



Effects of Systemic Disorders on Postoperative Complications After Simultaneous Bilateral Total Knee Replacement

Eşzamanlı Bilateral Total Diz Protezlerinde Eşlik Eden Sistemik Hastalıkların Erken Postoperatif Komplikasyonlar Üzerine Etkisi

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Objective: The aim of the present study was to retrospectively evaluate the association between accompanying systemic disorders and major complications developing in the early postoperative period in patients who underwent simultaneous bilateral total knee arthroplasty with combined spinal and epidural anaesthesia.

Methods: In the present study, the medical records of a total of 456 patients were analyzed. Preoperative data, including the American Society of Anesthesiologists physical status and presence of coronary artery disease (CAD), chronic pulmonary disease, diabetes mellitus (DM), hypertension and renal insufficiency were recorded. Furthermore, the data related to major complications, such as cardiac complications, respiratory complications, acute myocardial infarction (AMI), thromboembolism, cerebrovascular accident (CVA), confusion, acute renal failure (ARF), shock and cardiopulmonary arrest were recorded.

Results: We found that the frequency of complications markedly increased in the presence of concurrent DM and hypertension, or DM, hypertension and CAD, or DM and CAD. Further, 0.2% of the patients developed AMI, 3.3% developed cardiac complications, 2.2% developed respiratory complications, 0.9% developed thromboembolism, 0.2% developed CVA, 2% developed confusion and 0.4% developed cardiac arrest and shock in the first week after the operation. The frequency of cardiac and pulmonary complications and confusion was higher in patients aged above 65 years compared to patients below 65 years.

Conclusion: We observed that the frequency of cardiac and pulmonary complications and confusion in the early postoperative period was markedly higher in patients aged above 65 years and in patients with concurrent DM and cardiovascular comorbidities.

Keywords: Knee replacement, regional anaesthesia, postoperative complications, comorbidity

Amaç: Bu çalışmadaki amacımız retrospektif olarak kombine spinal epidural anestezi altında eşzamanlı bilateral total diz artroplastisi yapılan hastaların erken postoperatif dönemde gelişen major komplikasyonları ve bu komplikasyonların eşlik eden sistemik hastalıklarla ilişkisini incelemektir.

Yöntemler: Retrospektif olarak 456 hasta incelendi. Hastaların preoperatif değerlendirmedeki ASA fiziksel sınıflaması değerleri, koroner arter hastalığı (KAH), kronik akciğer hastalığı, diabetes mellitus (DM), hipertansiyon ve böbrek yetmezliği verileri kaydedildi. Ameliyat sonrası ilk bir hafta içinde gelişmiş kardiyovasküler ve solunum komplikasyonları, akut miyokard infarktüsü (AMI), tromboemboli, serebrovasküler olay (SVO), konfüzyon, akut böbrek yetmezliği, şok ve kardiyopulmoner arrest gibi major komplikasyon verileri kaydedildi.

Bulgular: Hastalarda DM ve hipertansiyon; DM, hipertansiyon ve KAH; DM ve KAH birlikteliklerinde komplikasyon görülme oranının istatistiksel olarak anlamlı bir şekilde arttığını saptadık. İlk bir hafta içerisinde hastaların %0,2'sinde AMI, %3,3'ünde kardiyovasküler komplikasyon, %2,2'sinde solunum sistemi komplikasyonu, %0,9'unda tromboemboli, %0,2'sinde SVO, %2'sinde konfüzyon, %0,4'ünde arrest ve şok ve %2,2'sinde akut böbrek yetmezliği geliştiğini tespit ettik. Ayrıca 65 yaş üstü hastalarda kalp ve solunum sistemi komplikasyonları ve konfüzyon görülme oranı 65 yaş altı hastalara göre istatistiksel olarak anlamlı yüksek olduğunu saptadık.

Sonuç: Eşzamanlı bilateral total diz artroplastisi uygulanan hastalarda görülen erken dönem kalp, pulmoner komplikasyon ve konfüzyon daha çok 65 yaş üstü yaşlı hastalarda ve beraberinde diabetes mellitus ve kardiyovasküler komorbiditesi olanlarda yüksek olduğunu bulduk.

Anahtar Kelimeler: Diz replasmanı, rejyonel anestezi, postoperatif komplikasyonlar, komorbidite

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Introduction

Total knee arthroplasty is the most successful treatment method for end-stage osteoarthritis (1, 2). The procedure can be performed unilaterally or bilaterally. Bilateral replacement can be performed at one week or one month intervals or simultaneously during a single operation (3, 4). A vast majority of patients undergoing bilateral total knee arthroplasty are in the advanced age group. The patients in this age group also have systemic disorders, particularly hypertension, heart failure, diabetes mellitus (DM), chronic obstructive pulmonary disease, which markedly affects mortality and morbidity. The diminished physiological adaptation capacities in older patients and the presence of comorbid systemic disorders increase the risk of complications during and after the operation. An increased risk of serious perioperative complications has been reported following bilateral total knee replacements (BTKR), including myocardial infarction, fat embolism and thromboembolic events (5, 6). These complications have been reported to be more common in elderly patients and in those with cardiovascular comorbidities (7). The attempts are to reduce the rates of mortality and morbidity and possible complications using regional anaesthesia. Therefore, regional anaesthesia is often preferred in geriatric patients undergoing surgery in the lower extremities. Regional anaesthesia is preferred over general anaesthesia in elderly patients because it avoids a loss of consciousness and the need of intubation, protects pulmonary functions, reduces surgical bleeding and the risk of thromboembolism and enables the administration of effective analgesia and early mobilization after the operation (8, 9).

The aim of the present study was to retrospectively evaluate the association between accompanying systemic disorders and major complications developing in the early postoperative period in patients who underwent simultaneous bilateral total knee arthroplasty with combined spinal and epidural anaesthesia.

Methods

The study was approved by the Ethics Committee of Turgut Özal University Medical Faculty (Approval date: 11.18.2013, 99950669/1125). In the study, medical records of 456 patients, who underwent simultaneous bilateral total knee arthroplasty under combined spinal and epidural anaesthesia between January 2011 and June 2013 in Dr. Abdurrahman Yurtaslan Oncology Training and Research Hospital T, were retrospectively reviewed. Data were obtained from the patient charts, anaesthesia monitoring sheets and hospital's electronic database.

Preoperative data, including age, sex, height, weight, American Society of Anesthesiologists (ASA) physical status and presence of coronary artery disease (CAD), cardiac valvular disease, chronic vascular disorder, chronic pulmonary disease, DM, hypertension (HT), smoking status, cancer and meta-

static cancer and kidney insufficiency, were recorded. Obesity was defined as a body mass index above 30. Before entering the operating room, a peripheral vascular access was obtained in all patients and 0.03 mg kg⁻¹ intravenous (IV) midazolam was administered for premedication. Standard monitoring was conducted in the operating room [SpO₂, blood pressure, electrocardiography].

The patients were placed in the seated position for the administration of combined spinal and epidural anaesthesia. Spinal block was performed at the L₃₋₄ or L₄₋₅ intervertebral disc space. Aseptic technique was used in all patients. Subcutaneous local anaesthetic (2% lidocaine) infiltration was performed before the intervention using a 25-gauge needle. An 18-G Tuohy epidural needle was introduced into the epidural space, through which a 28-g spinal needle was inserted into the subarachnoid space to administer 0.5% hyperbaric bupivacaine (10-12.5 mg) in 30 s. An epidural catheter was then inserted and the patients were placed in the supine position.

All patients were transferred to the postoperative intensive care unit after the operation. As a routine procedure, all patients were administered with 1-2 units of erythrocyte suspension after controlling haemoglobin levels. Congestive heart failure, heart blocks and hypotension (mean arterial pressure >60 mmHg) and hypertension that developed within a week after surgery were considered cardiac complications. Hypoxaemia, hypoventilation and aspiration were considered respiratory complications. Furthermore, data related to major complications, such as acute myocardial infarction (AMI), thromboembolism, cerebrovascular accident (CVA), confusion, acute renal failure (ARF), shock and cardiopulmonary arrest were recorded.

Statistical analysis

Categorical variables, including age, sex, ASA score, comorbid diseases and complications were expressed as number (n) and frequency (%). The chi-square test was used to compare categorical data.

MS-Excel 2007 and Statistical Package for the Social Sciences for Windows Ver. 16.0 (SPSS Inc., Chicago, IL, USA) software packages were used for statistical analyses. The level of statistical significance was set at p<0.05.

Results

The study included 456 patients (428 females and 28 males). Of all patients, 51.6% were below 65 years of age and 48.4% were above 65 years of age. Further, 70.8% had ASA physical status II and 25.5% had ASA III (Table 1). The percentage of patients having developed at least one complication was 57.1% in ASA IV, 9.6% in ASA III and 5.9% in ASA II patients. No complication occurred in ASA I patients.

Of all patients, 20.4% were obese, 20.4% had coronary artery disease, 70% had hypertension, 25% had DM, 15% had chronic pulmonary disease, 8.8% had chronic vascular dis-

Table 1. Demographic data

Variables (n=456)	Frequency n (%)
Age	
≤45	3 (0.7)
46-65	232 (50.9)
66-74	169 (37.1)
≥75	52 (11.4)
Gender	
Female	428 (93.9)
Male	28 (6.1)
ASA	
I	11 (2.4)
II	323 (70.8)
III	115 (25.2)
IV	7 (1.5)
ASA: American Society of Anesthesiologists	

Table 2. The incidence of comorbid diseases and the frequency of developing at least one complication

Comorbid diseases (n=456)	Frequency n (%)	At least one complication Frequency n (%)	p
Obesity	93 (20.4)	3 (3.2)	0.082
Coronary artery disease	93 (20.4)	9 (9.7)	0.361
Cardiac valvular disease	9 (2.0)	0 (0.0)	0.390
Chronic pulmonary disease	70 (15.4)	4 (5.7)	0.547
Diabetes mellitus	114 (25.0)	13 (11.4)	0.064
Hypertension	322 (70.6)	28 (8.7)	0.118
Smoking status	40 (8.8)	2 (5.0)	0.536
Cancer	18 (3.9)	0 (0.0)	0.219
Chronic vascular disease	40 (8.8)	2 (5.0)	0.536
Renal failure	3 (0.7)	0 (0.0)	0.622

ease, 0.7% had renal failure, 3.9% had cancer and 8.8% were smokers. The percentage of patients who developed at least one complication did not significantly differ depending on the presence of these diseases (Table 2). However, the rate of pulmonary complications in patients with DM was found to be significantly higher ($p=0.010$).

It was found that the frequency of complications markedly increased in the presence of concurrent DM and hypertension, or DM, hypertension and CAD, or DM and CAD (Table 3).

The researchers found that 0.2% of the patients developed AMI, 3.3% developed cardiac complications, 2.2% developed respiratory complications, 0.9% developed thrombo-

Table 3. Comorbid conditions and the frequency of developing at least one complication

Comorbid diseases (n=456)	Frequency n (%)	At least one complication Frequency n (%)	p
DM and HT	104 (22.8)	13 (2.8)	0.026
DM and HT and CAD	28 (6.1)	5 (1.0)	0.031
DM and CAD	30 (6.5)	5 (1.0)	0.047
DM: diabetes mellitus; HT: hypertension; CAD: coronary artery disease			

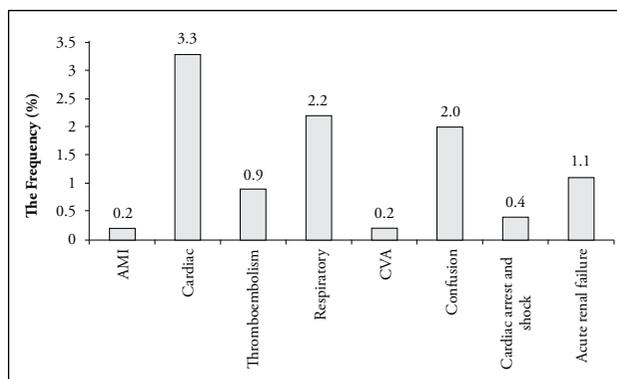


Figure 1. The frequency of complications

AMI: acute myocardial infarction; Cardiac: cardiac complications; Respiratory: respiratory complications; CVA: cerebrovascular accident

embolism, 0.2% developed CVA, 2% developed confusion, 0.4% developed cardiac arrest and shock and 2.2% developed acute renal failure in the first week after the operation (Figure 1).

The frequency of hypertension and DM was higher in patients aged above 65 years compared with those below 65 years. Further, the frequency of cardiac and pulmonary complications and confusion was higher in patients aged above 65 years compared with patients below 65 years. The frequency of developing at least one complication was found to be significantly higher in patients aged above 65 years compared with those below 65 years (Table 4).

Discussion

Total knee arthroplasty has offered painless and normal movements to many patients with the improvements in surgical and anaesthetic techniques. However, advanced age in the vast majority of the patients and postoperative complications lead to life-threatening situations. Therefore, an awareness of the major complications in the early postoperative period and the association between these complications and comorbid systemic conditions are essential for reducing morbidity and mortality by enabling a prompt diagnosis and treatment.

Of the patients in the study by Memtsoudis et al. (10), 59.8% were above 65 years and 39% were between 45 and 65 years. The mean age of the patients was 65 years in the study by

Table 4. Comorbid conditions and the frequency of complications in patients aged above and below 65 years

	Above 65 years n=221 (%)	Below 65 years n=235 (%)	p
Gender			
Female	199 (90)	229 (97.4)	0.001
Male	22 (10)	6 (2.6)	
Obesity	34 (15.4)	59 (25.1)	0.010
HT	178 (80.5)	144 (61.3)	<0.001
DM	66 (29.9)	48 (20.4)	0.020
CAD	52 (23.5)	41 (17.4)	0.107
AMI	1 (0.5)	0	0.302
Cardiac complications	13 (5.9)	2 (0.9)	0.003
Pulmonary complications	8 (3.6)	2 (0.9)	0.044
Thromboembolism	3 (1.4)	1 (0.4)	0.286
CVA	1 (0.5)	0	0.302
Confusion	9 (4.1)	0	0.002
ARF	3 (1.4)	2 (0.9)	0.604
Cardiac arrest	0	2 (0.9)	0.169
At least one complication	27 (12.2)	7 (3.0)	<0.001
DM: diabetes mellitus HT: hypertension CAD: coronary artery disease AMI: acute myocardial infarction CVA: cerebrovascular accident ARF: acute renal failure			

Urban et al. (11). In the present study, 51.6% of the patients were aged below 65 years and 48.4% were above 65 years, a finding similar to that reported in the aforementioned studies. Moreover, Lombardi et al. (12) have reported that the rate of cardiac, pulmonary and neurological complications were higher in patients aged above 80 years than those below 80 years. Mangaleshkar et al. (13) reported increased rates of complications and mortality in patients above 75 years undergoing bilateral knee arthroplasty. In the present study, the frequency of developing at least one complication was markedly higher in patients aged above 65 years. Furthermore, the frequency of cardiac and pulmonary complications and confusion was higher in patients aged above 65 years compared with patients below 65 years, a finding similar to that reported by Lombardi et al. female patients comprised 64% of the patients in the study by Dimitris et al. (14). In the study by Memtsoudis et al. (15), females comprised 59% of the study group. In the present study, females comprised 93% of the study population. In the study by Dimitris et al. (14) 6.2% of the patients had ASA IV, 55.5% had ASA III and 30% had ASA II. In the present study, 1.5% of the patients had ASA IV, 25.2% had ASA III and 70.8% had ASA II.

Of the patients who underwent BTKR in the study by Memtsoudis et al. (10) 42.6% had hypertension, 12.4% had DM, 8.3% were obese and approximately 10% had coronary artery disease and pulmonary disease. In the study by Urban

et al. (11) 9% of the patients had coronary artery disease, 2.4% had chronic pulmonary disease, 45% had hypertension, 6.5% had DM, 0.6% had cerebrovascular disease and 5.9% were smokers. In the present study, 20.4% of the patients were obese, 20.4% had coronary artery disease, 15.4% had chronic pulmonary disease, 25% had DM, 70.6% had HT, 8.2% were smokers, 3.4% had cancer, 8.8% had chronic vascular disease and 0.7% had renal failure. The frequency of hypertension and DM was found to be higher in patients aged above 65 years compared with patients below 65 years. Further, the percentage of patients who developed at least one complication did not significantly differ depending on the presence of these diseases. However, the rate of pulmonary complications in patients with DM was found to be markedly higher ($p=0.010$). Furthermore, we found that the frequency of complications considerably increased in the presence of concurrent DM and hypertension, or DM, hypertension and CAD, or DM and CAD.

Of the patients who underwent BTKR in the study by Urban et al. (11) 1.1% had MI, 0.6% had PE, 6.5% had confusion and 0.6% had renal failure. In the study by Memtsoudis et al. (10), 1.9% of the patients developed cardiac complications, 1.9% developed respiratory complications, 2.4% developed confusion and 0.9% developed PE. Furthermore, Memtsoudis et al. (15) revealed that 0.9% of the patients developed pulmonary complications, 0.2% developed cardiac arrest, 0.55% developed AMI, 6.5% developed cardiac complications and 1.5% developed thrombosis and PE. Singh et al. (16) reported MI in 0.1%, PE in 0.9% and deep venous thrombosis in 1% of the patients in the first seven days after total knee replacement. In the study by Pavone et al. (17), 5% of the patients developed arrhythmia, 0.2% developed congestive heart failure, 13% developed deep venous thrombosis in the lower extremity, 0.4% developed pulmonary embolism, 2% developed confusion and 0.4% developed acute renal failure. In the present study, 0.2% of the patients developed AMI, 3.3% developed cardiac complications, 0.9% developed thromboembolism, 2.2% developed respiratory complications, 0.2% developed CVA, 2% developed confusion, 0.4% developed cardiac arrest and 1.1% developed ARF. Further, the increased rate of cardiac and pulmonary complications and confusion in patients aged above 65 years was statistically significant. The frequency of developing at least one complication was significantly higher in patients aged above 65 years.

Conclusion

The researchers observed that the frequency of cardiac and pulmonary complications and confusion in the early postoperative period was significantly higher in patients aged above 65 years and in patients with concurrent DM and cardiovascular comorbidities. They consider that the knowledge of this association would reduce morbidity and mortality by enabling prompt diagnosis and treatment.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Turgut Özal University Faculty of Medicine (18.11.2013, 99950669/1125).

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