To Retain or Resurface the Patella in Primary Total Knee Arthroplasty: A Comparative Study

Preservar ou substituir a patela durante a artroplastia total de joelho: Estudo comparativo

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Abstract

Objective To evaluate and compare clinically and functionally patients undergoing primary total knee arthroplasty (TKA) with preservation or replacement of the patella.

Methods In a cross-sectional study, the functional results were evaluated and compared, using the Western Ontario and McMaster Universities (WOMAC) and Lequesne scores, of 158 patients undergoing primary TKA (162 knees); in 81 knees the patella was submitted to arthroplasty and in 81 the joint surface of the patella was preserved.

Results No significant differences were identified in terms of the Lequesne score ($p = 0.585$), global WOMAC score ($p = 0.169$), nor in terms of its subdivisions regarding stiffness ($p = 0.796$) and functional capacity ($p = 0.190$). There was a significant difference only in terms of the subdivision that evaluates pain in the WOMAC score, being lower in the group undergoing patellar arthroplasty ($p = 0.036$).

Conclusion In the present study, there was no difference in functional assessment in patients who underwent or not patellar replacement during primary knee arthroplasty surgery. However, individuals in whom the patella was preserved reported more pain.

Keywords
- arthroplasty, replacement, knee
- osteoarthritis, knee
- patella

Resumo

Objetivo Avaliar e comparar clínica e funcionalmente pacientes submetidos a artroplastia total primária do joelho (ATJ) com preservação ou substituição da patela.

Métodos Em um estudo transversal, foram avaliados e comparados os resultados funcionais, usando escores de Western Ontario and McMaster Universities (WOMAC, na sigla em inglês) e Lequesne, de 158 pacientes submetidos a artroplastia total primária o

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joelho (162 joelhos), sendo que em 81 joelhos a patela foi submetida a artroplastia e em 81 a superfície articular da patela foi preservada.

Resultados Não foram identificadas diferenças significativas quanto ao escore de Lequesne ($p = 0,585$), escore global de WOMAC ($p = 0,169$), nem quanto às subdivisões deste quanto a rigidez ($p = 0,796$) e a capacidade funcional ($p= 0,190$). Evidenciou-se diferença significativa apenas quanto à subdivisão que avalia a dor no escore de WOMAC, sendo menor no grupo submetido a artroplastia patelar ($p = 0,036$).

Conclusão No presente estudo, não houve diferença na avaliação funcional em pacientes submetidos a substituição ou não da patela durante a cirurgia de artroplastia primária do joelho. Entretanto, os indivíduos nos quais a patela foi preservada relataram mais dor.

Palavras-chave
- artroplastia do joelho
- osteoartrite do joelho
- patella

Introduction

Total knee arthroplasty (TKA) is a surgical procedure with proven clinical efficacy[1–4] resulting in a substantial functional and quality of life improvement in patients with gonarthrosis.[5,6]

The first modern total knee prosthesis (TKP) was developed by a Canadian orthopedist, Frank Guston, in 1960; subsequently, it was improved by John Insall in the 1970s, and the patellar component was introduced by Townley and Insall in 1972.[7] The introduction of a patellar component in TKA reduced the occurrence of anterior knee pain, but resulted in new complications, such as component failure, instability, patellar fracture, extensor tendon rupture, patellar avascular necrosis, and other soft tissue injuries.[8] Although such complications were attributed to a poor surgical technique and inadequate implant positioning, the fear of sustaining them hindered the routine adoption of patellar replacement.[8]

Over the years, surgical techniques and implants have improved, significantly reducing the occurrence of complications in patellar arthroplasties, and dividing surgeons regarding their adopted routine procedure.[9] Some authors suggest routine patellar replacement since it improves pain, functional scores, and patient satisfaction, with a lower rate of reintervention due to pain persistence.[10] Others defend patellar retention as routine due to the risk of complications and the potential advantage of patellar bone stock maintenance with similar satisfaction and functional rates.[11–13] Additionally, some still recommend patellar replacement in selected cases, believing that its routine performance is not supported by the literature.[14]

The present study aims to functionally evaluate subjects submitted to primary TKA with patellar joint resurfacing and to compare them with patients in whom the patellar joint surface was retained.

Materials and Methods

A total of 191 patients who underwent primary TKA from January 2012 to December 2014 for primary gonarthrosis were initially selected from our database to participate in the study. All of them had at least 5 years of follow-up, received the same implant (Advance Medial-Pivot Knee System, Microport Orthopaedics, Arlington, TN, USA) and were operated on by two experienced surgeons from an orthopedic reference hospital. After medical records analysis, 33 patients were excluded; 7 were deceased, 2 were unable to participate due to comorbidities not related to TKA, and 24 who were lost to follow-up. No patient met the exclusion criteria regarding complications with major functional impairment. Finally, 158 patients were included in the study. Four patients underwent bilateral TKA in different years: two subjects were submitted to a patellar arthroplasty in one knee, while the other patella was preserved; one patient had both patellae retained; and one patient underwent a bilateral arthroplasty. In these cases, both knees were assessed separately. The final sample consisted of 162 knees, including 81 knees with patellar resurfacing and 81 knees with patellar joint surface retention.

Knees were divided into two groups: those with patellar resurfacing during TKA and those with patellar joint surface retention. Patellar resurfacing was selectively indicated in case of moderate to severe patellofemoral arthrosis detected at a gross assessment during surgery. Only patellae with articular surfaces in good conditions were retained.

All patients were contacted by telephone by one of the authors (de Campos Júnior L. R.) and answered the Lequesne[15] and the Western Ontario and McMaster Universities (WOMAC) and its subdivisions questionnaires.[16] During contact, subjects were invited to participate in the study and, if they agreed, the call was resumed.

Patients who agreed to participate in the study signed an Informed Consent Form (ICF). The study was previously approved by the Research Ethics Committee of the institution.

Statistical Analysis

Quantitative variables were described as mean and standard deviation or median and interquartile range values. Categorical variables were described as absolute and relative frequencies. Mean values were compared using the t-Student test. In case of asymmetry, the Mann-Whitney test was applied. The Pearson chi-squared test was used to compare proportions. The level of significance was set at 5% ($p < 0.05$) and the

analyzes were performed with IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, NY, USA).

Results

A total of 46 patients were male and 112 were female; the study groups were homogeneous both in gender distribution and in number of knees (►**Table 1**). The ages of the subjects at the time of surgery, questionnaires application, and the interval between them were also homogeneous (►**Table 2**).

The median Lequesne score was 3.5 points for the group with patellar retention and 2.5 points for the group with patellar resurfacing; this difference was not sufficient to generate statistical significance (►**Table 3**).

In the WOMAC score, in all three evaluated areas (pain, stiffness, and difficulty to perform daily/physical activities) and the global score, the only significant difference was observed in pain, with a higher score in the group with patellar retention (►**Table 3** and ►**Figure 1**). There was no significant difference in joint stiffness scores between groups (►**Table 3**). Although there was no significant difference regarding the difficulty in daily/physical activities score ($p = 0.190$) and the global score ($p = 0.169$), median, 25th percentile and 75th percentile values were slightly higher among patients with patellar retention (►**Table 3** and ►**Figures 2** and **3**). Since scores were expressed as natural numbers, some median values were equal to zero because most subjects had the same score in a given subdomain.

Three patients presented complications during the study. Two subjects had surgical wound dehiscence, including one submitted to patellar resurfacing and another with patellar retention. Both underwent surgical debridement and antibiotic therapy with good outcomes. The third patient had an early periprosthetic infection and underwent a new surgical procedure for polyethylene change, washing and debridement, in addition to antibiotic therapy. One patient excluded due to loss at follow-up had a late knee infection and underwent a limb amputation.

Table 1 Knee distribution per patellar retention or resurfacing and gender

	Male	Female	Total
Patellar retention	23	58	81
Patellar resurfacing	24	57	81
	47	115	162

Table 2 Sample characterization per age and follow-up time

Variables	With no patellar resurfacing*	With patellar resurfacing*	*p*-value**
Age at surgery (years old)	71.9 ± 9.5	71.3 ± 6.3	0.614
Age at data collection (years old)	77.9 ± 9.8	77.2 ± 6.4	0.595
Follow-up (years)	5.9 ± 0.7	5.9 ± 0.8	0.918

*Mean ± standard deviation.
**Statistically significant difference considering $p < 0.05$.

Table 3 Scores evaluation per groups

Scores	With no patellar resurfacing*	With patellar resurfacing*	*p*-value**
	median (P25-P75)	median (P25-P75)	
Lequesne WOMAC	3.5 (0.5–7)	2.5 (0.5–7)	0.585
Pain	0 (0–2)	0 (0–1)	0.036**
Rigidity	0 (0–0)	0 (0–0)	0.796
Physical Activity	7 (1–12.5)	5 (0–9)	0.190
Total	8 (2–15)	5 (0.5–11.5)	0.169

Abbreviations: P25, 25th percentile value; P75, 75th percentile value; WOMAC, Western Ontario and McMaster Universities.
*Mean ± standard deviation.
**Statistically significant difference considering $p < 0.05$.

Discussion

Over the years, several studies have evaluated the difference in outcomes between the performance or not of patellar arthroplasty. Recently, Ha et al.[17] performed the first prospective randomized study in which patients had one knee submitted to TKA with patellar resurfacing and the other knee had the patella retained at the same surgical time and using the same implant model. After 5 years of follow-up, 60 patients (120 knees) were reevaluated. The authors found out that knees submitted to patellar resurfacing had less anterior pain ($p < 0.001$) and a lower incidence of patellar crepitation ($p < 0.001$). Although both knees showed functional improvement, it was significantly higher in those submitted to patellar resurfacing ($p < 0.001$). Neither knee presented complications nor required surgical revision. In a satisfaction assessment, 47% of the patients preferred the knee submitted to patellar resurfacing, while 46% were indifferent.[17]

Migliorini et al.[18] performed a meta-analysis of 31 articles, totaling 4,132 knees, while Longo et al.[19] carried out another meta-analysis with 35 articles and a total of 5,535 knees. Both found less anterior knee pain in patients who underwent patellar resurfacing ($p = 0.02$ and $p = 0.00001$, respectively); this same group also presented lower revision rates ($p < 0.0001$ and $p = 0.00001$, respectively). Only the first set of authors observed a statistically significant functional difference, with better function in patients undergoing patellar resurfacing ($p = 0.009$).

Better pain outcomes in patients undergoing patellar resurfacing was a common finding between our study and the literature; we believe that this is a well-defined outcome. Although we did not show any significant difference

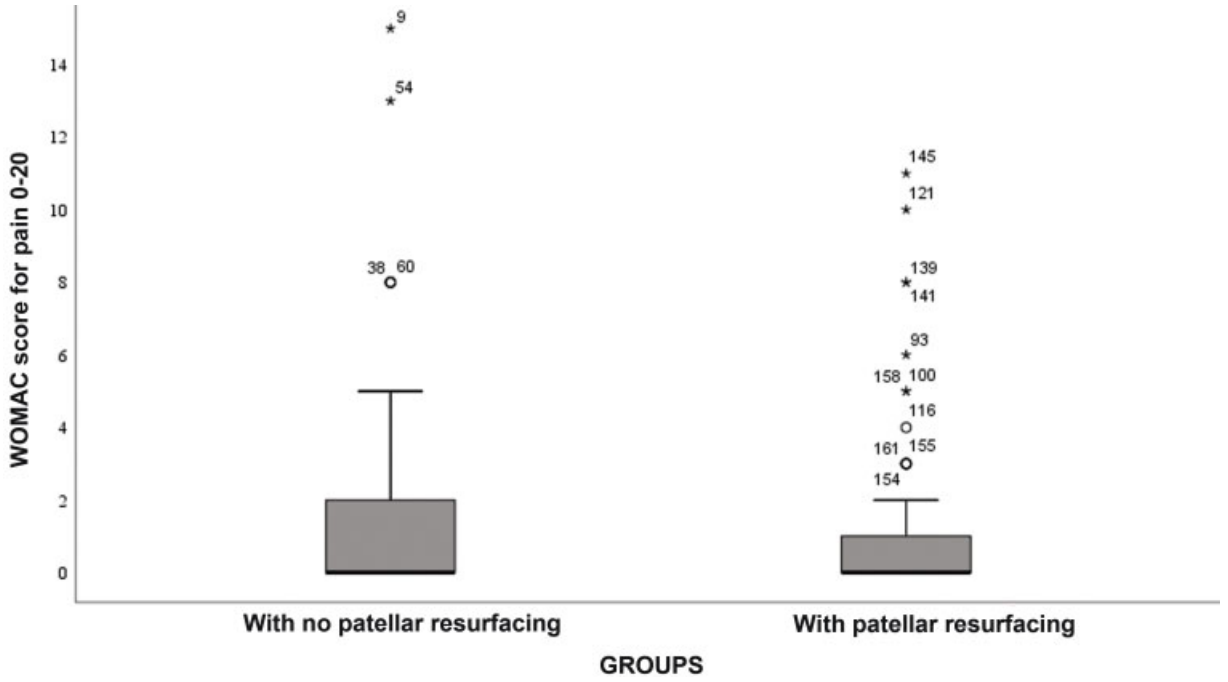

Fig. 1 Western Ontario and McMaster Universities (WOMAC) score for pain.

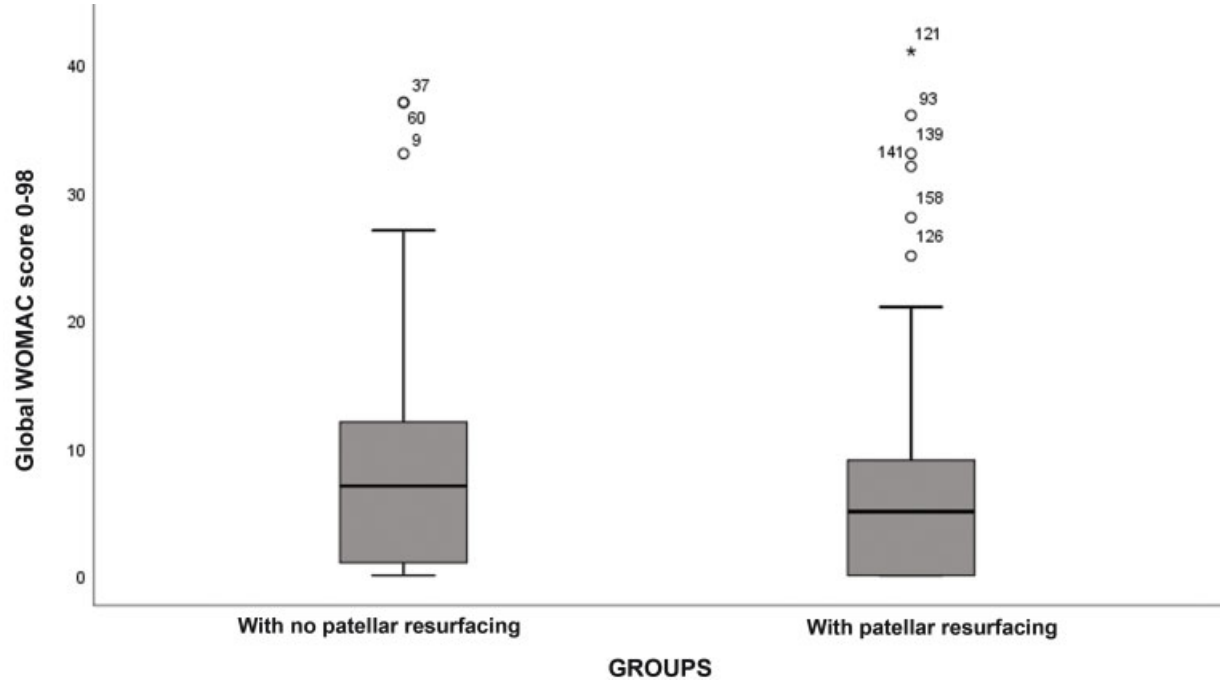

Fig. 2 Western Ontario and McMaster Universities (WOMAC) score for difficulty in daily living activities.

regarding the global WOMAC score and its subdomain for difficulty in daily living/physical activities, higher median values, relatively higher 25th and 75th percentiles and a considerably low *p*-value in the patellar retention group lead us to believe that the difference could become significant if the study population was larger. This hypothesis seems plausible, given the significance evidenced by Migliorini et al.[18] and Ha et al.,[17] and the consistent findings of Longo et al.,[19] who believe there is a trend for better function after patellar resurfacing. Further studies are certainly required for functional comparison between these groups of patients to generate solid evidence.

The three studies showed lower revision rates in the patellar resurfacing group.[17–19] Migliorini et al.[18] believe that this is related to individual dissatisfaction with pain persistence after patellar retention, leading surgeons to reoperate and perform a resurfacing procedure.[18] However, we tried to evaluate only the functional outcomes from two scenarios in ideal situations, excluding patients with complications leading to great functional impairment. We

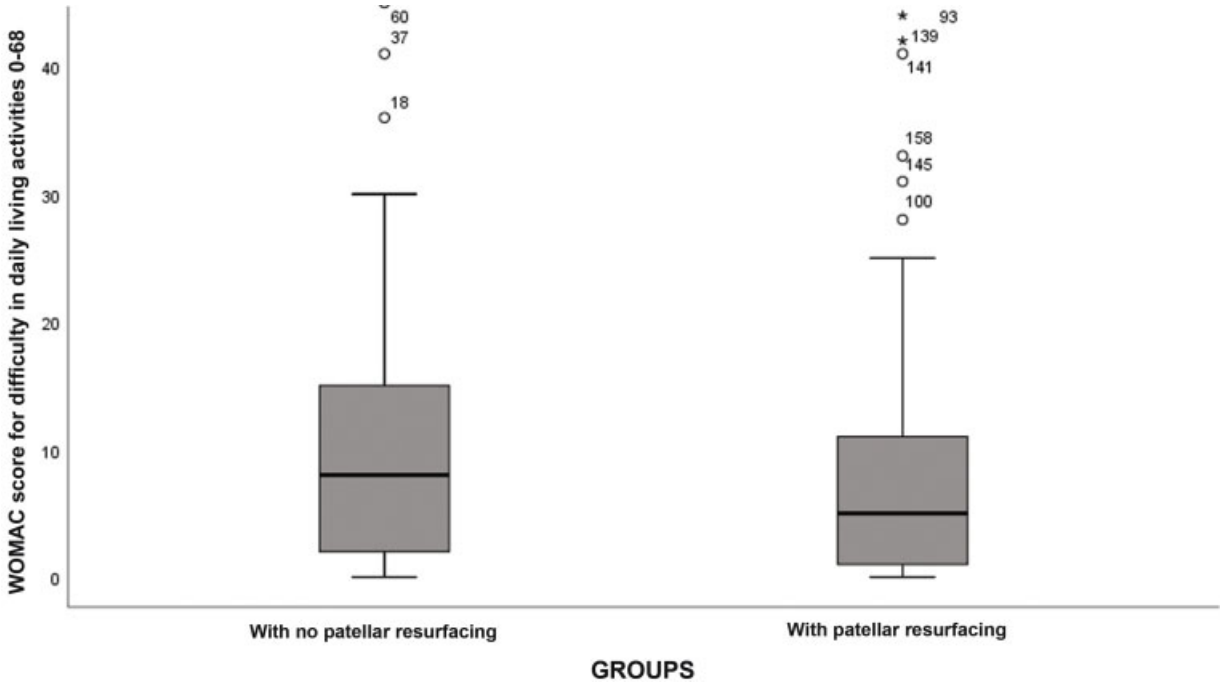

Fig. 3 Global Western Ontario and McMaster Universities (WOMAC) score.

believe that these complications and their analysis would affect group outcomes in a nonrepresentative way. We emphasize that despite this definition, only one patient who was excluded due to loss at follow-up had a serious complication which was not caused by patellar resurfacing. We believe that outcomes related to the incidence of revision must not be considered because there is a greater tendency to indicate revision in symptomatic patients with retained patellae. There are some questionable points in the aforementioned meta-analyzes: lack of description of the surgeons' skills and of the implant model in most studies, heterogeneity among studies,[19] use of different implants and inclusion of studies with 2 years of follow-up.[18]

In a cost-effectiveness study, Zmistowski et al.[20] reviewed 14 prospective randomized studies investigating different outcomes from surgeons who chose selective or nonselective patellar arthroplasty. After nonselective patellar arthroplasty, the persistence of anterior knee pain was 20.9% in the patellar retention group and 13.2% in the patellar resurfacing group ($p < 0.001$), with reoperation rates for patellar conditions of 3.7 and 1.6% ($p < 0.01$), respectively. In studies excluding patellae with arthrosis, the incidence of anterior pain was equivalent between groups, that is, 3.1% in the patellar retention group and 3.2% in the patellar resurfacing group ($p = 0.97$), while the rate of reoperation due to patellar pain persistence dropped to 1.2 and 0% ($p = 0.06$), respectively. After assessing the outcomes, complications and related costs, the study concluded that the routine performance of patella resurfacing does not have the best cost-benefit relationship and that patellar retention is better because it avoids revisions due to persistent pain and minimizes risks inherent to patellar arthroplasty.[20]

Since our service performs selective patellar arthroplasty procedures, we believe that, hypothetically, we exposed the patellar retention group to the best possible perspective in terms of clinical outcomes – after all, by preserving only patellae in good macroscopic conditions, we can state that the higher WOMAC scores for pain in the patellar retention group did not result from moderate or advanced arthrosis. However, even with selective arthroplasty, the difference between groups was significant, in contrast to Zmistowski et al.[20] We believe that the selection may also have been a reason for not identifying a significant difference between groups regarding global WOMAC and difficulty in daily living activities scores due to the probable reduction of the real difference that could have occurred in the absence of selection.

We recognize limitations in our study, such as sample size, lack of assessment of quality of life and mental health scores, and the application of questionnaires over the telephone. It is worth mentioning that all patients received the same prosthesis model and that the procedures were performed by the same group of experienced surgeons. Since we used scores validated for the Brazilian population,[15,16] the clinical and functional evaluation were based only on subjective criteria reported by patients, preventing objective data appraisal by an evaluator. We believe that this results in reliable outcomes – as Epstein et al.[21] states, symptoms referred by the patient are always the most important data. Instruments based on patients' report can provide data that are not achieved by physiological assessments and that may have greater reproducibility on quality of life than clinical, biochemical, and physiological indices.[21]

Conclusion

The present study revealed no significant difference between the group that underwent patellar resurfacing and the group with patellar retention in terms of Lequesne score, global WOMAC score and WOMAC scores for difficulty in daily living/physical activity and stiffness scores. There was a significant difference only in WOMAC score for pain, with a better outcome in the group undergoing patellar resurfacing even in the presence of selective arthroplasty.

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Conflict of Interests
The authors have no conflict of interests to declare..

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