

Hip osteoarthritis surgical profiles and morbid obesity: a case series and literature review

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Abstract

Morbid obesity is a possible mediating or moderating factor in the natural history of disabling hip osteoarthritis, often classified as an age associated single disease entity with homogeneous inter-individual and disease characteristics. In this brief we examined the baseline characteristics of a sample of 1000 hip osteoarthritis surgical cases to examine how frequently one might expect to find morbidly obese patients among a severely disabled hip osteoarthritis cohort undergoing primary or secondary hip surgery. We specifically sought to establish the extent to which this subgroup exists and whether their health profiles were similar or different from underweight cases. As well, we reviewed selected cases 65 years and younger and prevailing literature to discern if morbid obesity is likely to increase the risk of adverse outcomes among this hip osteoarthritis subgroup. To this end, data from the available records of severely disabled hip osteoarthritis cases undergoing primary or secondary surgery as well as the literature were scrutinized. Results show: 1) Cases of end-stage hip osteoarthritis are more likely to be overweight than of normal weight, with an equally small number of underweight and morbidly obese cases; 2) In comparing the underweight and morbidly obese cases, most of the latter are likely to have higher rates of one or more metabolic and/or other chronic health conditions, and a higher percentage are likely to be hospitalized for secondary surgeries or complications; 3) The functional status of morbidly obese candidates, is quite low, even when only young candidates are examined and many have already experienced some form of orthopedic complication; 4) Profiles of 2 superobese (BMI > 50) surgical candidates reveal, evidence of extensive prior orthopedic problems, and medical comorbidities. These findings and current research data indicate patients who are morbidly obese are receiving hip joint replacements, but that this group may be at a disadvantage health wise as well as functionally.

Introduction

The disease known as hip osteoarthritis is a common highly painful disabling joint disease with no known cure affecting a large proportion of the adult population [1,2]. One potentially preventable factor that may mediate or moderate the onset and progression of hip osteoarthritis is obesity [3]. Moreover, even though surgery to replace a diseased joint is generally successful, the presence of extremely high body weights in excess of ideal body weight [4,5] may impact the outcome of surgery for hip osteoarthritis quite negatively, rather than improving health status [5-7].

Although a negative outcome could further exacerbate the original problem, even if surgery is technically successful, very few community based endeavors exist to assist the obese hip osteoarthritis patient to attain a healthful weight, and healthy related behaviors either before or after surgery. Moreover, very few treatment centers specifically designed for those cases suffering from excess obesity are evident, even though these could potentially reduce the need for surgery, or delay this, or permit more healthful surgical outcomes at the outset. To raise awareness about this issue for the clinician and patient, this brief provides a snapshot of prevailing data that highlight the relevance of the aforementioned ideas.

To this end, a sizeable cohort of subjects with disabling hip osteoarthritis undergoing surgery were examined first, to discern body mass distributions in general, and rates of cases presenting with evidence of excess or morbid obesity, in particular. Cases defined as being morbidly obese, referring to cases 59-100% above their ideal weight were assessed with respect to the presence of complications arising from prior surgeries, and/or the presence of comorbid health

conditions, if any. In addition, given the controversy surrounding whether hip joint replacement surgery is appropriate for the morbidly obese, a systematic examination of the related literature was conducted.

We anticipated a small, but clinically important proportion of cases with hip osteoarthritis requiring some form of primary or secondary hip replacement surgery would be morbidly obese, meaning their body mass index would be equal to or exceed 40. Moreover, in the event body mass is a risk factor for osteoarthritis, we anticipated this subgroup would include individuals younger than 65 years of age, and that a fair proportion of these cases would be found to experience severe complications, protracted hospital stays, and prevailing comorbid health conditions, regardless of age. We anticipated that the research in this area on the whole would reveal that morbidly obese hip osteoarthritis cases may be at high risk for complications after surgery, despite efforts to improve their condition.

Materials and methods

Body mass indices (BMIs) calculated retrospectively from available height and weight data of a sample of 1000 cases of hip osteoarthritis requiring unilateral or bilateral hip replacement, as well as revision

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surgery were examined. In addition to demographic data, the presence and type of accompanying chronic health conditions, and reasons for hospitalization noted on the chart, the body mass indices of the cohort were categorized into 4 broad categories: underweight (BMI <than 20 kg.m⁻²), normal weight (BMI 20-24.9 kg.m⁻²), overweight (BMI 25-29 kg.m⁻²), and obese (>29 kg.m⁻²) categories. Grade 1 obesity was categorized as having a BMI 30-35, grade II obesity cases has BMIs 36-39, and morbid obesity or obese grade III was denoted as a BMI of 40 kg.m⁻² or greater. These data were systematically entered into SPSS version 17.0 files to generate descriptive data, and where data were amenable to quantitative analysis, an a priori significance level of 0.05 was adopted. Excluded were cases with rheumatoid arthritis and hip fractures.

Results

The mean age of the sample of 997 cases with complete date was 65.5 ± 12.98 years (range 23-94) and the majority (57%) were women. Calculations of body mass index showed most or 67% were overweight, on average. There were 40 excessively or morbidly obese cases, with body mass indices ranging from 40-68, and of these cases, 75% were 65 years of age or younger, and 22 were females and 18 were males. Among those in the excessively obese or morbidly obese category (BMI > 40 kg.m⁻²), 19% had diabetes compared to 11% among those in the healthy weight category, and 19/40 or approximately 50% of these excessively obese cases had comorbid hypertension histories (p < 0.01) and the mode for numbers of comorbid diseases was 2. Among the 35 cases who were categorized as being underweight, 5 or 14% had

cardiovascular disease, 2 or approximately 6% had high blood pressure, and none had a diabetes or depression diagnosis and the mode for numbers of comorbid diseases was 1 (Tables 1 and 2).

As outlined in Table 2, among the cohort of patients undergoing primary or secondary surgeries, slightly more cases were excessively obese than underweight, and those who were morbidly obese were likely to be hospitalized for serious complications following prior hip surgery than those who were underweight, as well as those in any other weight category. Table 3 depicts the overall health status and functional ability and past history of 12 morbidly obese cases and shows that many had prior hip osteoarthritis or other joint problems, and multiple comorbid conditions, even though they were all deemed relatively young adults. Findings from the two superobese cases shown in Table 4 are generally consistent in showing the increased risk of sub optimal outcomes in the short and long term among the severely obese hip osteoarthritis surgical candidate. Table 5 reveals consistent evidence that caution is advised when patients are morbidly obese and recommended for hip replacement surgery.

Discussion

Although the relationship between overweight and hip joint osteoarthritis is not definitive, results of this present analysis suggest overweight, and especially being morbidly obese is an important element observed among cases with disabling hip osteoarthritis, especially younger cases. This subgroup is also at risk for severe complications such as infection.

This is consistent with Changulani *et al.* [8] who found those in the morbidly obese range were almost 10 years younger on average than those in the normal weight category, and those with higher body weights were more likely to experience adverse surgical outcomes than those who were not. This also accords with Tai *et al.* [9] and with Guetner *et al.* [10]. As in Guetner *et al.*'s study, it appears younger adults, especially those who suffer from morbid obesity may be quite prone to developing hip joint osteoarthritis in both hips, as well as other disabling health conditions. They may also require early hip joint replacement surgery, while incurring an increased risk of poor surgical outcomes, and the onset of comorbid diseases that can prevent optimal outcomes.

While Grotle *et al.* [2] found no association between body mass and hip osteoarthritis, obesity, an independent predictor of disability [12-14] and pain [16,17], can undoubtedly place excess biomechanical stress on the hip joint. It can also increase chances of adopting a

Table 1. Characteristics of cohort of hip osteoarthritis patients requiring primary or secondary surgery (n=997).

Variable	Entire Cohort N=997
Age (years), mean ± SD	65.5 ± 12.98, range 23-94
Age range, (n,%)	
<65 yrs	391 (39.2)
>65 yrs	599 (60)
Sex	
Female	568 (57)
Male	424 (48)
BMI (kg.m ⁻²), mean ± SD	27.6 ± 5.7, range 15-68
Type of Surgery, (n,%)	
Unilateral surgery	770 (77.2)
Bilateral Surgery	54 (5.4)
Revision Surgery	122 (12.2)
Complications	48 (4.8)

BMI=body mass index

Table 2. Depiction of various patient attributes across body mass categories showing distinct differences between underweight and morbidly obese sample on selected variables (N=997).

BMI Category	BMI Category					
	Underwt	Normal	Overweight	Obesity		
Variable	<20	20-24.9	25-29.9	30-35	36-39	40+
Number of patients (n,%)	35 (3.5)	294 (29.5)	382 (38.3)	194 (19.5)	68 (8.8)	40 (4.0)
Mean BMI kg.m ⁻²	18.8 ± 3.9	22.3 ± 1.8	26.9±1.6	31.4±1.6	36.3±1.3	44±5.7
Number with Diabetes	0	4	21	9	4	9
Number with CVD	5	62	90	35	15	10
HBP	2	71	136	68	35	19
Depression	0	19	23	4	7	3
Revision surgery	1(0.8)	43(35.2)	44(36.1)	24(19.7)	7(5.7)	3(2.5)
Complications –within type						
-within wtcateg	1(2.1)	9(18.8)	17(35.4)	13(27.1)	4(8.3)	4(8.3)
	6.3%	3.1%	4.5%	5.7%	5.9%	10%

BMI=body mass index; CVD=cardiovascular disease; HBP=hypertension; Underwt=underweight

Table 3. Table depicting extent of disability observed among selected relatively young morbidly obese adults with hip osteoarthritis undergoing primary or secondary surgeries.

ID	Age	Gender	Comorbid status	BMI	>Ideal wt	# blocks	Prior Hx
1	62	F	HBP, MI, Hypothy	50	246	3	Yes
2	50	F	Hypothy, Depress, Asthma	40	188	2	No
3	65	F	HBP, MVP, Hypothy	42	208	2	No
4	53	F	HBP, Asthma	43	208	0	Yes
5	64	F	Diabetes, Depress, Asthma	44	-	0	No
6	65	M	Atrial fib, Prediab	40	166	3	Yes
7	57	M	Prediab	41	-	1	Yes
8	48	M	COPD, HBP	40	169	10	Yes
9	50	M	Diabetes, HBP	58	257	0	Yes
10	54	M	Diabetes, Atrial fib	40	166	0	Yes
11	51	M	HBP, Depress	45	186	1	No
12	56	M	Nil	44	191	.25	No

blocks=number blocks able to walk prior to surgery; Atrial fib=atrial fibrillation; COPD=chronic obstructive airways disease; HBP=high blood pressure; Hypoth=hypothyroidism; Hx=history; Depress=depression; Prediab=prediabetes

Table 4. Selected attributes of two hip osteoarthritis surgery cases classified as being super obese (BMI ≥50) exemplifying extent of disability despite being younger than 65 years of age.

ID	Gender Age	BMI # Meds	# Med Cond	# Yrs Impaired	Post-op hosp status after 5 days
1	F	50 >3	3	21	Ambulates only with assistance Stood with walker-no walking
2	M	58 >3	2	15	

BMI=body mass index; #meds=number medications; #med cond=number medical conditions; # yrsimpaired=number years impaired

sedentary lifestyle, and hence not unsurprisingly, greater body weight and body mass index during early and middle adulthood [15].

Since being overweight could render individuals of any age subject to abnormal hip joint loading forces, hip joint destruction may be especially exaggerated in the morbidly obese individual. Moreover, associated high rates of pain, as well as joint destruction and postural changes in those who are excessively obese can be expected to impact the pathogenesis of hip joint osteoarthritis both before and after surgery more profoundly than non-obese situations [18,19]. Alternately, the constellation of obesity, immobility and pain can independently raise the risk for hip joint osteoarthritis, and its disability [21-31].

Morbid obesity is an enormous health care problem, and should not be ignored as an important factor impacting the onset and rate of hip osteoarthritis disability and its severity, as implied in Table 4-where the relatively young hip surgery candidates had had many prior years of joint dysfunction, and very poor outcomes at five days post-surgery compared to standard outcomes for most uncomplicated procedures among healthy or normal weight subjects. Since ample research shows obesity is a preventable situation related to energy balance, the importance of food intake and nutrition, and restoring functional mobility cannot be overlooked in this regard, in our view, even if this was not the view of McAlden *et al.* [31].

Consequently, although patients with hip osteoarthritis may routinely receive physical therapy for limited periods before and after surgery, more emphasis on the role good nutrition can have on the joint, and on reducing inflammation, while reducing the ratio of fat to muscle should be stressed, along with possibly routinely extending the pre operative period as well as the intensity and duration of post operative therapy.

Helping to prevent excess obesity in the formative years, and ensuring those affected are monitored for any emerging pain and disability is recommended as well. Other possible recommendations

for reducing the adverse results shown in Tables 4 and 5, are the possible inclusion of nutrition educators in the team treating the hip osteoarthritis patient, and the design of foods that reduce diabetic complications, as well as vascular complications. Helping this sub group to reduce any proclivity towards depression is also indicated. As well, apprising the morbidly obese hip osteoarthritis surgical candidate of the increased risk of poor surgical outcomes at the outset, and encouraging weight loss is recommended.

Conclusion

Having a high body mass appears more characteristic than not of individuals hospitalized for purposes of total hip replacement, revision surgery, or severe complications from prior surgery. Whether this is a consequence of the disease, rather than a cause or risk factor it is important to consider:

1. A small percentage of end stage hip osteoarthritis cases are morbidly obese.
2. Those with excessively high body mass indices are younger on average than those 65 years of age.
3. Excessively obese cases with BMIs ≥ 40 were more likely to have high rates of diabetes and blood pressure than those of normal weight.
4. Being excessively obese is related to the presence of a severe surgical complication.

Hence despite the limitations of this cross-sectional study for pinpointing causation, this present overview implies efforts to minimize the onset and progression of obesity across the lifespan may prove highly beneficial, despite lack of consensus of a distinct correlation of these factors [25]. Moreover, those who are excessively obese and undergo surgery might be counseled about their situation and encouraged to lose weight prior to this intervention. Careful rehabilitation that takes into account the presence of comorbid conditions, may foster better

Authors	Study procedures and Sample	Results	Conclusion
Arsoy et al. [32]	The results of total hip arthroplasty in 42 primary total hip arthroplasties in super-obese patients (BMI \geq 50) were reviewed.	Twenty-four of the THAs had at least one complication. At least one major complication occurred in 11 of the THAs and at least one minor complication in 14 THAs	Caution should be used when proceeding with primary total hip arthroplasty with a BMI greater than 50.
Chee et al. [5]	The authors analyzed outcomes of 55 consecutive total hip replacements performed on 53 morbidly obese patients with osteoarthritis with a matched group of 55 total hip replacements in 53 non-obese patients.	Survival at five years was 90.9% for morbidly obese and 100% for non-obese patients Harris Hip and the Short-form 36 scores were significantly better in non-obese group ($p < 0.001$) The morbidly obese patients had higher complication rates, which included dislocation, superficial and deep infection	Morbidly obese patients should be advised to lose weight before undergoing total hip replacement, and counseled regarding the risk of complications.
Elson et al. [19]	This evaluation was performed to determine if morbid obesity (BMI \geq 35kg/m ²) is a contributing risk factor to cup malpositioning.	There was a significant correlation between morbid obesity with respect to underanteversion; using multivariate analysis, there was a trend toward a combined underanteversion/overabduction of the acetabular cup.	Of all variables considered, high BMI was the most significant risk factor leading to malpositioning.
Houdek et al. [6]	Studied the effect of morbid obesity as a risk factor for failure of two-stage revision total hip arthroplasty using medical records of 653 cases treated for periprosthetic joint infection over a 20 year period	Compared with nonobese cases, morbidly obese cases had higher re infection, revision, and reoperation rates,	Morbidly obese patients have increased risk of severe post-operative complications after revision total hip arthroplasty than nonobese patients
Jamesen et al. [22]	Examined one-year incidence of periprosthetic joint infections among 7181 primary hip and knee replacements.	The infection rate for those with normal body mass indices was 0.37%, while the rate for those who were morbidly obese was 4.66%	Morbid obesity increases the risk for periprosthetic infection following primary hip or knee replacement
Issa et al. [33]	Assessed the outcomes of primary total hip arthroplasty in super-obese patients compared to a cohort who had a normal body mass index.	The super-obese patients had significantly lower mean Harris hip scores (84 vs 91 points) and higher complication rate at final follow-up.	Patients may benefit from a discussion with their orthopaedic surgeons to develop realistic expectations from the outcomes of their arthroplasty procedure.
Pulido et al. [34]	Reviewed a database of 9245 patients undergoing hip or knee arthroplasty between January 2001 and April 2006	Prosthetic infections developed in 63 patients, and among the independent predictors was morbid obesity	Morbid obesity and other factors may predispose patients to periprosthetic joint infection
Pulose et al. [35]	Retrospectively examined 309 consecutive revisions of total hip arthroplasty from 2005-2009, and compared subgroup with body mass index greater than 35 to those with body mass indices below 35	At 36 months, there was a higher rate of re-operation in the obese group, especially for infection	Patients should be aware of their increased risk for post-surgical complications after total hip arthroplasty if they are obese
Rajgopalet al. [37]	Examined the complications and outcomes of total hip replacement (THR) in super-obese patients (body mass index (BMI) > 50 kg/m ²) compared with class I obese (BMI 30 to 34.9 kg/m ²) and normal-weight patients (BMI 18.5 to 24.9 kg/m ²), as defined by the World Health Organization.	Super-obese patients experienced significantly longer hospital stays and higher rates of major complications and readmissions than normal-weight and class I obese patients.	Despite improved function and satisfaction, morbidly obese group experience a significant increase in length of hospital stay and major complication and readmission rates.
Schwarzkopf et al.[38]	Conducted a retrospective study to determine the difference in outcomes among the super-obese	When categorized according to body mass index, the overall complication rate was higher for patients with BMI ≥ 45 Super-obese patients had an increased odds of developing in-hospital complications Length of stay was increased by 13.8% for each 5-U increase in BMI above 45	There is an increased risk of incurring complications among the super-obese, and this increases with BMIs greater than 45

overall long-term results. Research to examine this sub-group as a separate issue will potentially yield important understandings that can be applied to harm reduction efforts, as well as reparative efforts.

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