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Patient-reported outcomes after total hip and knee replacement: comparison of mid-term results

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Abstract

The aim of this study was to compare the mid-term functional outcomes of total knee replacement (TKR) and total hip replacement (THR). A cross-sectional postal audit survey of all consecutive patients who had a primary joint replacement at one orthopaedic centre 5-8 years ago was conducted. Participants completed an Oxford hip score or Oxford knee score, which are self-report measures of functional ability. Completed questionnaires were returned from 1112 THR patients and 613 TKR patients, giving a response rate of 72%. The median Oxford knee score of 26 was significantly worse than the median Oxford hip score of 19 ($p<0.001$). In conclusion, TKR patients experience a significantly poorer functional outcome than THR patients 5-8 years post-operatively.

Key words

Hip replacement, knee replacement, Oxford knee score, Oxford hip score, pain, disability

Introduction

Total hip replacement (THR) and total knee replacement (TKR) are widely accepted as effective surgical procedures to alleviate chronic joint pain and improve functional ability. Nearly 90,000 THR and TKR procedures were performed in 2006 in the NHS in England and Wales alone (1). With an aging population and surgical advancements, the incidence of joint replacement has been predicted to rise, with a 673% increase in primary TKR and a 174% increase in primary THR in the United States by 2030 (2).

Clinical evidence suggests that joint replacement results in excellent outcomes. The reporting of outcomes was traditionally focused on implant survivorship and objective outcomes, such as range of motion, knee stability and radiographic results. Survivorship analysis is limited because it fails to account for dissatisfied patients with a poor outcome who either have contraindications to revision surgery or chose not to undergo revision surgery. When these patients are included in survivorship analysis, much poorer outcomes are reported (3). Objective outcomes, such as range of motion, are also limited because they do not contribute to patient satisfaction or even correlate with physical function (4).

The more subjective surgeon-based outcome measures, such as the Knee Society Clinical Rating System (5) and Harris Hip Score (6), represent the early moves towards focussing assessment on the patient rather than exclusively on the implant. An intrinsic assumption of surgeon-based outcome measures is the existence of agreement between the views of patients and clinicians. Evidence suggests, however, that this is an erroneous assumption across all healthcare settings. A meta-analysis found that patients and doctors had differing perceptions of all domains of outcome, especially subjective quality of life domains such as emotions and social functioning (7). In a primary care setting, GPs tended to underestimate the severity of their patient's pain, particularly chronic pain (8). Within orthopaedic assessment, a lack of correlation has been demonstrated between surgeon and

patient ratings of outcomes and satisfaction after TKR (9). This discrepancy between patient and surgeon satisfaction could reflect the differing priorities of the two groups. Whereas surgeons may judge the success of surgery on joint alignment and stability, patients may evaluate outcome in terms of vitality and ability to return to valued leisure activities.

This discrepancy between patient and clinician ratings of health has guided the development of rigorously validated patient-reported outcome measures. These tools allow patients to rate their own health, thereby placing them at the centre of outcome assessment. The past decade in orthopaedic surgery has witnessed a shift in outcomes assessment from simply recording the success or failure of an implant towards patient satisfaction and health-related quality of life. There are several validated patient-centred outcome measures, including the generic SF-36 (10), the disease-specific Western Ontario and McMaster University Osteoarthritis Index (WOMAC) (11) and the joint-specific Oxford knee score (OKS) (12) and Oxford hip score (OHS) (13). These measures have been used extensively to assess short-term outcomes after joint replacement, but no study has yet explored mid-term outcomes in both primary TKR and THR using site-specific questionnaires in a large sample. Therefore, the aim of this postal audit survey was to compare mid-term functional outcomes between TKR and THR patients using the OKS and OHS.

Methods

A postal audit was undertaken of all consecutive patients who had a primary TKR or THR at one elective orthopaedic centre 5-8 years ago. The questionnaires assessed post-operative complications, such as wound infection, functional outcome and pain. To assess functional outcome after TKR and THR, the OKS or OHS were included in the survey. Results from the wound infection questions have been published previously (14, 15). Patients

who had a primary, unilateral TKR or THR and who returned a completed OKS or OHS were included in this analysis.

The Oxford questionnaires are patient-reported outcome measures that are designed to assess functional ability and pain from the patient's perspective. They are site-specific questionnaires developed for completion by patients undergoing TKR and THR. The OKS and OHS consist of 12 questions about pain and physical limitations experienced over the past four weeks because of the knee or hip. Each item has five response categories, giving a score of between 1-5 (low disability to high disability). Scoring involves summating the total for each item to produce a final score between 12-60, with a higher score indicating greater disability. Ten of the questions are the same on both Oxford questionnaires and the remaining two questions are specific to the OKS and OHS.

Statistics

Non-parametric tests were used in the analysis of the Oxford scores because the assumptions of normality were not met when the data was tested with a Kolmogorov-Smirnov test. Mann-Whitney U tests were used to determine if there were significant differences in age or Oxford questionnaire scores between unpaired groups. P-values of <0.05 were considered as significantly different.

Results

In total, 956 patients had a primary unilateral TKR and 1,704 patients had a primary unilateral THR at one elective orthopaedic centre 5-8 years ago. Of these patients, 269 were deceased at the time of follow-up and therefore questionnaires were sent to the remaining 857 TKR patients and 1534 THR patients. After the initial mail-out and two reminder mail-outs,

completed questionnaires were received from 613 TKR patients and 1,112 THR patients, giving an overall response rate of 72%.

Patient demographics are presented in Table 1. The mean age of TKR patients was significantly higher than THR patients ($p<0.001$). The median OKS was 26 (range 12-57) and the median OHS was 19 (range 12-55). The difference between the scores was statistically significant ($p<0.001$) indicating that TKR patients experienced a poorer functional outcome than THR patients. When the OHS and OKS were divided into five scoring bands, the disparity between the scores was present across all five bands (Table 2). Whereas 56% of THR patients obtained an optimum Oxford score of between 12-19, only 32% of TKR patients achieved the same functional results. The percentage of patients who obtained the poorest Oxford score of between 40-60 was over two-fold higher for TKR patients than THR patients (15% vs. 6%, respectively).

Responses to individual questions on the ten questions that are the same on the OHS and OKS are presented in Figure 1. It is apparent from Figure 1 that after TKR patients experience more functional limitations and pain in all dimensions of outcome assessed by the Oxford questionnaires. Some of the starkest differences in outcome were in pain severity, with the percentage of patients reporting moderate-severe pain two-fold greater for TKR than THR patients (26% vs 13%, respectively). The disparity in the percentage of patients reporting moderate-severe difficulty in managing stairs was even greater (21% TKR patients vs. 9% THR patients).

Because TKR patients were significantly older than THR patients, the OHS and OKS were compared by age groups (Table 3). The OKS remained significantly higher than the OHS in all age groups, with the exception of the <50 years of age group. This is most likely due to the fact that only eight TKR patients were in this group.

Discussion

Since the development of joint replacement in the 1960's and 1970's, advances in surgical technique and prosthetic design have dramatically improved patient outcomes. TKR is now more prevalent than THR and the future incidence of TKR is predicted to grow more rapidly than THR (16), establishing TKR as the most prevalent joint replacement surgery in the NHS.

Despite the high prevalence of TKR, the procedure still has an image of being less successful than THR (17). This representation of TKR is strongly supported by the findings of this study. This large-scale postal audit survey of outcomes after joint replacement found that TKR patients report a significantly poorer mid-term functional outcome than THR patients.

The results of this study support previous findings that THR results in better outcomes than TKR. Higher functional ability and greater pain relief has been reported after THR when compared to TKR at 6-months (18), 2-years (17) and 3-years (19) post-operative. These discrepancies in outcomes extend beyond pain and functional ability to wider areas of health-related quality of life, with THR patients reporting greater increases in vitality (18), social functioning (20) and energy (17) compared to TKR patients.

Not only are improvements after THR greater but they also occur more rapidly. As early as one week post-operative THR patients show improvements in pain and function whereas TKR patients demonstrate no equivalent improvements (21, 22). Reductions in pain and function limitations that are experienced in the first three months after THR can take TKR patients up to one year to obtain (20).

Although the consensus in the literature supports the findings of the current study, not all research reports a difference in outcomes after joint replacement. Although TKR patients experienced more pain at one-month pre-operative, Fitzgerald and colleagues found that there

was no difference in pain and function at 12-months after surgery (23). This suggests that patients have a extended recovery period after TKR but do improve to the level of THR patients. Another study found that there were no differences in pain between THR and TKR at 12-months post-operative (24). However, in the study by Benroth and collegues THR patients reported more pain pre-operatively and therefore made greater relative improvements in pain. Both of the above studies may have failed to find a difference in outcomes between THR and TKR because the SF-36 was the primary outcome measure. Because the SF-36 is a generic tool, it lacks the specificity and sensitivity of other disease-specific or joint-specific questionnaires (25). A strength of the current study was the use of the Oxford questionnaires which are joint-specific and more sensitive to change than both the SF-36 or WOMAC (26).

The current study adds to the existing literature by confirming that observed disparities in short-term functional outcome between TKR and THR are maintained at 5-8 years post-operative. The mid-term OHS and OKS obtained in this study are very similar to those reported at 6-months (12) and 12-months post-operative (27). This suggests that those patients who report a poor outcome at 6-12 months after TKR fail to improve. Therefore, because early results after joint replacement are predictive of long-term outcomes, interventions aimed at improving outcomes after TKR, such as a more intense rehabilitation programme, need to be targeted at the early post-operative period.

A possible explanation for the observed disparities in functional outcomes was the significantly higher age of TKR patients compared to THR patients. However, when the Oxford scores were compared between age groups the difference persisted, demonstrating that the poorer outcomes were independent of the higher age of the TKR patients. Similarly, other studies have controlled for patient demographics, such as age, gender and duration of OA and have still found significant differences in outcomes of THR and TKR (20).

The findings of this study have implications for the provision of TKR. Over a quarter of TKR patients reported experiencing moderate-severe pain at 5-8 years post-operative, indicating that a large proportion of people are undergoing major knee surgery that is failing to achieve its primary aim of pain relief. This raises questions about whether patient selection for TKR is appropriate. To improve patient selection, it would be necessary to have a pre-operative screening protocol to identify patient factors predictive of a poor outcome after TKR. Currently, no such protocol exists and this is an area of orthopaedics that requires further research.

Limitations of this survey should be acknowledged when interpreting the results. Because this audit was retrospective, the status of the patients prior to surgery is not known. This lack of pre-operative data limits the analysis to absolute scores and precludes comparing relative improvements in functional ability between TKR and THR. It is therefore possible that TKR patients experience equivalent improvements in function as THR patients but have a poorer pre-operative status. However, previous studies have found that THR patients experience a greater outcome when pre-operative functional limitations are similar to TKR patients (17, 20, 21). Even when pre-operative functional ability in THR patients is lower than TKR patients, THR patients still experience greater relative and absolute improvements (18). Other factors that are known to influence outcomes that were not measured in this study include medical co-morbidities, contra-lateral joint problems and impairment in other joints(28). Also, it was not possible from this retrospective audit to determine if patients had undergone multiple joint procedures during the follow-up period.

Although the OKS and OHS are joint-specific measures with high sensitivity, they have been found to lack specificity and therefore scores can be influenced by impairment in other joints (29). Previous studies have highlighted problems when using the OKS and the OHS in postal surveys, including lack of question clarity, irrelevant questions, and problems

with the reporting of pain(30-32). Another limitation of the study that needs to be acknowledged is the response rate of 72%. It is possible that non-responders had significantly different outcomes compared to responders, which may have bias the results. A previous study found that THR patients lost to follow-up reported more pain than those patients that were assessed (33). Therefore, the reported prevalence of poor outcomes may be an underestimation of the true occurrence of pain and disability after THR and TKR.

This study also has several strengths. To the author's knowledge, this is the largest reported postal survey comparing mid-term patient-reported functional outcomes after both THR and TKR. Sampling was not influenced by patient selection bias because all consecutive patients operated upon over a three-year period were included in the audit. Finally, the use of a validated joint-specific questionnaire lends sensitivity to the study.

In conclusion, this survey found that TKR patients report more pain and functional limitations than THR patients at 5-8 years post-operatively, independent of age. This highlights that further research needs to focus on improving functional outcomes after TKR. Research is currently underway to develop a pre-operative screening protocol to aid the identification of those patients who will experience a poor outcome after TKR.

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Table 1: Patient demographics

	TKR (n= 613)	THR (n = 1112)
Age (years)		
Mean (SD)	70.9 (8.4)	67.5 (11.3)
Side (%)		
Left	48	45
Right	52	55
Gender (%)		
Male	35	37
Female	65	64

TKR = total knee replacement, THR = total hip replacement, SD = standard deviation

Table 2: Percentage of patients in each scoring band of the OKS or OHS

	OKS (%)	OHS (%)
12-20	32	56
21-30	29	25
31-40	24	13
41-50	12	5
51-60	3	1

OKS = Oxford knee score, OHS = Oxford hip score
Score of 12= no disability, 60=maximum disability

Table 3: Comparison of OHS and OKS between age groups

	Knee		**Hip**		**P-value**
	% patients	Mean OKS	% patients	Mean OHS	
<50 years	1.3	31.1	6.6	21.6	p=0.055
50-59 years	6.4	27.2	13.5	21.0	p<0.001
60-69 years	33	26.9	32.3	21.3	p<0.001
70-79 years	44.7	28.5	34.9	22.2	p<0.001
>80 years	14.7	28.5	12.8	24.2	p=0.009

OKS = Oxford knee score, OHS = Oxford hip score

Figure 1: Percentage of patient responses to individual questions on the OKS and OHS

1.) How would you describe the pain you usually had from your knee/hip?

	Knee	Hip
None	37	56
Very mild	21	19
Mild	16	12
Moderate	19	11
Severe	7	2

2.) Have you had any trouble with washing and drying yourself (all over) because of your knee/hip?

	Knee	Hip
No trouble	52	50
Very little trouble	24	29
Moderate trouble	17	16
Extreme difficulty	5	4
Impossible to do	2	1

3.) Have you had any trouble getting in and out of a car or using public transport because of your knee/hip?

	Knee	Hip
No trouble	26	43
Very little trouble	23	31
Moderate trouble	38	21
Extreme difficulty	12	5
Impossible to do	1	0

4.) Could you do the household shopping on your own?

	Knee	Hip
No trouble	37	52
Very little trouble	18	19
Moderate trouble	20	12
Extreme difficulty	6	7
Impossible to do	18	10

5.) For how long have you been able to walk before the pain from your knee/hip becomes severe?

	Knee	Hip
No pain/more than 30 mins	47	62
16-30 mins	18	15
5-15 mins	16	9
Around house only	7	6
Not at all	12	8

6.) Have you been able to walk down/climb a flight of stairs?

	Knee	Hip
Yes easily	27	47
With little difficulty	22	27
With moderate difficulty	30	17

With extreme difficulty	14	7
No impossible	7	2

7.) After sitting at a table, how painful has it been for you to stand up from a chair because of your knee/hip?

	Knee	Hip
Not at all painful	39	60
Slightly painful	27	26
Moderately painful	22	11
Very painful	11	3
Unbearable	1	0

8.) Have you been limping when walking because of your knee/hip?

	Knee	Hip
Rarely/never	42	51
Sometimes	28	28
Often	10	5
Most of the time	10	9
All of the time	10	7

9.) How much has the pain interfered with your usual work (including housework)?

	Knee	Hip
Not at all	37	51
A little bit	25	25
Moderately	23	15
Greatly	10	7
Totally	5	2

10.) Have you been troubled by pain from your knee/hip in bed at night?

	Knee	Hip
No nights	48	64
Only 1 or 2 nights	13	12
Some nights	25	17
Most nights	8	4
Every night	6	3