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Effect of marital status on patient-reported outcomes following total hip arthroplasty: a matched analysis with minimum 2-year follow-up

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Abstract

Introduction: Mental health and patient expectation have been identified as key predictors of recovery following THA; however, there is limited literature examining the effects of social support and marital status on patient-reported outcomes (PROs).

Methods: Data were prospectively collected and retrospectively reviewed for patients who underwent THA between July 2008 and January 2016. Patients were included if they underwent primary THA during this period and if they had documented preoperative marital status of married, divorced, or never married. Married patients were group matched to non-married patients (divorced or never married) with similar sex, age, body mass index (BMI), gender distribution, and frequency of surgical approach.

Results: There were 414 married patients and 98 non-married patients who were eligible and had minimum 2-year follow-up. Mean PROs were significantly worse in the non-married group than the married group for the following measures: modified Harris Hip Score ($p = 0.002$), Harris Hip Score ($p = 0.002$), Forgotten Joint Score ($p = 0.04$), and the physical portions of the Veterans RAND ($p = 0.025$) and Short Form ($p = 0.02$) surveys.

Conclusions: Our study demonstrated inferior absolute PRO scores at latest follow-up for patients who were non-married compared to married following THA. These results show that while total hip replacement may still yield clinical benefit in all patients, non-married patients may ultimately achieve an inferior functional status, and expectations should be adjusted accordingly. Physicians should assess levels of psychosocial support in their patients prior to undergoing hip arthroplasty in order to optimise results.

Keywords

Marital status, mental health, patient reported outcomes, social network, total hip arthroplasty

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Introduction

Hip osteoarthritis (OA) is a multifactorial degenerative condition that causes pain, stiffness, and difficulty with activities of daily living. Recent population-based studies estimate the prevalence of hip OA as approximately 5% within the 40- to 75-year-old age group.[1,2] Total hip arthroplasty (THA) has been 1 of the most successful surgeries in orthopaedics since its popularisation in the late 1960s. Both operative characteristics, including surgical technique and implant features, and patient characteristics, including education level and social support, can influence short- and long-term outcomes following THA.[3,4] Social support following surgery manifests in numerous ways, including having someone to discuss concerns, reinforce decisions, and provide a

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source of comfort during stressful times. In addition, most THA patients return home following surgery; therefore, having support during the transition from the hospital to daily life is paramount. A spouse can theoretically provide a comprehensive support system and thus the effects of marriage on THA outcomes warrants further investigation.

In patient-reported outcome (PRO) studies following THA, prior reports have indicated preoperative functional status, medical co-morbidities, and patient expectations as predictors of postoperative functional outcomes.[5–7] Similarly, married patients and those with a higher education level have better functional outcomes than patients who are unmarried or with low education levels.[8–11] This has been attributed to better social support, coping skills, and improved ability to process and apply medical information. As a measure of health-related quality of life and physical functioning, most prior studies utilise the Western Ontario and McMasters Universities Osteoarthritis Index (WOMAC) and apply logistic regression to account for potential confounders as they investigate associations between clinical outcomes and variables of social network such as marital status.[5,8,12]

Purpose/hypothesis

The purpose of this study was to evaluate whether marital status for patients undergoing THA affects prospectively collected PROs. Our null hypothesis was that patients who are married undergoing THA would have improved postoperative PRO scores compared to non-married patients.

Methods

Prospective data collection extended through the study period of July 2008 and January 2016. Patients included underwent primary THA by the senior author (BGD) and had documented preoperative marital status of married, divorced, or never married. At a minimum of 2 years following surgery, outcomes data were collected through questionnaires distributed during office visits or over telephone. Complete follow-up included collection of the following patient-reported outcome measures (PROMs): Harris Hip Score (HHS), modified Harris Hip Score (mHHS), Forgotten Joint Score (FJS), physical and mental portions of the Veterans RAND (VR-12 Physical and VR-12 Mental) and physical and mental portions of the Short Form surveys (SF-12 Physical and SF-12 Mental), in addition to a 0–10 visual analogue scale (VAS) for pain and patient satisfaction on a 0–10 scale. Patients were excluded if they were widowed or underwent concomitant gluteus medius repair.

Married patients were group matched to non-married patients (divorced or never married) with respect to sex, age within 5 years, workers compensation status, body mass index (BMI) within 5 kg/m^2, and frequency of surgical approach (anterior or posterior). Both divorced and never-married patients comprised the non-married group since prior analysis showed no statistically significant difference in PROs, VAS, or patient satisfaction between the divorced and never-married cohort. All patients participated in the American Hip Institute Total Hip Arthroplasty Registry. While the present study represents a unique analysis, data on some patients in this study may have been reported in other studies. All data collection received Institutional Review Board approval.

Surgical technique

THA was indicated in patients with advanced osteoarthritis causing significant pain and disability in activities of daily living. All patients attempted and failed 3 months of nonoperative management including activity modification, non-steroidal anti-inflammatory drugs, intra-articular steroid injection, if indicated, and physical therapy. After administration of general anaesthesia and intravenous tranexamic acid (10 mg/kg), each patient was prepared and draped in a sterile manner. The hip joint was accessed using either the direct anterior or mini-posterior approach, as previously described.[13,14,15]

Postoperative rehabilitation

After discharge, patients were given prescriptions for 7.5/325 mg hydrocodone-acetaminophen and began 2 weeks of home physical therapy and nursing care. Patients were evaluated postoperatively at the following time points: 2 weeks, 3 months, and annually thereafter.

Statistical analysis

Data were analysed using Microsoft Excel (Microsoft; Redmond, WA, USA) with the Real Statistics Resource Pack add-in. Categorical variables were compared by Pearson's chi-squared test. The *F*-test was applied to all distributions of continuous variables and the Shapiro-Wilk test was used to assess normality. Based on these results, the study groups were compared using the Mann-Whitney U-test. Given the high volume of THA patients in our registry, a 4:1 (married: non-married) ratio was utilised in this analysis. An *a priori* power analysis found that a sample size of 274 married patients and 69 non-married patients would be necessary to detect a difference in HHS between groups, using a standard deviation of 10, at 90% power. The threshold for significance was set at 0.05.

Additionally, the standardised mean difference (SMD) was calculated to approximate the clinical significance of PRO differences between the married and non-married group. The SMD was calculated in the method described by Cohen,[16] using the pooled standard deviation of the married and non-married groups. The effect sizes were then compared to the threshold literature values of weak, SMD between 0.2 and 0.49; moderate, SMD between 0.5 and 0.79; large, SMD $\geqslant$0.8.[16]

Table 1. Patient demographics.

	Married	Non-married	*p*-value
Patients included in study	414	98	
Sex			0.070
Male	201 (48.6%)	61 (62.2%)	
Female	213 (51.4%)	37 (37.8%)	
Laterality			
Left	183 (44.2%)	60 (61.2%)	
Right	281 (55.8%)	38 (38.8%)	
Age at surgery (years, mean, SD, range)	58.2 ± 8.9 (34.9–90.5)	57.4 ± 10.7 (25.6–79.9)	0.690
BMI (kg/m^2, mean, SD, range)	29.3 ± 5.4 (15.4–51.6)	30.3 ± 6.7 (18.9–55.3)	0.148
Follow-up time (months, mean, SD, range)	42.3 ± 17.1 (24.0–96.6)	46.7 ± 23.2 (24.0–116.4)	0.496
Approach			0.356
Anterior	250 (60.8%)	54 (55.1%)	
Posterior	161 (39.2%)	44 (44.9%)	

SD, standard deviation.

Table 2. Patient-reported outcomes.

	Married	Non-married	*p*-value	SMD
Follow-up Outcomes				
mHHS	89.5 ± 15.1	84.8 ± 16.7	**0.002**	0.297
HHS	89.5 ± 13.8	85.1 ± 15.2	**0.002**	0.297
FJS	77.0 ± 27.1	74.2 ± 24.4	**0.043**	0.106
VR-12 Physical	50.8 ± 8.6	48.5 ± 9.6	**0.025**	0.252
VR-12 Mental	60.0 ± 6.9	59.5 ± 7.2	0.430	0.068
SF-12 Physical	49.4 ± 9.1	46.7 ± 10.5	**0.020**	0.272
SF-12 Mental	55.8 ± 6.5	56.5 ± 5.7	0.380	–0.230
VAS	1.1 ± 1.9	1.4 ± 2.2	0.114	–0.184
Patient Satisfaction	8.9 ± 2.0	8.7 ± 2.1	0.439	0.092

SMD, standardised mean difference

Results

There were 414 married patients and 98 non-married patients who were eligible for inclusion and had minimum 2-year follow-up. The married cohort was successfully group matched to the non-married cohort. As shown in Table 1, there was no significant difference between groups in age ($p = 0.69$), sex ($p = 0.070$), BMI ($p = 0.15$), or surgical approach ($p = 0.36$). The mean age was 58.2 and 57.4 years old, and mean BMI was 29.3 kg/m^2 and 30.3 kg/m^2 for the married and non-married groups, respectively. Most of the procedures were performed through the direct anterior approach: 60.8% in the married group and 55.1% in the non-married group. Mean follow-up time was 42.3 months (married) and 46.7 months (non-married).

At latest follow-up, mean PROs were significantly worse in the non-married group than the married group for the following measures: modified Harris Hip Score ($p = 0.002$), Harris Hip Score ($p = 0.002$), Forgotten Joint Score ($p = 0.04$), and the physical portions of the Veterans RAND ($p = 0.025$) and Short Form ($p = 0.02$) surveys (Table 2). There was no significant difference in mean patient satisfaction, which was 8.9/10 for the married group and 8.7/10 for the non-married group (P = 0.44). The SMD for mHHS, HHS, and FJS was 0.297, 0.297, and 0.106, respectively. Outcomes data are illustrated in Table 2, Figures 1 and 2.

Discussion

In the present study, we compared latest follow-up PROs between patients who were married and those non-married prior to THA. We group matched patients according to their preoperative marital status (married:non-married). Between the 2groups, differences in demographics such as patient sex, age, workers compensation status, and BMI were not statistically significant. Additionally, neither follow-up time nor the surgical approach, anterior or posterior, differed statistically between the 2 groups. Results of this study reveal married patients have statistically significant higher latest follow-up PROs such as mHHS, HHS, FJS, VR-12 Physical, and SF-12 Physical compared to non-married patients when undergoing THA. However, the effect size of marital status in the present study was weak (SMD between 0.2 and 0.49) with regard to these PROs.

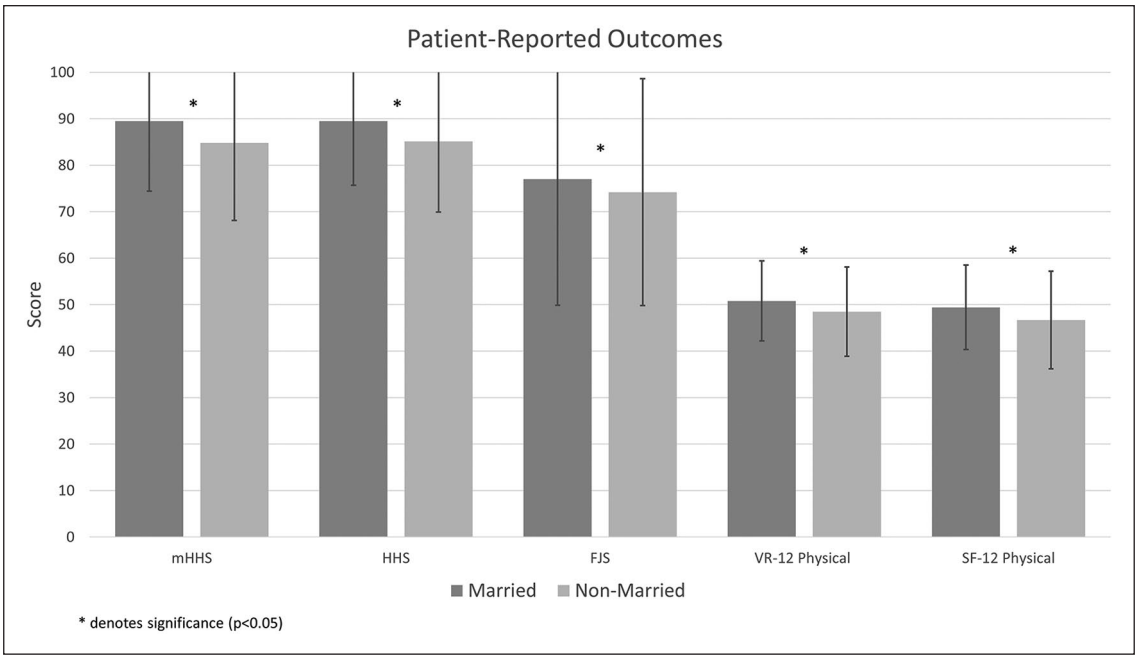

Figure 1. Compares patient-reported outcomes (PROs) between the married and non-married cohorts.

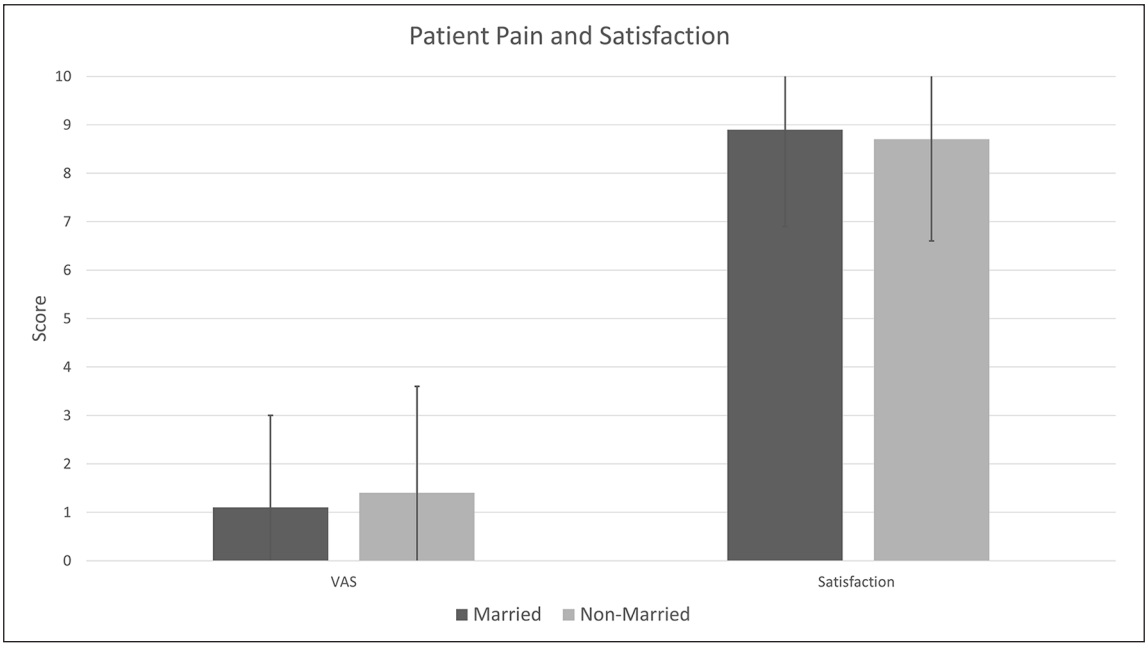

Figure 2. Compares pain and satisfaction between the married and non-married cohorts.

Many modifiable surgical factors affect outcomes following hip arthroplasty including surgeon experience, surgical technique, and implant positioning. These factors are influenced by level of surgeon training and experience.[17–20] Newer techniques such as robotic-arm assisted THA have been designed to further optimise implant positioning, as well as improve PROs and longevity of arthroplasty.[21–23] Despite the weak effect size of marital status found in the present study, literature does support the notion that demographic (age, gender, marital status),[24–26] socioeconomic (education level, income),[27,28] and psychosocial (mental health, surgical expectations) [29,30] can influence outcomes following arthroplasty. Of these patient related factors, mental health and patient expectation have been identified as key predictors of recovery following THA.[24,31] Certified medical health support staff such as caretakers, nurses, and

home physical therapists can facilitate the short-term recovery process for patients. We believe the emotional support a spouse can provide following the initial recovery period can affect 2-year outcomes following THA.

Decreasing levels of depression and anxiety, which may be elevated preoperatively due to apprehension about the impending operation, have previously been shown to influence health-related quality of life (HRQoL) outcomes.[24] Additionally, self-reported mental disorders have been linked to inferior outcomes following hip arthroscopy.[32] Thus, measures aimed at identifying depression, anxiety and levels of social support pre-operatively are important. The obvious question that arises from the previous statement is, what constitutes social support?

There has been more extensive work in regards to the concept of social support within the cardiac surgery literature by development of the ENRICHED Social Support Instrument (ESSI).[33] However, this tool has been extensively studied primarily in the cardiac surgical patient population, and thus the question to what constitutes social support in patients undergoing THA still remains to be answered. A study by Fitzgerald et al.[34] of individuals undergoing THA found that having greater social support resulted in better post-operative functional outcomes at 1 year. However, in this study, social support constituted a binary definition of high or low. High level of support was assigned to patients who were either married OR living with someone. Low level of social support was assigned to patients that were both not married AND living alone. Thus, it is difficult to determine which factor, having a roommate or marital status, in either group played a greater role in outcomes measurements. In addition, in a study by Greenfield et al.,[31] married patients reported better functional outcomes 1 year after THA compared to unmarried patients. Their study specifically looked at co-existent disease and its effect on postoperative complications and functional status. Without a group matched control analysis, it is difficult to control for confounding variables such as marital status, education, gender, or BMI. Schäfer et al.[9] determined the effect of marital status on "response to surgery," defined as delta change in global WOMAC score of $\geqslant$20 points at 6 months postoperatively compared to preoperative scores, in patients undergoing THA. The authors found a higher risk of "non-response" in widowed patients.[9] Lastly, Wu et al.[3] found emotional support was correlated to higher self-efficacy for functional ability (SEFA) 3 months following THA. However, both of these studies report short-term follow-up of 6 months and 3 months, respectively, making the results less generalisable.

Broadly speaking, social support includes any person or contact available to the patient undergoing THA during the peri-operative time period. Having someone to hear comments, discuss goals, and provide positivity can theoretically improve overall patient well-being during the vulnerable moments following total joint replacement surgery. We hypothesised married patients undergoing THA would demonstrate improved postoperative PRO scores compared to non-married patients. Results of this study show married patients have statistically significant higher PROs, including mHHS, HHS, FJS, VR-12 Physical, and SF-12 Physical scores compared to non-married patients undergoing THA at latest follow-up. Additionally, married patients were statistically more likely to achieve PASS ($p = 0.004$) and SCB ($p = 0.005$) in regard to mHHS. These results are especially important in the modern age of large joint replacement that has started to transition from the inpatient to outpatient setting. As the demand for joint replacements grows, it is imperative to improve patient safety and satisfaction while minimising costs and optimising the use of health-care resources.[35] Clinicians have developed accelerated multidisciplinary pathways in order to optimise the patient experience.[36–38] Preoperative patient education and assessment of social support has been deemed critical for proper patient selection of those able to recover away from traditional inpatient or rehabilitation settings.[39] Being married prior to undergoing THA may provide a larger overall social network with streamlined avenues for enhanced guidance as well as improved physical and emotional support. Results of this study build upon those of previous studies by demonstrating the positive effect of social support on minimum 2-year patient-reported outcomes following THA.

Strengths

The strengths of our study include being 1 of the first to compare married to non-married patients who underwent hip arthroplasty with minimum 2-year follow-up. The study has a group matched control design with sufficient statistical power using prospectively collected data in a cohort comparison. Neither group differed significantly in follow-up time nor surgical approach. This study used 7 different PRO tools to assess patient outcomes, addressing the psychometric evidence that no single PRO is adequate in hip arthroplasty.[40] Additionally, all procedures were completed by a single surgeon, thereby minimising variability in results.

Limitations

There are several limitations of this study. Weaknesses of the study include limited sample size and short-term follow-up. We expect true hip dysfunction to become evident after many years and to be possibly accelerated by non-married status. Future studies should focus on longer-term follow-up and larger cohorts. Additionally, we did not stratify based on non-married patient subcategories such as widowed, divorced, or never married. However, PROs of these subcategories were independently compared to

each other and no statistical differences were obtained. Grouping of the non-married patient subcategories was done in part to maintain sample size and find a difference in married versus non-married status. The group matched study design helps control for confounding variables like age, sex, and BMI. Lastly, while patients were matched on BMI, age, surgical approach, sex and laterality, other factors such as preoperative medical comorbidities were not addressed in this analysis. Future studies should utilise medical comorbidity indices limiting potential confounding variables from a matched control study.

Conclusion

Our study demonstrated inferior absolute PRO scores at latest follow-up for patients who were non-married compared to married. The 2 groups were group matched (married:non-married) with respect to patient sex, age within 5 years, workers compensation status, and BMI within 5 kg/m^2. The married group was statistically more likely to achieve PASS ($p = 0.004$) and SCB ($p = 0.005$) in regard to mHHS outcome measure. These results show that while total hip replacement may still yield clinical benefit in all patients, non-married patients may ultimately achieve an inferior functional status, and expectations should be adjusted accordingly. Physicians should assess levels of psychosocial support in their patients prior to undergoing hip arthroplasty in order to optimise results.

Declaration of conflicting interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: BGD: is a board member for American Orthopedic Foundation, American Hip Foundation, AANA Learning Center Committee, Hinsdale Hospital Foundation, and Arthroscopy Journal; Consulting Fees from Adventist Hinsdale Hospital, Amplitude, Arthrex, MAKO, Medacta, Pacira Pharmaceuticals, and Stryker; Educational funding from Arthrex, Breg, and Medwest; Food and Beverage from Arthrex, Ceterix Orthopaedics, DePuy Syntheses Sales, DJO Global, FUJIFILM SonoSite, Linvatec, MAKO Surgical Corporation, Medacta, Pacira Pharmaceuticals, Stryker, and Zimmer Biomet Holdings; Ownership Interests in Hinsdale Orthopedic Associates, American Hip Institute, SCD#3, North Shore Surgical Suites, Munster Specialty Surgery Center; Research support from Arthrex, ATI, Kaufman Foundation, Medacta, Pacira Pharmaceuticals, and Stryker; Royalties from Arthrex, DJO Global, MAKO Surgical Corporation, Stryker, and Orthomerica; Speaking fees from Arthrex and Pacira Pharmaceuticals; Travel and lodging from Arthrex, Medacta, and Stryker.
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