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ORIGINAL ARTICLE

Retrospective Study

Total knee arthroplasty: Effect of obesity and other patients' characteristics on operative duration and outcome

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Abstract

AIM: To examine the effects of patients' characteristics mainly obesity on operative duration and other outcome measures of knee arthroplasty.

METHODS: This is a retrospective chart review of 204 patients who had knee arthroplasty within the past five years (2007-2011) at King Abdulaziz Medical City in Riyadh, Kingdom of Saudi Arabia. The data collection form was developed utilizing the literature review to gather all the needed variables. Data were gathered from admission notes, nursing notes, operative reports and discharge summaries.

RESULTS: A feasible sample of 204 patients were included in the study. Of those patients, 155 (76%) were females. The mean age was 70.1 years for males (SD ± 9.4) and 62.7 years (SD ± 8) for females. Regarding the type of total knee replacement (TKR), 163 (79.9%) patients had unilateral TKR and 41 (20.1%) had bilateral TKR. Nine patients (4.4%) had a normal body mass index (BMI) (18.5 to < 25). Overweight patients (BMI 25 to < 30) represented 18.1%. Obesity class Ⅰ (BMI 30 to < 35) and obesity class Ⅱ (BMI from 35 to < 40) were present in 23% and 29.9% of the patients, respectively. Morbid obesity (BMI greater than 40) was present in 24.5%. The mean duration of surgery was 126.3 min (SD ± 30.8) for unilateral TKR and 216.6 min (SD ± 55.4) for bilateral TKR.The mean length of stay in the hospital was 12 d (SD ± 4.9). The complications that patients had after the operation included 2 patients (1%) who developed deep venous thrombosis, 2 patients (1%) developed surgical wound infections and none had pulmonary embolism. Patients' characteristics (including age, gender, BMI and co-morbidities) did not have an effect on the operative duration of knee replacement nor the length of hospital stay.

CONCLUSION: Our study shows that obesity and other patients' characteristics do not have effect on the operative duration nor the length of hospital stay following TKR.

Key words: Knee; Replacement; Arthroplasty; Implantation; Surgery; Orthopedics; Total knee arthroplasty; Total knee replacements

Core tip: Studying the effects of obesity and other patient's characteristics on the outcome and operative duration of knee arthroplasty (KA) is of great value for both patients and physicians. Studies regarding this subject have shown conflicting results, and the importance of these factors on the decision to perform KA is debatable among surgeons. In our study, we demonstrated that higher body mass index values were not associated with longer duration of surgery. We also found that patients' characteristics did not seem to be an important determinant of length of stay.

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INTRODUCTION

Knee replacement (KR) is one of the most commonly performed orthopedic procedures in the United States and United Kingdom. Over 600000 KRs are carried out annually in the United States. The articular surfaces that form the knee joint are covered with cartilage that functions like a shock absorber. When this cartilaginous coverage is lost or damaged, patients experience varying degrees of pain and functional impairment.

Osteoarthritis and rheumatoid arthritis are the underlying reasons of the majority of total knee arthroplasties[1-4]. KR is considered a safe and cost-effective procedure that improves patients' quality of life, physical function and alleviates pain[5]. Complications of KR, although rare and preventable, include thromboembolism, infection and prosthesis failure[6].

Many studies have reported how patients' characteristics such as age, gender and obesity influenced the outcome and prognosis of knee arthroplasty[7,8]. Nonetheless, the importance of these factors on the decision to perform knee arthroplasty is debatable among surgeons[9]. This may reflect the lack of available data. A systematic review of sixty-four studies concluded that future studies are needed to sort out the question of how patients' characteristics affect the outcome of knee arthroplasty[8]. With regard to the operative duration and its association with the obesity, we found relatively little literature addressing this issue. These studies have shown conflicting results, for example, a study of 172 KRs in United Kingdom found that higher body mass index (BMI) was associated with increased tourniquet time[10]. However, another study conducted in Spain on 100 patients found no association between the BMI and tourniquet time[11].

The length of hospital stay (LOHS) following KR is significantly affected by patients' characteristics. A recent study in the United States reviewed the preoperative data of 383 patients and found the mean LOHS to be 4.35 d and that increased age and lower BMI prolonged the hospital stay[12,13]. Furthermore, obese patients had higher revision rates in a study of 326 total KRs (TKR) conducted in London[13]. Yet, another study showed that the risk of prosthesis failure was not influenced by the patient's BMI[13].

Only a few studies were conducted in the Kingdom of Saudi Arabia concerning KR[14-17]. One study in Jeddah concluded that TKR improves quality of life and the observed complications compared well with the literature[15]. Another study surveyed patients' attitude toward TKR[17]. However, no national or regional studies have evaluated the effect of patient's characteristics on the outcome of the procedure.

The purpose of this study was to examine the effects of some patients' characteristics (age, gender, obesity and co morbidities) on certain outcome measures (operative duration, revision rate, length of hospital stay and post operative complications) of KR. Main focus was on the association between the patients' BMI and operative duration of KR.

MATERIALS AND METHODS

The Medical records of a feasible sample of all the patients (204) who underwent TKR (both unilateral and bilateral) within the past five years (2007-2011) at King Abdulaziz Medical City in Riyadh, Kingdom of Saudi Arabia were reviewed. Most of those patients were National Guard Health Affiars employees (military and non-military) or their families. Almost all of them were Saudis and some live in Riyadh (the capital of Saudi Arabia), while others came from suburban areas. Data were gathered from admission notes, nursing notes, operative reports and discharge summaries.

The data collection form was developed utilizing the literature review to gather all the needed variables. It contains two main sections, the first is about the patients' characteristics (*e.g.*, age, gender, BMI, co-morbidities…, *etc.*), while the second is regarding the surgery itself (*e.g.*, date, duration and complications).

Patients' confidentiality was maintained throughout the study, patients' names were not used. Instead patients' record numbers were documented for the purpose of validation. Access to the data was restricted to the investigators. Patients' consent was not required for this type of study. The study was approved by King Abdullah International Medical Research Center Institutional Review Board.

SPSS V20 was used. Data were entered into the

Table 1 Patient's characteristics

Variable		Frequency (*n*)	%
Gender	Males	49	24
	Females	155	76
Type of TKR	Unilateral	163	79.9
	Bilateral	41	20.1
Co-morbidities	Hypertension	126	61.8
	Diabetes	84	41.2
	Dyslipidemia	67	32.8
BMI	Normal BMI (BMI value 18.5 to < 25)	9	4.4
	Overweight (BMI value 25 to < 30)	37	18.1
	Obesity class 1 (BMI value 30 to < 35)	47	23
	Obesity class 2 (BMI value 35 to < 40)	61	29.9
	Morbid obesity (BMI value > 40)	50	24.5
Post Operative Complications	DVT	2	1
	PE	0	0
	Infection	2	1

TKR: Total knee replacement; BMI: Body mass index; DVT: Deep venous thrombosis; PE: Pulmonary embolism.

program from the completed forms. Univariate analysis (frequencies) and bivariate analysis were calculated. *P* value of $\leqslant$ 0.05 was considered significant. Different statistical tests were used including ANOVA and *t*-tests.

RESULTS

A total of 204 patients who underwent KR surgery were included in the study. Of those, 155 (76%) were females. Females' mean age was 62.7 years (SD ± 8) while males' mean age was 70.1 (SD ± 9.4) years.

Only 9 patients (4.4%) had a normal BMI (18.5-25). Overweight patients (BMI 25-30) represented 18.1%. Obesity class 1 (BMI 30-35) and obesity class 2 (BMI from 35 to 40) were present in 23% and 29.9% of the patients, respectively. Morbid obesity (BMI greater than 40) was present in 24.5% of the patients (Table 1).

Hypertension was present in 126 (61.8%) patients, diabetes was present in 84 (41.2%) patients, and dyslipidemia was present in 67 patients (32.8%). Osteoarthritis was the main cause of TKR (99.5%) of patients. One hundred and sixty-three (79.9%) patients had unilateral TKR while the rest had bilateral TKR. The mean duration of surgery was 126.3 min (SD ± 30.8) for unilateral TKR and 216.6 min (SD ± 55.4) for bilateral TKR. The mean length of stay in the hospital was 12 d (SD ± 4.9).

Two patients (1%) developed deep venous thrombosis, 2 patients (1%) had surgical wound infection and none had pulmonary embolism (Table 1).

t-test was used to assess the association between patients' gender and the mean operative duration. *P* values for unilateral and bilateral TKR are non significant (*P* = 0.69 for unilateral, 0.51 for bilateral). There is no difference between males and females with regard to the operative duration in either groups of TKR.

ANOVA test was used to assess the association between the BMI of patients and the operative duration. *P* = 0.28 for unilateral and *P* = 0.66 for bilateral TKR which means that there is no association between the BMI and operative duration in either groups.

There is no association between the presence of diabetes milletus, hypertension or dyslipidemia with the operative duration in both groups (Table 2).

Table 3 shows no difference between males and females with regard to the LOHS in either groups (*P* = 0.37 for unilateral, 0.79 for bilateral), also there is no association between the BMI and length of hospital stay in either groups (*P* = 0.27 for unilateral, 0.32 for bilateral).

DISCUSSION

Studying the effects of obesity (as measured by the BMI) and other patient's characteristics on the outcome and operative duration of KR is of great value for both patients and physicians.

In our study we found that the BMI is not associated with the operative duration of KR. In other words, we demonstrated that higher BMI values were not associated with longer duration of surgery in both unilateral and bilateral TKR. Thus, we believe that the BMI should not be considered an indicator for prolonged operative time when performing KR. This information is important because it will allow surgeons to appropriately utilize the operating room time and resources. Our finding is supported by the results of a study conducted in Spain on 100 patients who found that the BMI doesn't affect the operative duration[11]. However, a United Kingdom study that included 172 patients showed that higher BMI was associated with increased operative time[10]. Recently, two studies in New York, United States, found that obesity was related to longer duration of unilateral KR[18,19].

Our results showed that certain patients' characteristics (namely: age, gender and co-morbidities) did not have an effect on the operative duration of KR. To the best of our knowledge there are no studies that looked at the association between age, gender and co-morbidities and operative duration of KR.

The mean length of stay following TKR in our study was 12 d compared to 7.6 d in a study done in United Kingdom on over 500 patients[3]. This might be explained by including pre-operative admission days in our study when calculating the length of stay. This study revealed that patients' characteristics did not seem to be an important determinant of length of stay. A retrospective study in United States supports this as they found that age, gender, living arrangement and co-morbidities did not contribute significantly to

Table 2 Association of patient's characteristics and duration of surgery

Duration of surgery *vs*		Unilateral TKR					Bilateral TKR				
		n	%	Mean duration	SD	*P* value	*n*	%	Mean duration	SD	*P* value
Gender	Males	35	21.5	124.5	29.2	0.69	14	34.1	224.7	50.2	0.51
	Females	128	78.5	126.9	31.4		27	65.9	212.4	58.3	
BMI	Normal BMI (BMI value 18.5 to < 25)	5	3.1	115.8	44.6	0.28	4	9.8	239	51.2	0.66
	Overweight (BMI value 25 to < 30)	27	16.6	117.1	24		10	24.4	215.3	66.3	
	Obesity class 1 (BMI value 30 to < 35)	40	24.5	125.9	37.3		7	17.1	228.4	33.5	
	Obesity class 2 (BMI value 35 to < 40)	48	29.4	127	29.5		13	31.7	198.8	64.3	
	Morbid obesity (BMI value > 40)	43	26.4	133	27.4		7	17.1	226.8	42.5	
DM	Yes	63	38.7	124.7	30.8	0.59	21	51.2	215.2	56.4	0.87
	No	100	61.3	127.4	33.8		20	48.8	218.1	55.7	
HTN	Yes	99	60.7	126.3	29	1	27	65.9	223.8	50.3	0.25
	No	64	39.3	126.3	33.8		14	34.1	202.7	63.7	
DLP	Yes	52	31.9	126.7	25.8	0.92	15	36.6	227.1	42.2	0.36
	No	111	68.1	126.2	33.1		26	63.4	210.5	61.7	

TKR: Total knee replacement; BMI: Body mass index; DM; Diabetes mellitus; HTN: Hypertension; DLP: Dyslipidemia.

Table 3 Association of patients' characteristics and length of hospital stay

Length of hospital stay *vs*		Unilateral TKR					Bilateral TKR				
		n	%	Mean	SD	*P* value	*n*	%	Mean	SD	*P* value
Gender	Males	35	21.5	12.6	6.3	0.37	14	34.1	14.6	4.1	0.79
	Females	128	78.5	10.9	3.7		27	65.9	15	6.1	
BMI	Normal BMI (BMI value 18.5 to < 25)	5	3.1	10.8	2.5	0.27	4	9.8	12	2.2	0.32
	Overweight (BMI value 25 to < 30)	27	16.6	10.7	3.6		10	24.4	14.7	6.9	
	Obesity class 1 (BMI value 30 to < 35)	40	24.5	12.6	6.8		7	17.1	16.6	5.6	
	Obesity class 2 (BMI value 35 to < 40)	48	29.4	10.7	3.3		13	31.7	13.5	4.1	
	Morbid obesity (BMI value > 40)	43	26.4	10.9	3.3		7	17.1	17.9	6.1	

TKR: Total knee replacement; BMI: Body mass index.

LOHS[13]. But one recently published study in United Kingdom found that age > 80 and higher BMI were significant predictors for prolonged hospital stay following TKR[3].

The effects of patients' characteristics on the post-operative complications and KR revision rate could not be assessed because the numbers were too small to do appropriate statistical analysis.

Our study showed that osteoarthritis is the leading cause for TKR. One large community house-held study in Saudi Arabia showed the prevalence of knee osteoarthritis among adult Saudi inhabitants (those aged older than 16) was 13%, of which 30% between the ages 45-55 years. This was doubled by the age of 65 year[20]. In another study, 90% of patients with knee osteoarthritis were overweight and obese[21].

There is a strong association between obesity and osteoarthritis, which is more in females than males (OR for males is 2.0 and for females is 3.0)[22].

Obesity prevalence is increasing in all areas of the Kingdom of Saudi Arabia[23]. This will probably lead to increasing numbers of KRs because obesity is a well-known risk factor for osteoarthritis[24].

Strengths of our research include examining the outcome of both unilateral and bilateral KRs. Our research question is the first to be studied in Saudi Arabia.

There are several limitations to our study. First, the inter-surgeons differences and surgeons' expertise were not accounted for when calculating the operative duration of KR. Second, we looked at the total operative time which is not very accurate because other factors like anesthesia timing might affect it. Also, the type of the implant (prosthesis) was not considered. This is a retrospective chart review study and has the limitations common to those types of study designs mainly documentation bias. Another weakness is the small sample size.

To conclude, KR is a safe and cost-effective procedure that alleviates pain and improves function. The relationship between patients' demographics and the outcome of TKR is still not clear. Our study shows that patient's characteristics particularly obesity do not increase the operative time and do not prolong the hospital stay following TKR.

Total knee arthroplasty (TKA) is a safe procedure that alleviates pain and improves function. Patient's characteristics particularly obesity do not increase the operative time and do not prolong the hospital stay following TKA.

We believe that when scheduling patients for KR, patient's characteristics should not be viewed as accurate measures of operative difficulty and operative duration. However, this information should be addressed with caution as the literature review revealed contradicting results. Therefore, we recommend that larger and controlled studies should be done to better assess this topic especially in Saudi Arabia.

COMMENTS

Background

More than half million knee arthroplasties are done annually in United States, mainly due to osteoarthritis, which improves the quality of their lives. Patients with Osteoarthritis are usually old, obese with high percentage of comorbidities. There is controversies among studies of the effect of such patient's characteristics on the outcome of the surgery.

Research frontiers

There is controversy among studies of the effect of age, obesity and other patients' characteristics on the outcome of total knee arthroplasty (TKA). The result shows no effect.

Innovations and breakthroughs

There is debate among surgeons of the influence of patients' characteristics on the outcome of TKA. A systematic review of sixty-four studies concluded that further studies are needed to sort out this conflict. This study shows that there is no association between age, gender, obesity and comorbidities on TKA outcome.

Applications

This study shows that there is no effect of patients characteristics on the outcome of TKA, surgeons don't need to select their patients based on their characteristics to perform TKA or to predict a worse outcome.

Terminology

Total knee replacement, also referred to as TKA, is a surgical procedure where damaged surfaces of a knee joint are removed and replaced with artificial joint or prosthesis (http://ehealthmd.com/content/what-knee-replacement#ixzz39bBCZ6ak).

Peer-review

The objective of this study was to examine the effects of patient's characteristics on operative duration following knee arthroplasty. This is an interesting study.

REFERENCES

1 HCPUnet, Healthcare Cost and Utilization Project. Agency for Healthcare Research and Quality. Available from: URL: http://hcupnet.ahrq.gov

2 **Torpy JM**, Lynm C, Golub RM. JAMA patient page. Knee replacement. *JAMA* 2011; **305**: 844 [PMID: 21343586 DOI: 10.1001/JAMA.305.8.844]

3 **Jonas SC**, Smith HK, Blair PS, Dacombe P, Weale AE. Factors influencing length of stay following primary total knee replacement in a UK specialist orthopaedic centre. *Knee* 2013; **20**: 310-315 [PMID: 22910196 DOI: 10.1016/J.KNEE.2012.07.010]

4 **Singh JA**, Vessely MB, Harmsen WS, Schleck CD, Melton LJ, Kurland RL, Berry DJ. A population-based study of trends in the use of total hip and total knee arthroplasty, 1969-2008. *Mayo Clin Proc* 2010; **85**: 898-904 [PMID: 20823375 DOI: 10.4065/MCP.2010.0115]

5 **Martin GM**, Thornhill TS. Complications of Total Knee Arthroplasty. 2014. Available from: URL: http://www.uptodate.com/contents/complications-of-total-knee-arthroplasty

6 **Martin GM**, Thornhill TS. Total Knee Arthroplasty. Uptodate 2014. Available from: URL: http://www.uptodate.com/contents/total-knee-arthroplasty

7 **Jones DL**, Westby MD, Greidanus N, Johanson NA, Krebs DE, Robbins L, Rooks DS, Brander V. Update on hip and knee arthroplasty: current state of evidence. *Arthritis Rheum* 2005; **53**: 772-780 [PMID: 16208670 DOI: 10.1002/art.21465]

8 **Santaguida PL**, Hawker GA, Hudak PL, Glazier R, Mahomed NN, Kreder HJ, Coyte PC, Wright JG. Patient characteristics affecting the prognosis of total hip and knee joint arthroplasty: a systematic review. *Can J Surg* 2008; **51**: 428-436 [PMID: 19057730]

9 **Wright JG**, Coyte P, Hawker G, Bombardier C, Cooke D, Heck D, Dittus R, Freund D. Variation in orthopedic surgeons' perceptions of the indications for and outcomes of knee replacement. *CMAJ* 1995; **152**: 687-697 [PMID: 7882231]

10 **Sampath SA**, Voon SH, Sangster M, Davies H. The statistical relationship between varus deformity, surgeon's experience, BMI and tourniquet time for computer assisted total knee replacements. *Knee* 2009; **16**: 121-124 [PMID: 19013071 DOI: 10.1016/J.KNEE.2008.09.008]

11 **Lozano LM**, Núñez M, Segur JM, Maculé F, Sastre S, Núñez E, Suso S. Relationship between knee anthropometry and surgical time in total knee arthroplasty in severely and morbidly obese patients: a new prognostic index of surgical difficulty. *Obes Surg* 2008; **18**: 1149-1153 [PMID: 18506553 DOI: 10.1007/s11695-008-9481-3]

12 **Crawford DA**, Scully W, McFadden L, Manoso M. Preoperative predictors of length of hospital stay and discharge disposition following primary total knee arthroplasty at a military medical center. *Mil Med* 2011; **176**: 304-307 [PMID: 21456357 DOI: 10.7205/MILMED-D-10-00042]

13 **Epps CD**. Length stay, discharge disposition, and hospital charge predictors. *Aorn J* 2004; **79**: 975-976, 979-981, 984-997 [DOI: 10.1016/S0001-2092(06)60729-1]

14 **Ahlberg A**. Knee joint replacement in Saudi Arabia - present and future. *Ann Saudi Med* 1994; **14**: 281-282 [PMID: 17586917]

15 **Bakhsh TM**. Results of total knee replacement using a cemented stemmed prosthesis. *Saudi Med J* 2006; **27**: 661-666 [PMID: 16680257]

16 **Bakhsh TM**. Results of unicompartmental knee replacement. *Saudi Med J* 2007; **28**: 1062-1064 [PMID: 17603711]

17 **Behairy YM**, Motuweh SH, Kathlan KA. A survey of patients' attitude toward total knee replacement in a major center in the Kingdom of Saudi Arabia. *Saudi Med J* 2004; **25**: 1291-1293 [PMID: 15448794]

18 **Gadinsky NE**, Manuel JB, Lyman S, Westrich GH. Increased operating room time in patients with obesity during primary total knee arthroplasty: conflicts for scheduling. *J Arthroplasty* 2012; **27**: 1171-1176 [PMID: 22285256 DOI: 10.1016/J.ARTH.2011.12.012]

19 **Liabaud B**, Patrick DA, Geller JA. Higher body mass index leads to longer operative time in total knee arthroplasty. *J Arthroplasty* 2013; **28**: 563-565 [PMID: 23141864]

20 **Al-Arfaj AS**, Alballa SR, Al-Saleh SS, Al-Dalaan AM, Bahabry SA, Mousa MA, Al-Sekeit MA. Knee osteoarthritis in Al-Qaseem, Saudi Arabia. *Saudi Med J* 2003; **24**: 291-293 [PMID: 12704507]

21 **Al-Arfaj AS**. Radiographic osteoarthritis and serum cholesterol. *Saudi Med J* 2003; **24**: 745-747 [PMID: 12883606]

22 **Al-Arfaj AS**. Radiographic osteoarthritis and obesity. *Saudi Med J* 2002; **23**: 938-942 [PMID: 12235467]

23 **Al-Othaimeen AI**, Al-Nozha M, Osman AK. Obesity: an emerging problem in Saudi Arabia. Analysis of data from the National

Nutrition Survey. *East Mediterr Health J* 2007; **13**: 441-448 [PMID: 17684864]

24 **Oliveria SA**, Felson DT, Cirillo PA, Reed JI, Walker AM. Body weight, body mass index, and incident symptomatic osteoarthritis of the hand, hip, and knee. *Epidemiology* 1999; **10**: 161-166 [PMID: 10069252 DOI: 10.1097/00001648-199903000-00013]

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