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Does Obesity Have an Effect on the Outcomes of Unicondylar Knee Arthroplasty in Patients with Isolated Medial Gonarthrosis?

Má obezita vliv na výsledky unikondylární endoprotézy kolena u pacientů s izolovanou mediální gonartrózou?

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ABSTRACT

PURPOSE OF THE STUDY

The aim of this study was to evaluate and compare the functional outcomes and complication rates of patients in the mid-term follow-up period when patients applied with medial unicondylar knee arthroplasty (UKA) were grouped according to Body Mass Index (BMI) values

MATERIAL AND METHODS

The study included 125 patients applied with medial UKA between December 2013 and December 2017 because of isolated medial compartment gonarthrosis and completed at least 2 years of follow-up. The patients were separated into three groups: non-obese with a BMI < 30 kg/m^2, obese with BMI of 30–39 kg/m^2, and morbidly obese (BMI ≥ 40 kg/m^2). The implants used in all surgeries were cemented fixed-bearing implants. All patients were evaluated preoperatively with bilateral orthoroentgenograms, and weight-bearing anteroposterior and flexed lateral knee X-rays. Postoperatively, bilateral orthoroentgenograms and weight-bearing anteroposterior and flexed lateral knee X-rays were taken. Pre- and post-operative clinical outcomes were evaluated using the Knee Society Score (KSS), functional Knee Society Score (fKSS) Oxford Knee Score (OKS) and Visual Analogue Scale (VAS).

RESULTS

The 125 study patients comprised 83 females and 42 males with a mean age of 54 years (range, 42–71 years). No significant difference was determined between the three groups in respect of age, gender and side distribution ($p > 0.05$). In all three groups, the fKSS, KSS, OKS and VAS values at the final follow-up examination were statistically significantly improved compared to the preoperative values. No periprosthetic infection was determined in any patient throughout the follow-up period. Revision surgery was applied for various reasons to 5 patients; 2 in the non-obese group, 2 in the obese group, and 1 in the morbidly obese group.

DISCUSSION

In the last 20 years, a general increase has been seen in the number of obese patients with knee osteoarthritis requiring surgery. The increase in obesity represents an important worldwide public health problem.

CONCLUSIONS

The results of this study suggest that obesity does not influence the middle term outcomes of UKA. The functional outcome scores after surgery and improvement in these scores were comparable to patients with normal BMI.

Key words: medial gonarthrosis, obesity, unicondylar knee arthroplasty.

INTRODUCTION

Unicondylar knee arthroplasty (UKA) is currently the primary surgical treatment method for isolated medial compartment osteoarthritis of the knee (25). Compared to total knee arthroplasty (TKA), UKA has several advantages such as less bone loss, a shorter stay in hospital, and lower rates of infection and deep vein thrombosis (11, 16). It also provides a high level of patient satisfaction with a knee joint close to normal knee kinematics due to the preservation of the anterior cruciate ligament (ACL), the posterior cruciate ligament (PCL) and the patellofemoral joint (11, 16, 25). However, there are also disadvantages of being a technique-dependent operation with a long learning curve, and there are relatively high rates of revision surgery (6, 18).

In the first years when the technique was described, the patient selection criteria for UKA were extremely strict and obesity in patients was accepted as a contraindication(9, 10, 13). According to the criteria defined and popularised by Kozinn and Scott, patient weight of >82 kg was accepted as a contraindication for UKA with the concerns of early implant failure (13). The first study investigating the effects of obesity on UKA was by Heck et al. in 1993, in which it was reported that much higher failure rates were seen in obese patients

than non-obese patients (10). In a study by Deshmukh and Scott in 2001, the application of UKA was not recommended for patients >90 kg (9). In addition, Berend et al. reported early UKA failure in patients with a body mass index (BMI) of 32 kg/m^2 (2) .

In recent years, the worldwide incidence of obesity has greatly increased for reasons such as increased work tempo, poor nutritional habits, and environmental factors (21). The World Health Organization (WHO) has accepted obesity as a public health problem (3). Obesity is known to be a major contributing risk factor for knee osteoarthritis (12) and several large studies have shown a direct correlation between obesity and osteoarthritis (OA) of the knee (13–16). In recent years, many obese and/or morbidly obese, middle-aged patients have started to present at orthopaedic polyclinics with knee osteoarthritis.

Recent reports of successful early and mid-term results of UKA in obese patients have encouraged orthopaedic surgeons to apply UKA to obese patients (17, 18). In studies by Molloy and Affaloto, successful mid-term results were reported of UKA in obese patients (15,1). In our clinic, UKA has been applied in recent years to obese and even morbidly obese patients.

The aim of this study was to evaluate and compare the mid-term functional outcomes and complication rates of patients applied with medial UKA according to BMI values.

MATERIAL AND METHODS

Approval for this study was granted by the hospital Ethics Committee (01.07.2020-959). The study included 125 patients applied with medial UKA between December 2013 and December 2017 because of isolated medial compartment gonarthrosis and who completed at least 2 years of follow-up. The patients included were those with anteromedial knee arthritis other than inflammatory etiologies. The criteria for UKA application were defined as an intact cruciate ligament, full-thickness lateral cartilage, flexion contracture <15° and fully correctable intra-articular varus deformity. Patients with bicompartmental knee arthroplasty or lateral UKA were excluded from this study.

The height and weight of each patient were measured and the body mass index (BMI) was calculated. The patients were separated into three groups: non-obese with BMI < 30 kg/m^2 obese with BMI of 30–39 kg/m^2, and morbidly obese with BMI ≥ 40 kg/m^2. All the operations were performed by two experienced adult reconstruction surgeons using a medial parapatellar approach. The implants used in all surgeries were cemented fixed-bearing implants (Triathlon PKR Stryker®). The demographic data of the patients are shown in Table 1. All patients were evaluated preoperatively with bilateral orthoroentgenograms, and weight-bearing anteroposterior and flexed lateral knee X-rays. Postoperatively, bilateral orthoroentgenograms and weight-bearing anteroposterior and flexed lateral knee X-rays were taken. Pre- and post-operative clinical outcomes were evaluated using the Knee Society Score (KSS), functional Knee Society Score (fKSS) Oxford Knee Score (OKS) and Visual Analogue Scale (VAS). At the final follow-up examination, a mini-questionnaire was completed by the patients to determine patient satisfaction with the operation. The mean follow-up period of the patients was 51 months (range, 28–84 months).

Statistical analysis

Data obtained in the study were analysed statistically using SPSS vn. 20.0 software. Conformity of the data to normal distribution was assessed with the Shapiro-Wilk and Kolmogorov-Smirnov test. Descriptive statistics, Chi-square analysis, variance analysis and the Kruskal Wallis test were used. A value of $p<0.05$ was accepted as statistically significant.

RESULTS

Evaluation was made of 125 patients, comprising 83 females and 42 males with a mean age of 54 years (range: 42–71 years). Surgery was applied to 77 right knees and 48 left knees (1.6:1). The average BMI was 32.1 (range: 21–58.6). A total of 47 (37.6%) patients were classified as either normal weight or overweight, 46 (36.8%) as obese and 32 (25.6%) as morbidly obese. No statistically significant difference was determined between the normal-overweight, obese and morbidly obese groups in respect of age, gender and operated side ($p > 0.05$).

In all three groups, the fKSS, KSS, OKS and VAS values at the final follow-up examination were statistically significantly improved compared to the preoperative values. No statistically significant difference was determined between the groups in respect of the mean functional scores at the final follow-up examination ($p>0.005$) (Table 2). When the functional results were evaluated, 37 patients had excellent results, 59 good, 22 fair, and 7 poor. The functional scores of the groups are shown in Table 3. The results of the mini-questionnaire completed by the 125 patients at the final follow-up examination showed that 118 patients were satisfied with the operation and 7 were dissatisfied. Of the 7

Table1. Demographic data of patients

Demographic data	Overweight (n = 47)	Obese (n = 46)	Morbidly obese (n = 32)	p
Age (years)	52.28±3.89	54.52±4.50	53.03±3.51	0.068
Gender (male:female)	14:33	18:28	10:22	0.602
BMI (kg/m^2)	26.61±1.71	33.32±2.09	44.02±6.29	0.000
BMI – body mass index				

Table 2. Comparison of the VAS, KSS, fKSS, OKS scores according to the BMI groups

Funtional outcome	Overweight (n=47)	Obese (n=46)	Severely obese (n=32)	p
	KSS function			
Pre-operative	33.04±5.70*	39.26±9.60*	32.25±7.17*	0.000
Post-operative	59.17±12.24*	66.80±10.61*	60.06±12.02	0.004
Change	26.13±8.59	27.54±13.24	27.81±13.31	0.741
	fKSS function			
Pre-operative	47.26±7.33	44.96±12.17	42.81±11.98	0.267
Post-operative	86.94±13.97	84.57±14.83	81.34±16.73	0.271
Change	39.68±14.06	39.60±13.84	38.53±15.25	0.930
	VAS			
Pre-operative	8.19±0.99	8.39±0.91	8.62±1.02	0.151
Post-operative	2.04±1.38	2.22±1.62	2.39±1.78	0.626
Change	6.15±1.49	6.17±1.69	6.23±1.87	0.974
	OKS			
Pre-operative	21.32±4.83	20.43±5.27	18.84±5.36	2.219
Post-operative	41.17±6.33	39.83±6.34	39.66±6.80	0.710
Change	19.85±5.67	19.39±7.00	20.81±7.22	0.643
n=125				

*P values were provided by ANOVA analysis, *shows statictical diffirences by using posthoc comparisons*

Table 3. Functional scores according to the KSS

		BMI					
		Normal-overweight		Obese		Morbidly obese	
		n	%	n	%	n	%
Post KSS	Excellent	13	28.3	15	31.9	9	28.1
	Good	21	45.7	23	48.9	15	46.9
	Fair	10	21.7	7	14.8	5	15.6
	Poor	2	4.3	2	4.3	3	9.4
Total		46	100	47	100	32	100

Table 4. The time and reasons for revision surgery

Age	Sex	BMI	Revision reason	Revision time	Revision implant
55	F	37.1	tibial loosening	30 Mo.	PR. PCL subsituting TKA
50	F	40.3	tibial + femoral loosening	40 Mo.	PR. PCL subsituting TKA
61	M	35.9	tibial component collapse	22 Mo.	PR. PCL subsituting TKA
59	F	30.9	progression of osteoarthritis	26 Mo.	PR. PCL subsituting TKA
57	F	28.4	persistant pain	16 Mo.	PR. PCL subsituting TKA
Mo – months					

patients who were dissatisfied, 5 were the patients applied with revision surgery and the other 2 had poor fKSS scores.

No periprosthetic infection was determined in any patient throughout the follow-up period. Revision surgery was applied for various reasons to 5 patients. In all the revisions, PCL-sacrificing TKA was applied. The patients applied with revision surgery comprised 2 in the non-obese group, 2 in the obese group, and 1 in the morbidly obese group. In the morbidly obese patient, tibial stem extension and a medial side baseplate 10mm wedge were applied because of a large bone defect in the medial tibial plateau. The details of the times and reasons for revision are shown in Table 4.

DISCUSSION

The increase in obesity represents an important worldwide public health problem. Obesity has reached epidemic proportions globally, with more than 1.9 billion overweight adults in 2014 according to the World Health Organization and at least 600 million of those are clinically obese (1).

In the last 20 years, a general increase has been seen in the number of obese patients with knee osteoarthritis requiring surgery. Some surgeons are hesitant to apply UKA to obese and morbidly obese patients because of concerns of prosthesis survival, including early wear of the polyethylene insert, early implant failure, and component loosening (2, 3).

The use of UKA has become more widespread as excellent functional outcomes have been obtained even in long-term follow- up, and it has significant advantages compared to TKA. However, the weight or BMI of patients undergoing UKA is still controversial in the literature.

There are several studies in literature showing that UKA is not successful in obese and morbidly obese patients (2, 4, 9, 10). Berend et al reported a failure rate of 40% in obese and morbidly obese patients followed up for mean 40 months (2). Therefore, it was suggested that UKA patients with BMI >32 were associated with reduced prosthesis survival. Similarly, Bonutti et al. reported high revision rates in obese patients (4). As a result of the increasing number of obese patients, there has been a corresponding increase in the number of patients applied with UKA worldwide. Positive results started to be reported in current literature. Woo et al found that obesity had no significant influence on the 2-year outcomes of UKA (24). In a 7-year follow-up period, which is one of the longest to have been reported in literature, Cavaignac et al. found no correlation between obesity and fKSS and KSS scores in 254 patients (5). In a study by Molloy et al. in 2018, there was reported to be no negative effect of obesity on UKA survival and results (15). Encouraged by that study, UKA started to be applied to obese and morbidly obese patients in our clinic, and the mid-term results of this study were seen to be consistent with the current literature. At the final follow-up examination of the current study patients, no statistically significant difference was determined between the non-obese, obese and morbidly obese groups in respect of functional results. It was even observed that some patients in the morbidly obese group were very highly satisfied with the operation. This was attributed to morbidly obese patients having difficulty in mobilisation preoperatively and then with the decrease in pain postoperatively, they were able to perform daily life activities more comfortably.

The influence of obesity on the short- and midterm outcomes of UKA appears to be independent of the prosthesis design. Naal et al. (17) and Xing et al. (22) found no difference in the rate of prosthesis survival between non-obese and obese patients undergoing fixed-bearing UKA at a mean follow-up of 2 and 4.5 years, respectively. Kuipers et al. also reported no difference between non-obese and obese patients in respect of the survival of mobile-bearing UKA, at a mean follow-up of 2.4 years (14). A fixed insert prosthesis was used in all the current study patients and 94% survival was determined after a mean follow-period of 51 months.

The revision rates of UKA have been reported in literature to be slightly higher than those of TKA. This can be attributed to the role of factors such as UKA being a technique-dependent operation and the long learning curve. In addition, if pain has not recovered in patients who have been applied with UKA, even if there are no radiological findings, this is thought to have a role in making the decision more easily for revision with TKA (20, 23, 25). The general evidence that there are high revision rates in obese patients has started to change with recently published studies (1, 15, 19). Revision was applied for various reasons to 5 patients in the current study. The revision rates in this study were similar in both the obese and non-obese patients, which was thought to be due to appropriate selection criteria and the correct application of the technique.

Although successful mid-term results in obese patients have been reported in several recent studies, in the study by Xu et al., which had the longest follow-up period in literature, of the patients with good mid-term results, there were slightly higher revision rates in obese patients after follow-up of 10 years (23). Therefore, uncertainty remains about long-term survival of prostheses in the obese/morbidly obese patient group. Weight loss should be recommended to this patient group in the postoperative period in respect of both prosthesis survival and preventing general comorbidities.

CONCLUSIONS

Limitations of this study can be considered to be the relatively low number of patients, the retrospective study design and that there was no long-term follow up.

In conclusion, the results of this study suggest that obesity does not influence the mid-term outcomes of UKA. The functional outcome scores after surgery and improvement in these scores were comparable to those of patients with normal BMI.

Conflict of interest
The authors declare that they have no conflict of interest.

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