RESEARCH ARTICLE

The Relationship between Preoperative Smoking Cessation, Anxiety, and Postoperative Anxiety and Pain: A Prospective Clinical Trial at a University Hospital in the East of Turkey on 120 Participants

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Abstract

Objective: To reveal the relationship between smoking cessation before surgery, pre- and post-operative anxiety, and pain among chronic smokers.

Method: The cross sectional prospective clinical study was conducted in 2018 on the east of Turkey, in Van Yüzüncü Yil University Dursun Odabaş Medical Center in city of Van. After approval from the ethics committee participants of either gender aged 20-60 years scheduled to undergo rhinoplasty surgery and graded as American Society of Anaesthesiologists I–II were included. The participants were categorised into smokers group S and non-smokers group NS. Spielberger State-Trait Anxiety Inventory values for preoperative period, postoperative 0, which is the moment when the modified Aldrete score is >9, as well as for 2, 4 and 6 hours, and visual analogue scale values for the postoperative 0, 2, 4 and 6 hours were recorded. Data was analysed using SPSS 26.

Results: Of the 120 patients, there were 60(50%) in group S; 28(46.7%) females, 32(52.3%) males, overall mean age 33.0±9.7 years. In group NS, there were 34(56.7%) females and 26(43.3%) males with an overall mean age of 34.7±10.1 years (p>0.05). Group S had Spielberger State-Trait Anxiety Inventory preoperative and postoperative values significantly higher than group NS (p<0.05). While the values for postoperative 4 and 6 hours increased in group S, corresponding values decreased in group NS (p<0.05).

Conclusion: High anxiety scores in preoperative period appeared to be associated with stress from surgery and anaesthesia and could have been caused by smoking dependency during the preoperative and postoperative periods.

Keywords: Smoking cessation, Rhinoplasty surgery, Postoperative anxiety, Postoperative VAS values.

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Introduction

Smokers account for at least 30% of patients who undergo operations at any time, and they are more likely to experience perioperative complications than non-smokers.[1] Smoking causes 20% increase in hospital mortality and 40% in major postoperative complications.[2] Cessation of smoking before surgery can reduce these risks.[3,4]

Anxiety is among the most common withdrawal symptoms experienced when attempting to quit smoking.[5] Nicotine has acute anxiolytic effects[6,7] and those experiencing anxiety symptoms are more likely to use cigarettes as a tool to regulate their mood.[8] It is known that between 25% and 80% of patients admitted to hospital for surgery experience preoperative anxiety[9-11] and anxiety adversely affects the recovery of the patient.[12-14] Data shows that the postoperative recovery process is more painful, slower and more complex in patients with high preoperative anxiety.[15-17] The State-Trait Anxiety Inventory (STAI) scale is recommended for measuring patient anxiety in the preoperative phase and is considered the gold standard for the assessment of preoperative anxiety.[18]

Pain is an inherently subjective and disturbing experience, consisting of sensory-physiological, cognitive-evaluative, and motivational-emotional components.[19] Pain can also reinforce smoking behaviour through a number of mechanisms. It has been reported that smokers may experience more pain during withdrawal periods.[20] There is a reciprocal cycle between pain and smoking.[21] More pain may result in more cigarette addiction. It has been suggested that smokers who experience more pain and negative effects related to pain during the attempt to quit smoking may switch to smoking to partially alleviate their increased pain sensitivity. Pain scales are useful for the assessment of postoperative pain and for monitoring the effectiveness of treatment. The visual analogue scale (VAS) is the most commonly used instrument.[22] There is evidence that pain, smoking, and anxiety are common and co-morbid, and that these negative emotions are interrelated.[23]

The current study was planned to evaluate the effect of preoperative smoking cessation on preoperative anxiety and postoperative pain and anxiety scores in chronic smokers.

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Patients and Methods

This cross sectional prospective clinical study was conducted in 2018 in Van Yüzüncü Yil University Dursun Odabaş Medical Center in city of Van. After approval from the ethics committee (Approval No. 05;01/17/18) patients of either gender aged 20-60 years scheduled to undergo rhinoplasty surgery and graded as American Society of Anaesthesiologists I–II[24] were included. The participants who were ASA III and above, had chronic systemic disorders, admitted due to emergency and bleeding, had cardiac or neurological disorders, or refused to participate were excluded. The sample of this prospective clinical study was determined by the (Population Volume) Unknown Sample Calculation Formula. The minimum sample size was calculated as n=118.6. Thus, considering the study process, a study with 120 patients was envisaged.[25]

The participants who volunteered to participate and furnished written consent were informed about the study during their preoperative visits 20 days before their operations. The participants were categorised into smokers group S and non-smokers group NS. Subjects who were smokers were asked if they could quit smoking 2 weeks before their surgery. They were told that this would reduce the pulmonary complications that may occur during surgery and contribute to the literature through the current study. Those who could not abide by the request were asked to inform the study team, and they received no negative feedback for their inability to comply.

STAI[18] test was administered to all the patients one hour before their operations. Since rhinoplasty is not a painful condition before surgery, VAS[22] score was not checked in the preoperative period. The participants underwent standard general anaesthesia (2 mg/kg propofol, 3µg/kg fentanyl, 0.6 mg/kg rocuronium, 2.5 minimum alveolar concentration [MAC] sevoflurane), and rhinoplasty was performed by the same surgeon. Half-an-hour before extubation, 20 mg/kg paracetamol and 1mg/kg tramadol were administered to both the groups for postoperative analgesia. VAS and STAI scores for postoperative 0, which is the moment when the modified Aldrete score is >9, as well at 2, 4, and 6 hours were recorded. Service nurses were told to record the time of administration for patients who needed analgesics and postoperative first 6-hour evaluation scores and records kept by the nurses were examined and the findings were statistically evaluated.

Data was analysed using SPSS 26. Mean, standard deviation (SD), range, frequencies and percentages were used for descriptive statistics. The distribution of the variables was measured with Kolmogorov-Smirnov test. Mann-Whitney U test was used in the analysis of the independent quantitative data. Wilcoxon test was used to analyse the dependent quantitative data. Chi-squared test was used for the analysis of the independent qualitative data. P<0.05 was considered statistically significant.

Results

Of the 120 patients, there were 60(50%) in group S; 28(46.7%) females, 32(52.3%) males, overall mean age 33.0±9.7 years. In group NS, there were 34(56.7%) females and 26(43.3%) males with an overall mean age of 34.7±10.1 years (p>0.05). There were no significant difference between two groups for ASA grades (Table 1). Group S had STAI preoperative and postoperative 2, 4 and 6 hours values significantly higher than group NS (p<0.05). There was no inter-group difference in terms of STAI score at postoperative 0 (p>0.05).

STAI values in Group S at postoperative 0 and 2 hours were significantly lower (p<0.05) than the preoperative period, and the postoperative 4 and 6 hour values were significantly higher (p<0.05) than the preoperative values.

In the NS group, STAI values for all postoperative times were lower than the preoperative values (p<0.05). STAI values for both the groups at postoperative 0 hour were lower than preoperative values, and this was significant in group S (p<0.05). VAS scores at postoperative 0, 2, 4, and 6 hours showed no significant differences between the groups (Table 2).

In intra-group evaluations, no significant changes were detected between STAI values for postoperative 2 hour and the preoperative values (p>0.05). However, a significant difference was identified for hours 4 and 6 (p<0.05). While STAI values for postoperative 4 and 6 hours increased in group S, corresponding values decreased in group NS (p<0.05). No significant changes were identified during intra-group evaluations (p>0.05) (Figure).

Table-1: Demographic data.

	Group S Mean±SD /n (%)	Group NS Mean±SD /n (%)	*p*-value	
Age (years)	33.0±9.7	34.7±10.1	0.379	m
Gender				
Female	28 (46.7)	34 (56.7)	0.273	X^2
Male	32 (53.3)	26 (43.3)		
ASA				
I	29 (48.3)	36 (60)	0.200	X^2
II	31 (51.7)	24 (40)		
Smoking				
(+)	60 (100)	-	0.000	X^2
(-)	-	60 (100)		

m= Mann-Whitney U test; X^2= Chi-square test. SD: Standard deviation, ASA: American Society of Anaesthesiologists.

Table-2: Inter-group and intra-group comparison of Spielberger State-Trait Anxiety Inventory (STAI) and visual analogue scale (VAS) values.

	Group S Mean±SD	Group NS Mean±SD	*p*-value	
STAI				
Pre-op	62.0±7.7	51.6±9.7	0.000	m
0.h (PACU)	41.1±5.8	39.4±6.2	0.145	m
2.h	51.3±9.3	40.3±4.3	0.000	m
4.h	67.9±4.4	41.5±4.2	0.000	m
6.h	70.5±3.3	41.8±4.4	0.000	m
Changes by pre-op period				
0.h (PACU)	-21.0±10.3	-12.2±10.1	0.000	m
Intra-Group Change *p*-value	0.000[w]	0.000[w]		
2.h	-10.7±12.4	-11.3±11.7	0.916	m
Intra-Group Change *p*-value	0.000[w]	0.000[w]		
4.h	5.8±8.9	-10.1±11.8	0.000	m
Intra-Group Change *p*-value	0.000[w]	0.000[w]		
6.h	8.5±8.3	-9.8±11.7	0.000	m
Intra-Group Change *p*-value	0.000[w]	0.000[w]		
VAS				
0.h (PACU)	2.9±1.6	2.5±1.8	0.176	m
2.h	2.9±1.5	2.7±1.8	0.454	m
4.h	2.1±1.1	2.3±1.7	0.882	m
6.h	3.4±1.9	3.4±2.2	0.872	m
Change by 0. hour				
2.h	0.0±1.5	0.3±2.4	0.444	m
Intra-Group Change *p*-value	0.821[w]	0.463[w]		
4.h	-0.8±2.0	-0.2±2.5	0.200	m
Intra-Group Change *p*-value	0.056[w]	0.534[w]		
6.h	0.5±2.7	0.9±2.7	0.698	m
Intra-Group Change *p*-value	0.120[w]	0.055[w]		

[m] Mann-whitney u test / [w]Wilcoxon test ; PACU: Post-anaesthesia care unit.
SD: Standard deviation.

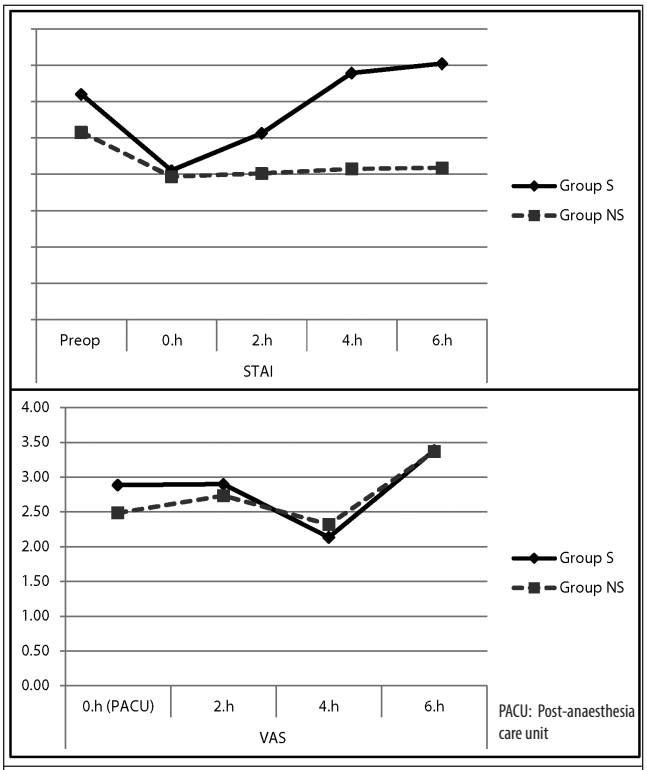

Figure: Spielberger State-Trait Anxiety Inventory (STAI) and visual analogue scale (VAS) value changes.

Discussion

The present study assessed the hypothesis that smoking cessation can cause anxiety in chronic smokers before surgery and impact preoperative anxiety scores and postoperative anxiety and pain scores. It is a known fact that smoking is associated with postoperative complications. Although smoking cessation prior to surgery is advocated and recommended, there is no consensus on when to quit smoking before surgery.[26] In a meta-analysis on the subject, patients' postoperative complication rates decreased by 19% for each preoperative week that they had ceased smoking.[27] Recent studies have shown that short preoperative withdrawal periods as long as two weeks can be effective in reducing postoperative complications.[26,28,29] Based on these findings and the fact that long-term smoking cessation is difficult for chronic smokers, the current study considered the ideal time for smoking cessation to be two weeks before surgery.

Preoperative anxiety can be observed in 25-80% of patients who are hospitalised for surgery.[10,30] In addition, the effects of anxiety can negatively affect a patient's recovery.[12] Age, gender, type of surgery, smoking, and ASA classification are known to be associated with preoperative and postoperative anxiety.[30] In the present study, standard operation and general anaesthesia practices prevented dissimilar results, as both groups were homogeneous in terms of their specified features. Smoking cessation is a clear cause of preoperative anxiety. Preoperative smoking withdrawal has been reported at rates ranging 46-100%.[32] STAI is considered to be an appropriate measure for assessing preoperative anxiety, administering two separate tests that have 20 questions apiece and is the accepted gold standard for evaluating anxiety. The STAI is disadvantageous due to its length and lack of specificity in assessing preoperative anxiety.[33]

In the present study, preoperative STAI values for both groups were high. These findings were related with anxiety of surgery and anaesthesia. Nevertheless, the study's results were original in that the statistically significant levels of anxiety in group S indicated that smoking cessation was favourable. The absence of any difference between the groups during at 0-hour STAI assessment at the post-anaesthesia care unit (PACU) could be attributed to a lack of recovery from anaesthesia or the participants' avoidance of answering lengthy questions. Although the 0-hour anxiety values were lower than the preoperative values in

both groups, the fact that these findings were more significant in group S indicates that the participants had considerable levels of cigarette deprivation during the preoperative period. It was thought that the increase in STAI scores at the 4th and 6th postoperative times may be related to recovery from anaesthesia and smoking cessation. These results contribute characteristic findings to the literature.

Another issue to consider is that pain can cause anxiety. It is known that preoperative anxiety can often cause postoperative pain and anxiety.[34] There are bidirectional pathways where pain and smoking contribute to one another.[34,35] The smoking rate can vary by as much as 30-68% among patients with pain.[1] Chronic smokers can also experience a greater sensitivity to pain during periods of smoking cessation.[37] The present study examined VAS values to determine if pain can impact anxiety during the postoperative period. The VAS is a popular tool for measuring pain. It consists of a horizontal 10cm line, with its extremes designated as "no pain" and "worst pain imaginable." Each patient marks the pain level, and the distance from "no pain" on the far left side of the scale is measured in cm, yielding a pain score from 0 to 10.[38]

In the current study, no significant differences were found between the groups' pain assessments with VAS. While there were no significant differences between the VAS values for the 2nd, 4th, and 6th hours between the groups, the STAI values were significantly higher in group S. This finding was believed to be associated with cigarette abstinence and to be independent of pain. In addition, although there were no statistical differences between the VAS values, the higher pain rankings in group S were connected to hyperalgesia caused by smoking. There has recently been an increase in publications focussing on anxiety, pain and smoking. Both pain and anxiety have been shown to motivate smoking behaviour, and smoking has been found to increase anxiety and the perception of pain.[39,40]

The current study has a few limitations. It did not consider how smoking frequency affected anxiety or pain scores. In order to establish a specific standard in the study, a baseline of a certain duration of smoking and quantity of cigarettes should be established. Nonetheless, previous studies have revealed that varying cigarette quantities and durations produce different postoperative effects.[26] Besides, the current results may have been affected by the different varieties of cigarettes that patients smoked as the contents of individual cigarette types are unique. Also, the current study was only performed on ASA I-II patients, and future studies should look at patients graded ASA III and above which may produce different results. Finally, because the study was conducted at a single centre, any generalisation of its results may be incorrect.

The current study, however, has produced secondary outcomes. Since patients are more likely to comply with a study's requests in the preoperative period, long-term smoking cessation may be achieved if patients are asked to stop smoking during this period. Future studies may explore the subject further with follow-up care about postoperative pulmonary complications and other issues.

Conclusion

Smoking, pain and anxiety were found to be interconnected. During the preoperative period, high anxiety scores were found to be related to stress due to surgery and anaesthesia. In group S, high anxiety scores during the preoperative and postoperative periods were linked to smoking cessation. While pain scores were similar in the postoperative period, high anxiety scores strengthened the notion that smoking withdrawal was preferable.

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