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Özgün Araştırma

Correspondence address
Yazışma adresi

Bilge KARSLI
Akdeniz University Faculty of Medicine, Department of Anaesthesiology and Reanimation, Antalya/ Türkiye

bilgekarsli@akdeniz.edu.tr

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Cihan SANBIRGAN
Akdeniz University Faculty of Medicine, Department of Anaesthesiology and Reanimation, Antalya, Türkiye
ORCID ID: 0000-0002-8119-0883

Nurten KAYACAN
Akdeniz University Faculty of Medicine, Department of Anesthesiology and Reanimation, Antalya, Türkiye
ORCID ID: 0000-0003-3542-4375

Bilge KARSLI
Akdeniz University Faculty of Medicine, Department of Anaesthesiology and Reanimation, Antalya, Türkiye
ORCID ID: 0000-0003-4520-8844

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The Effect of Preoperative Anxiety on Hemodynamic Parameters in Cesarean Section Under Spinal Anesthesia

Spinal Anestezi ile Sezaryende Preoperatif Anksiyete'nin Hemodinamik Parametrelere Etkisi

ABSTRACT

Objective:

Our aim in this study is to assess the effect of preoperative anxiety on intraoperative hypotension, postoperative recovery and maternal satisfaction in cesarean section under spinal anaesthesia.

Material and Methods:

In this study, 105 cesarean sections were included between ages of 18-45 and at 34-42 gestational weeks. Two different scales were used for the anxiety evaluation performed 1 hour before the operation, including STAI-I, II and VAS anxiety score.
Low, moderate and high anxiety levels were evaluated according to the scores obtained: low (20-37), moderate (38-44) and high (45-80) for STAI and low (0-3), moderate (4-6) and high (7-10) for VAS. During the operation, haemodynamic parameters were monitored at 5,10,15,20,30 minutes. In the post-operative first day, STAI-I, VAS, Post-Cesarean Mother Satisfaction Scale (PCMSS) and Post-Cesarean Recovery Scale (PCRS) were also evaluated.

Results:

In the evaluation of preoperative STAI -I and VAS anxiety scores, it was observed that the majority of cases had moderate anxiety group (61.9%, and 45.7%).
There was no significant correlation between preoperative STAI-I, STAI-II, VAS anxiety levels and SSAM, SSDS in our study. There was a negative correlation between postoperative VAS anxiety scores and SSAM but this was not significant. In our study, no significant difference was found in umbilical cord pH values in different anxiety levels. In preoperative high VAS levels, MBP decreased significantly in 30 minutes, and also vasopressor requirement decreased significantly in preoperative low VAS anxiety levels ($p<0.05$).

Conclusion:

Anxiety level of the patients should be reduced through non-pharmacological methods in preoperative visits considering the fact that patients are pregnant. Further studies with larger sample sizes should be performed to demonstrate clearly the effect of maternal anxiety on the hypotension during spinal anesthesia for cesarean section.

Key Words:
Anesthesia, Spinal, Hemodynamic parameters, Anxiety

ÖZ

Amaç:
Bu çalışmanın amacı, spinal anestezi ile sezaryende preoperatif anksiyetenin intraoperatif hipotansiyon, postoperatif derlenme ve maternal memnuniyet üzerine etkilerini değerlendirmektir.

Gereç ve Yöntemler:
On sekiz - Kırk beş yaş aralığında ve 34-42 gestasyonel haftasında sezaryen operasyonu olan 105 olgu çalışmaya dahil edildi. Operasyondan bir saat önce preoperatif anksiyeteyi değerlendirmek için iki farklı anksiyete skalası; STAI-I, II ve VAS kullanıldı. Elde edilen skorlar STAI için; düşük (20-37), orta (38-44), yüksek (45-80), VAS için; düşük (1-3), orta (4-6), yüksek (7-10) olarak değerlendirildi. Operasyon süresince hemodinamik parametreler 5.,10.,15.,20. ve 30.dk da monitorize edildi. Postoperatif birinci günde STAI-I, VAS, PCMSS (Post-Cesarean Mother Satisfaction Scale) ve PCRS (Post-Cesarean Recovery Scale) skalaları ayrıca kaydedildi.

Bulgular:
Preoperatif STAI-I ve VAS anksiyete slorları değerlendirildiğinde olguların çoğunluğunda orta derecede anksiyete skoru (%61,9, ve %45,7) gözlendi. Preoperatif STAI-I, II ve VAS anksiyete skorları ile PCMSS, PCRS arasında anlamlı bir korelasyon saptanmadı. Postoperatatif VAS skoru ile PCMSS arasında negatif bir korelasyon mevcuttu ancak bu anlamalı değildi. Çalışmamızda farklı anksiyete düzeylerinde umblikal kord pH değerleri arasında anlamlı fark yoktu.
Preoperatif yüksek VAS değerlerinde orta arter basıncı 30. dakikada anlamlı olarak azaldı ve düşük VAS değerlerinde intraoperatif vazopressör gereksinimi anlamlı olarak azaldı ($p<0.05$).

Sonuç:
Preoperatif nonfarmakolojik yöntemlerle gebe hastaların anksiyete düzeyi azaltılmalıdır. Maternal ankisyetenin spinal anestezi ile sezaryende hipotansiyon üzerine etkisini araştıran daha fazla sayıda olguyu içeren daha ileri çalışmalara ihtiyaç vardır.

Anahtar Kelimeler:
Anestezi, Spinal, Hemodinamik ölçümler, Anksiyete

INTRODUCTION
Preoperative anxiety can be defined as a state of dissatisfaction, which may be related to abnormal haemodynamic responses as a result of stimulation of the sympathetic, parasympathetic and endocrine system (1). Pregnancy leads women into a new stage in their lives and makes them experience biological and psychological changes. Almost all women suffer from stress, anxiety and depression during pregnancy period (2,3).
Spinal anesthesia is the most commonly used regional anesthesia method in cesarean section and the most common side effect is maternal hypotension (4-7). The main mechanism of maternal hypotension is the blockage of sympathetic efferent neurons (8). Anxiety causes widespread sympathetic activation and hypotension after spinal anesthesia has been shown to be more severe in patients with high basal sympathetic activity (9,10). The most commonly used scale for the measurement of anxiety is the State-Trait Anxiety Inventory (STAI) I and II scale developed by Spielberg et al. The STAI-I (State-Trait Anxiety Scale) determines how the individual feels himself / herself in a given moment and under certain conditions. The STAI-II (Trait Anxiety Scale) determines how the individual feels himself / herself independent of the situation and condition (11). Visual anxiety scale (VAS) is also used as another anxiety scale (12). Because of the high level of preoperative anxiety in pregnant women, we think that more severe hypotension may develop after spinal anesthesia. There are few studies evaluating the effect of preoperative anxiety on intraoperative hypotension in cesarean section under regional anesthesia. Our aim in this study is to assess the effect of preoperative anxiety on intraoperative hypotension, postoperative recovery and maternal satisfaction in cesarean section under spinal anaesthesia.
This article is under Nurten KAYACAN mentorship, it was produced from the specialty thesis of Cihan SANBIRGAN at Akdeniz University, Department of Anesthesiology and Reanimation.

MATERIAL and METHODS
Our study is a prospective observational study in elective caesarean section with spinal anesthesia following approval of the University Clinical Research Ethics Committee". The study was planned in accordance with the research and publication ethics specified in the "Helsinki Statement", "Good Clinical Practice Guidelines". Patients who agreed to participate in the study were informed about the study and "informed consent" was obtained. In this study, 105 cesarean sections were included between ages of 18-45 and at 34-42 gestational weeks. Active labor, preeclampsia, eclampsia, chronic hypertension, placental abnormalities, multiple pregnancies were not included in the study. Two different scales were used for the anxiety evaluation performed 1 hour before the operation, including STAI (I-II) anxiety score and Verbal Analoque scale (VAS).
According to anxiety scores, patients were evaluated in low, moderate and high anxiety categories: low (20-37), medium (38-44) and high (45-80) for STAI; low (0-3), medium (4-6) and high (7-10) for VAS.
All patients were monitored with electrocardiography (ECG), noninvasive blood pressure (NIBP) and peripheral oxygen saturation (SpO2 during the operation. Also, 500ml colloid and 1000ml crystalloid solution were initiated for fluid replacement simultaneously with spinal anesthesia. The 0.5% bupivacaine dose required for spinal anesthesia was given according to the doses of Harten JM et al. (13). The patients were brought to a tilt position 15 ° to the left and the operation was allowed to start when the anesthesia level was reached to T4. During the operation, systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP) and heart rate (HR) were monitored at 5,10,15,20,30 minutes. A 25% reduction in blood pressure was considered as hypotension and was treated by intravenous rapid fluid replacement and vasoconstric-

tor agent. Umbilical cord blood sample was analized. In the post-operative first day, STAI-I, VAS, Post-Cesarean Mother Satisfaction Scale (PCMSS) and Post-Cesarean Recovery Scale (PCRS) were also evaluated (14, 15).

Statistical analysis

Statistical analysis was performed with SPSS 23.0 program and p <0.05 was considered as significant. Fisher's Exact Test and Pearson Chi-Square test were used to analyze categorical data. Independent Samples t Test and Mann-Whitney U Test were used to analyze the difference between the two groups. The relationships between numerical data were evaluated by non-parametric Spearman Correlation Test and parametric Pearson Correlation Test.

RESULTS

The pregnant women (n:105) with cesarean section under spinal anesthesia were included in the study. Demographic data of the cases are shown in Table I.

Table I: Demographic data

	Mean ± SD
Age (year)	30.87±5.55
Weight (kg)	76.80±10.39
Height (cm)	161.37±5.70
Gestational age (week)	38.19±1.14
Parity (primiparous/multiparous) (%)	21.9±78.1
Baby weight (gr)	32.07±46.71
Baby Apgar score 1min / 5 min	8.61±0.59 / 9.89±0.33

Preoperative and postoperative mean anxiety scores are shown in Table II. In the evaluation of postoperative anxiety score; mean STAI-I anxiety scale was high (45.06 ± 2.94) and VAS scale was determined as low anxiety score (2.07 ± 1.82).

Tablo II: Preoperative and postoperative anxiety scores

	Low (%)	Moderate (%)	High (%)	Mean ±SD
Preoperative STAI- I	14.3	61.9	23.8	41.6±3.92
Preoperative STAI- II	0	44.8	55.2	44.91± 30.1
Postoperative STAI- I	1	48	56	45.06±2.94
Preoperative VAS	23.8	45.7	30.5	4.96±2.27
Postoperative VAS	75.2	21.9	2.9	2.07±1.82

STAI: State-Trait Anxiety Inventory, VAS: Visual anxiety scale

In the evaluation of preoperative STAI-I and VAS anxiety scores, it was observed that the majority of cases had moderate anxiety group (61.9%, and 45.7%). In the evaluation of preoperative STAI-II anxiety scores, it was observed that the majority of the cases were included in the high anxiety group (55.2%) but there is a little difference between moderate (44.8 %) and high anxiety (55.2%) groups. Postoperative VAS anxiety scale was observed as low anxiety scale (2.07±1.82).

Preoperative SBP and HR showed a significant decrease in all intraoperative measurements (p<0.05). A significant decrease was observed in the 5th and 10th minutes of DBP compared to preoperative values. A significant decrease was observed in 5th, 15th, 20th and 30th minute measurements of the MBP compared to preoperative values (p <0.05) (Table III).

Table III: Haemodynamic parameters

	SBP (Mean±SD)	DBP (Mean±SD)	MBP (Mean±SD)	KAH (Mean±SD)
Preoperative	122.74±15.01	75.27±11.45	91.33±12.47	98.17±12.95
5 min	100.4±14.03*	60.61±11.99*	74.57±12.16*	91.74±12.41*
10 min	95.48±13.03*	56.51±8.87*	70.67±10.18*	88.47±10.74*
15 min	94.90±11.42*	55.95±9.39	70.49±9.66	87.37±9.80*
20 min	97.14±10.39*	58.1±7.88	72.79±8.43*	86.55±9.09*
30 min	101.31±10.58*	61.42±7.51	75.04±7.97*	86.20±9.08*

(*) p<0.05: significant decrease compared to preoperative values

According to different preoperative STAI anxiety scores, there was no difference on SBP, DBP, MBP and HR changes (p>0.05). According to preoperative VAS anxiety score, the decrease of DBP at 30 min in high anxiety group was found as significant (p<0.05) (Table IV).

Table IV:
Vasopressor and atropine requirement

	STAI -I					STAI- II			VAS			
	Low n = 15	Moderate n = 65	High n = 25	P	Low n = 47	Moderate n = 47	High n = 58	P	Low n = 25	Moderate n = 48	High n = 32	P
Preop.	94.2 ± 12.48	90.15 ± 11.99	92.68 ± 13.73	0.51	92.53 ± 11.46	92.53 ± 11.46	90.36 ± 13.25	0.18	93.16 ± 15.16	92 ± 12.78	88.90 ± 9.30	0.64
5.min	75.8 ± 10.55	73.26 ± 12.39	77.24 ± 12.39	0.41	76 ± 10.70	76 ± 10.70	73.41 ± 13.21	0.26	74.32 ± 15.23	74.43 ± 10.62	74.96 ± 12.07	0.58
10.min	69.8 ± 11.16	70.84 ± 9.71	70.76 ± 11.15	0.81	69.40 ± 10.85	69.40 ± 10.85	71.70 ± 9.57	0.25	73.68 ± 10.09	68.75 ± 10.87	71.06 ± 8.67	0.32
15.min	68.73 ± 7.61	69.86 ± 9.86	73.2 ± 10.05	0.25	70.29 ± 9.46	70.29 ± 9.46	70.65 ± 9.91	0.83	72,16 ± 10.60	70.54 ± 9.23	69.12 ± 9.65	0.68
20.min	73.33 ± 2.863	72.18 ± 8.36	73.8 ± 10.48	0.45	72.82 ± 8.913	72.82 ± 8.913	72.75 ± 8.09	0.83	74.28 ± 10.10	73.25 ± 7.44	70.93 ± 8.35	0.40
30.min	76.13 ± 6.36	74.2 ± 7.58	76.6 ± 9.66	0.17	75.42 ± 8.64	75.42 ± 8.64	74.74 ± 7.45	0.5	76.68 ± 8.16	76.66 ± 6.082	71.34 * ± 9.24	0.01

(*) p<0.05

STAI: State-Trait Anxiety Inventory, VAS: Visual anxiety scale

No significant correlation was found between the degree of preoperative anxiety and PCMSS (p>0.05). Also, no significant relationship was found between the degree of preoperative anxiety and PCRS (p>0.05). However, when the postoperative VAS anxiety scores decreased, a significant increase was found in PCMSS (p <0.05) (Table V).

Table V: The effect of anxiety on maternal satisfaction and postoperative recovery

		PCMSS (Ort±SD)	P	PCRS (Ort±SD)	P
STAI -I (preop)	Low	5.36 ± 0.60	0.17	4.03 ± 0.80	0.28
	Moderate	5.44 ± 0.50		4.23 ± 0.73	
	High	5.63 ± 0.55		4.41 ± 0.84	
STAI –II (preop)	Low-Moderate	5.53 ± 0.51	0.31	5.53 ± 0.81	0.20
	High	5.43 ± 0.54		5.43 ± 0.62	
VAS (preop)	Low	5.58 ± 0.59	0.53	4.17 ± 0.61	0.28
	Moderate	5.44 ± 0.54		4.20 ± 0.76	
	High	5.43 ± 0.46		4.38 ± 0.71	
VAS (postop)	Low	5.48 ± 0.53	0.04*	4.22 ± 0.70	0.32
	Moderate-High	5.46 ± 0.56		4.34 ± 0.76	

(*) p<0.05

There was no correlation between preoperative low, moderate, high anxiety scores and umbilical cord pH values (p> 0.05). We found that patients with preoperative low VAS scores had significantly less vasopressors than patients with moderate and high VAS scores (p<0.05).

Although there was no statistically significant difference in atropine requirement between anxiety levels, no atropine requirement was observed in low anxiety (Table VI).

Table VI: Vasopressor and atropine requirement

		Vasopressor requirement			Atropine requirement		
		Yes	No	p	Yes	No	p
STAI-1 (preop)	Low	5	10	0.62	0	15	0.73
	Moderate	18	47		5	60	
	High	5	20		2	23	
STAI-2	Low-Moderate	13	34	0.83	1	46	0.12
	High	15	43		6	52	
VAS (preop)	Low	1	24	0.007*	0	25	0.31
	Moderate	14	34		4	44	
	High	13	19		3	29	

(*) p<0.05

DISCUSSION

In the past few decades, Cesarean section rates has been steadily increased worldwide (16, 17). The rising numbers are partly due to the rising number of women requesting an elective cesarean section (18, 19). The delivery anxiety is very important, because the postpartum maternal recovery and pain perception can be negatively affected (20, 21).

Preoperative anxiety is generally high women, and it can increase further in association with pregnancy in caesarean section cases. In addition to general concerns about their health and surgery, becoming distant from home and family, and interrupted daily routines, they also have anaesthesia-related concerns such as unsuccessful recovery, postoperative pain, and intraoperative awareness (22). Spinal anesthesia is one of the most commonly used regional anesthesia methods for cesarean operations and the most common complication is maternal hypotension (4-7). The main mechanism of maternal hypotension is the blockage of sympathetic efferent neurons (8). Anxiety causing widespread sympathetic activation and hypotension after spinal anesthesia has been shown to be more severe in patients with high basal sympathetic activity (9, 10). Spinal anaesthesia is associated with a higher preoperative anxiety level than general anaesthesia in obstetric patients (23). Although the effect of preoperative anxiety on hypotension due to spinal anesthesia has been studied in different surgeries, there are few studies on the effect of elective caesarean section. It is reported in a few studies that hypotension after spinal anesthesia is more common in patients with preoperative high sympathetic activation (9, 10, 24). In this observational study, the mean preoperative anxiety level of the women was found as middle anxiety level according to both STAI-I and VAS. Although preoperative mean STAI-II anxiety level was found as high, it was at the lowest limit of the scale and close to the middle anxiety level. The evaluation of intraoperative hemodynamic parameters such as SBP, DBP, MBP and HR showed significant decreases compared to preoperative values. In the evaluation of haemodynamic parameters in different anxiety groups, there was a statistically significant decrease at 30 th MBP in high VAS anxiety scores. According to STAI scores, there was no significant difference in hemodynamic parameters between low, middle and high anxiety levels. In our study, we found a minimal relationship between preoperative anxiety level and intraoperative hemodynamic decreases. We think that this is due to the fact that the anxiety level of the patients included in the study was mostly in the middle anxiety group and the number of cases between the different anxiety groups was not homogeneous. The majority of the cases had moderate anxiety level and low number of cases were the weaknesses of our study. The difference in the number of primiparous and multiparous pregnancies in the cases is the disadvantage of our study. Zinger SO and colleagues investigated the effect of preoperative anxiety on intraoperative hemodynamic changes in patients underwent cesarean section during spinal anesthesia. They concluded that high preoperative anxiety scores were associated with lower blood pressure after spinal anesthesia (24). In many studies, the level of anxiety was found to be higher in women, young people and those with poor anesthesia experience (25, 26). Although the patients in our study were female, pregnant, young and had regional anesthesia, the anxiety of patients were mostly at the level of moderate anxiety. This can be explained by the low number of cases and the majority of cases being multiparous in our study.

In our study, no significant difference was found in the use of vasopressor and atropine in different anxiety levels. However, the use of vasopressor in high VAS scores was higher than in low VAS scores. The delivery anxiety is very important, because the postpartum maternal recovery and pain perception can be negatively affected (18, 19). The fear of delivery also may lead to a negative maternal mood and anxiety disorders (27). The high anxiety scores before surgery can increase the postoperative pain scores, analgesic requirements and even cause persistent pain (28). In the caesarean section, mothers are seriously concerned with their health as well as their baby's health. Therefore, these patients have more anxiety than other patients.In caesarean section, pharmacological agents are not used for the treatment of preoperative anxiety because of

possible neonatal side effects. This can be prevented by giving patients detailed information about their operation and with preoperative pharmacological medications. Because of depressive effects of sedatives on newborns, pharmacological medications are omitted, especially in obstetric patients. Many case reports have been published concerning low motor tonus at birth among newborns and pregnant women given diazepam, especially in the 1960s (29, 30). These events led to a widespread antipathy to benzodiazepines, and as a result, there is an insufficient number of studies on this subject in the literature. Midazolam studies are limited in the treatment of preoperative anxiety in cesarean section and there were no significant differences about Apgar scores, umbilical cord blood gases compared to the control groups (31-33). Anxiety affects the patient's perception of postoperative pain and has a negative impact on recovery from anesthesia. Achmet A and colleagues compared the effect of preoperative anxiety on postoperative pain control and recovery from anesthesia in patients undergoing laparoscopic cholecystectomy. They concluded that high preoperative anxiety level negatively affects recovery from anesthesia and control of postoperative pain (34).

Patient satisfaction has become extremely important in evaluating the quality of health services. There are various factors affecting patient satisfaction, such as good behavior, general quality, accessibility, ability, information, solving problems. The most important of these is to inform the patient and this will increase patient satisfaction (35-37). Gorkem U and colleagues reported that detection of anxiety level before elective cesarean delivery and therapeutic approach may be useful for postoperative pain control (18).

Our patients were informed verbally during preoperative anesthesia. There was no significant correlation between preoperative STAI-I, STAI-II, VAS anxiety levels and SSAM, SSDS in our study. There was a negative correlation between postoperative VAS anxiety scores and SSAM but this was not significant. In our study, no significant difference was found in umbilical cord pH values in different anxiety levels. In preoperative high VAS levels, MBP decreased significantly in 30 minutes, and also vasopressor requirement decreased significantly in low VAS anxiety levels.

CONCLUSION

In conclusion, pregnancy, surgical operations and anaesthesia administrations are important stress factors for patients. Anxiety level of the patients should be reduced through nonpharmacological methods in preoperative visits considering the fact that patients are pregnant.

Further studies with a larger samples size should be performed to demonstrate clearly the effect of maternal anxiety on the hypotension during spinal anesthesia for cesarean section.

Ethics Committee Approval:

This research complies with all the relevant national regulations, institutional policies and is in accordance with the tenets of the Helsinki Declaration, and has been approved by the Akdeniz Medical Faculty Ethical Committee (Approval Number: 11.11.2015/307).

Informed Consent:

All the participants' rights were protected and written informed consents were obtained before the procedures according to the Helsinki Declaration.

Author Contributions:

Concept – N.K.,C.S.; Design – N.K.,C.S.,B.K.; Supervision – N.K.; Materials – C.S.,N.K.; Data Collection and/or Processing – C.S.,N.K.; Analysis and/ or Interpretation – C.S., N.K.; Literature Search – C.S.,N.K.; Writing Manuscript – N.K.,B.K.; Critical Review – N.K.,B.K.

Conflict of Interest:

The authors have no conflict of interest to declare.

Financial Disclosure:

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