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Recovery Expectations of Hip Resurfacing Compared to Total Hip Arthroplasty: A Matched Pair Study

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Abstract

Objective—Expectations of higher activity levels associated with hip resurfacing arthroplasty (HRA) may be driving better outcomes in this group compared to total hip arthroplasty (THA). Previous studies evaluated expectations before consulting with the surgeon, although these expectations are likely unrealistic and would change after the consultation. We compared HRA and THA patient expectation after consultation with the surgeon.

Methods—In a prospective registry setting, patients awaiting HRA were matched to THA patients on age, sex, and preoperative Lower Extremity Activity Scale score (range 1–18, 18 highest activity level). Patients completed a validated 18-item expectations survey preoperatively. Mean overall expectations scores were first compared. Exploratory factor analysis (EFA) was then performed to determine if grouping of individual expectations items represented meaningfully different underlying factors in the 2 groups.

Results—We matched 123 pairs. Mean expectation scores were similar (HRA: 85.2±15.5, THA: 87.3±13.9; p-value=0.249). EFA showed that HRA and THA patients shared in common expectations of 1) pain relief and improvement in daily activities (9 items) and 2) eliminating pain medications, the need for cane and improving sexual activity (3 items). THA patients perceived the remaining 6 items as an overall third expectation of participation in higher-level activities. However, HRA patients perceived a fourth expectation of normal range of motion (2 items) independent of the other higher-level activities (4 items).

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Conclusion—Even after consulting with a surgeon, patients' expectations differed between HRA and THA patients regarding higher-level activities. More counseling of patients seeking hip arthroplasty is thus needed.

Introduction

Young, active patients with hip arthritis have always been a challenging patient population in hip replacement surgery because of higher activity levels. The ideal implant for these patients remains controversial and has inspired innovation and design of modern prostheses. These advances include cementless fixation, new bearing surfaces, and most recently the latest generation of metal on metal hip resurfacing implants. Hip resurfacing arthroplasty (HRA) has emerged as an alternative to total hip arthroplasty (THA) in young, active patients (1, 2).

While there are many purported advantages of HRA, perhaps the most controversial is the claim that HRA results in higher activity levels compared to conventional THA (3–7). The reasons for these reports of better functional outcomes in HRA are debated and are likely multifactorial, including the larger diameter femoral head, differing post-operative restrictions, biased patient selection in certain studies, and differing expectations between patient groups (1, 7).

Patient recovery expectations, defined as anticipations that given events are likely to occur during or as a result of medical care (8), have been shown to affect patient satisfaction and outcome after total hip replacement (9, 10). Similarly, patients seeking HRA may achieve higher activity levels after surgery because they have expectations for a more active lifestyle than patients undergoing THA. There are few reports on patient perceptions of the benefit of HRA and these reports assessed patients before consulting with the surgeon (11, 12). These perceptions are usually based on information from different sources such as family and friends or the internet and may be unrealistic (9). However, in a real world scenario, patients do not decide to undergo either of these procedures without first consulting their surgeon.

The purpose of this study was to assess HRA patients' expectations after they have consulted with their surgeon and compare those expectations to matched conventional total hip arthroplasty patients using an exploratory factor analysis (EFA) approach. Our hypothesis from the outset was that patients undergoing HRA would not expect a more active lifestyle following surgery compared to patients awaiting THA after they consulted with their surgeon.

Patients and Methods

Patients consented and participating in a prospective hip replacement registry at the ****Blinded****, accrued between April 2008 and March 2009 comprised our study sample. ****Blinded****. This registry is approved by the Institutional Review Board.

One thousand and thirty patients undergoing hip replacement surgery were prospectively entered into the ****Blinded**** hip replacement registry. Of these 1030 patients, 230 were scheduled to undergo Hip Resurfacing Arthroplasty (HRA) and 800 were scheduled to undergo conventional Total Hip Arthroplasty (THA). As part of their baseline assessment, patients completed a survey consisting of demographic information and the Lower Extremity Activity Scale (LEAS) (13).

This study is a matched-case control study. To assure similar patient characteristics, we matched HRA patients to THA patients for pre-operative variables that could affect a patient's expectations of activity after hip replacement surgery. Patients were matched on

age ($\pm$ one year), sex, and pre-operative activity level using the LEAS (± 1 point). The LEAS is a validated questionnaire consisting of twelve questions. Each of the last three questions includes three levels of response for finer gradation at the higher levels of activity. The result is a self-administered eighteen-level scale (score range 1–18, higher is more activity) in which the patient chooses the statement that best represents his or her activity level (13). We chose age and gender for the matching because they account for important differences between the 2 patient groups (2). HRA patients are usually younger and mostly males. We also matched patients on the LEAS score (± 1 point) because it is a simple, yet sensitive, assessment of a patient's overall physical activity (13). For example, a score of 11 on the LEAS corresponds to a patient who defines their regular daily activity as being "up and about at will in my house and outside" and who works "outside the house in a moderately active job." By matching on this instrument, we account for a number of dimensions since LEAS has been shown from previous studies to correlate significantly with the WOMAC pain and function scores as well as with the number of comorbidities (13).

After matching, pre-operative expectations were compared using the HSS Hip Surgery Expectations Survey. The HSS Hip Surgery Expectations Survey is a patient-derived questionnaire that was designed to focus specifically on expectations of THA. This validated expectations survey, consisting of 18 items, has been developed to evaluate expectations of the different aspects of the recovery (pain relief, ability to perform personal, recreational and social activities of daily living, and psychological well being) (14). For each item, patients indicate whether or not they expect relief or improvement for a given activity on a 1 to 4 likert scale and an additional option of not having such expectation after surgery.

The HSS Hip Surgery Expectations Survey was collected in a prospective fashion, and completed by patients after consulting with the surgeon but prior to surgery. Assessment of expectations at this time reflects patients' realistic expectations that are based on pre-operative surgical consultation and their own perceptions. Thus, when completing the survey, the patients knew what procedure he or she would undergo, HRA or THA. Completing the survey prior to consulting with the surgeon may be problematic since, at this stage, patients are not sure they will undergo surgery and if so, patients may not be aware of the different surgical options available to them. There are also cases whereby patients who desire HRA may not qualify for such surgery and thus receive THA instead. In the Akerman et al. study, because their study was undertaken prior to consulting with an orthopaedic surgeon, 59% of the 139 patients were completely unaware of HRA and therefore did not complete the survey (11). Moreover, of those who completed the survey and were aware of HRA, 38% did not prefer one surgery type over the other. These findings confirmed our choice of assessing expectations after consulting with an orthopaedic surgeon.

First, an overall expectations score was calculated for each patient (range 0–100 with 100 highest expectation) and the means were compared using a paired t-test. To understand the underlying themes, survey item responses were dichotomized into whether or not the patient expected to be back to normal/having complete improvement. Covariance analysis followed by an exploratory factor analysis was performed to understand the relationship between the various expectations and how they are emphasized in the 2 patient groups. Non-parametric bivariate Spearman's correlations analysis was conducted to explore the relationship between expectations. Exploratory factor analysis (EFA) was then used to further explore the patient's responses to the HSS Hip Surgery Expectation Survey (15). EFA is a statistical method that is utilized to compress information on many variables into a few underlying factors by analysing their covariance structure. These factors are often difficult to measure unobservable characteristics of people which are considered to be more fundamental than the observed responses. In the current study, EFA was used to identify underlying factors among the measured responses to the Expectation Survey in the HRA and the THA patients.

Factors are optimised linear combinations of the standardised expectations variables and are constructed to account for as much total variance of the expectations variables as possible. To extract the factors, EFA with principal component analysis and varimax rotation was utilized. We used an eigenvalue >1 criterion to retain factors. A factor loading ≥ 0.5 for an expectation variable was considered as significantly contributing to a factor.

The minimum necessary sample needed to conduct factor analyses is controversial. However, there is evidence to suggest that our sample size (123 pairs) meets the requirements for the minimum needed sample size to conduct exploratory factor analysis $N=100$ (16). All analyses were conducted in SPSS 18.0.

Results

One hundred and twenty-three patients scheduled for HRA were successfully matched on age, sex, and activity level to 123 patients scheduled for THA. The 246 patients were counseled by 19 surgeons who then performed their surgeries. Each group had 99 men (80.5%) and 24 women (19.5%). The average age in the HRA group was 53.1 years (range 31.8 – 69.1 years) and 52.6 years in the THA group (range 32.1 – 68.8 years). The average pre-operative LEAS for the HRA group was 11.5 (range 3–18) and 11.4 (range 4–18) in the THA group.

The mean expectation scores of the 2 groups were 85.2 ± 15.5 and 87.3 ± 13.9 for the HRA and THA patients respectively. P-value for the paired t-test was 0.249, which was not statistically significant.

When the relationship between responses to expectation items was explored, numerous differences were observed. Spearman's correlation analysis showed the association (value of the correlation coefficient and significance level) between any 2 items was generally similar (value of the correlation coefficient was high and significance level was less than 0.01) when the HRA group was compared to the THA group (Appendix). However, there were a few instances where this trend was violated. Of the 648 correlations evaluated, there were 23 that different. For example, the correlation was significant (0.274, $p < 0.01$) in THA but non-significant (0.098, $p = 0.296$) in HRA patients between the expectations of improvement in the ability to walk and eliminating the need assistive devices.

Exploratory factor analysis was conducted using all of the items except for the expectations of employment for reimbursement because a substantial number of patients in each of the groups did not have this expectation. Factors resulting from the EFA explained 73.9% and 69.1% of the variance in the HRA and the THA groups respectively (based on an eigenvalue >1 and factor loading ≥ 0.50). Three factors of improvement expectations were identified by EFA in the THA group: (1) an expectation of pain relief and improvement in mundane functions, (2) an expectation of removing the need for assistive devices and medications and improvement in sexual ability, and (3) a third expectation encompassing improvements in social and psychological well-being as well as higher-level activities that are complex in nature and include sports, putting on shoes and cutting toe nails (Table 1). Eliminating the need for medication had high loadings to be considered for both factors 1 and 2, and improvement in sexual activity was similarly considered for both factors 2 and 3. When the EFA was run for the HRA group, four factors were identified. The (1) expectation of pain relief and improvement in mundane functions and the (2) expectation of removing the need for assistive devices and medications and improvement in sexual ability were reproduced in the HRA group, with the addition of the psychological well-being to the second factor. However, the third group of expectations was clearly divided into 2 separate factors: (3a) the expectation of improved ability to put on shoes and socks and to cut

toenails, and (3b) the expectation of improvement in sports and social activities as well as activities away from the house.

Discussion

Whether HRA patients can perform activities that THR patients cannot remains highly controversial in the orthopedic literature and among surgeons. Using a randomized, double blinded trial design, LaVigne et al. (2009) (7) reported no difference in functional outcomes (gait speed, postural balance, and specific functional tests) between HRA and large-head THA. By blinding the patients to which implant they received, the authors eliminated many of the confounding factors that could affect functional outcomes, including patient expectations.

In our study, where blinding was not part of the study design, we hypothesized that HRA patients would not have higher expectations or expect a more active lifestyle after surgery than THA patients. Our analysis showed that HRA patient overall expectations were indeed not higher, but rather similar to those of THA patients in expectations of pain relief and normal return to the mundane activities of daily living. However, when EFA was applied, HRA patients differed from THA patients in their expectation of more demanding activities, by emphasizing return to normal ability to put on shoes and socks and to cut toenails as an independent expectation from the expectation of overall improvement in social and higher-level activities. Normal return to putting on shoes and socks and to cutting toenails after surgery may be a proxy for HRA patients' expectation of return to normal range of motion after surgery and should be an area for further investigation.

Findings from the current study corroborate with the previous literature on this topic. In the study by Murphy et al., the authors surveyed 139 patients considering hip surgery and found that 80% of the surveyed patients who were aware of HRA felt that their overall range of motion would be better following HRA compared to THA (12). To be aware of the expectation of normal range of motion is important clinically because it may not be achievable in a subset of patients and leads to dissatisfaction. Previous reports have shown that expectations do affect patient outcomes and satisfaction in joint replacement surgery at 6 months, 1 year and 2 years after surgery, thus underscoring the importance of the current study (9, 10, 17). Clinicians and surgeons with a better understanding of the expectations of patients seeking hip arthroplasty surgery can help them make better choices regarding the type of surgery and expected outcomes.

Our study has a number of strengths. First, we use a validated expectations survey to study patient expectations. This 18-item survey was derived from focus groups and is the most comprehensive expectations assessment tool available. Second, this study was conducted using data from a specialized orthopedic tertiary care hospital where both HRA and THR are performed in large numbers. Patients seeking hip replacement surgery have significant access to information about HRA and THA. The surgeons may also be more comfortable performing both surgeries and are able to fully discuss with the patient the risks and benefits of each type of surgery. Third, a uniform preoperative hip joint replacement class, which provides guidance as to allowable activities after surgery but not specific to resurfacing, was given to each patient before the expectations survey. Although this intervention should make expectations of all patient more similar to those of a THA patient, we still found difference between HRA and THA patients.

This study has limitations. First, despite our matching criteria, this study likely did not control for all factors such as education and occupation that could have influenced patient expectations. Second, we used the 2 variables of normal return to putting on shoes and socks

and to cutting toenails as proxies for range of motion. Other factors should be considered in future research. Third, we have assessed patient expectations only after the consultation with the surgeon. It is unclear whether the surgeons accentuated or attenuated the patient expectation. Finally, our study represents experience of one specialized orthopedic center and may not be generalizable to the average patient seeing a typical orthopedic surgeon in a community hospital.

In conclusion, the results of this study demonstrated that young, active patients undergoing HRA surgery, unlike matched THA patients, emphasized an expectation of normal range of motion that is clinically important for physician and surgeons to understand as they discuss surgical options so as to appropriately select patients for HRA and manage expectations to avoid potential dissatisfaction. Further studies are necessary to determine the effect of these expectations on function, activity level, and satisfaction following HRA.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Significance and Innovation

- **Significance:** Patients' perceptions of the higher activity levels associated with hip resurfacing arthroplasty (HRA) may be driving better outcomes in HRA compared to conventional total hip arthroplasty (THA). Previous studies evaluated these expectations before consultation with the surgeon. These expectations are unrealistic and likely to change after consultation with the surgeon.
- **Innovation:** We evaluated expectations of resurfacing patients after consultation with the surgeon. We utilized a matched pair cross-sectional design by matching THA patients with similar demographic and functional status characteristics preoperatively. We analyzed the expectations data using both overall score analysis and item-specific analysis. We found resurfacing patients to differ from THA patients regarding higher level activities.

Exploratory Factor Analysis Results

Table 1

Explained Variance Expectations ^{*§}	THA			HRA		
	Factor 1 ^{**}	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3a
Daytime pain relief	0.68			0.70		
Relief of pain interfering with sleep	0.63			0.64		
Improvement in ability to walk	0.77			0.85		
Improvement in ability to stand	0.80			0.87		
Getting rid of limp	0.69			0.76		
Improvement in ability to climb stairs	0.83			0.79		
Improvement in ability to get in or out of a bed, chair or car	0.82			0.66		
Improvement in ability to perform daily activities around the home	0.76			0.65		
Improvement in ability to perform daily activities away from the home	0.71			0.63	0.59	
Eliminating need for medications	0.50	0.50		0.76		
Removing need for assistive devices		0.84		0.79		
Improvement in sexual activity		0.59	0.58	0.70		
Improvement in ability to exercise or participate in sports			0.76		0.68	
Improvement in ability to participate in social activities or recreation			0.77		0.81	
Improvement in ability to put on shoes and socks			0.74			0.75
Improvement in ability to cut toenails			0.74			0.81
Improvement in psychological well-being			0.63	0.60		

* Based on the Hospital for Special Surgery Hip Surgery Expectations Survey

§ Expectation of employment for monetary reimbursement was excluded from the EFA analysis.

** Each factor represents the aggregation of items based on their common variance and the numbers displayed under each factor for a particular item are loading of that item