THE INFLUENCE OF PATELLA RESURFACING ON PATIENT-REPORTED OUTCOMES – A RETROSPECTIVE OBSERVATIONAL STUDY AFTER TOTAL KNEE REPLACEMENT

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Abstract: *Patella resurfacing in total knee replacement remains a controversial topic, in spite of the multitude of studies published in the literature. We comparatively evaluated the outcomes of total knee arthroplasty with unresurfaced/ resurfaced patellae in a consecutive series of 155 patients, at 1 year postoperatively: 86 (55.5%) with resurfaced patellae and 69 (44.5%) unresurfaced. The two patient groups were similar in terms of age, gender, diagnosis, osteoarthritis grade, involved knee and alignment, and type of endoprosthesis implanted. We found no significant difference in Knee Society Score and anterior knee pain; the only observed difference was in tourniquet time, which was longer in the resurfaced group ($p< 0.0001$). Patients with unresurfaced and resurfaced patella show similar results in terms of knee function and anterior knee pain at 1 year postoperatively, with no significant differences. Further long term studies are needed to clearly show the superiority of one procedure over the other.*

INTRODUCTION

The need to resurface the patella during primary total knee replacement (TKR) is still a matter of debate, and because of the controversy surrounding this subject, the choice to resurface the patella or not is usually based on surgeon preference. Although a multitude of studies have been published on the subject, including well-designed, randomized controlled trials (1-4), the results are still controversial. According to Helmy et al., surgeons can be divided into three categories based on how they address the patella during TKR: universal resurfacers, selective resurfacers and nonresurfacers.(5)

Choosing to resurface the patella or leave it unresurfaced during TKR are both associated with specific complications.

On the one hand, a resurfaced patella could fracture or develop osteonecrosis, the patellar component could loosen or suffer polyethylene wear, the patella could be unstable or maltracking and patellar clunk or crepitus could also be present; on the other hand, unresurfaced patellae can lead to anterior knee pain and the need for re-interventions for resurfacing.(6-13)

Given the worldwide tendency of including more patient-reported outcomes into the postoperative evaluation of orthopaedic interventions (14,15), we designed a retrospective observational study to assess how patella resurfacing influences the results of TKR, taking the patient's perspective into account.

PURPOSE

The aim of this study was to comparatively evaluate the outcomes of total knee arthroplasty with unresurfaced/ resurfaced patellae in a consecutive series of patients treated in our institution.

In order to obtain a more patient-centred evaluation of the two procedures, we chose two patient-reported instruments for assessment: the functional KSS and the Visual Analogue Scale (VAS) for anterior knee pain. We also included a commonly used physician evaluated instrument – the Knee Society Score – KSS knee rating. The study was approved by our institution's Ethics Committee.

MATERIALS AND METHODS

The study group consisted of a consecutive series of patients who underwent TKR in the Clinic of Orthopaedics and Traumatology of the Mureș County Hospital between November 2011 and May 2014. We excluded patients with less than 1 year of postoperative follow-up, as well as those with spine or hip disorders that could influence the function of the observed knee.

Patient data, including demographic data, preoperative and 1 year postoperative KSS knee rating and functional scores, as well as VAS for anterior knee pain at 1 year after TKR, were all retrieved from the Clinic's records and introduced in a database. Information about diagnosis, type of implant and tourniquet time was also recorded for each case.

Statistical calculations were performed in spreadsheets and GraphPad InStat 3 software, using a significance threshold alpha of 0.05. When the value presented Gaussian distribution, parametric tests were used (unpaired t test for comparison of means); if in certain subgroups the distribution was non - Gaussian, non-parametric tests were used (Mann-Whitney for comparison of medians). For comparison of categorical data we used the chi square test.

RESULTS

In the aforementioned timeframe, a number of 173 TKRs were performed in our institution. Of these cases, 16 were excluded because of missing data (patients lost to follow-up at 1 year postoperatively), and 2 were excluded based on the presence of hip disorders that could influence the results.

A total of 155 patients were included, of which 86 (55.5%) have had patella resurfacing, while in 69 patients (44.5%) the patella was not resurfaced.

All patients had cemented TKR with one of the

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following two implants: the NexGen Legacy (LPS) fixed TKR system (Zimmer, Warsaw, IN) or the Scorpio NRG Knee System (Stryker, Mahwah, N.J.).

The two patient groups were comparable in terms of age, gender, osteoarthritis grade (according to the Ahlbäck classification), involved knee, preoperative knee alignment and type of endoprosthesis implanted (tables no. 1 and 3), with no statistically significant differences.

Table no. 1. Comparative assessment of the unresurfaced/ resurfaced groups in terms of patient characteristics and implanted endoprosthesis (chi square test); NG – NextGen, S – Scorpio

p	Characteristic		Patella resurfacing		Total
			Yes, count (%)	No, count (%)	
0.65	Gender	Female	59 (56.7)	45 (43.3)	104
		Male	27 (52.9)	24 (47.1)	51
0.92	Involved knee	Right	43 (55.8)	34 (44.2)	77
		Left	43 (55.1)	35 (44.9)	78
0.63	Knee alignment	Normal	23 (56.1)	18 (43.9)	41
		Valgus	5 (41.7)	7 (58.3)	12
		Varus	58 (56.9)	44 (43.1)	102
0.5	Ahlbäck grade	III	1 (25)	3 (75)	4
		IV	12 (60)	8 (40)	20
		V	73 (55.7)	58 (44.3)	131
0.46	Endoprosthesis	NG	41 (52.6)	37 (47.4)	78
		S	45 (58.4)	32 (41.6)	77

The majority of patients had primary osteoarthritis of the knee (77.4%), the next most frequent diagnosis being osteoarthritis secondary to varus alignment of the knee (12.9%), with no significant difference between the unresurfaced/ resurface groups (p=0.51).

Table no. 2 shows the diagnoses of the included patients and the percent of each diagnosis in the resurfaced and unresurfaced patella groups.

Table no. 2. Diagnosis in the two patient groups

Diagnosis	Patella resurfacing		Count
	Yes, count (%)	No, count (%)	
Primary osteoarthritis	70 (81.4)	50 (72.5)	120
Osteoarthritis secondary to varus alignment	8 (9.3)	12 (17.4)	20
Posttraumatic arthritis	2 (2.3)	2 (2.9)	4
Osteoarthritis secondary to valgus alignment	1 (1.2)	2 (2.9)	3
Osteonecrosis	2 (2.3)	0	2
Osteochondromatosis	1 (1.2)	1 (1.4)	2
Rheumatoid arthritis	2 (2.3)	0	2
Gout	0	1 (1.4)	1
Chondrocalcinosis	0	1 (1.4)	1
Total	86 (100)	69 (100)	155

There was no significant difference between the two patient groups regarding the evaluated scores (neither the KSS knee rating, nor the functional KSS) preoperatively and at 1 year postoperatively; anterior knee pain at the 1 year follow-up (as assessed by the patient using the VAS) was also similar between the two groups (table no. 3).

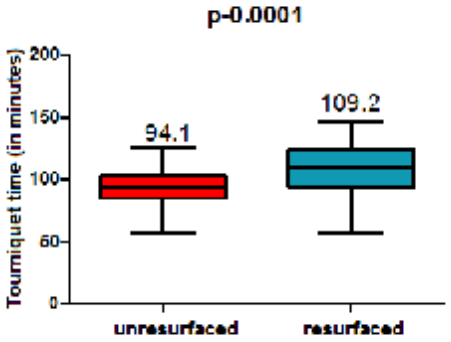
The only observed difference was in tourniquet time, which was longer in the resurfaced group (p< 0.0001, figure no. 1), but the mean difference was of approximately 15 minutes.

Table no 3. Comparative assessment of the unresurfaced/ resurfaced patient groups in terms of age, KSS scores and anterior knee pain at 1 year postoperatively

p	Characteristic		Patella resurfacing	
			Yes	No
0.1826	Patient age*	Mean	68.64	67.23
		Standard deviation	5.867	7.226
0.3896	Preoperative KSS*	Mean	45.21	46.88
		Standard deviation	12.23	11.73
0.9886	Preoperative functional KSS*	Mean	51.57	51.59
		Standard deviation	10.18	11.10
0.0688	KSS at 1 year postoperatively*	Mean	87.44	89.59
		Standard deviation	9.116	3.867
0.9946	Functional KSS at 1 year postoperatively*	Mean	83.49	83.48
		Standard deviation	9.109	9.366
0.2550	VAS for anterior knee pain at 1 year postoperatively**	Mean	1.756	2.043
		Standard deviation	1.371	1.548

*Unpaired t test; **Mann Whitney test; KSS – Knee Society Score; VAS – Visual Analogue Scale

Figure no 1. Differences in tourniquet time between the unresurfaced and resurfaced group



DISCUSSIONS

The first knee prostheses designs did not address the patella-femoral articulation and it was not until the 1970's that the problems associated with these (including anterior knee pain rates of over 50%) were thoroughly assessed, leading to a re-evaluation of the importance of the patella in TKR.(1) Subsequent designs required resurfacing of the patella, because they could not appropriately accommodate the native patella during the knee range of motion. The next generations of implants were already offering an option of retaining the unresurfaced patella, while biomechanical studies aided in furthering the understanding of the characteristics of the patella-femoral articulation, which resulted in improved designs.(1,16,17) To date, the majority of endoprosthetic implants offer the option to either resurface the patella or leave

it unresurfaced, so the choice is usually based on surgeon preference.(18-20) Still, it is a difficult decision, because there are no universal recommendations and either alternative is associated with a series of specific complications.(6,8-10,12) The choice is made even more difficult by the conflicting evidence, including the studies and meta-analyses that show no difference between the two options.(2,3,13,21-24)

Currently, there is no consensus about the most appropriate treatment of the patella during TKR, with many advocates of both resurfacing the patella and not resurfacing it.(1-5,8,25) A comprehensive article by Burnett and Bourne(1) lists the major indications for resurfacing and non-resurfacing the patella, the latter including a younger, thin patient, with non-inflammatory arthritis, in whom the patellofemoral articular cartilage is well-preserved, and the patella shows appropriate tracking, especially if the prosthetic femoral component is equipped with an anatomic trochlear groove for the native patella. Patients with inadequate patellae (as of size or thickness) could benefit from an unresurfaced patella as well. Habermann and Kerner also mention extreme patella alta or baja, as well as the inability to obtain an adequate mechanical fixation of the patellar component (either because of a previous fracture or significant bone loss) as situations in which a choice for not resurfacing the patella could yield better results.(26) In contrast, older, obese patients, with obvious radiological patellofemoral changes, patellofemoral symptoms, maltracking, or a history of patellar dislocation/ subluxation could benefit from a resurfaced patella.(1)

In our series of 155 patients, we found no significant differences between the resurfaced and unresurfaced groups in terms of the KSS knee rating, KSS functional score and VAS for anterior knee pain at 1 year postoperatively. This result is in line with those published by other authors (13,22-24,27), including the meta-analyses of Pilling et al. (3) and Chen et al.(2), looking at 16 randomized controlled trials assessing 3 465 knee replacements and 14 trials evaluating 1 725 patients respectively. Still many authors stress the increased incidence of anterior knee pain after TKR without patella resurfacing (28-31), including a large meta-analysis of over 7 000 cases.(18)

The total knee replacements included in our study were performed by 5 surgeons from our institution, using two types of implants. Even though this fact could alter the results, we did not find any significant differences between the two patient groups. Furthermore, the meta-analysis by Pavlou et al. (18) showed no influence of the prosthetic design on the clinical outcomes of TKR, a result that is probably also influenced by the fact that current prosthetic designs are better suited for the management of the patella-femoral articulation.

We found a significant difference in tourniquet time between the resurfaced and unresurfaced group, with patella resurfacing extending operative time by a mean of 15 minutes. However, this result did not influence the patient-reported outcomes obtained, and tourniquet time was still around 100 minutes total, a value that does not associate high rates of complications, as reported by Olivecrona et al.(32)

The limitations of our study are given by the small sample size, the retrospective design and the relatively short follow-up. However, our results are in line with those published in the literature, and show an adequate improvement of the knee scores at one year postoperatively. Still, according to van Hemert et al. the KSS might not be the most appropriate instrument to determine differences between resurfacing and retaining the patella, and a performance based test might be able to identify significant differences.(13) Our study was based on clinical and patient-reported outcomes only, without an assessment of re-interventions or further complications related to the patella-femoral joint. This might also limit our conclusions, especially in view of the fact that the expected-value decision analysis published by Helmy et al. showed that resurfacing the patella during primary knee arthroplasty is the best management strategy.(5)

As reviews of current literature have not been able to offer sufficient evidence to support either non-resurfacing of routine resurfacing of the patella during TKR, it seems that the best choice is to selectively resurface the patella after a thorough evaluation of the symptoms, imagistic changes and intra-operative findings.(21) Both methods of managing the patella can yield good results if appropriately chosen for each particular patient, based on his/ her individual characteristics.

CONCLUSIONS

Patients with unresurfaced and resurfaced patella show similar results in terms of knee function and anterior knee pain at 1 year postoperatively, with no significant differences. Tourniquet time can be slightly longer in case of patella resurfacing, but the difference does not seem to influence clinical outcomes. Further long term studies are needed to clearly show the superiority of one procedure over the other.

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