a cemented Exatech Optetrak prosthesis. Function was evaluated before surgery and after two years of follow-up with the Knee Society Score (KSS), Hospital for Special Surgery (HSS) and Oxford Knee Score (OKS). **Results:** a total of 206 TKRs were included, 94 in the group with resurfacing and 112 in the group without resurfacing. The mean age was 66.9 ± 9.7 years and 76.7% (n = 155) were female. Surgical time was longer in the group with resurfacing with a median of 100 minutes (Interquartile range-IQR: 90-110) compared to 85 minutes in the group without resurfacing (IQR: 70-90), p <0.001). Although functional improvement was observed before and after TKR in both groups, the change in clinical KSS, functional KSS, and OKS scores before and after TKR was better in the resurfacing group (p <0.05). **Conclusion:** Patellar resurfacing during TKR was associated with better functional outcomes at two years of follow-up. However, patients without resurfacing also reported functional improvement after TKR.

Keywords: Patellar resurfacing; osteoarthritis; total knee replacement; function.
Level of Evidence: III

Resuperficialización de rótula en reemplazo primario total de rodilla: Estudio comparativo a dos años de seguimiento.

RESUMEN

Objetivo: Comparar los resultados funcionales del reemplazo total de rodilla con resuperficialización de rótula o sin resuperficialización, a los dos años de seguimiento. **Materiales y Métodos:** Estudio observacional retrospectivo de grupos comparativos de pacientes con osteoartritis sometidos a un reemplazo total de rodilla primario con resuperficialización de rótula o sin este procedimiento, entre enero de 2014 y diciembre de 2016, en dos centros de Colombia. A todos se les colocó una prótesis cementada Optetrak®. La función se evaluó antes de la cirugía y a los dos años mediante las escalas *Knee Society Score* (KSS), *Hospital for Special Surgery* (HSS) y *Oxford Knee Score* (OKS). **Resultados:** Se incluyeron 206 reemplazos totales de rodilla: 94 (grupo con resuperficialización) y 112 (grupo sin resuperficialización). La media de la edad en la cohorte de estudio era de 66.9 ± 9.7 años y el 76,7% (n = 155) eran mujeres. El tiempo quirúrgico fue más prolongado en el grupo con resuperficialización (mediana 100 min, RIC 90-110) que en el otro grupo (mediana 85 min, RIC 70-90; p <0,001). Aunque se observó una mejoría funcional antes del reemplazo total de rodilla y después, en ambos grupos, el cambio en el KSS clínico, el KSS funcional y el OKS fue mejor en el grupo con resuperficialización (p <0,05). **Conclusiones:** La resuperficialización de rótula durante el reemplazo total de rodilla se asoció a mejores resultados funcionales a los dos años. No obstante, los pacientes sin resuperficialización también refirieron una mejoría funcional después del reemplazo total de rodilla.

Palabras clave: Resuperficialización de rótula; osteoartritis; reemplazo total de rodilla; función.
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INTRODUCTION

Total knee replacement (TKR) is a cost-effective procedure for the treatment of osteoarthritis, relieving pain and restoring function to the joint, muscles, ligaments, and other soft tissues involved in its movement. TKR is a procedure in constant evolution, which has made it possible to achieve up to 90% satisfactory outcomes.[1] However, persistent anterior knee pain continues to be one of the main complaints reported by patients after TKR (5-10%);[2] for this reason, patellar resurfacing has been proposed as a strategy to treat this complication.[3,4]

Patellar resurfacing during a TKR remains a source of disagreement among surgeons, with use rates ranging from 2% to 90%.[5,6] The decision whether or not to resurface the patella has been left primarily to the surgeon, as the reported evidence is not conclusive regarding its impact on functional outcomes and revision rates.[3,5] For example, in the meta-analysis by Longo et al., better scores on the functional scales were found, as well as a lower revision rate in patients who underwent TKR with patellar resurfacing.[7] In contrast, authors such as Grassi et al. have published comparable functional outcomes between the groups.[8] Recently, Parsons et al. reported that patellar resurfacing can be considered a cost-effective intervention, and that it has a low revision rate, although functional outcomes are equivalent between patients undergoing TKR with resurfacing and without it.[9] Therefore, the objective of this study was to compare the functional outcomes of TKR with patellar resurfacing with those without resurfacing at two years of follow-up.

MATERIALS AND METHODS

An observational, retrospective study of comparative groups of patients with osteoarthritis who had undergone primary TKR with or without patellar resurfacing was carried out between January 2014 and December 2016, in two centers in Colombia. The patients with patellar resurfacing were operated on in a single Center, in Cali, and the patients without resurfacing underwent surgery in Bogotá. For this study, 230 primary TKRs in the two cities, which had been followed up for a minimum of two years, were initially reviewed. Twenty-three patients with inflammatory arthritis and one patient with a history of fracture were excluded. All cases were identified through institutional records. This study was approved by an Institutional Ethics Committee and carried out according to the principles of the Declaration of Helsinki.

Surgical technique

With the patient in the supine position and under regional anesthesia, a medial parapatellar anterior approach was performed and the knee joint was exposed. Subsequently, the soft tissues of the joint were released, from the medial side to the pes anserinus insertion and from the lateral side to the joint capsule. The cruciate ligaments and menisci, and the medial and intercondylar osteophytes were removed. All patients received an Optetrak® cemented prosthesis (Exactech, Gainesville, FL, USA). The implant was placed using tibial extramedullary and femoral intramedullary guides. Patellar resurfacing was performed before component reduction maneuvers and varus and valgus flexion stability tests.

The rehabilitation process began 24 h after surgery with assisted passive isometric exercises for short periods, in order to recover the range of motion and strengthen the muscles. In addition, standing with the help of a walker or crutches was indicated. Once independence for short distances was recovered, active and passive exercises of the lower limbs began.

Data collection

All information was extracted from institutional medical records. The following data were recorded: age, sex, body mass index, range of motion, and total surgery time. Function was assessed preoperatively and at two years using the *Knee Society Score* (KSS), the *Hospital for Special Surgery* (HSS) scale, and the *Oxford Knee Score* (OKS).

Statistical Analysis

Variables are expressed as mean ± standard deviation or median (IQR interquartile range), according to the normality criteria assessed using the Shapiro-Wilk test. The comparison of demographic and clinical characteristics between the resurfacing and non-resurfacing groups was performed using the X^2 test for qualitative variables and

Student's t-test or nonparametric Mann-Whitney U-test for continuous variables. To compare function between groups, the change or difference between KSS, HSS, and OKS scores before the TKR and after two years was calculated. The significance of the change within each of the groups was tested with the nonparametric Wilcoxon signed-rank test for paired data and, between groups, with the Mann-Whitney U test. A p-value <0.05 was considered statistically significant. All analyses were performed using the Stata 16.0 program (StataCorp, College Station, TX, USA).

RESULTS

206 TKRs were included in the analysis: 94 in the resurfacing group and 112 in the non-resurfacing group. The mean age in the study cohort was 66.9 ± 9.7 years and 76.7% (n = 155) were women, with a body mass index of 28.4 kg/m^2 (IQR 25.4-31.6). As described in Table 1, no statistically significant differences were observed between the groups regarding age, sex and body mass index (p > 0.05). In contrast, patients who underwent TKR without resurfacing had lower ranges of motion than those with resurfacing, as well as lower scores on functional scales, at the preoperative assessment (Table 2). Surgery time was longer in the resurfacing group (p < 0.05). In most TKRs, a posterior-stabilized prosthesis (Optetrak®, Exactech, Gainesville, FL, USA) was used.

Table 1. Demographic and clinical characteristics of patients with and without resurfacing

Characteristics	Without resurfacing (n = 112)	With resurfacing (n = 94)	p
Sex, n (%), no. Female Male	109 83 (76.1) 26 (23.9)	93 72 (77.4) 21 (22.6)	0.831
Age Mean ± SD <55 years 55-75 years >75 years	 66.3 ± 9.3 9 (8.0) 81 (72.3) 22 (19.7)	 67.1 ± 10.2 8 (8.5) 64 (68.1) 22 (23.4)	0.549
BMI (kg/m^2) Median (IQR)	 28.0 (25.4-30.9)	 28.9 (25.7-32.1)	0.186
Extension Median (IQR)	 90.0 (90.0-105.7)	 110.0 (100.0-130.0)	0.000
Flexion Median (IQR)	 5.0 (0.0-10.0)	 0.0 (0.0-5.0)	0.000
Prosthesis, n (%) Cemented condylar constrained Classic cruciate retaining Classic posterior stabilized	 4 (3.6) 0 (0.0) 108 (96.4)	 0 (0.0) 12 (12.8) 82 (87.2)	0.000
Surgical time Median (IQR)	 85.0 (70.0-90.0)	 100.0 (90.0-110.0)	0.000

SD = standard deviation, BMI = body mass index, no. = number of complete data, IQR = interquartile range.

Table 2. Comparison of functional scale scores between patellar resurfacing and non-resurfacing groups.

Scale	Non-resurfacing (n = 112)	Resurfacing (n = 94)	p[a]
Clinical KSS[*]			
Preoperative	41.0 (33.0-54.0)	44.0 (36.1-48.0)	
2 years of follow-up	85.0 (73.1-92.0)	93.0 (89.0-93.0)	
Change (Δ)	40.0 (25.3-55.1)	47.0 (42.0-55.0)	0.000
p[b]Δ	0.000	0.000	
Functional KSS[*]			
Preoperative	45.0 (30-50.0)	50.0 (30.0-55.0)	
2 years of follow-up	70.0 (55.0-80.0)	100.0 (100.0-100.0)	
Change (Δ)	30.0 (10.0-40.0)	50.0 (45.0-70.0)	0.000
p[b]Δ	0.000	0.000	
HSS[*]			
Preoperative	55.5 (46.1-63.0)	61.5 (55.1-66.6)	
2 years of follow-up	79.9 (72.6-87.0)	89.0 (89.0-89.0)	
Change (Δ)	24.0 (13.6-34.1)	26.4 (20.5-32.1)	0.089
p[b]Δ	0.000	0.000	
OKS[*]			
Preoperative	15.0 (12.0-18.0)	14.0 (10.0-18.0)	
2 years of follow-up	37.0 (30.0-42.0)	44.0 (44.0-44.0)	
Change (Δ)	22.0 (14.0-26.0)	30.0 (27.0-34.0)	0.000
p[b]Δ	0.000	0.000	

KSS = *Knee Society Score,* HSS = *Hospital for Special Surgery*, OKS = *Oxford Knee Score*.
[*]Median (interquartile range).
[a]P-value between the groups with resurfacing and without resurfacing.
[b]P-value between the preoperative period and at the end of follow-up within each group.

Table 2 describes the scores of the functional scales before the TKR and after two years in the groups with resurfacing and without this procedure. Significant improvement in patient function after TKR was observed in both groups, based on the scores of the clinical KSS, functional KSS, HSS and OKS scales. However, the change in clinical KSS, functional KSS, and OKS scores before and after TKR was better in the resurfacing group ($p < 0.05$). On the HSS scale, the change before TKR and after it was not statistically significant between the groups ($p > 0.05$).

DISCUSSION

The decision to resurface the patella during TKR has been a matter of debate among surgeons. The main result of this study demonstrated that patients who underwent TKR with resurfacing of the patella had a greater change in the scores of the KSS and OKS functional scales at two years of follow-up compared to the preoperative evaluation.

Several authors have described the benefits of patellar resurfacing on functional outcomes and revision rates after TKR.[7,9,10] Those who oppose this procedure justify their conduct based on the potential complications associated with this additional step, such as instability, fracture, polyethylene wear, soft tissue impingement, and osteolysis.[11,12] For example, Schiavone Panni et al. published a patellofemoral complication rate of 7% in a cohort of patients with resurfacing, and reported cases of anterior pain, malalignment, and loosening of the patellar component.[13] However, a higher incidence of anterior pain (*odds ratio* [OR] 1.76; 95%CI 1.36-2.27) and revision surgeries (OR 3,24; 95%CI 2.11-4.99) has been described in patients without resurfacing, which has led surgeons to justify performing this procedure.[10]

In countries such as the United States, at least 80% of TKRs are performed along with patellar resurfacing; the trend of its use has not changed between 2004 and 2014. In other countries, such as Australia, England, and Denmark, the percentage of patients with resurfacing has increased. In contrast, in Sweden and Norway, the use of patellar resurfacing does not reach 10%, with a downward trend.[5] In Latin America, it is unknown how much this clinical practice is used, mainly due to the lack of national records.

On the other hand, some surgeons do not suggest the routine use of patellar resurfacing; instead, they recommend its selective use based on specific patient criteria, considering it in cases with a history of rheumatoid arthritis, advanced tibiofemoral osteoarthritis, patellofemoral osteoarthritis, anterior knee pain, genu valgum, and in revision surgeries.[14] However, the analyses that have compared the clinical outcomes between surgeons who usually, selectively or rarely conserve the patella, indicate better functional outcomes at five years of follow-up in patients treated by surgeons who usually conserve the patella, followed by those who perform this procedure selectively, with no differences in revision rates between the three use strategies.[15]

Regarding functional outcomes based on patient-reported outcomes, published meta-analyses have found inconclusive results on whether or not there is a benefit in favor of patella resurfacing. Longo et al.[7] reported better functional outcomes with patella preservation, as well as Migliorini et al.[10] who also reported a lower frequency of anterior pain (11.1% vs. 17.4%). Instead, Chen et al.[16] described better function in patients with patella resurfacing after five years of follow-up; however, in the third year after surgery, the results were statistically similar between the groups. On the other hand, Grassi et al.[8] published comparable functional outcomes between patients who underwent TKR with patellar resurfacing and those without this procedure.

These findings allow us to conclude that, despite the many published studies, it is still not possible to determine if patellar resurfacing improves the functional outcomes of TKR. However, it is important to highlight that, to the best of our knowledge, no meta-analyses have been published describing better functional outcomes in patients without resurfacing. In recent times, clinical outcomes have also not revealed differences between patients with patella resurfacing and those without this procedure, when they have been fitted with a patella-friendly knee prosthesis whose design has been modified to prevent problems associated with the extensor mechanism of the knee.[17,18]

Based on our findings and the literature, it can be concluded that the decision whether or not to resurface the patella during TKR will continue to be a matter of debate among orthopedists around the world. However, it is important to take into account that, although the decision may depend on the preferences of the surgeon, there has been a marked tendency to reduce revision rates when patellar resurfacing is performed, so it can be considered a cost-effective intraoperative approach, as suggested by Parsons et al.[9]

This study has limitations. First, the data analyzed comes from only two healthcare centers; therefore, their findings must be interpreted with caution. Second, patients were only followed up for the first two years after surgery, which can be considered a limited follow-up time to report, for example, the rate of secondary resurfacing. Furthermore, although significant differences in preoperative function were observed, the comparison between the groups is valid because the outcome variable was the change experienced in each group relative to the preoperative measurement. Third, due to the retrospective nature of this study, it was not possible to record complications in this group of patients; therefore, we recommend that the decision whether to resurface or not be made taking into consideration the findings provided by other published studies with a higher level of evidence.

CONCLUSION

Resurfacing of the patella during a TKR was associated with better functional outcomes at two years of follow-up. However, patients without resurfacing also reported functional improvement after TKR.

Conflict of interest: The authors declare no conflicts of interest.

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