Turkish Journal of Geriatrics
2014; 17 (4) 373-378

Elif DOĞAN BAKI[1]
Özal ÖZCAN[2]
Mehmet Ersegün DEMİRBOĞAN[1]
Serdar KOKULU[1]
Hanife UZEL[3]
Yüksel ELA[1]
Remziye Gül SIVACI[1]

İletişim *(Correspondance)*

Elif DOĞAN BAKI
Afyon Kocatepe University, Anesthesiology and Reanimation AFYON

Tlf: 0272 229 45 09
e-posta: elifbaki1973@mynet.com

Geliş Tarihi: 17/04/2014
(Received)

Kabul Tarihi: 31/08/2014
(Accepted)

[1] Afyon Kocatepe University, Anesthesiology and Reanimation AFYON
[2] Afyon Kocatepe University, Orthopedics and Traumatology AFYON
[3] Afyon Kocatepe University, Public Health AFYON

RESEARCH

INVESTIGATION OF THE EFFECTS OF ANESTHESIA TECHNIQUES ON INTENSIVE CARE ADMISSION AND POSTOPERATIVE MORTALITY IN ELDERLY PATIENTS UNDERGOING BILATERAL KNEE REPLACEMENT SURGERY

ABSTRACT

Introduction: The purpose of this study is to investigate the effects of anesthesia techniques on intensive care admission, postoperative complications and mortality in elderly patients undergoing elective bilateral knee replacement surgery.

Materials and Methods: A retrospective file review in the Anesthesiology and Reanimation Department of Afyon Kocatepe University between January 2008 and October 2013 was done on patients operated for bilateral knee replacement in the same sessions by the same surgeon

Results: 108 females and 27 males, a total of 135 patients, were included in this study. 83 patients were operated under general anesthesia while 52 were under regional (epidural+spinal) anesthesia. 123 (91.1%) of patients were admitted to service after operation while 12 (8.9%) of them were admitted to the ICU, 10 (7.4%) of whom were in Group G (general anesthesia) and 2 (1.5%) in Group R (regional anesthesia) (p>0.05). The development rates of complications were significantly higher in Group G (11.1%) than in Group R (0.7%) (p=0.005). Hypertension was the most frequent concomitant disease and acute renal failure was the most frequently observed complication. 15 of 16 patients in whom complications were observed had hypertension. Mortality was 1.48% .

Conclusion: Postoperative complications and intensive care unit admission are more frequently encountered among patients operated for bilateral knee replacement under general anesthesia than with regional anesthesia.

Key Words: Aged; anesthesia; Arthroplasty, Replacement, Knee

ARAŞTIRMA

BİLATERAL DİZ PROTEZİ NEDENİYLE OPERE OLAN YAŞLI HASTALARDA ANESTEZİ TEKNİKLERİNİN YOĞUN BAKIMA GİRİŞ VE POSTOPERATİF MORTALİTEYE ETKİSİNİN RETROSPEKTİF OLARAK İNCELENMESİ

ÖZ

Giriş: Bu çalışmanın amacı, elektif bilateral diz protezi uygulanacak yaşlı hastalarda uygulanan anestezi tekniklerinin postoperatif yoğun bakıma giriş, komplikasyonlar ve mortaliteye etkisinin incelenmesidir.

Gereç ve Yöntem: Afyon Kocatepe Üniversitesi Anesteziyoloji ve Reanimasyon Anabilim Dalı'nda Ocak 2008-Ekim 2013 yılları arasında aynı cerrah tarafından aynı seansta bilateral diz protezi yapılan hastalarda retrospektif dosya incelemesi yapıldı.

Bulgular: Çalışmaya 108 kadın, 27 erkek toplam 135 hasta dahil edildi. 83 hastaya genel anestezi uygulanırken, 52 hastaya rejyonel (epidural+spinal) anestezi uygulanmıştır. Operasyon sonrasında hastaların 123'ü (%91,1) servise çıkarken 12'si (%8,9) yoğun bakıma çıkmıştır (hastaların 10'u (%7.4) Grup G'de iken, 2'si (%1,5) Grup R'de idi) (p>0.05). Komplikasyon gelişme oranı Grup G'de (%11,1) Grup R'ye (%0,7) göre anlamlı derecede yüksekti (p=0,005). Hipertansiyon en sık görülen ek hastalık, akut böbrek yetmezliği en sık gözlenen komplikasyondu. Komplikasyon gelişen 16 hastanın 15'inde hipertansiyon mevcuttu. Mortalite %1,48 idi.

Sonuç: Bilateral diz nedeniyle opere olacak hastalarda genel anestezi uygulaması rejyonel anestezi ile karşılaştırıldığında yoğun bakıma çıkış ve postoperatif komplikasyonlar daha fazla olmaktadır.

Anahtar Sözcükler: Yaşlı; Anestezi; Bilateral Diz Protezi.

Introduction

Total knee arthroplasty (TKA), also known as total knee replacement, is one of the most commonly performed orthopedic procedures (1). In recent years this procedure has increased among the elderly day by day. Since most patients presenting as candidates for total knee replacement are older, special attention should be given to the patient's concomitant diseases and review of symptoms. It has been reported that surgical mortality increases 3-fold, while mortality related to anesthesia increases by 20% at this age (2,3).

Neuroaxial and other regional anesthetic techniques play a significant role in reducing the incidence of perioperative thromboembolic complications, providing postoperative analgesia, and simplifying early rehabilitation and hospital discharge in elderly patients undergoing orthopedic procedures (4).

The primary indication for total knee arthroplasty is the pain relief associated with arthritis of the knee in patients who have failed nonoperative treatments. For the properly selected patient, the procedure results in considerable pain relief, as well as improved function and quality of life (5). Despite the potential benefits of total knee arthroplasty, it is an elective procedure and should only be considered after extensive discussion of the risks, benefits, and alternatives.

The purpose of this study was to observe the effects of anesthetic techniques on postoperative mortality and intensive care unit (ICU) requirements in geriatric patients operated for total knee arthroplasty, retrospectively.

Materials and Methods

After the study protocol was approved by the local ethics committee of Afyon Kocatepe University (2014-98), the hospital records and files of 323 patients who had been operated for bilateral knee arthroplasty by the same surgeon between January 2008 and October 2013 were examined retrospectively. Among these patients, those over the age of 65 years and who underwent simultaneous bilateral TKA were enrolled. Finally the study was continued with 136 patients. Patients were contacted by telephone for long-term results.

Demographic data such as age, gender, height, weight, American Society of Anesthesiologists (ASA) physical status and preoperative comorbidities (diabetes, hypertension, coronary artery disease and other neurological conditions) were recorded. Anesthesia method, preoperative and postoperative blood count and biochemical values, intraoperative and postoperative transfusion requirements, intensive care output (and if so, length of ICU stay), and length of hospital stay were also recorded. Postoperative complications (pulmonary, cardiac, renal, neuronal), 1st month, and 6th month mortality were investigated as well. All of the data were evaluated by comparing the patients according to the method of anesthesia that they were administered (Group G=patients that were given general anesthesia, Group R=patients that were given epidural+spinal anesthesia).

IBM SPSS Statistics version 20 was used for all statistical analysis. Data was expressed as mean±SD. The Mann-Whitney U test was used to compare continuous variables and the Chi Square test was used to compare categorical variables. The Wilcoxon signed rank test was used to compare preoperative and postoperative variables. A p value less than 0.05 was considered to indicate a statistically significant difference.

Results

108 females and 27 males, a total of 135 patients, were included in this study. 83 patients were operated under general anesthesia while 52 were under regional (epidural+spinal) anesthesia. There were no significant differences in terms of demographic characteristics (age, weight, height and ASA) of patients between the groups (p>0.05) (Table 1).

Table 1— Patients' Data According to Type of Anesthesia Administered (mean ± SD).

	Group G (n=83) Mean± SD	Group R (n=52) Mean± SD	p
Age (year)	69.51±4.03	68.35±4.01	0.099*
Gender (female/male, n)	67/16	41/11	0.070#
Weight (kg)	71.42±7.97	71.65±5.79	0.575*
Height (cm)	161.24±13.49	162.96±6.61	0.599*
ASA class I/II/III,n	21/41/21	13/27/12	0.742#

*Mann-Whitney, #Chi-Square ASA American Society of Anesthesiologists.

Table 2— Comorbidities of The Patients.

	Group G (n=83)	Group R (n=52)
No comorbidities, n (%)	21 (15.6)	13 (9.6)
DM, n (%)	8 (5.9)	9 (6.7)
HT, n (%)	25 (18.5)	14 (10.3)
COPD, n (%)	2 (1.5)	1 (0.7)
Others, n (%)	3 (2.2)	– (–)
DM+ asthma, n (%)	1 (0.7)	1 (0.7)
DM+HT, n (%)	10 (7.4)	6 (4.4)
CD+asthma, n (%)	1 (0.7)	– (–)
CD+HT, n (%)	5 (3.7)	3 (2.2)
Asthma+HT, n (%)	2 (1.5)	3 (2.2)
DM+CD+Asthma, n (%)	– (–)	1 (0.7)
DM+CD+HT, n (%)	2 (1.5)	– (–)
DM+asthma+HT, n (%)	2 (1.5)	– (–)
CD+asthma+HT, n (%)	1 (0.7)	– (–)
CD+Asthma+HT+DM, n (%)	– (–)	1 (0.7)

#Chi-Square, DM; Diabetes Mellitus, HT;hypertension, COPD; chronic obstructive pulmonary disease, CD; cardiac disease, Others; hypotyroidism, chronic renal deficiency, obesity, P<0.05; statistically significant.

When the comorbidities of the patients were examined, there were no significant differences between the general and regional anesthesia patients (p=0.762). Hypertension was the most common comorbidity that was seen in both groups (Table 2).

Most of the patients (123, 91.1%) were admitted to service after operation while 12 (8.9%) of them were admitted to the ICU= 10 patients from Group G and 2 from Group R (this difference was not statistically significant). In addition, duration of ICU stay and hospital stay were similar for the two groups. The number of patients who were administered perioperative blood transfusion was also similar for the two groups. Mortality was quite low (1.48%) in the study group patients; only 2 patients from Group G died (Table 3). In one of the patients who died, a massive pulmonary embolism developed intraoperatively and she died on the first day postoperatively in the ICU; she had DM + asthma + hypertension and received general anesthesia. The other patient who died was 70 years old and had hypertension only; she developed acute renal failure and died on the fifth day postoperatively; she had also received general anesthesia.

Post-operative complications are shown in Table 4. Complications were observed in a total of 16 (11.9) patients; 15 (11.1%) in Group G and 1 (0.7) in Group R. This difference was statistically significant (p=0.005) (Table 4). The most common complication was acute renal failure (3.7%) (Table 4). All of the patients who developed acute renal failure were from Group G (Table 4).

Perioperative laboratory parameters of patients are shown in Table 5. All parameters were similar in the two groups. Postoperative neutrophil lymphocyte ratio (NLR) and WBC values were significantly higher than preoperative measures in both groups (p<0.001), but there was no significance between the groups (p>0.05). Preoperative and postoperative platelet lymphocyte ratio (PLR) and mean platelet volume (MPV) values were also similar between the groups (Table 5).

Table 3— Postoperative Exit, Perioperative Blood Transfusion and Mortality Dispersion of Patients According to the Type of Anesthesia Given.

	Group G (n=83)	Group R (n=52)	p
Postoperative exit			
Service room, n (%)	73 (88.0)	50 (96.2)	0.128
ICU, n (%)	10 (12)	2 (3.8)	
ICU stay (day)	1	1	
Hospital stay (day)	8.22 ± 3.54	8.35 ± 2.97	0.360*
Perioperative blood transfusion			
Intraoperative, n (%)	54 (65.1)	42 (80.8)	0.067#
Postoperative, n (%)	78 (94)	47 (90.4)	0.401#
Mortality			
1st month, n (%)	2 (1.48)ε	0	0.259#
6th month, n (%)	0	0	

Fisher's Exact test, *Mann Whitney U, #Chi-Square, ICU; intensive care unit, %; within the group, εwithin total of patients.

Table 4— Postoperative Complications and Concomitant Diseases of Patients who Developed Postoperative Complications.

	Group G (83)	Group R (52)	p
Complication, no, n (%)	68 (50.4-81.9)	51 (37.8-98.1)	0.005#
Complication, yes, n (%)	15 (11.1-18.1)	1 (0.7-1.9)	
Pulmonary embolism, n (%)	2 (1.5-2.4)	–	
Acute infact, n (%)	–	1 (0.7-1.9)	
Pneumothorax, n (%)	1 (0.7-1.2)	–	
Acute renal failure, n (%)	5 (3.7-6.0)	–	
Wound infection, n (%)	4 (3.0-4.8)	–	
Delirium, n (%)	1 (0.7-1.2)	–	
Vertigo, n (%)	1 (0.7-1.2)	–	
Anisocoria, n (%)	1 (0.7-1.2)	–	

#p<0.05, Chi-Square, %; of total -within the anesthesia group.

Table 5— Perioperative Hemogram and Biochemical Values of Patients.

	General (n=83) Mean ± SD	Regional (n=52) Mean ± SD	P*
Hemogram			
Hb , preop	13.53±1.45	13.48±1.24	0.858
Hb, postop	10.81±1.43	10.45±1.29	0.190
WBC, preop	7.71±2.9#	7.48±2.18#	0.450
WBC, postop	13.91±3.44#	12.25±3.93#	0.070
MPV, preop	9.68±1.64	9.69±1.24	0.823
MPV, postop	10.36±1.97	10.02±1.26	0.251
NLR, preop	2.36±1.1#	2.55±1.33#	0.480
NRL, Postop	12.96±9.49#	12.03±7.57#	0.897
PLR, preop	129±48.74	133±50.8	0.573
PLR, postop	210± 58,27	211±48.02	0.245
Biochemical			
Na, preop	144.42±13.53	140±2.85	0.861
Na, postop	138.16±3.21	137.31±3.32	0.180
K, preop	4.53±0.38	4.45±0.38	0.325
K, postop	4.14±0.51	4.04±0.339	0.403
BUN, preop	21.55±4.91	17.13±4.02	0.354
BUN, postop	22.22±8.20	20.04±5.19	0.348
Cr, preop	0.78±0.32	2.5±13.20	0.846
Cr, postop	1.01±0.54	0.84±0.20	0.269
Alb, preop	3.39±0.27	3.39±0.35	0.751
Alb, postop	3.21±0.29	3.17±0.34	0.343

*Mann Whitney U, #Wilcoxon,p<0.001 Values are presented as mean ± SD Hb; hemoglobin, WBC; white blood cell, MPV; mean platelet volume, NLR; neutrophil lymphocyte ratio, PLR; platelet lymhocyte ratio, Na; sodium, K; potassium, BUN; blood urea nitrogen, Cr; creatinine, Alb; albumin

Discussion

Since the beginning of the last century, one of the most important social changes is the increase in life expectancy. Today, 12% of the world's population is aged 65 and over. For various reasons, half of this population needs surgical intervention; because of this, they also need anesthesia (3). Geriatric patients who undergo orthopedic procedures often have hip and knee surgery. To the best of our knowledge, there are no studies in the literature comparing, retrospective-

ly, the effectiveness of anesthetic techniques on postoperative mortality and morbidity in geriatric patients operated for bilateral knee arthroplasty. The main findings in the current study were: 1) 123 (91.1%) of patients were admitted to service after operation, while 12 (8.9%) of them were admitted to the ICU: 7.4 % of those were in the general anesthesia group and 2 (1.5%) were in the regional anesthesia group (p>0.05); 2) The rate of complications was significantly higher in Group G (11.1%) than in Group R (0.7%) (p=0.005). Hypertension was the most frequent concomitant disease and acute renal failure was the most frequently observed complication. 15 of 16 patients in whom complications were observed had hypertension; 3) Mortality was 1.48% .

Intensive care requirements are likely to increase in the future because of the increase in the elderly population with serious comorbidities. Besides surgical procedures, anesthesia methods may affect intensive care admission. Kaufmann and colleagues reported that intraoperative neuraxial anesthesia might reduce postoperative admissions to the ICU for high risk patients undergoing elective hip and knee replacement surgery (6). Prospective data have demonstrated that intraoperative hemodynamic stability could be better provided, and less fluid and blood transfusion was necessary, with neuroaxial anesthesia (7,8). In the present study, 12 (8.9 %) patients were admitted to ICU: 7.4 % were in the general anesthesia group and 1.5 % were in the regional anesthesia group. Additionally, the intraoperative transfusion requirement was higher in the regional anesthesia group, but this difference was not statistically significant.

While older age itself is an increased risk, accompanying diseases add to the risk and further reduce organ function. Hypertension is a common problem, especially in elderly patients; it is usually a cause of sudden death with ischemic heart disease (3). These patients cannot tolerate blood and fluid loss well, and arterial-venous blood pressure and fluid-electrolyte balance may deteriorate very easily (9,10). In this study, complications were seen at a significantly higher rate in Group G (11.1%) than in Group R (0.7). Hypertension was the most common comorbid disease. 15 of 16 patients in whom complications were observed had hypertension. This may confirm that we need to be more careful perioperatively in elderly patients with hypertension, and if patients do not have contraindications, regional anesthesia may be the best choice.

Modern total knee arthroplasty consists of resection of the diseased articular surfaces of the knee, followed by resurfacing with metal and polyethylene prosthetic components. Bilateral simultaneous knee arthroplasty has been associated with an increased risk of complications, and patients should be counseled as such. In many studies, it was found that applying bilateral TKA in the same session was superior to one-sided and/or two sessions. Applying bilateral TKA in the same session reduced not only health expenditure but also length of hospital stay, while it was emphasized that rate of complication was not changed (11-13). Sarban et al. compared unilateral and simultaneous bilateral knee arthroplasty performed in patients with gonarthrosis in terms of morbidity and clinical results. They found similar levels of morbidity (14). A 2007 meta-analysis demonstrated that simultaneous bilateral knee replacement carries an increased risk of serious cardiac and pulmonary complications, as well as increased mortality, compared with staged bilateral or unilateral surgery (15). In our study, only patients who underwent bilateral knee surgery in the same session were included, and the mortality rate was low. Length of hospital stay did not differ between the groups.

This study has some limitations. The most important one is its retrospective design, with the deficiency of variability in data collection.

PLR has been recently suggested to be a marker of thrombotic and inflammatory condition, mainly in patients with malignancies (16,17). NLR is a readily available and inexpensive laboratory marker that is used to assess systemic inflammation. In the literature, it has been shown that diabetes mellitus, thyroid functional abnormalities, essential hypertension, valvular heart diseases, acute coronary syndromes, renal and/or hepatic failure, metabolic syndrome, and many inflammatory diseases may potentially affect NLR (18,19). In the present study, postoperative NLR ratio values were significantly higher than preoperative ones in both groups (p<0.001), but there was no significant difference between the groups (p>0.05) (20).

In conclusion, we found that use of regional anesthesia in a selected group of orthopedic patients was not only associated with a lower rate of ICU admission postoperatively, but also led to fewer complications. In addition, it is important to be more careful perioperatively with elderly patients with hypertension. Finally, simultaneous bilateral TKA seems to be a good choice in selected patients. Nonetheless, a prospective study may be required to compare the effects of regional and general anesthesia on morbidity and mortality in elderly patients.

Conflict of interest: None declared

REFERNCES

1. Alden KJ, Duncan WH, Trousdale RT, et al. Intraoperative fracture during primary total knee arthroplasty. Clin Orthop Relat Res. 2010;468(1):90-5. (PMID:19430855).
2. List WF. Anesthesia in geriatric patients. Minerva Anestesiol 1999;65(12):831-5. (PMID:1070938).
3. Can SO, Genç ST, Okten F. Anaesthesia management in geriatric orthopedic surgery patients: general or regional? Türkiye Klinikleri J Anest Reanim 2004;2:161-70.
4. Marino ER. Anesthesia for orthopedic surgery, In: Butterworth JF, Mackey DC, Wasnick JD (Eds). Morgan& Mikhail's Clinical Anesthesiology. 5th edition, Lange, Mc Graw Hill, USA 2013, pp 789-801.
5. Lavernia CJ, Guzman JF, Gachupin-Garcia A. Cost effectiveness and quality of life in knee arthroplasty. Clin Orthop Relat Res 1997;345:134-9. (PMID:9418630).
6. Kaufmann SC, Wu CL, Pronovost PJ, et al. The association of intraoperative neuroaxial anesthesia on anticipated admission to the intensive care unit. J Clin Anesth 2002;14(6):432-6. (PMID:12393111).
7. Liu S, Carpenter RL, Neal JM. Epidural anesthesia and analgesia. Their role in postoperative outcome. Anesthesiology 1995;82 (6):1474-506. (PMID:7793661).
8. Christopherson R, Glavan NJ, Norris EJ, et al. Control of blood pressure and heart rate in patients randomized to epidural or general anesthesia for lower extremity vascular surgery. Perioperative Ischemia Randomized Anesthesia Trial (PIRAT) Study Group. J Clin Anesth 1996;8(7):578-84. (PMID:8910181).
9. Jın F, Chung F. Minimizing perioperative perioperative adverse events in the elderly. Br J Anaesth 2001;87(4):608-24. (PMID:11878732).
10. Rooke GA. Authonomic and cardiovascular function in geriatric patient. Anesthesiol Clin Nort Am 2000;18(1):31-46. (PMID:10934998).
11. Sarıcaoğlu F, Akıncı SB, Atay S, Çağlar Ö, Aypar Ü. The effects of anesthesia techniques on postoperative mortality in elderly geriatric patients operated for femoral fractures. Turkish Journal of Geriatrics 2012;15(4):434-8.
12. Jankiewicz JJ, Sculco TP, Ranawat CS, et al. One stage versus 2-stage bilateral total knee arthroplasty. Clin Orthop 1994;309:94-101. (PMID:7994981).
13. Cohen RG, Forest CJ, Benjamin JB. Safety and efficacy of bilateral total knee arthroplasty. J Arthroplasty 1997;12(5):497-502. (PMID:9268788).
14. Hersekli MA, Akpınar S, Ozalay M, et al. A comparison between single-and two -staged bilateral total knee arthroplasty operations in terms of the amount of blood loss and transfusion, perioperative complications, hospital stay, and cost-effectiveness. Acta Orthop Traumatol Turc 2004;38(4):241-6. (PMID:1561876).
15. Sarban S, Kocabey Y, Tabur H, et al. Comparison of simultaneous bilateral versus unilateral total knee artroplasty in terms of morbidity and clinical efficiency. Journal of Harran University Faculty of Medicine 2005;2(4):10-5.
16. Restrepo C, Parvizi J, Dietrich T, Einhorn TA. Safety of simultaneous bilateral total knee arthroplasty. A meta-analysis. J Bone Joint Surg Am 2007;89 (6):1220-6. (PMID:17545424).
17. Wang D, Yang JX, Cao DY, et al. Preoperative neutrophil, lymphocyte and platelet-lymphocyte ratios as independent predictors of cervical stromal involvement in surgically treated endometrioid adenocarcinoma. OncoTargets Ther 2013;6:211-6. (PMID:23525143).
18. Smith RA, Ghaneh P, Sutton R, et al. Prognosis of resected ampullary adenocarcinoma by preoperative serum CA19-9 levels and platelet-lymphocyte ratio. J Gastrointest Surg 2008;12(8):1422-8. (PMID:18543046).
19. Alkhouri N, Morris-Stiff G, Campbell C, et al. Neutrophil to lymphocyte ratio: A new marker for predicting steatohepatitis and fibrosis in patients with nonalcoholic fatty liver disease. Liver Int 2012;32(2):297-302. (PMID:22097893).
20. Stotz M, Gerger A, Eisner F, et al. Increased neutrophil-lymphocyte ratio is a poor prognostic factor in patients with primary operable and inoperable pancreatic cancer. Br J Cancer 2013;109(2):416–21. (PMID:23799847).