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Çeşitli Total Diz Protezi Uygulamalarının (Bilateral Simultane, Ardışık Bilateral ya da Tek Yanlı) Erken Postoperatif Komplikasyonlara Etkisi

The Influence of the Total Knee Prosthesis Applications (Bilateral, Simultaneous, Consecutive Bilateral or Single-Sided) on the Early Postoperative Complications

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Özet

GİRİŞ ve AMAÇ: İleri evre diz artrozunun cerrahi tedavisinde genellikle femoro-tibial eklemin değiştirildiği iki kompartmanlı diz protezi ameliyatı başarıyla uygulanmaktadır. Uygulama, bilateral olgularda değişik yöntemler kullanılarak; aynı seansta ya da farklı zamanlarda şeklindedir. Bu çalışmada simultane bilateral total diz artroplastisi (TDA), seanslı bilateral TDA ve unilateral TDA'ni erken postoperatif komplikasyonlar yönünden karşılaştırdık.
YÖNTEM ve GEREÇLER: Nisan 2004 ve Ocak 2009 tarihleri arasında, simultane bilateral (n=85), seanslı bilateral (n=30) ve unilateral (n=85) TDA uygulanan toplam 185 hastanın son dönem gonartroza sahip 285 dizi retrospektif olarak değerlendirilmiştir. Bu 185 hastanın kayıtları ortalama 27,1±9,85 aylık takip periodunda, demografik örnekleme, preoperatif eştanılar ve perioperatif komplikasyonlar açısından incelendi. Cerrahinin tipi, yaş, cinsiyet, ASA (Amerikan Anesteziyoloji Birliği) skorları ve turnike zamanı perioperatif komplikasyonlar açısından karşılaştırıldı.
BULGULAR: Simultane bilateral TDA uygulanan hastalarda ve bu hasta grubunda ASA 2 olanlarda ASA 1 olanlara göre perioperatif komplikasyon oranı belirgin olarak daha yüksekti (sırasıyla, p<0,027 ve p<0,171). TDA uygulama tipi ile 70 yaş altında olan hasta grubu içerisinde komplikasyon görülme sıklığı operasyon türüne bağlı olarak anlamlı değişim göstermekteydi (p=0,034). Bilateral simultane operasyonlarda komplikasyon görülme sıklığı unilateral grubuna göre istatistiksel olarak daha yüksek idi (p=0,012).
TARTIŞMA ve SONUÇ: Seanslı ve unilateral uygulamalara göre simultane bilateral TDA belirgin olarak daha yüksek perioperatif komplikasyon riskine sahiptir. Ancak, simultane bilateral TDA uygulamasına, uygun endikasyon durumunda, hastanın onayı ve tercihi doğrultusunda karar verilmelidir.

Anahtar Kelimeler: Artroplasti, diz komplikasyonları, komorbiditide.

Abstract

INTRODUCTION: In the surgical treatment of the advanced-stage knee arthrosis, two-compartment knee prosthesis surgery is applied successfully in which femoro-tibial joint is usually replaced. Application can be performed by using various methods in bilateral cases in the same session or in different sessions. In this study, we compared simultaneous bilateral total knee arthroplasty (TKA) with bilateral TKA with session and with unilateral TKA in terms of early postoperative complications.
METHODS: 285 series of the 185 patient having late-period gonarthrosis in which simultaneous bilateral TKA (n=85), bilateral TKA with sessions (n=30) and unilateral TKA (n=85) were applied between April 2004 and January 2005 were retrospectively assessed. The records of these 185 patients were studied within the mean period of 27.1±9.85 months in terms of demographic sampling, preoperative concurrent diagnosis and perioperative complications. The type of surgery, age, gender, ASA (American Anesthesiology Association) Scores and tourniquet time were compared in terms of perioperative complications.
RESULTS: In patients in which simultaneous bilateral TKA was applied and in those with ASA2 among this patient group the perioperative complication ratio was significantly higher compared to those with ASA1 (p<0.027 and p<0.171 respectively). The TKA type and the incidence of complication were demonstrating significant variation depending on the surgery type (p=0.034). The incidence of complication was statistically higher in bilateral simultaneous surgeries compared to unilateral group (p=0.012).
DISCUSSION AND CONCLUSION: Bilateral TKA has significantly higher perioperative complication risk compared to applications with sessions and to the unilateral applications. However, decision for simultaneous bilateral TKA should be made in case of suitable indication, if this is confirmed by the patient and in the direction of the preference of the patient.

Keywords: Arthroplasty, knee complications, comorbidity.

GİRİŞ

The advantages of the bilateral TKA with single anesthesia are that it is suitable for patient and that it has shorter hospitalization (1-6). However,

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some surgeons avoid performing single-session application due to the more frequent complication risk (7-13). Actually, the condition of the patient determines the surgical risk. The general condition of the patient is classified according to the American Anesthesiology Association (AS) scoring and many studies demonstrate that ASA-1 and ASA-2 patients are the safest group (14). According to this classification, it has been accepted that single-session application has higher risk in ASA-3and ASA-4 patients compared to consecutive application.

Knee arthritis is presented ad bilateral symptomatic in one third of the cases. The surgical options for this type of patients are simultaneous arthroplasty in both knees in which two distinct surgery team operate, consecutive arthroplasty in which one surgery team establishes with one anesthesia and approach with session which is achieved with anesthesia applied in two separate times. Which approach is the most secure in this type of patients is still contentious in the literature (6-8,15-21). Consecutive procedures require longer anesthesia time. This has been shown to be associated with the occurrence of side-effect (1,4,12,22-25).In this study, our aim is to analyze the early-period complication and the morbidity of the TKA surgery applied with single or two sessions to the patients with bilateral gonarthrosis. In order to reveal this, it was investigated 1) whether there is a difference between ASA scoring and bilateral single-session application in terms of complication 2) whether bilateral single-session application contributes to either morbidity or mortality in patients older than seventy years old 3) whether either single-session application or intermittent double-session application has influences on the perioperative complications and on the time of hospitalization.

MATERIALS AND METHODS

285 series of the 185 patient having late-period gonarthrosis in which simultaneous bilateral TKA (n=85), bilateral TKA with sessions (n=30) and unilateral TKA (n=85) were applied between April 2004 and January 2005 were retrospectively assessed. 285 series of totally 185 patients with the diagnosis of gonarthrosis in which bilateral TKA with single session was applied by an experienced knee surgeon (MU) to eighty five patients, in which bilateral TKA was applied in separate times to fifteen patients and in which unilateral TKA was applied to eighty five patients were included into the study. The inclusion criteria were as follows: 1) persistent pain despite 6 months of conservative treatment; 2) serve gonarthrosis which was level 4 or 5 according to the Ahlbäck classification system 3) presence of functional knee muscles.The exclusion criteria were as follows: 1) presence of previous knee surgery. 3) infection of the knee joint, 4) neurologic deficit in muscles around the knee.

The patients were assessed in terms of age, gender, diseases existing before and after the surgery, ASA scores, hospitalization time and complications. The groups were compared in terms of general complications (neurological, cardiovascular, pulmonary, gastrointestinal and urinary system complications) and orthopedic complications. Standard approaches were applied to the patients preoperatively and postoperatively. Preoperatively, 1×0.4-ml subcutaneous enaksaparin-Na was initiated in the night before the surgery as the thromboembolism prophylaxis and it continued for twenty eight days postoperatively. As the antibiotic prophylaxis, 1-gram cephazoline was initiated preoperatively half an hour before the surgery and it continued 24 hours postoperatively. Prosthesis designs with cement were used in all of the patients (Scorpio, Genesis II). Tourniquet was opened in the knee firstly begun in patients in whom unilateral TKA, bilateral TKA with session and simultaneous bilateral TKA were applied. No bleeding control was done in the second knees of the bilateral simultaneous group and tourniquet was opened after jones bandage by closing directly. Jones bandage was applied to all of our patients. Transfusion applications were decided as preoperative and postoperative by the responsible surgeon according to the clinical and laboratory needs of the patients. The same rehabilitation protocol was applied to all

patients. Until the second postoperative day, drain was drawn after the isometric quadriceps exercises. Afterwards, they were allowed to step and the active knee movements were initiated. Other exercises continued at the same time.

STATISTICAL ANALYSIS

The analysis of the data was established in SPSS 115.5 software package. Whether the distribution of the continuous variables fitted to the normal distribution was investigated through the Shapiro Wilk test. Descriptive statistics were shown as arithmetic mean ± standard deviation for numerical variables and as number of observations (%) for nominal variables. To fact whether there is a statistically significant difference between independent groups in terms of the characteristics which were obtained by means of measurement was studied through Student's t-test or Mann Whitney U test when the number of the independent groups was two, and this was studies though One-Way Variance Analysis or Kruskal Wallis test in case where the number of independent groups was more than two. In cases where the result of the test statistics of Kruskal Wallis was significant, the group which caused to the difference was determined by performing Kruskal Wallis multiple comparison testing. For categorical comparisons, Chi-square or Fisher' Absolute test were used. The results were accepted as statistically significant for $p<0.05$.

RESULTS

The mean age of the patients included into the study was detected as 66.3 ± 7.11 years old. 32 of the cases (17.3%) were males and 153 of them were females (82.7%). The surgical groups were statistically similar in terms of the means of age and the distribution of genders respectively (p=0.435 and p=0.049 respectively). Mean follow-up time 27.1±9.85 months. Statistically significant difference was found between the surgery groups in terms of the distributions of ASA levels (p=0.003). Thus, the mean of the cases within the bilateral simultaneous group was statistically lower than that of either the bilateral TKA with session or unilateral group in terms of ASA level (p=0.016 and p=0.009 respectively) (Table 1). At least one complication was detected in postoperative period in the 20% of the cases within the bilateral group with session, and in 35.3% of the cases within the bilateral simultaneous group and in 17.6% of the cases within the unilateral group. A statistically significant difference was found in terms of the incidence of postoperative complication between groups (p=0.027). The prevalence of complication was statistically higher in the bilateral simultaneous group compared to unilateral group (p=0.009) (Table 2). Within the group with age less than seventy years old, the incidence of complication demonstrated a significant variation depending on the surgery type (p=0.034). Thus, the incidence of complication in bilateral simultaneous surgeries was statistically higher compared to the unilateral group (p=0.012). Within the group with age less than seventy years old, time of hospitalization after the surgery demonstrated a significant variation depending on the surgery type (p=0.003). Thus, the mean time of hospitalization after the surgery was statistically higher in the bilateral simultaneous group compared to either bilateral group with session or to the unilateral group (p= 0,025 and p<0,001 respectively). When no classification was made according to age and in the assessment made in general sense, time of hospitalization demonstrated a significant variation depending on the surgery type (p=0.006). Thus, Thus, the mean time of hospitalization after the surgery was statistically higher in the bilateral simultaneous group compared to either bilateral group with session or to the unilateral group (p= 0,005 and p=0,010 respectively) (Table 3). Within the bilateral simultaneous group, it was observed that the development of complication varied statistically depending on the ASA level (p=0.014). Thus, the origin of the difference in question was the fact that the development of complication in ASA-2 cases was statistically more common compared to ASA-1 cases. It was observed that there was a statistically significant difference in terms of the complication availability and in terms of the applied surgical procedure (p=0.027). Thus, it was observed that bilateral simultaneous TKA surgery increased the risk of complication development in a statistically significant manner compared to other groups

(p=0.007) (Table 4).

Table 1. Distribution of Age, Gender and ASA Levels between groups

		Bilateral with sessions (n=15)	Bilateral Simultaneous (n=85)	Unilateral (n=85)	p
Age(yrs)		68.6±6.78	65.9±6.88	66.4±7.40	0.435
<70 Years Old		8 (53.3%)	56 (65.9%)	56 (65.9%)	0.621
>70 years old		7 (46.7%)	29 (34.1%)	29 (34.1%)	
Gender	Male	0 (0%)	20 (23.5%)	12 (14.1%)	0.049
	Female	15 (100%)	65 (76.5%)	73 (85.9%)	
ASA		2.1±0.46 **(1**-3)*	1.6±0.51 (1-3)	1.9±0.67 **(I**-3)*	0.003

*Difference between the Bilateral Simultaneous group is statistically significant (p<0.05).

Table 2. Distribution of Equivalent Diagnosis and the prevalence of complication between surgical groups

	Bilateral with sessions (n=15)	Bilateral Simultaneous (n=85)	Unilateral (n=85)	p
Comorbidity	14 (93.3%)	72 (84.7%)	70 (82.4%)	0.554
Complication	3 (20.0%)	30 (35.3%)*	15 (17.6%)	0.027

* Difference between the Unilateral group is statistically significant (p=0.009).

Table 3. Distribution of the Incidence of Complication and that of Length of Stay between the Operation Types within the Age Groups

Age	Groups		Bilateral with Session	Bilateral Simultaneous	Unilateral	P
<70 years old	**Complication**	Yes	7 (87.5%)	38 (67.9%)	49 (87.5%)	0.034
		No	1 (12.5%)	18(32.1%)	7 (12.5%)*	
	Hospitalization		8.4±2.82*	14.4±6.45	12.3±6.12*	0.008
	Postoperative Hospitalization		6.5±2.43*	10.4±5.80	**8.I**±3.99*	0.003
>70 years old	**Complication**	No	5 (71.4%)	17 (58.6%)	21 (72.5%)	0.515
		Yes	2 (28.6%)	12 (41.4%)	8 (27.6%)	
	Hospitalization(day)		13.0±10.14	15.0±5.96	14.9±11.15	0.158
	Postoperative Hospitalization(day)		9.6±9.18	9.9±5.31	9.6±8.38	0.164
General	**Hospitalization**		**II.4**±6.82*	14.6±6.24	13.2±8.21*	0.006
	Postoperative Hospitalization(day)		7.7±5.26*	10.2±5.61	8.6±5.86*	<0.001
	Time spent until the surgery(day)		4.37±3.70#	4.7±3.84#	4.5±4.83#	0.874

* Difference between the Bilateral Simultaneous group is statistically significant (p<0.05).
# The difference between the length of stay after the surgery is statistically significant (p<0.05).

Table 4. Distribution of Risk Factors on the Development of Complication.

		There is no Complication (n=137)	There is Complication (n=48)	P
Age Groups	<70 Years Old	94 (68.6%)	26 (54.2%)	0.071
	>70 Years Old	43 (31.4%)	22 (45.8%)	
Gender	Male	20 (14.6%)	12 (25.0%)	0.101
	Female	117 (85.4%)	36 (75.0%)	
Surgical Group	Bilateral with session	12 (8.8%)	3 (6.3%)	0.027
	Bilateral Simultaneous	55 (40.1%)	30 (62.5%)	
	Unilateral	70 (51.1%)	15 (31.3%)	
Comorbidity	No	23 (16.8%)	42 (87.5%)	0.482
	Yes	114 (83.2%)	24 (66.7%)	
Anesthesia	General	46 (52.3%)	24 (66.7%)	0.351
	Spinal	28 (31.8%)	6 (16.7%)	
	Epidural	7 (8.0%)	3 (8.3%)	
	Spinoepidural	7 (8.0%)	3 (8.3%)	
ASA	1	46 (33.6%)	11 (22.9%)	0.171
	2	76 (55.5%)	34 (70.8%)	
	3	15 (10.9%)	3 (6.3%)	
The Presence of Cardiac Disease		14 (10.2%)	8 (16.7%)	0.235
Right Knee Tourniquet Time(minutes)		104.9±22.91	101.9±22.07	0.617
Left Knee Tourniquet Time(minutes)		107.3±26.89	97.6±32.79	0.120

DISCUSSION

Generally, we concluded that simultaneous bilateral total knee arthroplasty has led to more perioperative complication and to increasing morbidity when compared to unilateral total knee arthroplasty.

In the literature, it has been reported that simultaneous bilateral total knee arthroplasty is a convenient options (1,4,6,13,26,27). Bilateral knee arthroplasty can be presented as a reliable procedure as the procedure with session. However, simultaneous bilateral TKA increases the perioperative complications being dependent from all factors. To recommend the method with session as bilateral TKA option seems to be a more reliable method in terms of either patient or physician. Although it has not been proved, the most risky group is with those having cardiopulmonary problems. In these patients, it has been claimed that bilateral approach causes a slight increase in the complication rate compared to approaches with session (1,5,8,11,12). However in our study, we detected any significant increased complication rate between groups and we also detected any correlation between preoperative comorbidities and post operative complications in the groups, separately.

The study conducted by Leonard et al consisting of ninety two cases reported that ninety five percent of the patients were satisfied from this procedure and that they will prefer this surgical option again if it is necessary (16). When compared with bilateral total knee arthroplasty with session, the patients stay in hospital with shorter time and they return back earlier to their activities (28).Shorter length of stay in hospital reduces considerably the cost (15,19). Reuben et al compared the cost of both bilateral total knee arthroplasty with session with the simultaneous bilateral total knee arthroplasty and they observed that the cost of the simultaneous bilateral total knee arthroplasty was 36% less than that of bilateral total knee arthroplasty with session (15).In a study conducted by Hozack et al., bilateral simultaneous total knee arthroplasty and unilateral total knee arthroplasty were compared and it has been seen that cardiopulmonary complications in bilateral simultaneous total knee arthroplasties are three fold (14% and 5%) (18).We detected substantial time discrepancy between groups. The simultaneous bilateral arthroplasty groups had longer length of stay in hospital; therefore, we consider that the cost of both simultaneous bilateral total knee arthroplasty group was higher than other two groups.

Many studies comparing the simultaneous bilateral total knee arthroplasty with the bilateral total knee arthroplasty with session and with the unilateral total knee arthroplasty have demonstrated equivalent results in terms of either clinical results or life of implant (16,17,29,30). Although many studies made on the simultaneous bilateral total knee arthroplasty indicate higher complication and perioperative morbidity rate, many other studies have demonstrated equivalent rates (11,17,28,31,32).In a study conducted by Hozack et al., bilateral simultaneous total knee arhtroplasty and unilateral total knee arthroplasty were compared and it has been seen that cardiopulmonary complications in bilateral simultaneous total knee arthroplasties are three fold (14% and 5%) (18). In addition, although those advocating the bilateral simultaneous total knee arthroplasty accept that it has higher complication rates, they report that complication and morbidity rates are lower and they insist on this procedure. Many studies have illustrated that there is an increase in the incidence of the perioperative complications after the bilateral simultaneous total knee arthroplasty. Among the most serious complications, cardiopulmonary system complications are the most important (arrhythmia, myocardial infarction, pulmonary embolism) (10,11,16-18,23,30,33). In our study, cardiopulmonary system complications which was the most frequent non-surgical complication in our study were seen mostly in the simultaneous bilateral TKA groups, which is

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nearly threefold higher than in the unilateral groups, however, complication depends on surgery was seen more than nonsurgical complications in the all compered groups and superficial wound infection was seen mostly in the all compered groups, especially in the simultaneous bilateral total knee arthroplasty group, and they were treated with appropriate antibiotics.

It has been seen that mortality risk is higher in those with cardiopulmonary disease and in elderly people. In another study, Parvizi (9) et al. have investigated the mortality rates within the thirty days after the total knee arthroplasty in 22540 patients during a twenty eight-year time period. Hence, the postoperative thirty-day mortality rates have been found statistically higher compared to the unilateral total knee arthroplasty. Beside, perioperative mortality risk has been found higher in male patients more than seventy years old. Lombardi et al (10) found that patients older than eighty years have higher complication risk in either simultaneous bilateral knee arthroplasty or unilateral total knee arthroplasty compared to younger patients. In the current study, to be male and in older age is associated with the higher death risk during the follow-up time compared to be young and to have female gender. Furthermore, it has been detected that the patients who died within the first year after the surgery were older compared to those who lived more than one year postoperatively. We didn't see any patient who died within the first year after surgery but we detected that patients older than seventy years had less complication ratio than younger patients, furthermore, in patient group older than seventy years, we detected more complication ratio in the simultaneous bilatarel TKA groups than other groups.

In this study, there are natural problems such as fallacy of information belonging to the retrospective investigation and potential weaknesses such as not to have control group.

According to the results of the conducted studies, the patients experiencing bilateral total knee arthroplasty are at slightly higher risk in terms of perioperative cardiovascular, pulmonary and neurological complications compared to those experiencing unilateral arthroplasty. According to the recent studies, the patients accept to have higher surgical risk in order to have their surgical care locally. Furthermore, it is suggested that the patients will require taking higher surgical risk in order to shorten the recovery time, the length of stay in hospital and time spent until passing to the painless period. According to these results, in the patients requiring the application of bilateral knee arthroplasty, it is not possible to say definitely which surgical approach is the most secure. To decide this, it is necessary to conduct randomized prospective studies comparing procedures with sessions and simultaneous procedures. Perioperative complication risk in simultaneous bilateral knee arthroplasty demonstrates slightly higher increase compared to the unilateral total knee arthroplasty. Despite this, mortality rates are similar.

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