Evaluation of preoperative anxiety level of the surgeons

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Abstract

Aim: Preoperative anxiety is a common state experienced by the patients undergoing surgical procedures. Preoperative anxiety can occur not only in patients but also in surgeons. The aim of this study was to evaluate the preoperative anxiety level of the surgeons.

Methods: The study included 100 surgeons, aged 26-64 years. Before attending the first elective operation of the day, the surgeons were asked to fill the State-Trait Anxiety Inventory (STAI) and salivary cortisol sample was taken from them preoperatively. The surgeons also filled the evaluation form that includes information about their surgical department, academic superscription, years of clinical experience in medical sciences, years of clinical experience in relevant department, and the name and the group of the surgery.

Results: One hundred surgeons comprised of 46 assistant doctor, 34 specialists, 15 associate professor, 3 professor and 2 doctor lecturers were participated in the study. The mean STAI-1 score were 39.5 ± 11.2 and the mean STAI-2 were 40.4 ± 8.7. The mean salivary cortisol levels were 12.0 ± 8.1 nmol/l. There was no statistically significant difference between genders, surgical departments, academic superscriptions, years of medical and surgical experiences and surgical procedure groups in terms of STAI-1scores, STAI -2 scores and salivary cortisol levels (p>0.05)

Conclusions: Based on STAI-1 scores, STAI-2 scores and salivary cortisol levels, the preoperative anxiety level of the surgeons did not differ by gender, surgical department, academic superscription, years of medical and surgical experiences and surgical procedure groups.

Keywords: *Anxiety, Cortisol, Preoperative, Surgeon*

1. Introduction

Preoperative anxiety is reported to be present in up to 80% of patients[1]. Safe and qualified patient outcomes are directly related with good performance in the operating room. Surgery is a stressful event not only experienced by patients but also by the surgeons. The stressors that surgeons are exposed to during surgery may be related to technical or equipment problems, teamwork problems, distractions, poor time management, patient related factors and personal factors[2–4]. Anxiety of the patients prior to surgery has been well-studied. However, there are limited data in the literature about preoperative anxiety of the surgeons. In a study conducted in the United Kingdom, it was determined that surgical performance anxiety was very common, and it was associated with worse psychological wellbeing among surgeons[5]. Anxiety consists of physiological, cognitive and behavioral components[6]. Anxiety-related moderate physiological arousal can positively affect performance through increased motivation, attention, and motor skills[7]. On the other hand, performance anxiety can affect cognitive processes such as attentional control, self-focus, and worry. Performance anxiety is experienced not only among surgeons but also in musicians and athletes who are exhibiting skill performance. Surgeons can develop adaptive pre-performance rituals or coping strategies as behavioral responses to performance anxiety like musicians or athletes do[8]. In a study ritual such as a singer listening to the same playlist of songs before every show or a tennis star bouncing a tennis ball a certain number of times before serving are shown to improve performance by reducing anxiety[9]. The coping strategies used by surgeons can be summarized as: early recognition of risks, stop and stand back, control of self and control of the situation[2]. Although pre-performance rituals and coping strategies are useful in reducing anxiety, in some cases a surgeon's over-dependence on certain rituals may have detrimental effects in the longer term[8]. Spielberger's State-

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Trait Anxiety Inventory (STAI) has been a validated tool for examination of preoperative anxiety[10]. Cortisol is a stress hormone secreted from the adrenal cortex. Salivary cortisol levels accurately reflect free and active cortisol blood levels[11]. The assessment of salivary cortisol is used in studies for evaluating preoperative anxiety[12,13]. In this study the first question was 'Does the surgeons have preoperative anxiety like the patients have?'. The other questions were whether this preoperative anxiety was related with gender, surgical department, academic superscription, years of medical and surgical experiences and surgical procedure groups. Our aim in this study was to evaluate the preoperative anxiety level of the surgeons by using STAI scale and determining the salivary cortisol levels.

2. Materials and methods

The study was approved by the Ethics Committee of Adana City Training and Research Hospital (approval no.746 on March 11, 2020) and registered at ClinicalTrials.gov. One hundred surgeons aged 26-64 years were enrolled in this study. Surgeons were consisted of those performing operations in general surgery, obstetrics and gynecology, pediatric surgery, urology, orthopaedic surgery, ophthalmology, otorhinolaryngology, plastic and reconstructive surgery, gynecologic oncology, surgical oncology, cardiovascular surgery and neurosurgery. Their academic superscriptions were specialist, assistant doctor, doctor lecturer, associate professor, and professors. The study was conducted between November 2020 and December 2021. Surgeons, who would perform the first elective operation of the day and accepted to participate, were included into the study. Surgeons who were non volunteers and who had a history of anxiolytic, antidepressant drug usage were excluded. While the first elective patients of the day were admitted to the operating rooms and were being prepared by the anesthesiology team, informed consents were obtained from the surgeons. Salivary cortisol samples were taken from them, and they were asked to fill the evaluation form, STAI-1 (state anxiety section) form and STAI-2 (trait anxiety section) form. Participants in the study were selected among surgeons who had not eaten, drank anything other than water, or smoked 1 hour before saliva collection to eliminate the risk of affecting their cortisol levels. During saliva collection, surgeons were given a small amount of cotton and were asked to chew the cotton and place it in a sterile tube. As soon as the salivary cortisol samples were taken, the samples were numbered and delivered to the central laboratory by transportation, keeping the identity of the surgeons confidential. Salivary cortisol levels were measured with competitive immunoenzymatic colorimetric method, by using cortisol kits (DiaMetra Cortisol Salivary kits), Next Level Alisei (Italy) device. Each surgeon started the operation in 15 minutes after giving samples for salivary cortisol and filling the study forms. There are so many issues which affect to the anxiety such as hunger state, to be on duty the night before. Optimizing these conditions are very difficult. STAI and salivary cortisol levels were used as the subjective and objective measurements of preoperative anxiety in our study. STAI is a questionnaire consisted of two separate subsections of 20 items which measures state and trait anxiety. State anxiety is described as the degree of anxiety at a particular time and in a particular situation. The degree of anxiety in individual experiences in general is described as Trait anxiety[10]. The scores of STAI -1 and STAI-2 differs between 20 and 80. A STAI score of 20-37 is defined as no anxiety or low anxiety, a score of 38-44 is defined as moderate anxiety, a score exceeding 45 is defined as high anxiety by Spielberger[14]. The evaluation form consisted of the following information: age, gender of the surgeon, surgical department, academic superscription, years of clinical experience in medical sciences, years of clinical experience in relevant department, and the name and group of the surgery which was going to be performed.

2.1. Statistical analysis

A priori power analysis was made with statistical package program G*Power 3.1.9.7 (Franz Faul, Universitat Kiel, Germany); an effect size (0.35) was chosen between the medium (0.25) and large (0.4) effect sizes that Cohen standardized for ANOVA. The minimum sample size was found to be 93, with the number of groups being 3, the desired power being 85%, the effect size being (f)=0.35 and α =0.05. For those who may be excluded from the study for various reasons during the study, the sample size was increased by approximately 10% to 100. The study was conducted in a training and research hospital. Because of the diversity in terms of surgical departments, age, gender and academic superscriptions, we have determined a reasonably large size effect.

The IBM SPSS Statistics Version 25.0 statistical software package was used to perform the statistical analysis. Descriptive statistical methods (frequency, percentage, mean, standard deviation, minimum-maximum) were used to evaluate the study data. Conformity of data to normal distribution were analyzed using Kolmogorov-Smirnov, skewness-kurtosis, and graphical methods (histogram, Q-Q Plot, Stem and Leaf, Boxplot). In the evaluation of normally distributed quantitative data; Independent Samples t-test (T Test in independent groups) or One- Way Anova Test was used. Tukey HSD test was used to find the differences in cases where there is difference in multiple comparisons. Relationships between variables were evaluated with Pearson Correlation Test. A level of α= 0.05 was set to determine statistical significance.

3. Results

One hundred surgeons (19 Female, 81 Male), with an average age of 38 years were participated in the study. They comprised of 46 assistant doctor, 34 specialist, 15 associate professor, 3 professor and 2 doctor lecturers. Years of medical and surgical experiences were classified as <10 years, 10-19 years and ≥20 years. Demographic characteristics of the surgeons are shown in Table 1.

Table 1

Demographic characteristics of the surgeons

		n Mean ± SD	% Median(Min-Max)
Gender(F/M) *	F	19	19.0
	M	81	81.0
Age(years) **		38.0 ± 9.2	38.0 (26.0 – 64.0)
Academic superscriptions*	assistant doctor	46	46.0
	specialist	34	34.0
	doctor lecturer	2	2.0
	associate professor	15	15.0
	professor	3	3.0
Years of medical experience**		13.4 ± 9.2	13.0 (1.0 – 41.0)
	<10 years	42	42
	10-19 years	30	30
	≥20 years	28	28
Years of surgical experience**		9.8 ± 8.0	9.0 (0.0 – 37.0)
	<10 years	51	51.0
	10-19 years	33	33.0
	≥20 years	16	16.0

**: n / %, **: mean ± SD / median(min-max), F:Female M:Male*

Surgical procedure groups consist of Group A1: Specific surgeries and interventions. (eg, Liver transplantation), Group A2: Specific surgeries and interventions (eg, Radical prostatectomy, Bentall procedure), Group A3: Specific surgeries and interventions (eg, Cerebral aneurysm, debulking surgery), Group B: Special surgeries and interventions (eg, Histerectomy, total laryngectomy), Group C: Major surgeries and interventions. (eg, Tonsillectomy, dacryocystorhinostomy), Group D: Moderate surgeries and interventions (eg, Polypectomy uterus, histerescopy), Group E: Minor surgeries and interventions (eg, Curetage uterus, sphincterotomy). The numerical distribution of the surgeons according to their department and the number of surgeries according to surgical procedure groups are given in Table 2. The mean STAI-1 score were 39.5 ± 11.2 and the mean STAI-2 were 40.4 ± 8.7 in our study, which would correspond to a level of moderate anxiety. When we analyzed these values as a category, we would see that 48 % of the surgeons presented low anxiety, 22 % of the surgeons presented moderate anxiety, 30 % of the surgeons presented high anxiety for STAI-1. And 43 % of the surgeons presented low anxiety, 27 % of the surgeons presented moderate anxiety, 30 % of the surgeons presented high anxiety for STAI-2. The laboratory reference range of morning cortisol was 0.0-19.2 in our study. We determined that the mean salivary cortisol levels were 12.0 ± 8.1 nmol/l. The median salivary cortisol levels were 10.4 (1.3 – 48.6). There was no statistically significant difference between genders, surgical departments, academic superscriptions, years of medical and surgical experiences and surgical procedure groups in terms of STAI-1scores, STAI -2 scores and salivary cortisol levels as shown in Table 3 (p>0.05). The relationship between salivary cortisol levels and scores of STAI-1 and STAI-2 were also examined in the study. It was found that the relations between STAI-1 and STAI-2 scores were not statistically significant (p>0.05) as shown in Table 4.

Table 2

Surgical departments of the surgeons and groups of the surgeries

		n	%
Surgical department	Neurosurgery	12	12.0
	Pediatric surgery	7	7.0
	General surgery	11	11.0
	Surgical oncology	3	3.0
	Ophthalmology	6	6.0
	Obstetrics and gynecology	11	11.0
	Otorhinolaryngology	10	10.0
	Cardiovascular surgery	11	11.0
	Orthopedic surgery	10	10.0
	Urology	11	11.0
	Plastic and reconstructive surgery	3	3.0
Group of the surgery	A2	4	4.0
	A3	49	49.0
	B	32	32.0
	C	13	13.0
	D	2	2.0

Table 3

Comparison of STAI scores and salivary cortisol levels by gender, surgical department, academic superscriptions, years of medical and surgical experiences and surgery groups

			Score of STAI-1	Score of STAI-2	Salivary cortisol level
Gender	Female (n=19)		41.5 ± 10.6	42.0 ± 7.0	12.1 ± 6.5
	Male (n=81)		39.1 ± 11.4	40.0 ± 9.1	11.9 ± 8.5
		p*	0.408	0.364	0.942
Surgical department	Neurosurgery(n=12)		45.8 ± 11.3	42.8 ± 8.3	10.1 ± 5.2
	Pediatric surgery (n=7)		40.4 ± 10.2	38.9 ± 9.4	16.7 ± 7.5
	General surgery (n=11)		32.6 ± 8.5	39.1 ± 5.0	11.0 ± 9.7
	Surgical oncology (n=3)		34.0 ± 12.5	38.3 ± 9.3	7.4 ± 5.3
	Ophthalmology(n=6)		39.7 ± 11.6	40.7 ± 12.8	19.6 ± 13.1
	Obstetrics and gynecology(n=11)		39.5 ± 11.0	42.7 ± 10.5	8.8 ± 4.8
	Gynecologic oncology(n=5)		41.4 ± 9.7	44.4 ± 11.7	15.9 ± 10.8
	Otorhinolaryngology(n=10)		45.4 ± 12.9	43.0 ± 6.0	12.8 ± 4.8
	Cardiovascular surgery(n=11)		36.4 ± 9.2	38.8 ± 9.6	8.5 ± 4.4
	Orthopaedic surgery(n=10)		35.9 ± 9.3	35.9 ± 6.7	13.7 ± 12.7
	Urology(n=11)		43.3 ± 14.1	41.1 ± 9.8	12.2 ± 6.8
	Plastic and reconstructive surgery(n=3)		31.0 ± 4.0	33.7 ± 3.1	9.5 ± 5.1
		p**	0.120	0.619	0.168
Academic superscriptions	Assistant doctor(n=46)		40.2 ± 11.9	41.3 ± 8.3	11.8 ± 9.5
	Specialist (n=34)		38.9 ± 10.9	39.5 ± 9.3	12.8 ± 7.1
	Doctor lecturer(n=2)		35.0 ± 8.5	28.0 ± 4.2	9.1 ± 2.1
	Associate professor(n=15)		39.3 ± 12.1	39.8 ± 8.3	11.6 ± 7.3
	Professor(n=3)		41.0 ± 4.6	47.0 ± 4.6	9.0 ± 4.5
		p**	0.962	0.149	0.913
Years of medical experience	<10 years(n=42)		40.2 ± 12.0	40.9 ± 7.8	11.9 ± 9.6
	10-19 years(n=30)		36.4 ± 10.1	37.7 ± 8.8	12.5 ± 8.0
	≥20 years(n=28)		41.9 ± 10.9	42.5 ± 9.4	11.6 ± 5.8
		p**	0.159	0.096	0.907
Years of surgical experience	<10 years(n=51)		38.8 ± 11.6	40.1 ± 7.8	12.2 ± 9.8
	10-19 years(n=33)		38.9 ± 11.2	39.3 ± 8.9	11.7 ± 6.5
	≥20 years(n=16)		43.2 ± 10.2	43.4 ± 10.8	11.8 ± 4.9
		p**	0.371	0.299	0.972
Group of the surgery	A2(n=4)		34.8 ± 6.0	36.8 ± 4.3	5.2 ± 4.1
	A3(n=49)		39.1±10.6	40.5 ± 8.8	11.8 ± 8.5
	B(n=32)		40.5 ± 12.2	40.7 ± 8.9	12.8 ± 8.4
	C(n=13)		38.7 ± 11.3	40.0 ± 9.8	13.2 ± 7.0
	D(n=2)		49.5 ± 23.3	41.5 ± 9.2	8.9 ± 0.6
		p**	0.622	0.942	0.454

Table 4

The relationship between salivary cortisol levels and scores of STAI- 1, STAI-2

	Salivary cortisol level	
	r	P*
Score of STAI-1	-0.122	0.227
Score of STAI-2	-0.081	0.420

** Pearson Correlation Test*

4. Discussion

In this study, we evaluated the preoperative anxiety level of the surgeons. We determined that gender, surgical department, academic superscription, years of medical and surgical experiences of the surgeons and surgical procedure groups had no significant effect on STAI-1 scores, STAI -2 scores and salivary cortisol levels. Anxiety is an unpleasant sensation experienced in patients awaiting surgery. In the development of preoperative anxiety, the main fact is the fear of unknown. Fear from postoperative outcomes, complications, pain, death and worries about family members, worries about being consciousness during the operation are the factors leading to anxiety[15,16]. Patients experience preoperative anxiety. But what about surgeons? Do they have anxiety too? Surgery is a stressful process and increased stress can impair operative performance and have a negative impact on the patient safety and outcomes[2]. Jones et al. evaluated surgeon's stress with six colorectal surgeons in anterior resection procedures using heart rate variability (HRV) measurements and STAI scores[17]. They reported that significantly increased levels of stress were measured with HRV in correlation with STAI scores. Erestam et al. conducted an experimental simulation study with volunteer surgeons. They evaluated the stress during simulated operations with stressors. A sugar containing drink was given in the intraoperative period and was considered as intervention from the stressors. Changes in salivary cortisol, heart rate, STAI scores were evaluated. They reported that intraoperative pause did not reduced stress in surgeons measured with salivary cortisol, heart rate or STAI scores[18]. Marrelli et al. evaluated the stress among oral surgeons using salivary cortisol, salivary immunoglobulin A, heart rate and systolic blood pressure values. They randomly grouped the surgeons according to their experience level as: senior (more than 10 years of experience), expert (5-10 years of experience) and junior (less than 5 years of experience). They also grouped the operations as: easy, intermediate or complex according to technical difficulty. They reported that oral surgeons are exposed to stress related pathologies independently of experience and sex. They also reported that the stress management ability was higher in senior surgeons than the other less experienced surgeons independently of the difficulty of the operations[19]. Stress and anxiety are interrelated conditions. Various emotional and environmental stressful situations can precipitate anxiety disorders. In addition, anxiety can sometimes appear as a psychophysiological signal of stress[20]. While the stress of the surgeons is well examined in the literature, few studies exist about surgeon's anxiety. Miller et al. evaluated performance anxiety and wellbeing of the surgeons. The demographic data of the surgeons that they reported was similarly to our demographic data findings. They reported that mean participant age was 41.2 years, mean surgical experience was 15.3 years. Among participants, 62.7% of participants were male, 36.9% were female and 0.4% preferred not to say. They reported that a total of 87% of the surgeons experienced surgical performance anxiety, a total of 65% of the surgeons reported that performance anxiety negatively impacted their surgical performance and 96% of the surgeons felt that surgical performance anxiety impacted surgeons' wellbeing[5]. In our study the anxiety that the surgeons presented were stated as low, moderate and high anxiety according to Spielberger and were not as high as the anxiety percentage experienced by the surgeons in Miller's study. Kilavuz et al. conducted a survey administered to otorhinolaryngologists and investigated their anxiety levels during and after pediatric adenotonsillectomy procedures. They reported a significant increase in surgeon's anxiety in the postoperative period. They reported that anxiety levels of the surgeons were significantly negatively correlated with their years of experiences[21]. In our study, there was no significant difference in terms of experience and preoperative anxiety levels of the surgeons. Anxiety is a psychological and physiological condition. In general, anxiety is observed in all periods of life in women and in adult ages of men with a reduction after the age of 50[22]. In their study Norton et al. reported that women exhibit the cognitive and somatic symptoms of anxiety more severely than men[23]. Studies have shown that there was a gender difference in preoperative anxiety levels of the patients measured by STAI scores. Female patients were found to be more anxious than men[24–26]. In our study, however, there was no significant difference between male and female surgeons in this regard. The results expected from this study could have been different, for example, the preoperative anxiety level in female surgeons might have been higher than in men, it might have been lower in senior surgeons than in junior surgeons, it might have been higher in surgeons performing specific or major surgeries than surgeons performing minor surgeries. But our results showed that there was no statistically significant difference. This should not mean that the study did not contribute to the literature. Because not being able to find a statistically significant difference is actually a consequence itself. One of the limitations of this study was that the study was conducted in a single center. Another limitation of this study was that the academic superscriptions, genders, and surgical departments were not numerically equal distributed. There were only 2 doctor lecturers and 3 professors. The numbers of female surgeons participated in the surgery was approximately one quarter of the male surgeons. The numbers of the surgeons in surgical departments varied. Because STAI was used, response bias exists. The self-report nature of the STAI introduces the potential for response bias. Some surgeons may provide socially desirable answers, leading to underestimation or overestimation of their anxiety levels.

5. Conclusions

In conclusion, based on STAI-1 scores, STAI-2 scores and salivary cortisol levels, the preoperative anxiety level of the surgeons did not differ by gender, surgical department, academic superscription, years of medical and surgical experiences and surgical procedure groups. We think that our study, which is rare in the literature, is important in terms of guiding future studies. Further studies are needed to evaluate the preoperative anxiety including more surgeons with equally distributions.

Statement of ethics

The study was approved by the Ethics Committee of Adana City Training and Research Hospital (approval no.746 on March 11, 2020) and registered at ClinicalTrials.gov.

Conflict of interest statement

The authors declare that they have no financial conflict of interest with regard to the content of this report.

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Author contributions

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