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Araştırma

Perioperative Regional Anesthesia Complications in Geriatric Patients: Clinical Report

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ABSTRACT

Objective: *The study aims to retrospectively determine and prevent the causes of perioperative complications that occurs among geriatric patients who are exposed to regional anesthesia.*

Material and Methods: *The records were investigated for patient's age, gender, physical evaluation scores of the American Society of Anesthesiologists (ASA), type of surgery, regional anesthesia technique, the local anesthetic types, duration of surgery and anesthesia related complications as well as the most likely systems to which these complications were related. The cardiac arrests were also recorded. Patients were grouped according to their ages; Group Y (over 65 years) and Group G (17-65 years).*

Results: *The 1114 patients were analysed from the anesthesia assesment forms and records. According to ASA classification, the rate of hypotension showed an increase from I to IV for group G ($p<0.001$) and group Y ($p<0.001$), whereas there was no difference between the groups ($p>0.05$). The frequency of cardiovascular complications with respect to duration of surgery was significantly higher in longer operations (>60 minutes) than in shorter operations (<60 minutes) in group G than in group Y (($p<0.05$). Regional anesthesia technique related cardiovascular complications occured more often with spinal anesthesia in group G than in group Y ($p<0.001$). With heavy bupivacaine, bradycardia occurred more often in group G than in group Y ($p<0.001$). Three cardiac arrests occurred in the group Y, but there were no cardiac arrests in group G.*

Conclusion: *In the elderly, all anesthesia techniques have their own complication rates so the anesthetic technique should be selected according to patients' co-morbidities, with careful preanesthetic evaluation and close monitoring in experienced hands.*

Keywords: *geriatri, anesthesia, epidural, spinal, complications*

ÖZ

Geriyatrik Hastalarda Perioperatif Rejyonal Anestezi Komplikasyonları: Klinik Rapor

Amaç: *Bu çalışmada rejyonal anestezi uygulanmış geriyatrik hasta grubunda ameliyat esnasında görülen komplikasyonları retrospektif olarak tespit etmek ve sebeplerini önlemek amaçlanmıştır.*

Gereç ve Yöntemler: *Kayıtlar hastaların yaşı, cinsiyeti, ASA fiziksel skorları, ameliyat tipi, kullanılan rejyonal anestezi tekniği, lokal anestezik tipleri, ameliyat süresi ve anesteziye bağlı komplikasyonlar ile bu komplikasyonların ilgili olabileceği sebepler için incelenmiştir. Kalp krizleri de kayıt altına alınmıştır.Hastalar yaşlarına göre gruplandırılmlıştır. Grup Y (65 yaş üstü), Grup G (17-65 yaş).*

Bulgular: *1114 hastaya ait anestezi değerlendirme formları ve kayıtları analiz edilmiştir. ASA sınıflandırmasına göre, hipotansiyon oranı grup G ($p<0,001$) ve grup Y ($p<0,001$) de I'den IV'e artış gösterirken gruplar arasında bir fark gözlemlenmemiştir ($p>0,05$). Ameliyat süresine bağlı kardiyovasküler komplikasyon sıklığı grup G'de grup Y'ye kıyasla uzun süren operasyonlarda (>60 minutes) kısa süren operasyonlara (<60 minutes) göre önemli oranda yüksektir ($p<0,05$). Rejyonal anestezi tekniğine bağlı kardiyovasküler komplikasyonlar spinal anestezi kullanılan hastalarda grup G'de grup Y'den daha sık görülmüştür ($p<0,001$). Heavy bupivacaine ile bradikardi grup G'de grup Y'den daha sık görülmüştür. Grup Y'de üç kalp krizi görülürken, grup G'de hiç görülmemiştir.*

Sonuç: *Tüm anestezi tekniklerinin kendine özgü komplikasyon oranları vardır, dolayısıyla yaşlı hastalarda, kullanılan anestezi tekniği hastalıklar göz önünde bulundurularak dikkatli anestezi öncesi değerlendirmelerle ve yakın takip ile tecrübeli kişilerce yapılmalıdır.*

Anahtar kelimeler: *geriyatri, anestezi, epidural, spinal, komplikasyon*

INTRODUCTION

As the average life span has increased due to advancements of medical service quality and the rise of attention on health conditions, the aging population started to increase rapidly. Thus, today, more elderly patients are expected to undergo surgical interventions [1].

Elderly patients planned for surgery are at risk of having substandard outcomes due to age-associated changes and decreased physiological reserve impede the body's ability to maintain homeostasis during

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times of physiological stres [2,3]. This condition gets even more complicated by various comorbidities such as heart disease, lung disease, diabetes mellitus, etc. Atypical presentation of diseases, diminished heart and lung reserves and alterations in the pharmacodynamics and pharmacokinetics of drugs are also observed [4].

Regional anesthesia is frequently used in geriatric patients. Despite apparent benefits of regional anesthesia, some complications may occur. Some of these complications are hemodynamic disturbances, cardiovascular toxicity, failure of block, neural injury and backache.

The primary purpose of our study was to determine and prevent the causes of perioperative complications that occurred among geriatric patients exposed to regional anesthesia.

MATERIALS and METHODS

After obtaining ethics committee approval (17.12.2012, 06/11) from the Yıldırım Beyazıt Education and Research Hospital Ethics Committee, records of patients who had undergone surgery between January 2011 and January 2012 were reviewed retrospectively. The patients, whose full anesthesia assesment forms and records were not available and those with blood loss more than 700 mL, emergency surgery and surgical procedures exceeding 180 minutes were excluded from the statistical analysis. Patients were evaluated according to age, Group Y (over 65 years) and Group G (17-65 years). The records were searched for patient's age, gender, American Society of Anesthesiologists (ASA) physical status, type of surgical intervention, regional anesthesia technique, the local anesthetic types, duration of surgery and anesthesia related complications. Anesthesia related complications were defined as: hypotension (systolic blood pressure <95 mmHg or decrease 20 % of initial systolic blood pressure), bradycardia (heart rate (HR) <50 beat/minute), cardiac arrest, respiratory failure (respiratory rate <6 breath min^{-1}), insufficient anesthesia, unsuccessful regional anesthesia.

The causes of the complications as well as the most likely systems to which they were related, ASA physical status, and complication status in accordance with duration of surgery, regional anesthesia technique, the local anesthetic types, were taken into account. The cardiac arrests were recorded.

Statistical Analysis

The statistical analysis was performed by a certified statistician. Data analysis was performed using SPSS for Windows, version 11.5 (SPSS Inc., Chicago, IL, United States). Metric discrete variables were shown as mean±standard deviation or median (min-max), where applicable. Categorical data were expressed as number of cases with percentages. Data were analyzed using, where appropriate. We also performed a subgroup analysis according to age; Group G = age ≥65 and Group Y = age <65. A p value less than 0.05 was considered statistically significant.

RESULTS

Anesthesia records of 1215 patients were evaluated and 1114 records were included in the statistical analysis as they were complete data sets. Demographic data are summarized in Table 1. There were 66.2 % male patients in group Y, and 89.5 % in group G ($p<0.001$). There were 33.8 % female patients in group Y and 10.5 % in group G ($p<0.001$). The surgical interventions were distributed as follows; general surgery 26.5 %, orthopedic surgery 48 %, plastic reconstructive surgery 3.4 %, urologic surgery 18.9 %, neurosurgery 1.3 % and cardiovascular surgery 1.9 % (Table 2). General surgical procedures consisted of inguinal and scrotal herniorrhaphy, hemorrhoidectomy, anal fissurectomy and perianal fistula. Orthopedic procedures included arthroscopy of the knee, total knee replacement and shoulder arthroplasty. Free Flap Surgery and skin grafting of the lower extremity reconstruction, transurethral prostate resection, transurethral bladder tumor resection, varicosel surgery, varisectomy were the plastic reconstructive surgery, urology and cardiovascular interventions.

Spinal anesthesia was the mostly used regional anesthesia technique in 90.6 % patients. Epidural anesthesia was performed in 4.9 % patients and combined spinal-epidural anesthesia was used in 3.6 % patients.

Intergroup analysis also revealed a difference in regional anesthesia techniques: epidural anesthesia

was performed mostly in group G (10.2 %) whereas combined spinal epidural anesthesia was performed mostly in group Y (4.7 %) (p<0.001) (Table 1).

Table 1. Demographic data, type of regional anesthetic technique, and frequency of complications, compared regarding for age groups.

Variables	<65 years (n:857)	≥65 years (n:257)	p value
Gender			
Male	567 (66.2 %)	230 (89.5 %)	<0.001
Female	290 (33.8 %)	27 (10.5 %)	<0.001
ASA			
I	485 (56.6 %)	78 (30.4 %)	<0.001
II	290 (33.8 %)	108 (42.0 %)	0.016
III	62 (7.2 %)	65 (25.3 %)	<0.001
IV	20 (2.3 %)	6 (2.3 %)	0.999
NA Block			
Epidural	29 (3.4 %)	26 (10.2 %)	<0.001
Combine	40 (4.7 %)	0 (0.0 %)	<0.001
Spinal	779 (91.9 %)	230 (89.8 %)	0.313
Complications			
EPIDURAL	n=29	n=26	
Hypotension	3 (10.3 %)	0 (0.0 %)	0.238
Bradycardia	3 (10.3 %)	0 (0.0 %)	0.238
COMBINE	n=40	-	
Hypotension	4(10.0 %)	-	
Bradycardia	3(7.5 %)	-	
SPINAL	n=779	n=230	
Hypotension	28 (3.6 %)	25 (10.9 %)	<0.001
Bradycardia	24 (3.1 %)	20 (8.7 %)	<0.001
PLAIN BUPIVACAINE	n=34	n=116	
Hypotension	3 (8.8 %)	15 (12.9 %)	0.765
Bradycardia	3 (8.8 %)	7 (6.0 %)	0.695
HEAVY BUPIVACAINE	n=615	n=125	
Hypotension	25 (4.1 %)	9 (7.2 %)	0.127
Bradycardia	20 (3.3 %)	12 (9.6 %)	<0.001
LEVOBUPIVACAINE	n=208	n=13	
Hypotension	7 (3.4 %)	1 (7.7 %)	0.389
Bradycardia	7(3.4 %)	1(7.7 %)	0.389
DURATION OF SURGERY			
<60 min	n=236	n=49	
Hypotension	4 (1.7 %)	2 (4.1 %)	0.275
Bradycardia	5(2.1 %)	1(2 %)	1.000
≥60 min	n=580	n=202	
Hypotension	30 (5.2 %)	23 (11.4 %)	0.002
Bradycardia	25(4.3 %)	19(9.4 %)	0.007
ASA I	n=485	n=78	
Hypotension	7 (1.4 %)	3 (3.8 %)	0.149
Bradycardia	13 (2.7 %)	5 (6.4 %)	0.089
ASA II	n=290	n=180	
Hypotension	13(4.5 %)	7(6.5 %)	0.417
Bradycardia	12(4.1 %)	6(5.6 %)	0.589
ASA III	n=62	n=65	
Hypotension	9 (14.5 %)	15 (23.1 %)	0.218
Bradycardia	4 (6.5 %)	8 (12.3 %)	0.259
ASAIV			
Hypotension	6 (30.0 %)	0 (0.0 %)	0.280
Bradycardia	1 (5.0 %)	1 (16.7 %)	0.415

Table 2. Type of surgical intervention.

Clinics	n=1114
General Surgery	295 (26.5 %)
Orthopedy	534 (47.9 %)
Plastic Surgery	38 (3.4 %)
Urology	211 (18.9 %)
Cardio Vascular Surgery	21 (1.9 %)
Neurosurgery	14 (1.3 %)

Table 3. Frequency of complications regarding for ASA classification within ≥65 years group.

Complications	ASA I (n:78)	ASA II (n:108)	ASA III (n:65)	ASA IV (n:6)	p value
Hypotension	3 (3.8 %)[a]	7 (6.5 %)[b]	15 (23.1 %)[a,b]	0 (0.0 %)	<0.001
Bradycardia	5 (6.4 %)	6 (5.6 %)	8 (12.3 %)	1 (16.7 %)	0.325

[a]:ASA I vs ASA III (p<0.01), [b]:ASA II vs ASA III (p<0.01).

Table 4. Frequency of complications regarding for ASA classification within <65 years group.

Complications	ASA I (n:485)	ASA II (n:290)	ASA III (n:62)	ASA IV (n:20)	p value
Hypotension	7 (1.4 %)[a,b,c]	13 (4.5 %)[a,d,e]	9 (14.5 %)[b,d]	6 (30.0 %)[c,e]	<0.001
Bradycardia	13 (2.7%)	12 (4.1%)	4 (6.5 %)	1 (5.0%)	0.426

[a]:ASA I vs ASA II (p<0.05), [b]:ASA I vs ASA III (p<0.05), [c]:ASA I vs ASA IV (p<0.001), [d]:ASA II vs ASA III (p<0.01), [e]:ASA II vs ASA IV (p<0.001).

According to the ASA physical status, the rate of hypotension showed an increase from I to IV for groups G (p<0.001) (Table 3) and group Y (p<0.001) (Table 4), whereas there was no difference between the groups (p>0.05) (Table 1).

The frequency of cardiovascular complications with respect to duration of surgery in both groups revealed that hypotension and bradycardia rates were significantly higher in longer operations (>60 minutes) than in shorter operations (<60 minutes) in group G [11.4 %, 9.4 % respectively] than in group Y [5.2 %, 4.3 % respectively] (p<0.05) (Table 1).

Relations between cardiovascular complications and regional anesthesia technique and the local anesthetics used were also evaluated. Spinal anesthesia technique related complications like hypotension and bradycardia occurred more often in group G [3.6 %, 3.1 % respectively] than in groupY [10.9 %, 8.7 % respectively] (p<0.001) (Table 1). With heavy bupivacaine, bradycardia occurred more often in group G 9.6 % than in group Y 3.3 % (p<0.001) (Table 1).

Prevalance of complications (%) between groups is shown in Figure 1.

Three cardiac arrests 0.03 % occurred in the group Y, but there were no cardiac arrests in group G. Heavy bupivacaine had been used in those cardiac arrest patients. None of the patients had signs of systemic toxicity and respiratory depression.

DISCUSSION

In this study, where we have investigated the perioperative complications such as cardiovascular complications, we have found out that for both groups, the number of cardiovascular complications increased with longer duration of surgery and as ASA physical status moved from I to IV. Inter-group comparison of complications showed no significant difference. In addition, in patients with spinal anesthesia and heavy bupivacaine use, cardiovascular system complications occurred more frequently. The rate of complications appeared to be dependent to a number of risk factors: the patient's age, the number of associated diseases, the preoperative status, whether the operation was emergent and the duration of procedure.

Advanced age has been considered as a risk factor of mortality and morbidity, but there is a controversy [5]. Age alone is not a good predictor for risks in surgery, and should not be the only criterion used to determine which patients are eligible for surgery [6]. American Society of Anesthesiologists' grading makes no judgement on age. Of far greater importance than age are co-morbidities and acute physiological derangement [7]. Carretta et al. [8] reported that advanced age was a risk factor for mortality after hip fracture surgery. In contrast, another study Cerit et al. [9] found that the perioperative complication rate in ASA I patients was 1.9 %, while in ASA V patients complication rates were up to 60 %. Lupei MI et al. [10] found that increased ASA physical status is associated with increased length of stay in surgical intensive care unit. They found that mortality was not related to age, it was related to comorbid diseases. In our study, parallel to the Cerit et al. study, we found more perioperative complications in high ASA patients in both groups. It is essential that the anesthesiologists should be aware of the alterations associated with age-related co morbidities and patient medications in order to provide the most effective perioperative treatment for this group of aged patients. It is commonly accepted that postoperative complications are largely related to the perioperative procedure and not to the regional anesthesia itself [11,5].

Risk of perioperative complications is increased with longer duration of surgery. Bailey et al. [12] found that mortality and cardiopulmonary and cerebrovascular complications were reduced when the duration of surgery is no more than 3 hours. Another study showed that number of complications is correlated with the duration of surgery and blood loss [13]. With a longer duration of operation, volume loss due to operation, reaction to surgical stress and perioperative hypothermia increase myocardial work, oxygen demand and thus increase oxygen consumption to 500 %. This situation can cause ischemia, arrhythmias and hypotension, in geriatric patients with limited phsyiological reserve. In our study, complications were also significantly higher during the operations which lasted longer than 60 minutes in geriatric groups. Therefore, well planned, shorter and minimal invasive operations are more suitable for geriatric patients.

The choice of local anesthesic agent is important in preventing cardiac, neurological toxicity and therefore becomes an important variable that should be tailored to individual patient requirements to optimize outcomes. There are several studies reporting that the cardiovascular and central nervous system-related side effects of levobupivacaine are less frequent than those experienced with bupivacaine [14,15]. Güleç et al. [16] found that levobupivacaine did not cause any significant changes in haemodynamic parameters, and showed a similar sensory block onset and duration time compared with bupivacaine in elderly. In our study we found that more cardiovascular complications occurred with bupivacaine in geriatric group.

We also found that more cardiac complications such as bradycardia and hypotension occrred with spinal anesthesia in group G than in the group Y. In accordance, Carpenter et al. asserts that age related changes in the cardiovascular system may lead to a frequent incidence of systemic hypotension and bradycardia associated with spinal anesthesia [17].

In elderly patients, spinal hypotension is caused

predominantly by decrease in the systemic vascular resistance than a decrease in cardiac output [18]. This causes more elderly patients requiring treatment than young patients. It has also been observed that crystalloid preloading alone may not be sufficient in elderly to compensate for the decrease in systemic vascular resistance [19]. In recent years, goal directed therapy (GDT), a combination of intravenous fluids and inotropes during surgeries in which spinal anaesthesia is used, has been suggested since this therapy may improve outcomes by decreasing the rate of minor postoperative complications [20]. Therefore one should aggressively apply some preemptive clinical strategies to lower the risks for these patients. Preoperative advanced cardiac consideration and close monitoring should be among these clinical strategies in preventing the development of hemodynamic disturbance. In our study, we found that it is essential that the anesthesiologist is aware of the alterations associated with aging, coexisting diseases, and patient medications in order to provide the most effective perioperative treatment for this group of aged patients.

Pulmonary complications following surgery lead to increased morbidity, length of stay and perioperative mortality in elderly patients. The results of two meta-analyses reveiwing outcome data in patients receiving either general anesthesia or epidural or spinal anesthesia found some trends in improved pulmonary outcomes in the epidural or spinal group [21,22]. Mark D. Numan et al. [23] found a 24 % decrease in pulmonary complications among patients recieving regional anesthesia. We did not have any pulmonary complications in either of the groups.

Undiagnosed respiratory insufficiency, high sympathetic blockade, or both may have contributed to occurrence of cardiac arrest [24]. Between 1978 and 1986, an analysis of the American Society of Anesthesiologists (ASA) Closed Claims database revealed 14 cases of cardiac arrest in young healthy patients during spinal anesthesia [25]. Our study also found that cardiac arrests were higher with spinal anesthesia in the younger group.

Old age, history of surgery or anatomical abnormalities of spine can be pre-disposing factors in failure of neuraxial techniques in elderly patients. The anesthesiologist's experience is important to prevent neural injury, backache and failure of block in geriatric patients who are especially under high risk.

The limitations of our study was that there were different number of patients in the groups; however, we find the distribution to be accurate considering the distrubition of population in Turkey. In order to increase the number of geriatric patients, we think that we need to take more records into consideration.

CONCLUSION

Physiology and co-morbid diseases among geriatric patients are the most important factors that cause complications in this patient group. ASA scores, anesthesia technique, duration of operation and type of local anesthesic used can also contribute to the occurrence of these complications. In the elderly, all anesthesia techniques have their own complication rates so the anesthetic technique should be selected according to patients' comorbidities, with careful preanesthetic evaluation and close monitoring in experienced hands.

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