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The Effect of Body Mass Index Class on Patient-Reported Health-Related Quality of Life Before and After Total Hip Arthroplasty for Osteoarthritis

Registry-Based Cohort Study of 64,055 Patients

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Background: Overweight status and obesity represent a global epidemic, with serious consequences at the individual and community levels. The number of total hip arthroplasties (THAs) among overweight and obese patients is expected to rise. Increasing body mass index (BMI) has been associated with a higher risk of mortality and reoperation and lower implant survival. The evaluation of perioperative health-related quality of life (HRQoL) has recently gained importance because of its direct relation to, and impact on, patients' physical, mental, and social well-being as well as health-service utilization. We sought to evaluate the influence of BMI class on HRQoL preoperatively and at 1 year following THA in a register-based cohort study.

Methods: This observational cohort study was designed and conducted on the basis of registry data derived from the Swedish Hip Arthroplasty Register (SHAR) and included 64,055 primary THAs registered between January 1, 2008, and December 31, 2015. Patients' baseline preoperative and 1-year postoperative EuroQol-5 Dimension-3 Level (EQ-5D-3L) responses were documented by the treating department and reported to the SHAR through the patient-reported outcome measures program. The EQ-5D-3L includes a visual analogue scale (EQ VAS), which measures the patient's overall health status.

Results: At 1 year of follow-up, all BMI classes showed significant and clinically relevant improvements in all HRQoL measures compared with preoperative assessment ($p < 0.05$). Patients reported improved perception of current overall health status for the EQ VAS. Underweight, overweight, and all obesity classes showed increasingly worse 1-year HRQoL compared with normal weight, both with unadjusted and adjusted calculations.

Conclusions: In this study, we found that all BMI classes had significant improvement in HRQoL at 1 year following THA. Patients who were underweight, overweight, or obese (classes I to III), compared with those of normal weight, reported worse hip pain and EQ-5D-3L and EQ VAS responses prior to THA and at 1 year postoperatively. These results can assist both health-care providers and patients in establishing reasonable expectations about THA outcomes.

Level of Evidence: Prognostic Level III. See Instructions for Authors for a complete description of levels of evidence.

Overweight status and obesity represent a global epidemic, with serious consequences at the individual and community levels. The prevalence is on the rise, especially in the Western world. According to a 2017 report by the Organization for Economic Cooperation and Development, the mean prevalence of obesity (a body mass index [BMI] of ≥30 kg/m^2) among adults was 19.5% and ranged from <6% in Japan, to nearly 15% in Sweden, to >35% in the U.S.[1]. The World Health Organization (WHO) considers obesity a chronic, progressive disease[2]. Apart from increased mortality, obesity is associated with a long list of health issues, such as cardiovascular and cerebrovascular incidents, type-2 diabetes mellitus,

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hyperlipidemia, fatty liver diseases, certain types of cancer, and respiratory and joint diseases[3]. Furthermore, individuals who are obese have a higher incidence of unemployment and a higher dependence on disability benefits and retire earlier than those of normal weight[4]. At the same time, the number of total hip arthroplasty (THA) procedures as a successful treatment for osteoarthritis of the hip has dramatically increased over recent decades. The number of THAs among overweight and obese patients is expected to rise. Several studies have investigated the influence of BMI, as a reference for body weight, on postoperative functional outcome (both patient-reported and surgeon-reported) and complication rates, finding that increasing BMI has a negative effect on these parameters[5]. For instance, increasing BMI was associated with a higher risk of mortality and reoperation and lower implant survival[6]. However, the evaluation of perioperative health-related quality of life (HRQoL) among these patients has recently gained importance because of its direct relation to, and impact on, patients' physical, mental, and social well-being as well as health-service utilization. The latter may also reflect the cost-effectiveness of the applied treatment, giving a value-based model for resource distribution.

Generally, there are 2 main types of HRQoL measures: generic and disease-specific[7]. Generic measures, such as the Short Form (SF)-36 and the EuroQol-5 Dimension (EQ-5D), are preference-based and can be used to assess broad aspects of HRQoL, detect general health disadvantages or benefits of treatment, and compare various interventions across health conditions. Disease-specific measures, such as the Oxford Hip Score (OHS) and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), are designed to assess functional outcome in relation to joint disease and may be more sensitive to changes than the generic measures. In their meta-analysis of cohort studies, Pozzobon et al. found that preoperative obesity was associated with worse clinical outcomes of hip or knee arthroplasty with respect to pain and disability when mostly evaluated by disease-specific measures[8]. However, no impact on participation in physical activity was observed. They also concluded that the methodological quality of the included 30 studies was generally poor, mainly because of a lack of controlling for the confounding factors of age, sex, and BMI and of the use of a representative sample. Moreover, they found great variability of follow-up duration across studies, ranging from 2 weeks to 11 years. Only 1 study in this meta-analysis used a generic measure (SF-36), while none of the studies used the EQ-5D[9].

The purpose of the current registry-based cohort study was to investigate the influence of BMI class on HRQoL preoperatively and 1 year after THA.

Materials and Methods

Study Design and Setting

This observational cohort study was designed and conducted on the basis of data derived from the Swedish Hip Arthroplasty Register (SHAR) and followed the STROBE (Strengthening The Reporting of OBservational studies in Epidemiology) guidelines[10]. The SHAR was launched in 1979 to prospectively evaluate implant survival, fixation methods, and surgical techniques of THAs performed in Sweden. The SHAR includes data from all publicly and privately funded hospitals. The completeness of registration for primary THAs is between 97% and 99%. In Sweden, a patient's unique personal identity number provides information on date of birth and allows linkage between national registries. Participating hospitals record variables such as implant serial number, type of fixation, and surgical approach for each surgical procedure[11]. Since 2008, ASA (American Society of Anesthesiologists) physical status classification has been recorded in the registry, and weight and height are also recorded, allowing for the calculation of BMI.

The study was approved by the Regional Ethical Review Board in Gothenburg, Sweden.

Patient Selection

The inclusion criteria were patients with primary osteoarthritis who were treated surgically with THA using uncemented, cemented, hybrid, or reverse hybrid fixation, between January 1, 2008, and December 31, 2015. Resurfacing THAs were excluded. In patients with bilateral THA during the study period, only the first THA was included. Patients who were missing documentation of BMI or ASA class were excluded.

BMI was classified according to the WHO classification, as follows: <18.5 kg/m^2 = underweight, 18.5 to 24.9 kg/m^2 = normal weight, 25 to 29.9 kg/m^2 = overweight, 30 to 34.9 kg/m^2 = class-I obesity, 35.0 to 39.9 kg/m^2 = class-II obesity, and ≥40 kg/m^2 = class-III obesity.

Outcome Measures

Patients' baseline preoperative and 1-year postoperative EQ-5D-3-Level (EQ-5D-3L) responses were documented by the treating department and reported to the SHAR through the patient-reported outcome measures (PROMs) program[11]. The EQ-5D-3L is a self-assessment questionnaire and includes a visual analogue scale (EQ VAS). The EQ-5D-3L questionnaire assesses 5 HRQoL dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) by grading each dimension according to 1 of 3 severity levels (no problems, moderate problems, or extreme problems). The combination generates 243 possible scores. We used the U.K. time trade-off (TTO) value set to calculate the EQ-5D-3L index, ranging from –0.594 to 1, where 1 represents the best possible health state and 0 represents death. Scores of <0 represent health states worse than death[12]. The EQ VAS records the patient's perception of current overall health status, ranging from 0 (worst imaginable health state) to 100 (best imaginable health state). The PROM questionnaire also contains a Likert scale for hip pain (1 = no pain, 2 = very mild, 3 = mild, 4 = moderate, and 5 = severe pain), and, at the time of follow-up, a Likert scale addressing satisfaction with the surgical outcome (1 = very dissatisfied, 2 = dissatisfied, 3 = neither satisfied or dissatisfied, 4 = satisfied, and 5 = very satisfied). Data on the patient-reported Charnley comorbidity classification, divided into 3 classes (1 hip involved, 2 hips involved, and other severe comorbidities), were also retrieved from the PROMs program.

Confounders

Before the study start, we decided to include the following confounders; age, sex, type of fixation, ASA class, and surgical approach. These variables previously demonstrated an association with both exposure and outcome and are not considered to be in the causal pathway between potential risk factors and outcome[13].

Statistical Analysis

Descriptive statistics were used to document BMI classes, patient characteristics, and HRQoL outcomes. Means and standard deviations were calculated for continuous variables and frequency distributions, for categorical variables. Simple and linear-regression analyses were used to assess the association between BMI and the EQ-5D-3L index score and EQ VAS at 1 year of follow-up, calculating unadjusted and adjusted estimates. The adjustment was done, as determined a priori, for age, sex, ASA class, preoperative HRQoL, and Charnley classification. These variables previously demonstrated an association with both exposure and outcome and are not considered to be in the causal pathway between potential risk factors and outcome. R (version 3.4.4; R Foundation for Statistical Computing) was used to perform all analyses.

Results

We identified 127,663 primary THAs that were registered between January 1, 2008, and December 31, 2015, in the SHAR. Resurfacing THAs, the second hip procedure performed in bilateral THAs, patients with secondary osteoarthritis, and those with missing data were excluded, leaving 64,055 patients (mean age, 69 years; 57% female) for analysis (Fig. 1). The majority of patients were classified as normal weight (31%) or overweight (44%). Overall, age at the time of surgery decreased and ASA class increased with increasing BMI class. The most commonly used fixation technique was cemented, and a posterior surgical approach was used in nearly half of the procedures (Table I).

Preoperatively, the majority of patients had moderate problems with mobility, no problems with self-care, no or moderate problems with usual activities, moderate to extreme pain/discomfort, and no to moderate anxiety/depression. Regarding patients' perception of their current overall health status using the EQ VAS, on average, a score of slightly greater than 50 was recorded. Compared with patients of normal weight, patients classified as overweight through class-III obese had increasingly worse preoperative HRQoL, according to both unadjusted and adjusted calculations. HRQoL for underweight patients was also worse than that of patients of normal weight and was comparable to the class-I obesity group (Table II).

Postoperatively, HRQoL was worse for the underweight group than for the normal-weight group, and was increasingly worse as BMI class increased from overweight through class-III obesity as demonstrated in both unadjusted and adjusted calculations (Table III).

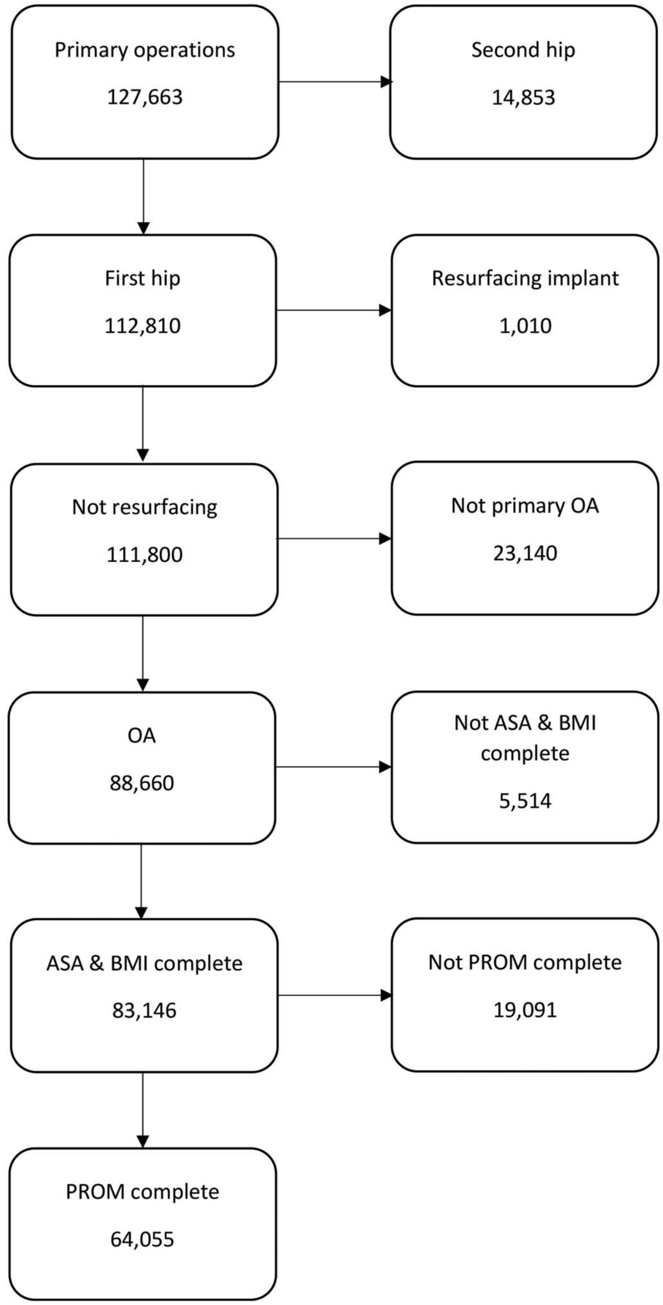

Fig. 1

Flowchart of study patients. OA = osteoarthritis.

At 1 year of follow-up, all BMI classes showed significant ($p < 0.05$) and clinically relevant improvements in all HRQoL measures compared with preoperative assessment (Table IV; see Appendix). Patients reported improved perception of current overall health status of 68 to 78 for the EQ VAS.

Discussion

This registry-based cohort study demonstrates the negative effect of increasing BMI class on preoperative and 1-year HRQoL, whereby patients who were overweight and in obesity

TABLE I Patient Demographics and Preoperative Hip Pain and HRQoL

	Underweight	Normal Weight	Overweight	Class-I Obese	Class-II Obese	Class-III Obese
No.	395	19,892	28,221	12,036	2,899	612
Age* *(yr)*	73.05	70.41	68.88	67.35	65.78	64.23
Sex, female *(%)*	90.4	65.1	50.5	54.5	62.2	69.4
ASA *(%)*						
I	24.1	32.6	26.2	16.3	6.8	6.7
II	57.7	56.5	61.8	65.2	58.6	45.9
III	16.7	10.7	11.7	18.1	34.0	46.1
IV/V	1.5	0.2	0.3	0.4	0.6	1.3
Fixation *(%)*						
All cemented	79.7	70.9	68.0	67.3	65.6	64.1
All uncemented	8.9	14.7	17.0	17.7	19.2	22.1
Hybrid	3.5	2.3	1.9	1.8	1.8	2.1
Reversed hybrids	7.8	12.1	13.1	13.2	13.3	11.8
Surgical approach *(%)*						
Posterior	48.1	50.6	52.5	54.0	53.7	55.2
Direct lateral	43.3	42.6	41.7	41.0	41.8	41.7
Other	8.6	6.8	5.8	5.1	4.6	3.1
PROMs preoperatively						
Hip pain*	3.6	3.5	3.5	3.6	3.8	3.8
EQ-5D-3L mobility *(%)*						
No problems	7.1	9.2	8.0	6.2	3.9	5.7
Moderate problems	92.2	90.6	91.8	93.5	95.6	93.3
Extreme problems	0.8	0.2	0.2	0.3	0.5	1.0
EQ-5D-3L self-care *(%)*						
No problems	77.5	81.7	78.9	73.7	67.9	62.4
Moderate problems	21.0	17.6	20.4	25.3	30.8	35.9
Extreme problems	1.5	0.7	0.8	1.0	1.4	1.6
EQ-5D-3L usual activities *(%)*						
No problems	41.5	43.6	40.4	34.7	29.5	25.3
Moderate problems	48.9	48.6	50.5	53.9	55.2	54.4
Extreme problems	9.6	7.8	9.1	11.4	15.3	20.3
EQ-5D-3L pain/discomfort *(%)*						
No problems	2.0	1.6	1.5	1.4	1.4	1.3
Moderate problems	53.2	60.4	59.3	52.2	43.2	37.9
Extreme problems	44.8	38.0	39.1	46.4	55.4	60.8
EQ-5D-3L anxiety/depression *(%)*						
No problems	42.8	58.7	60.8	57.3	53.7	49.5
Moderate problems	52.9	38.1	36.3	39.4	41.6	45.6
Extreme problems	4.3	3.3	2.9	3.2	4.7	4.9
EQ-5D-3L index*	0.39	0.45	0.44	0.38	0.32	0.27
EQ VAS*	54.6	57.3	57.1	53.7	50.8	49.1

*The values are given as the mean.

classes I to III showed worse results compared with normal-weight patients, as did those who were underweight compared with those of normal weight. However, all BMI classes showed significant and clinically relevant improvements in all HRQoL parameters at the 1-year follow-up compared with preoperatively.

TABLE II Effect of BMI Class on Preoperative Hip Pain and HRQoL*

	Unadjusted		Adjusted†	
	Estimate	95% CI	Estimate	95% CI
Hip pain				
Underweight	0.11	0.034, 0.19	0.052	−0.025, 0.13
Normal weight				
Overweight	0.036	0.021, 0.050	0.064	0.049, 0.078
Class-I obesity	0.15	0.13, 0.16	0.15	0.13, 0.17
Class-II obesity	0.28	0.25, 0.31	0.26	0.23, 0.29
Class-III obesity	0.32	0.26, 0.39	0.28	0.22, 0.34
EQ-5D-3L index				
Underweight	−0.060	−0.090, −0.029	−0.038	−0.068, −0.0074
Normal weight				
Overweight	−0.010	−0.016, −0.0049	−0.018	−0.023, −0.012
Class-I obesity	−0.062	−0.069, −0.055	−0.060	−0.066, −0.053
Class-II obesity	−0.13	−0.14, −0.12	−0.11	−0.13, −0.10
Class-III obesity	−0.17	−0.20, −0.15	−0.15	−0.17, −0.13
EQ VAS				
Underweight	−2.7	−4.9, −0.54	−1.2	−3.3, 0.99
Normal weight				
Overweight	−0.19	−0.60, 0.20	−0.68	−1.1, −0.28
Class-I obesity	−3.6	−4.1, −3.1	−3.3	−3.8, −2.9
Class-II obesity	−6.5	−7.4, −5.7	−5.3	−6.1, −4.4
Class-III obesity	−8.2	−10, −6.5	−6.5	−8.3, −4.8

*CI = confidence interval. †Adjusted for age, sex, ASA class, and preoperative Charnley class.

The influence of BMI on HRQoL in general has gained importance during recent decades, and many reports have discussed the physical and mental consequences of weight gain and its different treatment methods. While increasing BMI seemed to mainly worsen the physical domain of HRQoL scores such as the physical component summary (PCS) score of the SF-36 in a dose-dependent manner, the mental component summary (MCS) score was only reduced in class-III obesity[14]. However, reviews based on randomized trials demonstrated inconsistent associations between weight loss and improved HRQoL, especially among patients who underwent dietary, medical, and lifestyle treatments compared with bariatric surgery[15].

The underlying mechanisms of how BMI influences HRQoL are still unclear. Obesity might be associated with chronic inflammatory and autoimmune reactions, whereby increased adipose tissue can serve as an endocrine organ of adipocytes, fibroblasts, endothelial cells, and immune cells such as mast cells, neutrophils, eosinophils, adipose tissue macrophages, and B and T cells[16-19]. The growth of adipocytes might be accompanied by relative adipocyte hypoxia and stress and increased expression of chemoattractant and cytokine-like biologically active hormones such as adipokines. These local changes promote the infiltration of inflammatory cells and contribute to obesity-associated, chronic, low-grade inflammation[20,21]. There is growing evidence of an association between this low-grade inflammation and negatively affected HRQoL, especially self-rated physical health scores[22].

In the present study, we found an inverse correlation between BMI class and age, EQ-5D-3L index, and EQ VAS preoperatively, except for underweight patients, who showed results comparable with those of class-I obesity (Table I). These interesting correlations concur with the findings of other studies. Changulani et al. found that morbidly obese patients were 10 years younger, on average, at the time of surgery than those with a normal BMI[23]. In addition, Haynes et al. reviewed the literature to find that obesity was associated with lower age at the time of THA[24]. However, Okifuji and Hare reported the results of several clinical and experimental studies and demonstrated the direct relation between increasing BMI class and chronic pain and increased analgesic consumption, especially in younger patients[25]. Possible explanations for these observations include increased pain sensitivity with a lower pain threshold, high-level forces on the joint surface, and the lower physical activity of obese patients. The lower EQ-5D-3L index and EQ VAS among underweight patients compared with normal-weight and overweight patients can be difficult to explain. Lower body fatty tissue and nutritional status and muscle and bone mass, and worse socioeconomic status, might all be contributing factors.

TABLE III Effect of BMI Class on 1-Year Postoperative Pain and HRQoL*

	Unadjusted		Adjusted†	
	Estimate	95% CI	Estimate	95% CI
Hip pain				
Underweight	0.063	−0.046, 0.17	0.028	−0.044, 0.10
Normal weight				
Overweight	0.041	0.047, 0.087	0.041	0.028, 0.054
Class-I obesity	0.099	0.14, 0.19	0.083	0.066, 0.10
Class-II obesity	0.13	0.16, 0.24	0.093	0.065, 0.12
Class-III obesity	0.12	0.061, 0.18	0.085	0.026, 0.14
EQ-5D-3L index				
Underweight	−0.055	−0.078, −0.032	−0.032	−0.054, −0.010
Normal weight				
Overweight	−0.014	−0.018, −0.010	−0.017	−0.021, −0.013
Class-I obesity	−0.054	−0.059, −0.049	−0.048	−0.053, −0.043
Class-II obesity	−0.093	−0.10, −0.084	−0.075	−0.084, −0.066
Class-III obesity	−0.11	−0.13, −0.094	−0.095	−0.11, −0.077
EQ VAS				
Underweight	−4.8	−6.8, −2.8	−3.0	−4.8, −1.1
Normal weight				
Overweight	−1.17	−1.5, −0.80	−1.4	−1.7, −1.0
Class-I obesity	−4.4	−4.9, −3.9	−3.7	−4.2, −3.3
Class-II obesity	−8.0	−8.8, −7.3	−6.6	−7.3, −5.8
Class-III obesity	−10.5	−12.1, −8.9	−9.0	−10.5, −7.5
Satisfaction				
Underweight	−0.051	−0.14, 0.038	0.00066	−0.087, 0.089
Normal weight				
Overweight	−0.022	−0.038, −0.0059	−0.041	−0.058, −0.025
Class-I obesity	−0.062	−0.082, −0.042	−0.079	−0.099, −0.058
Class-II obesity	−0.068	−0.10, −0.033	−0.079	−0.11, −0.044
Class-III obesity	−0.037	−0.11, 0.034	−0.056	−0.13, 0.015

*CI = confidence interval. †Adjusted for age, sex, ASA class, and 1-year postoperative Charnley class as well as for the corresponding preoperative variable, with the exception of satisfaction, which was not evaluated preoperatively.

At the 1-year follow-up, all BMI classes showed statistical and clinical improvement in hip pain, the EQ-5D-3L index, and the EQ VAS (Tables I, III, and IV). The minimal clinically important differences (MCIDs) vary among these 3 parameters. For hip pain, an approximately 15% improvement is considered meaningful for the patient and reflects changes in a clinical intervention[26,27]. For the EQ-5D-3L index and EQ VAS, the MCID is debatable. For patients with chronic pain, the results suggest that an MCID of 0.10 for the EQ-5D-3L index and 10 for the EQ VAS are considered clinically important[28]. In our study, the improvement reported was substantially higher than these values. When evaluating the different BMI classes with normal weight as a reference, all classes reported worse HRQoL results. Several studies in the literature have examined the influence of BMI on the results of THA using different types of outcome scores and documented the incidence of postoperative complications. However, serious limitations in the design and conduct of those studies can be encountered, such as limited sample size with skewed distribution among the BMI groups, inadequate or a total absence of adjustment for confounders, and limited external validity. In addition, the majority of those studies have used disease-specific functional outcome scores. For instance, Chan and Villar[29] and McLaughlin and Lee[30] found no differences in Harris hip scores between nonobese and obese patients before and after THA. Similarly, Stickles et al.[31], Kessler and Käfer[32], Michalka et al.[33], and Andrew et al.[34] concluded that obese patients enjoy as much improvement and satisfaction as nonobese patients using the WOMAC and OHS, respectively. Also, Stevens et al. reported a low influence of overweight status/obesity on physical functioning and HRQoL but considerable impact on complications and comorbidity[35]. Similar to our results, McLawhorn et al. used the EQ-5D in a registry-based study of 2,733 patients and found that BMI class was independently associated with lower

TABLE IV Comparison of Preoperative and Postoperative Hip Pain and HRQoL According to BMI Class*

	Preop.		Postop.		Difference	
	Mean	SD	Mean	SD	Mean	SD
Hip pain						
Underweight	3.58	0.76	1.37	0.74	−2.21	1.01
Normal weight	3.47	0.81	1.31	0.68	−2.16	1.00
Overweight	3.51	0.78	1.35	0.73	−2.16	1.01
Class-I obesity	3.62	0.76	1.41	0.79	−2.21	1.03
Class-II obesity	3.75	0.75	1.44	0.82	−2.31	1.04
Class-III obesity	3.79	0.75	1.43	0.81	−2.37	1.06
EQ-5D-3L index						
Underweight	0.39	0.32	0.76	0.25	0.37	0.35
Normal weight	0.45	0.31	0.81	0.22	0.36	0.33
Overweight	0.44	0.31	0.80	0.23	0.36	0.34
Class-I obesity	0.38	0.31	0.76	0.25	0.37	0.36
Class-II obesity	0.32	0.32	0.72	0.27	0.40	0.37
Class-III obesity	0.27	0.31	0.70	0.28	0.42	0.36
EQ VAS						
Underweight	54.59	21.63	73.55	21.43	18.95	25.54
Normal weight	57.34	22.30	78.34	19.52	21.00	25.81
Overweight	57.14	21.95	77.17	19.52	20.03	25.52
Class-I obesity	53.71	22.07	73.94	20.63	20.23	26.55
Class-II obesity	50.80	22.97	70.28	21.59	19.48	28.10
Class-III obesity	49.09	23.39	67.87	23.07	18.78	28.55

*SD = standard deviation.

HRQoL scores 2 years after primary THA, and the absolute scores among obese patients were lower than among nonobese patients[36]. Other studies documented the negative impact of increasing BMI on the risk of postoperative complications such as infection, dislocation, revision, and mortality[6,24,37,38].

Our study had limitations. Despite the set of variables included in the SHAR, parameters such as smoking status, detailed data on comorbidities, nutritional status, radiographic classification of osteoarthritis, symptom duration, and the experience and volume of the individual surgeons were not available. Therefore, as with most registry-based studies, residual confounding can exist. Nevertheless, confounders were selected a priori and based on established relationships. The registry-based observational study design with the above-mentioned limitation restricts the possible conclusions and the ability to definitively draw conclusions about causality. However, with the current study, which was based on a national registry, we present relevant clinical data that are important for the surgeon in the risk-benefit analysis and preoperative counseling of patients. The methods for measuring BMI were variable and included estimates by health-care professionals, actual measurements at the preoperative assessment, and patient-reported values. The use of BMI as a surrogate measure for excess fat, while not distinguishing between the distributions of fat, muscle, and bone mass, is another limitation. Also to be mentioned are the multiple comparisons performed among the BMI classes, which might increase the risk of a type-1 error. In addition, the EQ-5D-3L questionnaire has ceiling and floor effects, which could mask some of the differences among patients with good or bad outcome[39]. A further limitation of the study is that we have only evaluated short-term outcomes at 12 months following surgery, and the long-term effect of BMI remains to be investigated.

Strengths of our study include the large, nationwide study group from a registry with prospectively collected data of high completeness and validity. The EQ-5D-3L questionnaire is well validated and yields a widely used preference-based score, which allows for comparison with the results of other studies and can be used in assessing the cost-effectiveness of a THA procedure. The benefit of using a general HRQoL measurement in the evaluation of THA is the possibility of evaluating other factors affecting, or being affected by, the change in hip function. For instance, there has been some evidence of the influence of anxiety and/or depression on mortality in patients following THA[40,41].

Conclusions

In this study, we found that all BMI classes had significant and clinically relevant improvements in HRQoL at 1 year following THA. Patients who were underweight, overweight, or obese (classes I to III), compared with those of normal weight, reported worse hip pain and EQ-5D-3L and EQ VAS responses prior to THA and at 1 year postoperatively. These results can assist both health-care providers and patients in establishing reasonable expectations about THA outcomes.

Appendix

eA Supporting material provided by the authors is posted with the online version of this article as a data supplement at jbjs.org (http://links.lww.com/JBJSOA/A241). ■

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