



Effect of body mass index on functional recovery after total knee arthroplasty in ambulatory overweight or obese women with osteoarthritis

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Objective: The aim of this study was to evaluate the relationship between body mass index (BMI) and functional status after total knee arthroplasty (TKA) in ambulatory overweight or obese women with knee osteoarthritis (OA).

Methods: The study included 78 women who underwent elective primary TKA for osteoarthritis. Age, height, body weight and BMI were recorded. Functional status was evaluated using the Turkish version of the Knee Injury and Osteoarthritis Outcome Score (KOOS). The Timed Up and Go (TUG) test was used to evaluate performance-based functional assessment.

Results: Mean age of the patients was 66.5±5.8 (range: 56 to 79) years and mean duration of symptoms was 9.56±7.1 years. Body mass index was 30 or higher in 47 patients (60%) and between 25 and 29 in 31 (40%). Body mass index did not correlate with the KOOS or TUG test. Postoperative KOOS scores showed a statistically significant increase (p<0.01). Postoperative TUG test values showed significant improvement (p<0.01).

Conclusion: Body mass index had no negative effect on functional recovery and mobility in the ambulatory overweight or obese women undergoing TKA. Physical function improved significantly after knee arthroplasty.

Key words: Body mass index; functional status; KOOS; total knee arthroplasty; TUG.

Obesity is an important problem all over the world. The prevalence of obesity in the United States was reported as 35.5% and 35.8% among adult men and women, respectively, in 2009-2010. These results were comparable with those from 2003 to 2008.^[1] In Turkey, the prevalence of obesity has been reported as 29.5%, according to body mass index (BMI) values.^[2]

Obesity is a well-known risk factor for knee osteoarthritis (OA).^[3] Knee OA causes pain, functional limitation and poor quality of life. When treatment with non-pharmacological and pharmacological agents is unsuccessful, surgical intervention can be considered. Joint arthroplasty for hip or knee OA provides pain relief and functional recovery.^[4] Functional status and quality of

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life usually improves significantly after knee arthroplasty.^[5-7] However, a satisfactory improvement in pain and functional status may not always be achieved in patients with joint arthroplasty. This might be related with surgical factors or patient characteristics.^[7] Preoperative pain and functional status, in addition to patient characteristics and social support, have been found to be significantly related with pain relief and functional status after hip or knee arthroplasty.^[4]

The majority of previous studies have shown that obesity does not have a significant effect on the functional recovery after knee arthroplasty and improvement in quality of life.^[8-14] However, negative effects of obesity on functional recovery after total knee arthroplasty (TKA) has been reported in other studies.^[15,16] The assessment of outcome with self-assessment questionnaires is important due to the elective nature of TKA.^[7]

The aim of this study was to investigate the effect of BMI on functional recovery in women who had unilateral TKA due to primary knee OA.

Patients and methods

The study included 78 ambulatory overweight or obese female patients with knee OA who underwent elective primary unilateral TKA between April 1, 2009 and May 31, 2010. Patients with cognitive disorder, inflammatory or infectious diseases, such as septic arthritis, rheumatoid arthritis or ankylosing spondylitis, neurological diseases, epilepsy, symptomatic hip OA, any comorbid disease which may interfere with the operation, cardiac pacemaker, previous knee surgery, or any deformities affecting ambulation were excluded.

Patient demographics, age, height and weight were recorded and BMI calculated. BMI of 30 or greater was considered 'obese' and BMI between 25 and 29 was considered 'overweight'. Radiological severity of knee OA was evaluated using Kellgren-Lawrence grading. Comorbidities were recorded. Patients were evaluated on the day before the operation and 12 weeks after surgery. All patients were evaluated with the Knee Injury and Osteoarthritis Outcome Score (KOOS) and the Timed Up and Go (TUG) test.

The KOOS is a specific measurement that helps to assess knee functions and knee-related quality of life. It consists of 42 items in 5 subscales, including pain, patient's view of other symptoms, daily living, sports and recreational activities and knee-related quality of life.^[17] Reliability and validity of the Turkish version of the KOOS has been studied.^[18]

The TUG test was used for the assessment of func-

tionality and mobility.^[19] The time required for standing up from the chair, walking 3 meters on the floor, turning around, returning and sitting down again was recorded in seconds. The participants wore comfortable shoes during the test. The average of 3 trials was calculated. The same investigator managed all measurements. A moderate positive correlation has been reported between the KOOS and TUG in knee OA.^[20]

The posterior cruciate ligament sparing technique was used for joint stability. A cemented total knee prosthesis was used for all patients. The distal end of the femur and the proximal cartilage end of the tibia was removed and a cemented prosthesis inserted. A plastic component was fixed to form the joint space. Osteoarthritis most commonly leads to a varus deformity and tight medial soft tissues which are released in the following order to attain satisfactory balance.

After surgery, an elastic bandage was applied to the knee. Lower extremities were elevated for venous circulation. Cold pack was used three times a day after TKA to prevent postoperative pain and edema. Simple analgesics were used for pain control. Quadriceps isometric, active assistive knee range of motion (ROM) exercises, active straight leg raise exercises and active ROM for the ankle were initiated the first postoperative day. Moreover, ambulation with the knee in full extension was initiated with assistance of a walker. Active abduction and adduction exercises for the hip were performed. Patients were discharged within 7 days and given a home exercise program.

This study was approved by the hospital Ethics Committee. Informed consent was obtained from all patients.

All data were analyzed using SPSS for Windows (SPSS Inc., Chicago, IL, USA) software. Data analysis included frequencies and was given in mean \pm standard deviation, minimum and maximum. The Friedman test, paired t-test and Pearson's correlation tests were used for the comparison of parametric and non-parametric results at preoperative and postoperative Weeks 3 and 12. P values of less than 0.05 were considered statistically significant.

Results

Clinical characteristics of the patients are summarized in Table 1. Body mass index was 30 or higher (obese) in 47 (60%) patients and 25 to 29 (overweight) in 31 (40%). Radiological severity of knee OA was Grade 4 in 71 patients (91%) and Grade 3 in 7 (9%). Average number of comorbidities was 1.69 ± 0.81 . Sixty-two (79%) patients had hypertension and 23 (29%) had diabetes

mellitus. Mobility and functional statuses are shown in Table 2.

Average duration of TUG test at the baseline and postoperative Week 12 were 17.88 ± 6.29 seconds and 11.58 ± 3.96 seconds, respectively. A significant improvement was found in the TUG test measurement performed after TKA ($p=0.00$).

KOOS daily living scores of obese patients were significantly worse before arthroplasty ($p=0.007$) (Table 2). However, there was no statistically significant difference between obese and overweight patients in terms of

other subscales of the KOOS at the baseline ($p>0.05$). Preoperative and postoperative KOOS for all subscales are shown in Table 3 and Figure 1.

There was a significant improvement in terms of KOOS subscales after TKA ($p=0.00$). Only 11 patients (14%) used walking aids at the 12th week follow-up.

A significant improvement was found in KOOS subscales at postoperative Week 12 ($p<0.05$). Correlations between BMI and TUG and KOOS are summarized in Table 4. There was no significant correlation between BMI and KOOS or TUG ($p>0.05$).

Table 1. Clinical features of the obese and overweight patients.

	Obese patients (Mean±SD)	Overweight patients (Mean±SD)	p
Age (years)	66.4±6.2	66.5±5.1	0.90
Height (cm)	153±4.9	156±6.5	0.01
Weight (kg)	84.3±9.1	67.8±6.6	0.00
BMI (kg/m ²)	35.9±4	27.5±1.1	0.00
Symptom duration (years)	10.9±8	7.4±4.7	0.06
Comorbidity (n)	2±0.7	1.1±0.6	0.00

BMI: Body Mass Index. Descriptive statistics are used in statistical analysis. Significant p values are written in bold.

Table 2. Baseline functional status of the obese and overweight patients.

	Overweight patients (Mean±SD)	Obese patients (Mean±SD)	p
TUG test (sec)	18.2±6.3	17.4±6.3	0.50
KOOS			
Symptoms	36±16	37±11	0.70
Pain	25±11	28.9±15	0.20
SRF	2.3±3.2	3.7±4.8	0.20
DL	22±10	29±14	0.007
QoL	6.5±15	8.7±15	0.20

DL: Daily living; QoL: Quality of life, SRF: Sports, recreation and function. T-test was used for statistical analysis. Significant p values are written in bold.

Table 3. Pre- and postoperative KOOS values.

	Preoperative			Postoperative			p
	Mean	Min	Max	Mean	Min	Max	
KOOS							
Pain	26.78	0	67	93.62	50	100	0.00
Symptoms	36.44	11	71	94.76	50	100	0.00
SRF	2.88	0	15	20.68	0	35	0.00
DL	24.78	0	85	93.59	50	100	0.00
QoL	7.41	0	100	80.04	50	94	0.00

DL: Daily living; QoL: Quality of life; SRF: Sports, recreation and function. The Friedman test was used for statistical analysis. Significant p values are written in bold.

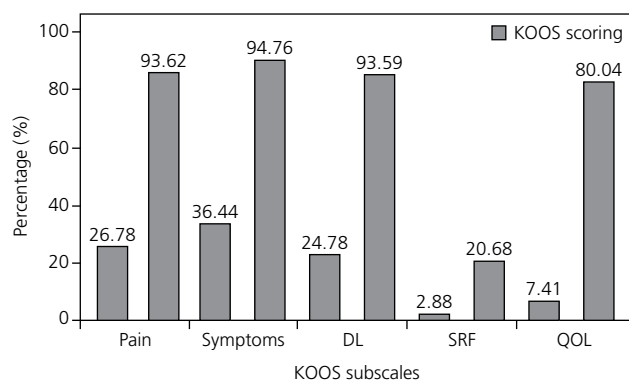


Fig. 1. Pre- and postoperative KOOS scoring. DL: Daily living; QoL: Quality of life; SRF: Sports, recreation and function.

Discussion

According to results of this study, BMI had no significant effect on knee pain, daily living, sports and recreational activities or knee-related quality of life in overweight or obese female patients who underwent TKA due to primary knee OA. In addition, no significant relationship was found between BMI and the improvement in postoperative functional mobility as measured by the TUG test. Although functional scores were low in obese patients who had TKA in previous studies, it has been reported that obesity had no significant effect on functional recovery as measured with different methods.^[8-14,21]

Using the SF-36 Health Survey to measure physical function and quality of life 1 year after arthroplasty due to primary knee OA in 1,011 patients, Stickles et al.^[22] reported that the WOMAC OA index and age showed a negative correlation with BMI. It was concluded that obese patients improved as much as non-obese patients in terms of quality of life, knee pain and function and that obesity did not have a negative effect on functional recovery or improvement in quality of life. Zeni and Snyder-Mackler reported a significant increase in the TUG score at the end of the first year after TKA and that higher BMI was associated with the poor functional recovery.^[16]

In the current study, a significant improvement was observed in functional status and mobility 12 weeks after unilateral knee arthroplasty in women with symptomatic OA. Rastogi et al. also reported a significant increase in all KOOS parameters at the 4th week after TKA.^[23]

The evaluation of functional status with both the self-assessment scale KOOS and the performance-based mobility TUG test can be considered a strength of this study. On the other hand, the limitation of this study was the absence of long-term follow-up.

Table 4. Correlations between BMI and TUG and KOOS.

	BMI	
	r	p
TUG	0.084	0.465
KOOS		
Pain	-0.134	0.242
Symptoms	-0.123	0.282
DL	-0.074	0.518
SRF	-0.134	0.241
QoL	-0.016	0.890

BMI: Body mass index; DL: Daily living; QoL: Quality of life; SRF: Sports, recreation and function.

In conclusion, significant functional recovery was observed in overweight or obese women after primary, elective TKA due to knee OA. Body mass index did not have a negative effect on functional recovery.

Conflicts of Interest: No conflicts declared.

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