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SCIENTIFIC ARTICLE

The relationship between preoperative anxiety levels and vasovagal incidents during the administration of spinal anesthesia

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Abstract
Background: It was aimed to investigate the relationship between preoperative anxiety and vasovagal symptoms observed during the administration of spinal anesthesia in patients undergoing surgery in the perianal and inguinal regions.
Methods: The study included patients with planned surgery for inguinal hernia repair, anal fissure, hemorrhoid and pilonidal sinus excision. The study included a total of 210 patients of ASA I–II, aged 18–65 years. Patients were evaluated in respect of demographic characteristics, smoking and alcohol consumption, ASA grade and educational level. Correlations were evaluated between the number of attempts at spinal anesthesia and anesthesia history with vasovagal symptoms and educational level, gender, smoking and alcohol consumption and anesthesia history with anxiety scores. The instant (transient) state anxiety inventory part of the Transient State/Trait Anxiety Inventory (State Trait Anxiety Inventory – STAI) was used to determine the anxiety levels of the participants. Clinical findings of peripheral vasodilation, hypotension, bradycardia and asystole observed during the administration of spinal anesthesia were recorded.
Results: Vasovagal incidences during the administration of spinal anesthesia were seen to increase in cases of high anxiety score, male gender, and an absence of anesthesia history. Educational level and the number of spinal needle punctures were not found to have any effect on vasovagal incidents.

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Conclusion: The determination of causes triggering vasovagal incidents seen during the application of spinal anesthesia, better patient information of regional anesthesia implementations and anxiety relief with preoperative anxiolytic treatment will help to eliminate potential vasovagal incidents.

PALAVRAS-CHAVE
Ansiedade;
Raquianestesia;
Síncope;
Vasovagal

A relação entre os níveis de ansiedade no período pré-operatório e os incidentes vasovagais durante a administração de raquianestesia

Resumo
Justificativa: O objetivo deste estudo foi investigar a relação entre a ansiedade no período pré-operatório e os sintomas vasovagais observados durante a administração de raquianestesia a pacientes submetidos à cirurgia nas regiões perianal e inguinal.
Métodos: O estudo incluiu pacientes com cirurgias agendadas para correção de hérnia inguinal, fissura anal, hemorroidas e excisão de fístula pilonidal. Foram incluídos 210 pacientes entre 18-65 anos e estado físico ASA I-II. A avaliação dos pacientes compreendeu história de tabagismo e consumo de álcool, classificação ASA e nível de escolaridade. As correlações foram avaliadas entre o número de tentativas de aplicação da raquianestesia e história de anestesia com sintoma vasovagal, nível de escolaridade, sexo, tabagismo e consumo de álcool, história anestésica e escores de ansiedade. O inventário do estado (transitório) de ansiedade, parte do Inventário de Ansiedade Traço-Estado (*State Trait Anxiety Inventory*-IDATE), foi usado para determinar os níveis de ansiedade dos participantes. Achados clínicos de vasodilatação periférica, hipotensão, bradicardia e assistolia observados durante a administração da raquianestesia foram registrados.
Resultados: Observamos aumento dos incidentes vasovagais durante a administração da raquianestesia em casos com escores elevados de ansiedade, pacientes do sexo masculino e pacientes sem história anestésica. O nível de escolaridade e o número de punções com agulha espinhal não mostraram ter qualquer efeito sobre os incidentes vasovagais.
Conclusão: Determinar as causas que desencadearam os incidentes vasovagais observados durante a aplicação da raquianestesia, fornecer boa informação ao paciente sobre a anestesia regional e promover alívio da ansiedade com tratamento ansiolítico no pré-operatório contribuirão para eliminar possíveis incidentes vasovagais.

Introduction

Vasovagal syncope, which is also known as vasodepressor syncope, of neurocardiogenic origins is thought to be the result of abnormal interactions of the neurocardiovascular mechanism complex which is necessary for the maintenance of systemic and cerebral perfusion, is one of the most frequently seen syncope types.[1]

Clinically, syncope has four main parameters which may be indicators; loss of consciousness, loss of postural tonus, spontaneous recovery and cardiovascular findings additional to multiple etiologies. In the classic form of neurocardiogenic syncope, cardiovascular findings such as hypotension, bradycardia, paleness and sweating are seen together with the classic syncope findings. Each parameter of neurocardiogenic syncope is related to an increase in vasovagal activity and is evaluated as a vasovagal symptom.[2]

Although the etiology is not fully known, an increase in afferent signals to the central nervous system, when the vagus dorsal motor nucleus and the nucleus ambiguus responsible for parasympathetic activity in the medulla are stimulated, inhibition of sympathetic activity following suppression of the rostral ventromedial and ventrolateral nuclei responsible for sympathetic activity and the activation of parasympathetic activity cause syncope by creating bradycardia and/or hypotension.[3–7] In syncope of neurocardiogenic origin, severe anxiety may be the origin of the syncope.

Anxiety is a spontaneous and ambiguous low mood feeling, the reason for which is unknown and may be experienced with the senses of fear, distress and impending bad events. It is a natural reaction that people develop against situations where they do not feel secure and a kind of feeling of alertness when a situation is perceived as life-threatening. The anxiety incidence among hospital patients is between 10% and 30% in general.[8] Preoperative anxiety incidence in adult patients has been reported as between 11% and 80%.[3]

Anxiety is healthy and functional up to a certain level. Therefore, the target related to anxiety in patients prepared preoperatively is a ''medium'' or ''healthy'' level of anxiety.[9]

Preoperative anxiety is a situation characterized by unrest and concern arising from any illness, hospitalization, anesthesia and surgery or not knowing what is to happen.[10] Anxiety increases the stress response by activating the release of neuroendocrine mediators in patients. This has a negative effect on surgery, anesthesia and postoperative recovery.[11]

Although bradycardia and cardiac arrest dependent on vagal reflexes are rarely confronted in general and regional anesthesia, the seriousness of these rare complications requires maximum precautions to be taken.

In previous studies, syncope has been reported to occur at least once in 3% of the general population and this rate increases to 6% in the elderly.[12,13] Syncope has been determined in 3% of all emergency polyclinic presentations and in 1% of hospitalized patients.[14] However, with the exception of case reports, to the best of our knowledge, there have been no studies in literature on preoperative or perioperative syncope and the etiology has not been comprehensively researched.

In this study, it was aimed to investigate the factors causing reflex bradycardia, seen during the administration of regional anesthesia in patients undergoing planned elective surgery in the perianal and inguinal regions, and to evaluate the relationship with preoperative anxiety.

Material and method

The study included 210 ASA I–II patients aged 18–65 years with planned surgery for inguinal hernia repair, anal fissure, hemorrhoid and pilonidal sinus excision. Approval for the study was granted by the hospital ethics committee and informed consent was obtained from all patients. Any patients who were illiterate or could not understand Turkish or had sight and hearing problems or psychiatric disorders were excluded from the study. The instant (transient) state anxiety inventory part of the Transient State/Trait Anxiety inventory (State Trait Anxiety Inventory – STAI) which is validated for Turkish people by Ömer and Le Compte in 1976 was used to determine the anxiety levels of the participants.[15] This test comprises two different subunits, each involving 20 items that measure trait and state anxieties separately. The trait anxiety section was designed to measure feelings within the last 7 days, and the other subunit was designed to measure current feelings. Participants were requested to mark one of the options of ''never'', ''sometimes'', ''frequently'' or ''almost always'', for each item in the survey. Positive scores were given for items 3, 4, 6, 7, 9, 12, 13, 14, 17 and 18, and negative scores were given for items 1, 2, 5, 8, 10, 11, 15, 16, 19 and 20 in the survey. The scores were marked by hand. Scores between 1 (or −1) and 4 (or −4) were given for each item according to the positive and negative characteristics and 50 was added to the total scores obtained. The highest and lowest scores were accepted as 80 and 20 respectively (Fig. 1). The patients were evaluated to have low, moderate and high anxiety when they had STAI values of 20–37 as, 38–44 as and 45–80, respectively.

In the premedication room, before the administration of premedication, the STAI anxiety scale was applied to all the patients by an anesthetist and the results were noted. A record was made of the patient age, gender, height, weight, history of smoking and alcohol consumption, ASA grade and educational level. An intravascular route was opened and the patient was transferred to the operating theatre. On

Spielberger state trait anxiety inventory				
	Never (1)	Sometimes (2)	Frequently (3)	Almost always (4)
1. Calmed down				
2. Safe				
3. Tense				
4. Annoyed				
5. Comfortable				
6. Upset				
7. Concerned with future misfortunes				
8. Relaxed				
9. Anguished				
10. At ease				
11. Self-confidence				
12. Nervous				
13. Restless				
14. Downhearted				
15. Rested				
16. Satisfied				
17. Concerned				
18. Stunned				
19. Happy				
20. I fell good				

Figure 1 Spielberger State Trait Anxiety Inventory.

Table 1 Demographic features of the patients.

	Vasovagal symptom present ($n = 40$)	Vasovagal symptom absent ($n = 170$)	p value
Age	28 ± 3.5	34 ± 6.4	0.091
Height (cm)	170 ± 14.3	172 ± 11.2	0.166
Weight (kg)	72 ± 12.4	70 ± 13.4	0.657
Operation time (min)	46 ± 14.8	49 ± 13.4	0.541
Female/male	3/37	51/119	0.003
Smokers, n (%)	21 (52.5)	70 (41.2)	0.324
Alcohol abusers, n (%)	20 (50)	81 (47.6)	0.421
ASA I/II	28/12	114/52	0.268
Primary education/high school/further education	22/8/10	84/49/37	0.527

Independent t-test, Pearson chi-square test.
SD, standard deviation.

the operating table, heart rate and rhythm were monitored with electrocardiography, non-invasive blood pressure (NIBP) and peripheral oxygen saturation (SpO_2) monitoring were applied. After the monitorization, the patient was moved into a sitting position and the lumbar area was cleaned 3 times with povidone iodine then sterile draped. Entry was made with a 26G pencil point spinal needle between L4–L5 or L3–L4, located with palpation, and the number of entries attempted for the application of spinal anesthesia was recorded. The spinal anesthesia was applied to all the patients in a sitting position and no anxiolytic was applied to any patient. During the procedure, systolic pressure observed <90 mmHg and diastolic <60 mmHg was evaluated as hypotension, <60 bpm as bradycardia and 0 bpm as asystole and these values were recorded. In cases of bpm < 40, 1 mg atropine was administered.

Statistical methods

The power of the study was determined as 0.99 in a confidence interval of 95% and at significance level of 0.05. This finding indicated that the sample was sufficient (effect size = 0.27).

SPSS 15.0 program was used in the data analysis. The Shapiro–Wilk and Leneve tests were used respectively for the conformity of the data to normal distribution and variance homogeneity. Parametric and nonparametric methods were used in the analysis of the variables with and without homogeneous variance and normal distribution respectively. The independent-samples t-test was used in the comparison of 2 independent groups. The Pearson chi-square test was used in the comparison of categorical data. Quantitative data were expressed as mean $\pm$ standard deviation (SD) in the tables. Categorical data were expressed as number (n) and percentage (%). The data were analyzed at 95% confidence interval and a value of $p < 0.05$ was accepted as statistically significant.

Results

A total of 210 patients were included aged 18–65 years of ASA grade I–II. No statistically significant difference was determined between those showing and not showing vasovagal symptoms in respect of age, height, weight, smoking, alcohol consumption or ASA grade ($p > 0.05$) (Table 1).

Vasovagal symptoms were observed in a total of 40 patients. Preoperatively, vasovagal symptoms were seen in mean 19% of the patients (Table 1).

There were no cases in either group who were illiterate or had not received any education. No statistically significant difference was seen between the groups in respect of vasovagal symptoms and level of education ($p > 0.05$) (Table 1).

The most frequently observed vasovagal symptoms were sweating and dizziness. Cardiogenic origin findings were observed in 27 patients and in one of these an asystolic table formed. In some patients, several symptoms were observed at the same time (Table 2).

Of the 40 patients showing vasovagal syncope symptoms, one had a history of spinal anesthesia and six of general anesthesia. A statistically significant difference was determined between the groups in respect of history of general and spinal anesthesia ($p < 0.05$) (Table 3).

Type of surgery and number of spinal puncture attempts did not have statistically significant effect on vasovagal symptom occurrence ($p > 0.05$) (Table 3).

The patients having vasovagal symptoms had high degree of anxiety (STAI > 45) at a significantly higher rate than the patients having no symptoms ($p < 0.001$) (Table 4).

A statistically significant relationship was determined between high anxiety scores and gender and no history of spinal or general anesthesia ($p < 0.05$). No statistically significant relationship was determined between high anxiety scores and educational level, smoking and alcohol consumption ($p > 0.05$) (Table 5).

Table 2 Vasovagal incidents seen in patients.

Type of symptom	n (%)
Sudation	30 (75%)
Hypotension/dizziness	16 (40%)
Bradycardia	10 (25%)
Asystolia	1 (2.5%)

Table 3 Comparison of patient's previous anesthesia experience, operation type, number of spinal puncture attempts.

	Vasovagal symptom present ($n = 40$)	Vasovagal symptom absent ($n = 170$)	p value
Spinal anesthesia history, n (%)	1 (2.5)	64 (37.6)	<0.001
General anesthesia history, n (%)	6 (15)	84 (49.4)	<0.001
Operation type			
Inguinal hernia	12	42	0.398
Pilonidal sinus	14	80	
Anal fissure	6	34	
Hemorrhoid	8	16	
1 trial/>1 trials	16/24	156/14	0.051

Pearson chi-square test.

Table 4 Degree of anxiety in vasovagal symptom occurring and nonoccuring patients.

	Vasovagal symptom present ($n = 40$)	Vasovagal symptom absent ($n = 170$)	p value
STAI 20–37 (low degree of anxiety)	2 (5%)	106 (62.3%)	<0.001
STAI 38–44 (moderate degree of anxiety)	8 (20%)	44 (25.8%)	
STAI 45–80 (high degree of anxiety)	30 (75%)	20 (11.9%)	

STAI, State Trait Anxiety Inventory.
Pearson chi-square test, *n* (%).

Discussion

In the current study, factors causing vasovagal incidents which are often encountered during spinal anesthesia were investigated and the relationship with anxiety was evaluated. In literature, although there are many case reports of preoperative vasovagal incidents and vasovagal incidents observed during regional anesthesia interventions, the current study presents a wider case series.[16,17]

Anxiety is the first response when people confront a problem and the most frequent reaction in cases of illness. Anxiety develops in hospital patients, especially those who are to undergo any surgical intervention.[9] In addition to surgical interventions, all anesthesia applications are perceived as dangerous by patients and both preoperative and postoperative stress and tension develop with this perception.[18]

While different tests have been used in the evaluation of preoperative anxiety in literature, the use of STAI, which includes both a state and trait anxiety scale is widely accepted.[19]

Preoperative anxiety incidence has been reported between 11% and 92% in various surgical patient groups.[20] While STAI-S threshold, which is used for the state of anxiety with clinically distinctive symptoms, is accepted as 39–40, it has been determined as 44–45 for patients in a preoperative period. The reason for this is that STAI-S indicates how people feel independently of the present situations and circumstances.[20]

In the current study, patients with STAI-S scores >45 were classified as high degree anxiety and these patients constituted 23% (50) of the total patient group.

Anxiety levels have been reported to be higher in females in many studies.[20–22] As the hospital where the study was conducted serves a military base, there was a greater number of males in the current study population. Contrary to the general literature information, anxiety in females was lower

Table 5 Relationships of education level, gender, smoking, use of alcohol and anesthesia experience with anxiety scores.

	STAI 45–80 high degree of anxiety ($n = 50$)	STAI 38–44 medium degree of anxiety ($n = 52$)	STAI 20–37 low degree of anxiety ($n = 108$)	p value
Gender F/M	9/41	20/32	25/83	0.021*
Education PS/HS/FE	26/11/13	28/13/11	52/33/23	0.069
Spinal anesthesia history, *n* (%)	10 (50)	15 (28.8)	40 (37.03)	0.032*
General anesthesia history, *n* (%)	10 (50)	20 (38.4)	60 (55.5)	0.049*
Smokers, *n* (%)	21 (42)	26 (50)	47 (43.5)	0.365
Alcohol abuser, *n* (%)	25 (50)	26 (50)	50 (46.2)	0.348

Pearson chi-square test *$p < 0,05$.
PS, primary school; HS, high school; FE, further education.

than that of males in this study. The significantly higher number of males in the study population may be the reason for this difference. While the anxiety connected with being separated from the family was reported to be higher in females, some researchers have also stated that females express their anxieties more easily than males.[23]

It was considered that this difference could be connected with levels of expressed emotion being more restricted in males in our society. In the current study, it was determined that the anxiety levels of males were statistically higher in the preoperative period compared to those of females.

Some studies have reported that previous surgical experience reduced preoperative anxiety and this is explained with the conditional learning model, in which an unconditional fear stimulus is encountered at short intervals.[22]

While there are studies which have stated that the anesthesia experience did not change the preoperative anxiety level, there are also studies which have suggested that the anesthesia experience reduced anxiety in men, while it did not affect anxiety in women.[23,24] There are also studies in literature, which have reported that patients with an anesthesia experience of more than 10 years previously had fewer anesthesia-dependent anxieties compared to those who had undergone surgery within the last 10 years.[10] In the current study, regional and general anesthesia experiences were questioned separately, and a statistically significant difference was determined in vasovagal incidences between the patients with and without anesthesia experience.

It has been reported in literature that a physical status of ASA II and above and the size of operation affected the level of anxiety. In some studies, the ASA status was reported to be a determinant of the preoperative anxiety level.[22] The current study was applied to patients with ASA I–II status undergoing operations with discharge on postoperative day 1 at the very latest, considering the expected amount of bleeding, operation time and postoperative hospitalization duration. No significant difference was determined in terms of ASA status between the groups participating in this study.

Some researchers have stated that age was not a factor affecting the anxiety level,[12,23,24] although Ramsay determined that the rate of anxiety was higher in a middle-aged patient group and connected that with the family responsibilities of these patients. There is a greater sense of pre-destiny in older patients and younger patients may be better informed about health-related negative incidents through media technology.[10] In the current study, the patient population with observed vasovagal incidents was mostly comprised of younger patients, which conforms with literature, although no statistically significant difference was determined between two groups.

While it has been reported in some studies that anxiety increased with an increasing level of education, other studies have shown that the education level did not affect the degree of anxiety.[25,26] It was stated in one study that preoperative anxiety levels were higher in those who had received education for more than 12 years.[22] In the current study, no relationship was determined between the level of education and anxiety. The level of anxiety was higher in patients with a primary school level of education and lower in those who had attended high school but the difference was not statistically significant.

Preoperative nicotine replacement treatment has been shown not to have any effect on the preoperative anxiety levels of smokers and the symptoms developing connected to deprivation in smokers did not clinically create a serious problem in the perioperative period.[27,28] In the current study, no difference was observed in the anxiety levels between smokers and non-smokers.

This study had some limitations, including the implementation of spinal anesthesia only, that most of the study population was male and the limited number of operation types. Future studies could investigate vasovagal symptoms seen during the implementation of regional anesthesia and peripheral nerve blocks.

Conclusion

The determination of the factors causing vasovagal incidents during spinal anesthesia application has a place in both diagnosis and treatment as they should be known by both patients and anesthetists. The prevalence of vasovagal incidences increases with high anxiety scores and absence of anesthesia history. Evaluation of the anxiety levels of patients, reducing unwanted vasovagal problems with preoperative anxiolytic medication and informing patients about the application of regional anesthesia will be helpful in eradicating vasovagal incidents.

Conflicts of interest

The authors declare no conflicts of interest.

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