Complications related to regional anesthesia

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Regional anesthesia techniques have been performed 12 times more often in the last 2 decades compared with previous decades, and this enormous increase may be related to the advantages of regional anesthesia and rarity of its serious complications.[1] The emerging point of this study was the increasing incidence of regional anesthesia practice in our clinic, and the fact that the applications were performed by the residents under the supervision of the specialists. The aim of this study was to investigate complications related to regional anesthesia practice as well as its frequency and treatment.

This retrospective study was conducted in the Anesthesiology and Reanimation Clinic of Ankara Numune Training and Research Hospital in Ankara, Turkey. Between December 2004 and November 2005, 1041 patients that had regional anesthesia for surgery were analyzed retrospectively after the approval of our Institution's Ethical Committee. The data were obtained from the information in the regional anesthesia sheets. These sheets included the demographic data and American Society of Anesthesiologists (ASA) physical classification of the patient as well as the data on the type of the operation. The complications were classified into 3 groups as perioperative, procedure-related, and postoperative, and the time that they appeared and their management was also recorded. The analysis of the data was performed using the SPSS package program version 11.5. Descriptive statistics were stated as median (minimum-maximum) or frequency (%). Chi square or Fisher's exact test was used for categorical comparisons. Mann Whitney U test, or Kruskal Wallis analysis of variance was used to compare the groups for continuous measurements. $p<0.05$ was regarded as statistically significant.

The mean age of patients was 52.69 ±15.81 years (18-95). Of the total cases, 696 (66.9%) were male and 345 (33.1%) female. The numbers and the ratios of the types of regional anesthesia procedures, which were performed in our clinic, were 585 (56.2%) spinal, 263 (25.3%) combined spinal epidural (CSE), 182 (17.5%) epidural, and 11 (1.1%) peripheral nerve blocks. The complications related to the procedure of regional anesthesia that appeared during the operation were hypotension in 107 patients (10.27%), bradycardia in 46 patients (4.4%), nausea and vomiting in 35 patients (3.4%), insufficient block in 44 patients (4.22%), motor aphasia in one patient (0.1%), and respiratory and cardiac arrest in 3 patients (0.3%). One of those incidences resulted in death of the patient (0.096%) **(Table 1)**. Postoperative complications were low back pain in 48 patients (4.7%), post dural puncture headache (PDPH) in 42 patients (4.1%), neck pain

Table 1 - The distribution of the complications with the types of blocks.

Parameters	Block type			*P*-value
	Spinal, N=585*	Epidural, N =182*	CSE, N=263*	
	n (%)			
Hypotension	25 (4.3%)†	26 (14.3%)†	56 (21.7%)†	<0.001
Bradycardia	16 (2.7%)†	5 (2.7%)†	25 (9.5%)†	<0.001
Nausea-vomiting	10 (1.7%)†	8 (4.4%)†	17 (6.5%)†	<0.001
Insufficient block	21 (3.6%)‡	14 (7.7%)	9 (3.4%)‡	0.041
PDPH	33 (5.6%)§	0	9 (3.4%)	0.2
Low back pain	24 (4.1%)	11 (6.0%)	13 (4.9%)	NS
Urinary retention	8 (1.9%)	9 (5.2%)†	19 (8.2%)†	<0.001
Respiratory depression	2 (0.34%)	1 (0.54%)		
Motor aphasia	0	1 (0.17%)	0	NS
Cardiac arrest	2 (0.34%)	0	1 (0.38%)	NS
Death	0	0	1 (0.38%)	NS

Data are presented as percentage. NS - no statistically significant differences, PDPH - post dural puncture headache, CSE - combined spinal epidural, *total number of the blocks, †significantly different among block types ($p<0.05$), ‡$p<0.05$ compared with epidural block, §$p>0.05$ compared with CSE.

in 12 patients (1.2%), urinary retention in 36 patients (3.5%), neurological damage in 4 patients (0.4%) and cutaneous-subcutaneous infection in 2 patients (0.2%). Perioperative complications were accidental dural puncture in 14 patients (3.2%), vascular trauma or intravascular catheter placement in 13 patients (2.9%), and subarachnoidal catheterization in 6 patients (1.4%). Hypotension, bradycardia, nausea-vomiting, and urinary retention were seen more frequently in CSE (p=0.00074), while insufficient block was evident in epidural anesthesia (p=0.04). The PDPH was similar between the spinal and CSE groups (**Table 1**). The frequency of hypotension was directly proportional with the increased age and ASA status of the patients (p=0.002, p=0.007). The frequencies of accidental dural puncture, and vascular trauma, or intravascular catheter placement also increased with increased age (p=0.048, and p=0.033). The incidence of vasovagal reflex increased with decreased age and ASA (p=0.006). There were no statistical correlation between age and ASA status of patients and the other complications. Respiratory and cardiac arrest occurred due to correction of the lithotomy position in the early postoperative period in one patient, due to high spinal block in one patient, and in another one due to pulmonary embolism. The patient with pulmonary embolism did not respond to cardiopulmonary resuscitation and died.

Serious complications of regional anesthesia are rare. This is why the studies on incidence and characteristics must be performed on a large number of patients.[1] Our study was performed in a single institution, the sheets could not be completed for every regional anesthesia case due to work load in the operating room, and sometimes the postoperative follow up was short; hence, the reasons for inclusion of the aforementioned number of the patients into our study. Our study showed that incidences of hypotension, accidental dural puncture, and intravascular catheter placement, or vascular injury increased with increasing age. Studies have shown that in the elderly the risk of hypotension was more than 50%, the reflex vasoconstriction was less in the areas where anesthesia was not applied, and the residual arterial tonus was decreased, and the cardiac output decreased relatively more following vasodilatation.[2] We suggest that the anatomical changes related to aging may be a factor in the accidental dural puncture, intravascular catheter placement, and vascular injury. The incidence of hypotension was 10.4% in our study. With the data available, the criteria that were used to define hypotension and its degree could not be determined. The low incidence in our study may be related to appropriate hydration in the perioperative period as well as the differences in the definition of the hypotension. In our clinical practice, we treat hypotension if the blood pressure drops by 20-25%. Hypotension was most frequently seen in CSE anesthesia. The reason for this may be the use of hypotonic local anesthetics in CSE practice. However, Goy et al[3] claimed that the same medication doses resulted in higher sensory-motor levels and a higher hypotension incidence when compared with single shot spinal (SSS).

Cardiac arrest is another complication that appears perioperatively. It is very rare during spinal or epidural anesthesia. We determined 3 cases of cardiac arrest during regional anesthesia. Two of them occurred during CSE, and one of them during spinal anesthesia patients. One of the cardiac arrests among CSE cases resulted in death. It was reported that the risk of cardiac arrest due to spinal anesthesia was less than 0.05%. A retrospective Swedish study with 17 years of follow up evaluated cardiac arrest and anesthesia-related deaths, and the rate of mortality related to spinal anesthesia was reported as 1/7000.[2] It is hard to establish the cause of the cardiac arrest as surgery-related, anesthesia-related, or patient-related. In their prospective study, Auroy et al[4] reported 26 cases of cardiac arrest among 40640 spinal anesthesia patients. Six of those incidences resulted in death of the patient. Cardiac arrest occurred in only 3 of 30143 epidural anesthesia cases. In our study, the prevalence of cardiac arrest during spinal anesthesia was high (0.17%). Our results may not be confident because of the limited number of cases.

The phrenic nerve may rarely be affected by the block at the level of C3-5 and apnea may ensue, however, respiratory arrest is more frequently due to excessive sedation, obesity, ventilation/perfusion mismatch, hypotension in the respiratory center, and ischemia due to decrease in the cardiac output.[2] A significant reduction in the functional residual capacity may cause difficulty of phonation. In our study, 3 cases have been described that developed respiratory depression following profound hypotension. In 2 of those patients, respiration improved with management of the hypotension. The third patient had coronary artery disease, hypertension, diabetes mellitus, and chronic obstructive pulmonary disease, and a transient respiratory depression appeared after the procedure. The patient's ventilation was assisted with a mask, and the surgery went on after stabilization of the respiration and hemodynamics of the patient. Meanwhile, the patient's motor aphasia was recognized. The motor aphasia continued in the recovery room after the operation, and it regressed together with the regression of the level of the block. In our study, the prevalence of this complication was 3.2%. Three of them occurred during epidural, and 11 of them during CSE procedures. We

believe that those techniques require more experience, and the prevalence was high in our study because they were performed by the residents.

One of the most common complications encountered in our study was PDPH, and there was no correlation with the number of the trials, age, or gender. Its reported prevalence is between 0.2-24%.[2] The PDPH in our study was most commonly seen after the use of 22G spinal needles with a proportion of 73.8%. The incidence of PDPH is related to the size of the tip of the needle, the aperture at its tip, and where the needle is directed during surgery. There was infection in the entrance of the epidural catheter in 2 orthopedic patients. The prevalence of the infections related to epidural catheters is reported as 1-2/10,000, and they are usually caused by *Staphylococcus aureus* and coagulase negative *Staphylococci*.[5] There were 4 neurological complications as 2 radiculopathies, one transient neurological symptom (TNS), and one sciatic nerve paralysis. There was no paresthesia during the insertion of the needles or injection of the medications. Auroy et al,[4] encountered radiculopathy in 19 of 40,640 spinal, and 5 of 30,413 epidural anesthesia patients.

Our success rate after the first trial was 70.7%. The ratio of patients that were converted to general anesthesia due to insufficient block was 4.3%, and this rate was higher in epidural anesthesia.

In conclusion, this retrospective study allowed us to learn the incidence of complications related to regional anesthesia and provide detailed analysis of these complications in our clinic. This study may be an initiator for educational reorganizations and further investigations.

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