

Original Research Article

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Assessment of total knee replacement in obese patients and nonobese patients: a comparative study

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ABSTRACT

Background: The present study was carried out with the objective to assess the influence of morbid obesity on the outcome after TKR and with the aim to compare the outcome following TKR in a consecutive series of morbidly obese patients ($BMI >40 \text{ kg/m}^2$), and matched it with group of non-obese patients ($BMI <30 \text{ kg/m}^2$).

Methods: The study period planned was of two years. The totals of 100 patients undergoing total knee replacement were selected for the study period. On the basis of body mass index inclusion criteria for the two groups were decided. Of the total 100 patients, they were divided into two groups. One group 1 consisted of obese patients with total of 50 patients and group 2 consisted of non-obese patient with total of 50 patients.

Results: At the end of two years when the data was compared with the preoperative assessment, it was found to significantly better where value of p was <0.001 . However when the comparison was done between the two groups, it was found that scores were lower in the group 1 patients which included the obese patients.

Conclusions: Total knee arthroplasty is a safe and efficacious operation in obese patients with no significantly greater risk of complications. However, post-operative clinical scores and absolute improvement in the scores are statistically superior in non-obese patients at one year follow-up. Obese patients should be started on weight loss programs and counselled about possible inferior results for total knee replacement.

Keywords: Evaluations, Obesity, Total knee replacement

INTRODUCTION

Our waiting room provides evidence each day that obesity continues to be a major problem for all individuals. Obesity puts excess pressure on weight-bearing joints, so heavier people are more likely to need joint replacement. But obese patients face more risk from the surgery, and they get less improvement. Unfortunately, there is rise in the percentage of obese patients within the population of patients who seek joint replacement.¹

Patients with obesity are more likely to have certain diseases and health conditions that increase the risks of surgery. These include cardiovascular disease, including

high blood pressure, obstructive sleep apnea, type 2 diabetes development, infection, slow recovery.²

Obesity has reached epidemic proportions, with more than one-half billion obese people living around the world. The World Health Organization defines overweight as having a body mass index between 25 and 29 and obesity as having a BMI of 30 or higher. The WHO further classifies obesity as Class I (BMI 30-34.9), Class II (BMI 35-39.9), and Class III (BMI >40).^{2,3}

The demand for total knee replacements has increased in the last 20 years and is expected to continue rising. Knee replacements are usually performed when a patient's knees have been so severely damaged by arthritis or

injury that everyday activities; such as climbing stairs or walking several blocks become impossible.⁴

According to the Rothman Institute, obesity is responsible for 200,000 joint replacements a year; a risk of complications among those BMI is 40 to 50 may be daunting. These risks includes decreased durability of the prosthesis since it will be subjected to more wear and tear, complications resulting from conditions more frequently found among obese patients, such as hypertension, sleep apnea, and diabetes.⁵

The Rothman Institute states that because the surgery is more difficult to perform, malpositioning and joint instability problems are more common. An orthopaedic surgeon may advise weight loss before knee surgery; with morbidly obese patients, bariatric surgery is sometimes performed before the knee operation is undertaken.^{6,7}

Hence the present study was carried out with the objective to assess the influence of morbid obesity on the outcome after TKR and with the aim; to compare the outcome following TKR in a consecutive series of morbidly obese patients ($BMI >40 \text{ kg/m}^2$), and matched it with group of non-obese patients ($BMI <30 \text{ kg/m}^2$).

METHODS

The study was conducted at the medical institute of the city. The study period planned was of two years April 2014 to March 2016. The totals of 100 patients undergoing total knee replacement were selected for the study period. The ethical clearance certificate was taken from the ethical committee of the institute. All the patients were informed about the study prior inclusion into the study and also the informed consent was signed by all the patients before their inclusion into the study. The patients who had previously undergone a THA or TKA were excluded, if their preoperative BMI was less than 40 kg/m^2 , if an additional concurrent procedure was performed, if the procedure was a revision TKA, or if a 2-stage procedure for septic arthritis was performed.

Body mass index was calculated for all the patients included in the study. On the basis of body mass index inclusion criteria for the two groups were decided. Of the total 100 patients, they were divided into two groups. One group 1 consisted of obese patients with total of 50 patients and group 2 consisted of non-obese patient with total of 50 patients. The inclusion criteria for group 1 were the body mass index was greater than 40 kg/m^2 and for group 2 the body mass index was kept to be lower than 30 kg/m^2 . The groups were matched for gender, type of prosthesis, age and preoperative knee society score. The follow up period was kept for two years. Luckily no patients were lost during the follow up period and all the patients parameters were regularly recorded and data were maintained.

The KSS is a joint-specific outcome scoring system comprising a separate knee score, which rates the joint itself, and a function score, which rates the ability of the patient to walk and climb stairs. Both components are scored out of a maximum of 100 points. The specific parameters assessed by the knee score component are pain (50 points), range of movement (25 points) and stability (25 points), with deductions for flexion contracture, extensor lag and malalignment. The function score component addresses the walking distance (50 points) and the ability to climb stairs (50 points), with deductions for any walking aids used.

Postoperative rehabilitation process was common for both the groups and same team of surgeons performed the surgery in both the groups and also assessed the follow up period for all the total patients.

All statistical analysis was undertaken using SPSS v 13.0 (SPSS Inc., Chicago, Illinois). The two groups were compared using Student's *t*-test, the chi-squared test with Yates correction for continuity for proportions and the log-rank test for survivorship analysis. The level of significance was set at $p<0.05$.

RESULTS

On assessing the preoperative variables for both the groups, no significant difference was noted between them. The mean follow up period recorded for both the groups was 2 years (Table 1). At the end of two years when the data was compared with the preoperative assessment, it was found to significantly better where value of *p* was <0.001 . However when the comparison was done between the two groups, it was found that scores were lower in the group 1 patients which included the obese patients. On comparing the radiolucent lines around the implants in both the groups, in obese patients higher rate was notes and the difference was found to be statistically significant (Table 2).

Table 1: Preoperative characteristics of the two groups

	Morbidity	Non-obese patients	P value
Mean body mass index in Kg/m² (range)	45.3	28.2	<0.001
Mean height in cm (range)	163	168	-
Mean weight in kg (range)	115	75	-
Mean age in years	64	62	-
Osteoarthritis	41	41	-
Rheumatoid arthritis	9	9	-

Table 2: Clinical and radiological results at last follow up.

	Obese patients	Non-obese patients	P value
Mean knee score	83.47	91.45	0.07
Mean function score	73.87	85.47	0.01
Progressive radiolucent lines	8	1	0.03

On assessing the complications following the total knee replacement surgery, it was found to be significantly higher in the obese patients with that of non-obese patients with p value <0.001 (Table 3). Out of 50 patients in the obese group superficial infection was found in 10 patients; no cases of deep infection were noted. Using pain and revision as the end point, the five year survivorship was 75% in the obese group and to be 98% in the non-obese patients.

Table 3: Postoperative complications.

	Obese patients	Non obese patients	P value
Superficial wound infection	10	0	-
Deep wound infection	0	0	-
Over all complications	10	0	0.001

Patients with a body mass index >40 kg/m² should be advised to lose weight prior to total knee replacement and to maintain weight reduction. They should also be counselled regarding the inferior results which may occur if they do not lose weight before surgery.

DISCUSSION

Among patients seeking joint replacement surgery, the prevalence of obesity is much higher than that in the general adult population. "The bottom line is that obesity is increasingly common among patients undergoing joint replacement and it creates a myriad of technical and medical challenges. Fehring et al reported that the prevalence of obesity among total joint replacement patients nearly doubled from 1990 to 2005. Obesity is a known risk factor for osteoarthritis due to increased loading as well as adipocytes-induced activation of pro-inflammatory agents.⁸

Evidence shows that increased body weight and obesity are associated with osteoarthritis (OA) of the knee and, ultimately, the need for TKA. In 1988, Felson and Anderson first reported obesity as an independent risk

factor for the development of OA.^{9,10} Once the damage to the articular cartilage progresses to the level of bone-to-bone contact, total knee arthroplasty is the definitive treatment to relieve pain and restore functional loss caused by severe progressive OA. Conflicted findings have been found in the previous studies done by the individuals in comparison between the obese and non-obese patients. There is agreement in the literature that the functional outcome following TKA in morbidly obese patients is significantly worse than in patients who are not obese.¹¹ Jarvenpaa et al found a significantly higher number of technical errors in a group of obese TKA patients than in nonobese patients. The authors noted 17 technical errors in 52 obese patients compared with five errors in 48 non obese patients.¹⁰

Overall, both groups of patients have statistically significant improvements in all parameters post-operatively. Consistent with other studies, the excellent result of TKR is shown in both obese and non-obese groups in our centre.¹² However, our obese patients performed inferiorly postoperatively in KSS Function scores, range of movement and maximum flexion. Our study showed the obesity influence adversely both the postoperative KSS function score as well as the absolute improvement in KSS function score. KSS function scores consider walking distance, stair climbing and need for walking aids in the assessment of the patient.

Finally, there was no difference in maximum flexion between the obese group and the non-obese group pre-operatively. However, the post-operative maximum flexion is significantly better in the non-obese group. We felt that the improvement in maximum flexion within the obese group may be restricted secondary to possibly large amount of thigh and calf soft tissues opposition. This suggests that while morbidly obese patients may achieve similar pain relief, range of movement and stability, they are likely to remain more functionally impaired following TKR, with limitation of walking distance, ability to climb stairs and greater dependence on walking aids.

The influence of BMI on the eventual outcome following TKR remains uncertain. Several studies have compared the results in obese and non-obese patients, with follow-up ranging from 1 to 15 years. The rate of perioperative complications, where reported, has been found to be similar for obese and non-obese patients, although infection may be significantly higher for patients with a BMI >35 kg/m.

It is therefore imperative that we define the results of TKR in these patients early, and identify any pitfalls in the criteria for selection for an operation which has otherwise proved to be extremely successful in alleviating pain and improving mobility for a large number of patients. The two groups were not matched for medical co-morbidity or disease in the adjacent hip or knee and we do not know if these factors may have confounded the overall results.

Total knee arthroplasty is a safe and efficacious operation in obese patients with no significantly greater risk of complications. However, postoperative clinical scores and absolute improvement in the scores are statistically superior in non-obese patients at one year follow-up. Obese patients should be started on weight loss programs and counseled about possible inferior results for total knee replacement.

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