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Early complications of revision total knee arthroplasty in morbidly obese patients

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Abstract

Introduction Morbid obesity is a known risk factor for complications and failure following primary total knee arthroplasty. Complications following revision total knee arthroplasty (rTKA) in the morbidly obese (BMI > 40) have not been well described. A retrospective cohort study was designed to investigate the early complications of rTKA in morbidly obese patients.

Methods Revision TKA procedures were performed between January 2009 and December 2012 at a single institution. Comparisons were made between patients with a normal BMI (18.5–25) and patients with morbid obesity (BMI > 40).

Results Thirty-three of 141 morbidly obese patients (23.4%) had a complication compared to 10 of 96 patients with a BMI 18.5–25 (10.4%) ($p = 0.011$). Morbidly obese patients were younger (69.3 vs. 61.4 years, $p < 0.0001$), and their most frequent complication in comparison with patients with normal BMI was wound healing problems ($p = 0.01$).

Conclusion Morbidly obese patients are at a significantly increased rate of early complications following rTKA compared to a normal weight cohort, especially with regard to wound complications. The morbidly obese group was significantly younger at the time of rTKA. In addition, this study highlights the importance of risk stratification for morbidly obese patients undergoing rTKA.

Keywords Revision total knee arthroplasty · Morbid obesity · Complications

Introduction

The incidence of revision total knee arthroplasty (rTKA) has increased dramatically concomitant with increasing numbers of primary total knee arthroplasty (TKA) [1, 2]. The relationship between morbid obesity and poor outcomes in primary TKA has been well documented, and we are seeing an ever increasing number of young, sick, and obese patients undergoing primary TKA [3–6]. Early postoperative complications, including infection, wound dehiscence, and genitourinary complications as well as postoperative mortality, are noted to be significantly higher in obese patients undergoing primary TKA as well [3].

The effect of morbid obesity (BMI > 40) on rTKA has not been as clearly described. Some studies suggest that body mass index (BMI) has no significant effect on complications after rTKA [7]. Others have reported rates of re-revision after rTKA as high as 2.9 times greater in patients with a BMI > 40 compared to rTKA patients who are not morbidly obese [8]. Morbid obesity is associated with an increased risk of moderate–severe functional limitations [9]. Kasmire et al. [10] showed that BMI had an impact on postoperative function and range of motion (ROM) after rTKA as assessed by The Western Ontario and McMaster Universities Arthritis Index (WOMAC). Similarly, Pulos et al. reported on the effect of obesity (BMI > 35) on revision total hip arthroplasty, noting that complications, infection, re-admission, and re-operation were significantly increased in this group [11]. More recently, a review of 93 morbidly obese patients undergoing rTKA were shown to have a significantly higher revision, re-operation, and infection rate than a comparative group with normal BMI at a minimum 5-year follow-up [12].

Much emphasis is now being placed on identifying early complications in an effort to limit readmissions. The purpose of this cohort study is to determine (1) Is the rate of early complications after revision TKA increased in the morbidly obese patient population compared to patients with normal

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BMI? and (2) Which complications are the most frequent in the morbidly obese population after revision TKA?

Methods

Using our institutional database, a retrospective cohort study was designed to investigate the early complications of rTKA procedures. All patients who underwent rTKA between January 2007 and December 2012 at our institution were included. A minimum of 2 years of follow-up was required. These patients were then selected into two study groups: those with morbid obesity (BMI > 40) and those with a normal BMI (BMI 18.5–25). Patients undergoing re-revision TKA and unicompartmental knee arthroplasty revision to a TKA were excluded from the study. Patients undergoing rTKA for aseptic loosening, periprosthetic joint infection, patellofemoral problems, periprosthetic fractures, malpositioning, instability, and osteolysis were included in the study. All patients received the same standardized postoperative regimen. They all received perioperative antibiotics in the hospital, risk-stratified anticoagulation, and formalized physical therapy in the hospital and upon discharge.

Immediate medical postoperative complications included wound complications, deep vein thrombosis (DVT), pulmonary embolism (PE), myocardial infarction (MI), mortality, and intensive care unit (ICU) admission. Post-hospitalization complications included deep periprosthetic joint infection, cellulitis, aseptic loosening, component subsidence, amputation, mortality, and revision surgery. Complications were obtained from a chart review of clinic follow-up notes and recorded in RedCap, a secure online database. Patients who lacked 2 years of follow-up notes in clinic were contacted by phone to capture any extra complications that may have occurred.

Comparisons were made between patients with a normal BMI (18.5–25) and patients with morbid obesity (BMI > 40). Chi-square and Fisher's exact tests were used to determine differences in complication rates between groups.

Results

A total of 985 revision TKAs were performed between January 2007 and December 2012. Of these, 704 were excluded because their BMI was between 25 and 40. Twenty-nine patients did not have a documented BMI. Fifteen were not included in the analysis because they did not meet the inclusion criteria (re-revision, failed TKA).

Of the remaining 237 patients, 96 patients had a BMI < 25 (40.5%) and 141 patients with BMI > 40 (59.5%). Average follow-up was 3.1 years (0–8.2 years). Age, sex, and BMI variables are shown in Table 1. The morbidly obese group was also significantly younger at time of revision surgery (mean age 61.1 vs. 68.9 years, $p < 0.0001$). Overall, 43 of 237 patients (18.1%) had a complication. Thirty-three of 141 morbidly obese patients (23.4%) had a complication compared to 10 of 96 patients with a BMI 18.5–25 (9.4%) ($p = 0.011$).

Table 1 Demographics of the two comparison groups

	BMI < 25	BMI > 40	*p* value
Age	69.3 (43.4–93.9)	61.4 (32.6–87.3)	< 0.0001
BMI	23.5 (22.1–24.2)	44.4 (41.9–48.1)	< 0.0001
Follow-up (years)	2.9 (0–8.2)	3.3 (0.04–7.9)	0.14
Sex			
Female	61 (40%)	93 (60%)	0.7817
Male	35 (42%)	48 (58%)	

Follow-up and age: mean (range); *t* test

BMI: median (IQR); Wilcoxon

Sex: *N* (%); Fisher's exact

The most common complications were wound complications, which occurred significantly more in the morbidly obese group ($p = 0.04$) with nine in the morbidly obese and one in the comparison group. None of the other complications assessed had a statistically significant difference. However, for every category of complications analyzed, the occurrence was higher in the morbidly obese group. There were four deep venous thromboses (DVTs) in the morbidly obese group, while only one DVT in the normal BMI group ($p = 0.65$). There were six deep infections in the morbidly obese compared to two deep infections in the normal BMI group ($p = 0.48$). Six morbidly obese patients had a postoperative cellulitis compared to zero patients with normal BMI ($p = 0.08$) (Table 2). With the numbers available, we also found no significant difference in manipulations, ICU admission, amputation, and mortality.

Discussion

Obesity is known to be a significant risk factor for the development of osteoarthritis of the knee [13]. As such, we are seeing a dramatic rise in the utilization of primary TKA in obese patients [4, 6]. There is a growing preponderance of evidence highlighting the negative impact of morbid obesity on TKA outcomes [3–6]. More recent data have suggested the same trends apply to revision hip and knee arthroplasty [9, 11, 12]. Our study demonstrates that rTKA in the morbidly obese patient population is associated with a 2.6x increased rate of early complications compared to patients with a normal weight (BMI 18.5–25).

We noted a 2.6x increase in complications in the morbidly obese compared to those with a normal BMI. This is similar

Table 2 Complications in each comparison group with further description of specific complications experienced

	#pts	# of comp	Rate of comp (%)	Wound comp	DVT	Infection	Cellulitis	Aseptic loosening	Other
BMI 18.5–25	96	10	10.4	1	1	2	0	0	6
BMI > 40	141	33	23.4	9	4	6	6	2	6
Total	237	43	18.4	10	5	8	6	2	12

to the increased complication rates reported in re-revision TKA (2.9x increase) [8] and in aseptic revision knees in the morbidly obese (3.8-fold increase) [12]. The morbidly obese had significantly increased complications despite aging on average 8 years younger than comparative group. Prior studies have indicated that there is a national trend for an increased utilization of TKA in a younger, sicker and more obese cohort [6]. The age discrepancy is concerning, indicating that not only are obese patients undergoing primary TKA at a younger age, their initial surgery is potentially less durable requiring revision surgery at a younger age as well.

We found a statistically significant higher rate of wound complications in the morbidly obese cohort compared to those of a normal weight following rTKA. Wound complications in the obese undergoing TKA are well documented in the literature [3, 14–16]. Wound healing problems such as prolonged drainage are a harbinger for the development of deep periprosthetic infection (PJI) [3, 17, 18]. Although we did not show a statistical difference in PJI among our two groups, there was a 6x higher rate of infection or cellulitis in the morbidly obese group compared to the non-obese. In addition, every other complication identified in the study (DVT, aseptic loosening), although not statistically significant with the numbers presented, was higher in the morbidly obese group.

There are several limitations to a study of this design. It was designed to investigate the early complications only and may miss further complications that occurred at a later date such as aseptic loosening, wear, osteolysis, and late infection that may occur outside our average follow-up of 3 years. Secondly, although complications are relatively objective, we did not evaluate the functional outcomes of patients. Other studies have suggested poorer functional outcomes in rTKA in morbidly obese patients [12]. Thus, while some patients may not have experienced a formal complication, their outcome may or may not be considered a clinical success. Thirdly, overall complications in both cohorts were low. With the numbers available in our study, failure to reach statistical significance in several other categories may have resulted from an underpowered study. In addition, the retrospective study involved multiple surgeons over a long period of time with varying techniques that could impact outcome. Lastly, and most importantly, we did not control for comorbidities; therefore, the true effect of obesity on outcomes, rather than the effect of their associated comorbidities, is impossible to elucidate.

Conclusion

Morbidly obese patients are at a significantly higher risk of early complications following rTKA compared to a normal weight cohort. This is consistent with the trends reported after primary TKA. Unlike primary TKA, however, many rTKA are not elective and may require urgent surgical intervention regardless of a patient's BMI and limited time and options to optimize patients. In addition, patients, surgeons, hospitals, and payors must understand the increased risks associated with morbidly obese patients undergoing rTKA. Methods to appropriately risk stratify patients are imperative.

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Compliance with ethical standards

Conflict of interest All conflicts of interest have been disclosed and none are pertinent to this study.

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