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Dr. Seelam Narasimha Reddy
Assistant Professor, Department
of Orthopaedics, Katuri Medical
College and Hospital,
Edulapalem, Guntur, Andhra
Pradesh, India

Dr. Buggaveeti Goutham
Senior Resident, Department of
Orthopaedics, Guntur Medical
College and Hospital, Andhra
Pradesh, India

Dr. Yadlapalli Venkatesh
Junior Resident, Department of
Orthopaedics, Katuri Medical
College and Hospital, Andhra
Pradesh, India

Corresponding Author:
Dr. Yadlapalli Venkatesh
Junior Resident, Department of
Orthopaedics, Katuri Medical
College and Hospital, Andhra
Pradesh, India

Role of body mass index on total knee replacement rehabilitation and outcome

Dr. Seelam Narasimha Reddy, Dr. Buggaveeti Goutham and Dr. Yadlapalli Venkatesh

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Abstract

Aim: To evaluate the effect of body mass index on functional outcome in total knee replacement.

Materials and methods: This is a prospective study conducted in Katuri medical college and hospital, Guntur; from November 2017 to November 2019 for total knee replacement. Total 50 patients were included. Age, gender, pre-operative body mass index, pre-operative and post-operative functional scores [International knee society score: KSS], complications were recorded. Based on WHO BMI classification patients were grouped. The functional outcome of the normal weight group (BMI < 25) i.e. group 1 was compared to the overweight and obese (BMI ≥ 25) group i.e. group 2. A separate sub-group analysis was performed to compare all five WHO BMI groups' i.e. Normal weight, overweight, class 1, 2&3 obese.

Results: With a mean age of 65.8 (52-78), 50 primary total knee replacements were included. 60% (30) were female. The mean body mass index was 28.8 (18-52). Seventy percent of patients were either overweight or obese. Follow-up was 1 year. There was no statistically significant difference in pre or post-operative KSS in the normal weight (BMI < 25) group compared to patients with a BMI ≥ 25 ($P > 0.05$). Sub-group analysis revealed poorer KSS in class 2 obese (74.8) compared to overweight (86.4) and class 1 obese (82.2). Overall there was 1 case of infection (2%) in obese group with no complications in the normal weight group.

Conclusion: Post-operative functional outcome was not influenced by BMI comparing normal weight ones with the ones in overweight or underweight category. So, there is no need to deny TKR basing on weight alone.

Keywords: Total knee arthroplasty, body mass index, knee society score, total knee replacement

Introduction

TKR is an effective surgical treatment of osteoarthritis which is prevalent in developing countries like India. It has been shown that obesity increases the risk of development of knee osteoarthritis^[1]. Obesity is an independent risk factor for number of complications of surgery like acute coronary syndrome, wound infection. The outcome of obese patients undergoing TKR as compared to non-obese patients is of interest with some studies showing similar outcomes and some showing inferior outcomes in obese patients with increasing cases^[2].

Materials and Methods

A total of fifty patients were included in the prospective study conducted in Katuri medical college and hospital, Guntur, from November 2017 to November 2019 for total knee replacement. Age, gender, pre-operative body mass index (BMI), pre- and post-operative functional scores [International knee society score: KSS], complications were recorded. Body mass index (BMI) was calculated pre-operatively for each patient using the standardized formula; weight in kilograms, divided by height in meters squared. International knee society scores were collected pre-operatively and 1 year post operatively.

Patients were divided into two groups for the purpose of the study i.e. group 1 with a normal BMI (less than or equal to 25) and group 2 who were overweight or obese (greater than 25) according to the WHO BMI classification³ (Table.1) Sub-group analysis was also performed comparing all five WHO BMI groups; Normal weight -15(30%), overweight -20(40%), class 1 obese-4(8%), class 2 obese -6(12%) and class 3 obese -5(10%).

Table 1: WHO BMI classification ^[3]

Who BMI classification	
Under- weight	< 18.5
Normal	18.5-25
Over weight	>25
Obese-I	30-34.9
Obese-II	35-39.9
Obese-III	≥ 40

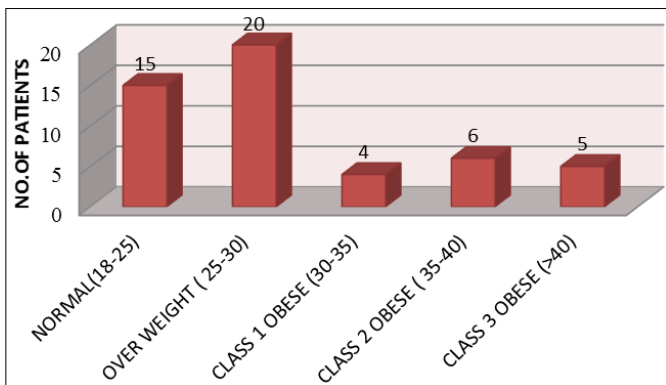
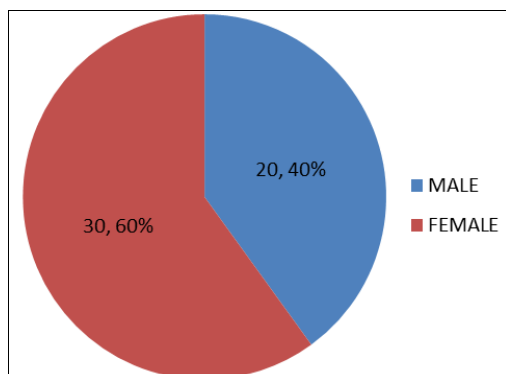
The Primary outcomes assessed were pre-operative and 1 year post-operative KSS. The original KSS ^[4] has a "Functional Score" section (3 items) and a "Knee Score" section (7 items). Both sections are scored from 0 to 100, with higher scores indicating better knee conditions and lower scores indicating worse knee conditions.

Statistical analysis

Statistical analysis was performed using appropriate computer software. Results are presented as a mean, percentage and standard deviation for each BMI group according to the WHO classification were analyzed. Statistical significance between the two main study groups i.e. group 1 (BMI < 25) and group 2 (BMI > 25) were assessed using the student *t* test. Test significance set at $P < 0.05$. Finally sub-group analysis was performed comparing each of the BMI sub-groups.

Results

A total of 50 primary total knee replacements were performed at the institution between 2017 and 2019. The mean age was 65.8 years (52-78), with 40% Male and 60% Female shown in figure 2. Follow up is taken as 1 year. The distribution according to WHO BMI group is shown in Figure 1. The mean BMI was 28.8 (18-52) with 30% (15) obese, 40% (20) overweight and 30% (15) normal weight. The comparative study groups consisted of Group 1 ($n = 15$ patients) and Group 2 ($n = 35$ patients).

**Fig 1:** Distribution according to BMI group**Fig 2:** Sex distribution

Functional outcome

There was no significant difference in the pre-op Knee scores between Group 1; 56.4 (48-56) and Group 2; 52.6 (32-52) ($P > 0.05$). Similarly, there was no significant difference in the post op scores between the two groups, 88.6 (82-94) and 82.2 (72-86) ($P > 0.05$) respectively. The functional outcome scores are presented in Tables 2 and 3.

Table 2: Pre and post-operative knee society scores

KSS scores	Group 1 (BMI < 25)	Group 2 (BMI > 25)	P value
Pre-operative	56.4	52.6	$P > 0.05$
6 mo post-operative	88.6	82.2	$P > 0.05$

Table 3: Sub group analysis of post-operative knee society scores

BMI	1 year post-operative Knee Society Score
Normal	88.6
Over weight	86.4
Class 1 obese	82.2
Class 2 obese	74.8
Class 3 obese	76.3

Overall there was 1 case of infection (2%) in class 3 obese group with no complications in the normal weight cohort (BMI < 25). The total number of complications was not sufficient to perform any statistical analysis.

Discussion

Overall this study revealed no significant difference in short term postoperative functional outcome in patients with a normal BMI as compared to overweight/obese group / underweight group. This study showed equivalent functional outcome comparing normal weight BMI with BMI > 25 is in keeping with study conducted by Baker *et al.* ^[5] Similarly deshमुख *et al.* ^[6] revealed no correlation with BMI and functional outcome in 1 year. However, there is also evidence that increasing BMI, particularly greater than 40 results in inferior outcomes. Collins *et al.* ^[7] reviewed 445 TKR's and found inferior clinical outcome in patients with BMI > 30. Although obese patients achieved lower outcome scores they achieved significant functional improvement. Similarly on using KSS scores there is no significant difference in outcome between two groups ^[5, 12, 13, 14]. In this study obese patients achieved lower outcome scores as compared to non-obese patients. However; they achieved significant absolute functional improvement. So authors concluded that there is no reason to deny TKR in obese patients. With no difference in functional outcome, the incidence of all complications was higher in the obese and overweight group as compared to the normal weight group. Overall there was 1 case of infection (2%) in class 3 obese group with no complications in the normal weight cohort (BMI < 25). The total number of complications was not sufficient to perform any statistical analysis in our study.

There is evidence in the literature in relation to the increased risk of perioperative TKA complications with increasing BMI. The etiology is multifactorial. Wound healing and both superficial and deep peri-prosthetic joint infections are more common with increasing BMI. A meta-analysis by Kerkhoffs *et al.* ^[8] showed an odds ratio of 2.38 for deep infection and 1.9 for all infection in obese patients as compared to non-obese patients in an analysis of 5061 and 15276 patients respectively. Obese patients are also having higher chances of developing thromboembolic disease post operatively ^[9]. So the patients are counselled in regarding the higher risk of perioperative complications with increasing BMI. In a study obese patients who lost significant

proportion of bodyweight preoperatively actually had a higher rate of infection compared to control ^[10]. Further research is needed. Morbid obesity has shown the increase the risk of perioperative complications during TKA, including superficial wound infections and prosthetic joint infections. The exact pathophysiology is unclear; this may be partly due to weakened immune response in obese patients. In our reviews we found increased complications in morbidly obese patients. Amin *et al.* ^[11] found more difference in complication rate i.e. 32% of morbidly obese patients experienced complications of which 17% were superficial wound infections, and 5% were prosthetic joint infections, while no complications were reported in their control group. This is due to surgery in morbidly obese patients requiring longer operative time which increases the risk of postoperative infections.

In this study the patient numbers were sufficient to statistically compare the functional outcome scores. The early functional outcome may not correspond to long-term functional outcome. So more research in this area for further differences is needed. In conclusion, overall there was no significant difference in early post-operative functional outcome comparing BMI <25 with those of a BMI > 25 in 50 primary TKA. Patients should be counselled preoperatively regarding the increased risk of complications with more BMI, however they should not be deferred TKA based solely on weight if there are no contraindications to undergo the procedure.

Conclusion

Post-operative functional outcome was not influenced by BMI comparing normal weight ones with the ones in overweight or underweight category. So, there is no need to deny tkr basing on weight alone.

References

1. Felson DT, Anderson JJ, Naimark A, Walker AM, Meenan RF. Obesity and knee osteoarthritis: the Framingham Study. *Annals of internal medicine* 1988;109(1):18-24.
2. Kurtz S, Ong K, Lau E, Mowat F, Halpern M. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. *Jbjs* 2007;89(4):780-5.
3. WHO. Geneva: World Health Organization. Global database on Body Mass Index: BMI Classification 2006.
4. Insall John, Dorr N, Lawrence D, Scott Richard D, Norman Scott W. Rationale of the knee society rating system. *Clinical Orthopaedics and Related Research* 1989;248:13-14.
5. Baker P, Petheram T, Jameson S, Reed M, Gregg P, Deehan D. The association between body mass index and the outcomes of total knee arthroplasty. *JBJS* 2012;94(16):1501-8.
6. Deshmukh RG, Hayes JH, Pinder IM. Does body weight influence outcome after total knee arthroplasty? A 1-year analysis. *J Arthroplasty* 2002;17:315-319.
7. Collins RA, Walmsley PJ, Amin AK, Brenkel IJ, Clayton RA. Does obesity influence clinical outcome at nine years following total knee replacement? *J Bone Joint Surg Br* 2012;94:1351-1355.
8. Kerkhoffs GM, Servien E, Dunn W, Dahm D, Bramer JA, Haverkamp D. The influence of obesity on the complication rate and outcome of total knee arthroplasty: a meta-analysis and systematic literature review. *J Bone Joint Surg Am* 2012;94:1839-1844.
9. Mantilla CB, Horlocker TT, Schroeder DR. Risk factors for clinically relevant pulmonary embolism and deep venous

thrombosis in patients undergoing primary hip or knee arthroplasty. *Anesthesiology* 2003;99:552-560.

10. Inacio MC, Kritz-Silverstein D, Raman R, Macera CA, Nichols JF, Shaffer RA *et al.* The risk of surgical site infection and re-admission in obese patients undergoing total joint replacement who lose weight before surgery and keep it off post-operatively. *Bone Joint J* 2014;96:629-635.
11. Amin AK, Clayton RAE, Patton JT, Gaston M, Cook RE, Brenkel IJ. Total knee replacement in morbidly obese patients. Results of a prospective, matched study. *J Bone Jt Surg Br* 2006;8888(10):1321-1326.
12. Chen JY, Lo NN, Chong HC, Bin Abd Razak HR, Pang HN, Tay DK *et al.* The influence of body mass index on functional outcome and quality of life after total knee arthroplasty. *The bone and joint journal* 2016;98(6):780-5.
13. Bordini B, Stea S, Cremonini S *et al.* Relationship between obesity and early failure of total knee prostheses. *BMC Musculoskelet Disord* 2009;10:29.
14. Spicer D, Pomeroy D, Badenhausen W *et al.* Body mass index as a predictor of outcome in total knee replacement. *International Orthopaedics (SICOT)* 2001;25:246-249.