



## Is there a difference between the ability to kneel after unilateral and bilateral total knee replacement ?

Rajesh SOFAT, Unnikrishnan RAMKUMAR, David WELLSTED, Harish PARMAR

*From Queen Elizabeth II Hospital, Welwyn Garden City, United Kingdom*

This study investigates the difference between the ability to kneel in patients after unilateral and bilateral total knee replacement. We used the Oxford knee questionnaire to assess knee function, and an additional question was introduced to identify the reasons for any difficulty or inability to kneel. Responses were received from 424 patients representing an 88.9% response rate.

There was a statistically significant ( $p < 0.01$ ) difference in kneeling ability between the two groups. With bilateral total knee replacement, 73% of patients found it extremely difficult or impossible to kneel, compared to 62% of patients with unilateral total knee replacement. There was no statistical difference between the two groups in their overall Oxford knee function score or in their responses on reasons for difficulty or inability to kneel.

**Keywords** : total knee arthroplasty ; unilateral ; bilateral ; kneeling.

### INTRODUCTION

There have been a few recent studies looking at kneeling after total knee replacement (3-6). However there is no study comparing kneeling ability after unilateral and bilateral knee replacements. We have therefore assessed the difference in ability to kneel after unilateral and bilateral knee replacement in a large group of patients operated on at a district hospital. The reasons for inability to kneel were also studied.

### PATIENTS AND METHODS

We identified patients who had total knee replacement between January 1996 and December 2002 from the computerised records at our hospital. All surviving patients who were aged 80 or less and were at least 12 months after their knee replacement were included in the study. The Oxford knee questionnaire (1) was sent by post to all patients with a stamped addressed envelope. For the purpose of this study, an additional question (table I) was added to the Oxford knee questionnaire, in order to study and analyse reasons for inability or difficulty to kneel. Patients with bilateral total knee replacements were sent two questionnaires to complete, one for each knee.

The questionnaire was sent to 477 patients, 217 male and 260 female, with 610 total knee replacements. The

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■ Rajesh Sofat, FRCS, Associate Specialist.

*Department of Trauma & Orthopaedics, Queen Elizabeth II & Lister Hospital, Hertfordshire, United Kingdom.*

■ Unnikrishnan Ramkumar, FRCS, Trust Registrar.

■ Harish Parmar, FRCS (Orth), Consultant in Orthopaedic Surgery.

*Department of Trauma & Orthopaedics, Queen Elizabeth II Hospital, Welwyn Garden City, United Kingdom.*

■ David Wellsted, MD, Lecturer.

*Health Research Development and Support Unit, University of Hertfordshire, United Kingdom.*

Correspondence : Mr. Rajesh Sofat, Department of Trauma & Orthopaedics, Lister Hospital, Stevenage SG12 4AB, United Kingdom. E-mail : rsofat@doctors.org.uk.

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Table I. — The additional question introduced to find out the reasons for inability to kneel and the number of responses to different options

7B. If you cannot kneel or find it difficult to kneel what could be the reason for this ?
1. knee pain or stiffness
2. hip pain or stiffness
3. back pain or stiffness
4. did not know that you could kneel on it
5. anxiety

age range was 39 to 80. Time from surgery ranged from 13 to 96 months.

## RESULTS

We received valid responses from 424 patients, i.e. an 88.9% response rate. Of these, 320 patients had undergone unilateral TKR and 104 patients bilateral TKR, giving 320 and 208 knees respectively (table II). Eight questionnaires were returned without completing, for following reasons : change of address (2 patients), death (3 patients), and patient demented (3 patients).

The statistical analysis shows that the two groups were well matched (table II). In both groups

there were more females than males. Mean age was 71.5 years for unilateral and 70.1 years for bilateral knee replacements. The duration after knee replacement had a mean of 47 months for unilateral and 46 months for bilateral patients.

The Oxford Knee Questionnaire is based on a parametric response scale ; therefore most of the data is parametric and comparisons have been conducted using appropriate t-tests. The possible scores on Oxford questionnaire are 12 to 60, 12 being excellent. The average total Oxford score per knee was 27.3 for unilateral TKR and 25.6 for bilateral TKR ; the difference between the groups was not statistically significant ( $t [506] = 1.70, p > 0.05$ ). The average response per item for the average total Oxford knee scores was also similar in both groups (total Oxford score/number of items = 2.3 unilateral and 2.1 bilateral).

Responses to question 7 of the Oxford Knee Questionnaire (“Could you kneel down and get up again afterwards?”), were severely skewed to response 4 (extreme difficulty) and 5 (impossible to kneel) hence a non-parametric comparison was used to analyse this. Extreme difficulty or impossibility to kneel was reported for 62% of unilateral knees and 73% of bilateral knees (table III). The responses of patients with unilateral knee replacements

Table II. — Data Summary. Note that N refers to the number of knees. Months before survey indicated the time between the TKR and when the survey was filled in

Unilateral TKR									
	N	Mean	Sd	95% CI	Minimum	Maximum		N	Knees
Age at operation	320	71.5	6.5	70.8 - 72.3	47	80			
Months to survey	320	47	25	44.2 - 49.7	13	96	Female	179	179
Total score	312	27.8	11.4	26.0 - 28.6	12	59	Male	141	141
		Median	Interquartile range						
Additional question	312	4	2		1	5			
Bilateral TKR									
	N	Mean	Sd	95% CI	Minimum	Maximum			
Age at operation	208	70.1	7.8	69.0 - 71.1	37	79			
Months to survey	208	45.6	20.4	42.8 - 48.4	14	93	Female	60	120
Total score	196	25.6	10.3	24.1 - 27.0	12	56	Male	44	88
		Median	Interquartile range						
Additional question	196	5	2		1	5			

Table III. — Comparing the responses of unilateral versus bilateral patients on question 7 of The Oxford Knee Questionnaire. The percentage of responses for each response category in the group (unilateral or bilateral) is given in brackets

Response	Yes, easily	With little difficulty	With moderate difficulty	With extreme difficulty	No, impossible	Total
Unilateral	27 (8%)	47 (15%)	46 (15%)	69 (22%)	123 (39%)	312
Bilateral	6 (3%)	28 (14%)	18 (9%)	44 (23%)	100 (51%)	196
Total	33 (6%)	75 (15%)	64 (13%)	113 (22%)	223 (44%)	508

Table IV. — Comparison between unilateral and bilateral patients on responses to additional question regarding reasons for difficulty to kneel. Note those giving multiple responses to this question are not included in this analysis

Response	None	knee pain or stiffness	hip pain or stiffness	back pain or stiffness	Did not know that you could kneel on it	anxiety	Total
Unilateral	31 (11%)	111 (40%)	25 (9%)	29 (10%)	54 (19%)	30 (11%)	280
Bilateral	31 (16%)	70 (37%)	10 (5%)	14 (7%)	39 (21%)	25 (13%)	189
Total	62	181	35	43	93	55	469

Table V. — Comparison between unilateral and bilateral patients on responses to the additional question, including multiple responses. To enable multiple responses to be included the response categories have been grouped with items 1-3 labelled as discomfort and items 4 and 5 as anxiety. Those patients who included a response from both 1-3 and 4-5 were added to a third category discomfort and anxiety

Response	No Response	Discomfort	Anxiety	Discomfort & Anxiety	Total
Unilateral	31 (10%)	180 (56%)	94 (30%)	12 (4%)	317
Bilateral	31 (15%)	101 (49%)	66 (32%)	9 (4%)	207
Total	62	281	160	21	524

(median 4) were reliably lower than for the patients with bilateral knee replacements (median 5, Mann-Whitney  $U = 26063$ ,  $df = 196$ ,  $p < 0.01$ ).

The response to our additional question, "If you cannot kneel or find it difficult to kneel, what could be the reason for this," was analysed to evaluate the reasons the patients gave for their response to question 7 on kneeling difficulty (table I). This question uses response categories and the patients could give multiple responses, and it was therefore analysed using  $\chi^2$ . There was no difference in the way unilateral and bilateral patients responded to this question (table IV and V) or whether a single response was made (496/528 knees :  $\chi^2 = 6.4$ ,  $df = 5$ ,  $p > 0.05$ ) or multiple responses ( $\chi^2 = 4.7$ ,  $df = 3$ ,  $p > 0.05$ ).

There were 20 patients who did not respond to question 7 (table VI). Their responses to our additional question were evenly spread across the categories, and only 5 out of 20 indicated that they did not know that they could kneel, again similar to response if patients had answered the question 7.

## DISCUSSION

Over the past few years there has been growing interest to study kneeling ability in the arthritic knee especially after various types of knee arthroplasty. In 2003, Hassaballa *et al* (3) investigated patients' kneeling ability before and at one and two years after total or unicompartmental knee replacement and patellofemoral replacement and found

Table VI. — Response to additional question, for patients who gave no response to 7

Response	None	1	2	3	4	5	Total
Question 7a	1 (5%)	5 (25%)	3 (15%)	4 (20%)	5 (25%)	2 (10%)	20

that the kneeling ability was best in unicompartmental knee replacement and worst in patellofemoral knee replacement. Overall they found that only 20% of their 253 knees had little or no difficulty with kneeling post-operatively at two years. There seems to exist a marked difference between patients' perceived and actual ability to kneel, which has been studied by Hassaballa *et al* (4) in 2004. Only 37% of their 122 patients after total, unicompartmental and patellofemoral knee replacement thought they could kneel, whereas 81% were actually able to kneel.

Palmer *et al* (5) in a study published in 2002 also found that only 32 out of 100 knees in 75 patients said they could kneel, although in actual 64 knees the patients were able to demonstrate the ability to kneel comfortably. There was no difference between the 'kneelers' and 'non-kneelers' with regards to overall knee score, range of movement and the presence of patellar resurfacing. Schai *et al* (6), in their study on difference in patient's actual ability and their perceived kneeling ability after total knee replacement, found that 44% of their patients stated that they could kneel, but 82% were actually observed to kneel. There was again a significant difference between observed and perceived kneeling ability.

Dawson *et al* (1) during development of the Oxford Knee Score Questionnaire found that at one year follow-up, only 1% of patients could kneel easily, 13% could with little difficulty, 24% with moderate difficulty, 12% with extreme difficulty and 51% of patients found it impossible to kneel i.e. 63% of their patients found it extremely difficult or were unable to kneel.

To our knowledge there is no study that has evaluated the difference in kneeling ability between patients with unilateral and bilateral total knee replacements. We used the Oxford Knee Score Questionnaire because it is a validated patient based knee questionnaire. Dawson *et al* (1) found this practical, reliable and valid. The Oxford knee

questionnaire was also ranked the best among disease/site-specific questionnaires when they were tested on patients selected from the Swedish Knee Arthroplasty Registry who had undergone total knee replacement (2). We added a further question to analyse any differences in the reasons for the patients' inability to kneel with unilateral or bilateral knee replacements. Hassaballa *et al* (3) also noticed this limitation of Oxford Knee questionnaire in their study.

Complex statistical methods were used to analyse our data, to ensure that the assessment is as robust as possible. We found that 73% of patients with bilateral total knee replacement found it extremely difficult or impossible to kneel in comparison to 62% of patients with unilateral total knee replacement who found it extremely difficult or impossible to kneel. The difference was statistically significant ( $p < 0.01$ ). In comparison the total Oxford score per knee was 27.3 for unilateral TKR and 25.6 for bilateral TKR, and the difference was not statistically significant ( $p > 0.05$ ). The average response per item for the total scores (total score/number of items = 2.3 unilateral and 2.1 bilateral) relates to responses between slight and mild discomfort overall. Additionally in response to question 1 ("How do you describe the pain you usually have from your knee?"), the patients report only a low level of pain – mean 2.4 –, with 8% reporting mild pain or less. This implies that the rather extreme responses to the kneeling score (question 7) does not reflect the way in which the patients respond to their other knee score questions overall. Thus the kneeling scores appear to be out of line with the patients' responses to the questionnaire as a whole, not only to the total overall scores for bilateral knees and unilateral knees, but also to the average response per item for the total scores. Palmer *et al* (5) also made similar observations.

In our study, an overall 39% of patients reported knee pain as the reason for not kneeling, 20% reported that they did not know that they could

kneel, and 12% cited anxiety for not kneeling. Therefore one third (32%) of patients do not kneel because they either do not know or feel they are unable to kneel. There was no statistically significant difference between the responses made by the unilateral group in comparison to the bilateral group. The patients are generally pleased with the results of total knee replacement when considering the overall function, but with regards to kneeling they seem to be cautious or ignorant. It appears that better patient advice and education on kneeling should in itself improve kneeling capability of patients after total knee replacement.

Our study shows that patients with bilateral knee replacements have significantly more difficulty in kneeling compared to those with unilateral knee replacements, and we believe this is primarily due to a cumulative difficulty experienced by patients in each operated knee. In the last decade there seems to be no significant improvement in the overall kneeling ability after knee replacement. Whether further improvement in surgical technique, such as the development of minimally invasive approaches, using computer navigation and/or improvement in prosthetic design will help improve this key function of knee joint, remains to be seen.

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