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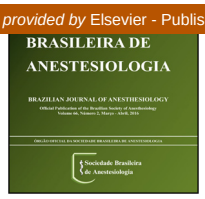

SCIENTIFIC ARTICLE

The effect of passive exposure to tobacco smoke on perioperative respiratory complications and the duration of recovery☆

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KEYWORDS
Tobacco smoke;
Passive smoking;
Airway complication

Abstract
Background: The incidence of perioperative respiratory complications and postoperative care unit recovery time investigated in patients with passive tobacco smoke exposure according to the degree of exposure.
Methods: Total 270 patients ranging in age from 18 to 60 years with the ASA physical status I or II exposed and not exposed to passive tobacco smoke received general anesthesia for various elective surgical operations evaluated for the study. Patients divided into two groups as exposed and non-exposed to passive tobacco smoke, those exposed to passive smoke are also divided into two groups according to the degree of exposure. Patients taken to the postoperative care unit (PACU) at the end of the operation and monitorized until Modified Aldrete's Scores became 9 and more. Respiratory complications evaluated and recorded in intraoperative and postoperative period.
Results: A total of 251 patients were enrolled; 63 (25.1%) patients had airway complications, 11 (4.4%) had complications intraoperatively and 52 (20.7%) patients had complications postoperatively. There has been found significant relation with passive tobacco smoke exposure and high incidences of perioperative and postoperative respiratory complications. The risk of cough, desaturation and hypersecretion complications were found to be increased depending on the degree of exposure. There was significant relation between the degree of passive smoke exposure and the duration of PACU stay.
Conclusion: Passive tobacco smoke exposed general anesthesia receiving patients also regarding to the degree of exposure having high rates of perioperative respiratory complications and prolongation of PACU stays when compared with unexposed patients.

☆ Study held in Tepecik Teaching and Research Hospital, Department of Anesthesiology and Reanimation, İzmir, Turkey.

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PALAVRAS-CHAVE
Fumaça de tabaco;
Fumante passivo;
Complicação respiratória

O efeito da exposição passiva à fumaça de tabaco em complicações respiratórias no perioperatório e a duração da recuperação

Resumo
Justificativa: A incidência de complicações respiratórias no perioperatório e o tempo em sala de recuperação pós-anestesia no pós-operatório em pacientes com exposição passiva à fumaça de tabaco foram avaliados de acordo com o grau de exposição.
Métodos: No total, 270 pacientes com idades entre 18-60 anos, estado físico ASA I ou II, passivamente expostos e não-expostos à fumaça de tabaco, submetidos à anestesia geral para vários procedimentos cirúrgicos eletivos, foram avaliadas para o estudo. Os pacientes foram divididos em dois grupos: passivamente expostos e não expostos à fumaça de tabaco. Aqueles com exposição passiva à fumaça também foram divididos em dois grupos de acordo com o grau de exposição. Os pacientes encaminhados à sala de recuperação pós-anestesia (SRPA) ao final da cirurgia foram monitorados até atingirem 9 ou mais no escore modificado de Aldrete. As complicações respiratórias foram avaliadas e registradas nos períodos intraoperatório e pós-operatório.
Resultados: Foram incluídos 251 pacientes, dos quais 63 (25,1%) apresentaram complicações respiratórias, 11 (4,4%) complicações no intraoperatório e 52 (20,7%) complicações no pós-operatório. Houve relação significativa entre a exposição passiva à fumaça de tabaco e a alta incidência de complicações respiratórias no perioperatório e pós-operatório. O risco de complicação como tosse, dessaturação e hipersecreção aumentou de acordo com o grau de exposição. Houve relação significativa entre o grau de exposição passiva à fumaça e o tempo de permanência em SRPA.
Conclusão: Os pacientes com exposição passiva à fumaça de tabaco apresentaram altas taxas de complicações respiratórias no perioperatório e prolongamento da permanência em SRPA, em comparação com os pacientes não expostos.

Introduction

Passive smoking is the inhalation of smoke by persons other than the intended active smoker. It occurs when tobacco smoke permeates any environment, causing its inhalation by people within that environment.

Turkey's smoking rate of the population over the age of 15 in 2006 was 33.4%, while this rate for the year 2012 is decreased to 27.1%. Nearly 2 million 200 thousand people quit smoking and passive exposure to tobacco smoke decreased by 60%, also despite being not prohibited, smoking at home decreased by 35% when compared to 2008.

Active and passive exposure to tobacco smoke is one of the main morbidity and mortality cause. Epidemiological and clinical studies shown that the active and passive smoking causes cardiovascular, cerebrovascular, lung, gastrointestinal tract and cancer diseases.[1,2]

There are studies showing that active and passive smokers may experience perioperative airway complications in general anesthesia because of the airway changes which is caused by continuous smoke exposure.[3–14] Passive exposure to cigarette smoke is being associated with increased postoperative mortality due to the respiratory complications, prolonged postoperative follow-up period and prolonged anesthetic requirements.[9,10]

In this study, we aimed to research whether is there a significant differences in the incidence of respiratory complications during preoperative and postoperative period and the duration of recovery in patients who exposed passively to tobacco smoke compared with unexposed patients.

Material and methods

Study planned as a prospective and approved by the Tepecik Teaching and Research Hospital, Local Ethics Committee. 270 adult patients ranging in age from 18 to 60 years with the American Society of Anesthesiologists (ASA) I or II score who received general anesthesia for various elective surgical operations between the dates 01/09/2011 and 31/08/2012 were included to the study. Patients in ASA III-IV physical status, having chronic respiratory disease or having acute upper or lower respiratory tract infection within 2 weeks, who has severe systemic disease and active smokers or quitted smokers within 5 years are all excluded from the study. Although included in the study, 19 patients who are detected in preoperative period for upper respiratory tract infections were also excluded from the study.

The remaining 251 patients divided into study and control groups. 156 patients who are exposed to passive cigarette smoke were in study group and a 95 patients who are unexposed to smoke were in control group. 96 patients of the study group who are passively exposed to 10 or less cigarette

smoke named as Group 1 and 60 patients of the study group who are passively exposed to more than 10 cigarette smoke named as Group 2.

The patient's history was important to determine the state of exposure. Passive exposure defined as involuntary inhalation of smoke by a non-smoker because of living or working with a smoker. And the victims were not able to change their environment. Degree of exposure determined with the number of cigarettes passively smoked according to the patient's history. Patients exposed to 10 or less cigarettes per day grouped as Group 1. If there was exposure to smoke more than 10 cigarettes we put the patients in Group 2. Our main aim by dividing passive smokers into two groups were to investigate the respiratory complications if its changing by the degree of passive smoking.

Twenty gauge intravenous cannula inserted and i.v. 2 mg midazolam (Dormicum, Roche) administered for premedication before patient taken to the operation room. Electrocardiogram, noninvasive arterial blood pressure (Nikbu), peripheral oxygen saturation (SpO_2) and end-tidal CO_2 ($EtCO_2$) monitorizations were performed in operating room. The anesthesia method administered to patients was determined by the primer anesthesiologist of the patient and those clinicians were not informed before about the patients status which is related with the study. Airway control performed by mask, laryngeal mask airway (LMA) or endotracheal intubation depending on the operation. Anesthesia was induced with propofol (Propofol, Fresenius Kabi) 2–2.5 mg kg^{-1}, remifentanil (Ultiva, Glaxo Smith Kline) 1 $\mu g/kg^{-1}$ and intubation provided with 0.1 mg kg^{-1} vecuronium (Norcuron, Schering Plough). After intubation, mechanical ventilation parameters was set at 50% oxygen-air mixture with an inspired oxygen concentration of 50% (FiO_2), 6–7 mL kg^{-1} of tidal volume and 12–14 breaths min^{-1} set for respiratory frequency to obtain end-tidal CO_2 concentration levels at 30–35 mmHg. Maintenance of anesthesia provided with sevoflurane 1–2% (Sevorane, Abbott), 0.05–2 $\mu g\, kg^{-1}$ remifentanil infusion and intermittent 0.05 mg kg^{-1} vecuronium boluses in intubated patients. Paracetamol 1 g 15 min – IV administrated for postoperative analgesia near to the end of surgery. At the end of the operation, all patients who underwent intubation were extubated after the decurarization with atropine (0.02 mg/kg) and neostigmine (0.05 mg/kg). Laryngospasm (failure to ventilate the patient, need of continuous positive pressure ventilation to maintain ventilation and requirement of additional doses of muscle relaxants), bronchospasm (wheezing, expiratory wheezing, airway peak pressure increase), breath holding (more than 15 s), desaturation (oxygen saturation below 95%), hypersecretion (according to the increase of quantity and density of secretions and more than 2 times the necessity of oral or nasal aspiration) and cough (more than 15 s) are all accepted as airway complications during the intraoperative and postoperative period. In case of more than one of these complications seen, than only the most severe or significant complication were noted. Modified Aldrete's Score (MAS) was used for determining when patients can be safely discharged from the postanesthesia care unit (PACU). MAS evaluated each 5 min in PACU stay and patients discharged from pacu to post-surgical ward when MAS was 9.

Statistical analysis

Statistical analysis of the data was performed by the program, SPSS (Statistical Package for Social Sciences) Version 15.00 in Ege University Faculty of Medicine Department of Biostatistics. Mann Whitney U test was used for comparison of inter-group differences for abnormally distributed parameters and used to determine the group which is leading to differences. The ''Chi-Square test'' and ''Fisher's Exact Chi-square test'' was used for the comparison of qualitative data. Results evaluated at 95% confidence interval and $p < 0.05$ for significance.

Results

When the demographic data of 251 patients participated in the study were evaluated for age, weight, height, ASA and educational attainment there were no statistically significant differences between the groups ($p > 0.05$). In the distribution by gender, male gender in all groups was less, and this difference than found to be statistically significant ($p = 0.005$). When groups compared according to the duration of anesthesia, duration of surgery, chosen anesthesia method for airway management, use of muscle relaxants and operation type, the results were statistically similar in all groups ($p > 0.05$) (Table 1).

Respiratory complications observed in 63 of 251 (25.1%) patients. The distribution of complicated patients was, 23 (23.9%) in Group 1, 32 (53.8%) in Group 2 and 8 (8.4%) in control group. Differences of respiratory complications in groups found statistically significant ($p < 0.01$) (Table 1).

Eleven cases (4.4%) of respiratory complications occurred in intraoperative period and 52 cases (20.7%) of respiratory complications occurred in postoperative period. Intraoperative complications occurred in 11 patients, 5 in Group 1 and 6 in Group 2 were all in tobacco smoke exposed groups and compared to the control group statistically significant difference was found ($p < 0.05$).

Postoperative pulmonary complications observed in 52 patients and 44 were in tobacco smoke exposed groups (18 in Group 1; 26 in Group 2) while only 8 patients were in the control group that present statistically significant difference ($p = 0.005$) (Table 2).

Laryngospasm developed in 8 (3.2%) patients, 6 had this complication in postoperative period and 2 had this complication in intraoperative period. These patients underwent positive pressure ventilation and there was no need for additional doses of muscle relaxants. Bronchospasm only seen intraoperatively and in 2 (0.8%) patients. 9 (3.6%) patients showed breath-holding and 7 (2.8%) patients showed desaturation in the postoperative period. Jaw thrust maneuver was performed in 1 desaturated patient and intubation was not required. Hypersecretion documented in 2 (0.8%) patients in intraoperative period and in 43 (17.1%) patients in postoperative period. Intraoperative cough complication developed in 1 (0.4%) patient and postoperative cough developed in 23 (9.2%) patients.

When respiratory complications evaluated according to the groups there was no statistically significant difference intraoperatively or postoperatively between the groups for the documented complications as laryngospasm, bronchospasm and breath holding.

Table 1 The demographic and surgical characteristics of patients.

	Control group ($n=95$, 37.8%)	Group 1 ($n=96$, 38.2%)	Group 2 ($n=60$, 23.9%)	Total ($n=251$)	p
Age (year)	45.00 ± 11.22	44.00 ± 10.02	45.00 ± 11.02	44.00 ± 10.68	0.977
Weight (kg)	73.00 ± 15.51	75.00 ± 16.26	75.00 ± 17.40	75.00 ± 16.28	0.318
Height (cm)	160.00 ± 6.66	159.50 ± 12.63	160.00 ± 8.78	160.00 ± 9.94	0.129
ASA physical status					0.730
1	55 (57.9%)	55 (57.3%)	38 (63.3%)	148 (59.0%)	
2	40 (42.1%)	41 (42.7%)	22 (36.7%)	103 (41.0%)	
Educational attainment					0.132
None	14 (14.7%)	14 (14.6%)	10 (16.7%)	38 (15.1%)	
Primary school	53 (55.8%)	62 (64.6%)	33 (55.0%)	148 (59.0%)	
Secondary school	10 (10.5%)	2 (2.1%)	10 (16.7%)	22 (8.8%)	
High school	14 (14.7%)	12 (12.5%)	5 (8.3%)	31 (12.4%)	
University	4 (4.2%)	6 (6.3%)	2 (3.3%)	12 (4.8%)	
Gender					0.005
Female	77 (81.1%)	92 (95.8%)	54 (90.0%)	223 (88.8%)	
Male	18 (18.9%)	4 (4.2%)	6 (10.0%)	28 (11.2%)	
Anesthesia duration (min)	110.00 ± 51.05	107.50 ± 54.05	110.00 ± 56.90	110.00 ± 53.57	0.748
Surgery duration (min)	95.00 ± 50.92	95.00 ± 49.92	90.00 ± 53.56	95.00 ± 51.08	0.850
Muscle relaxant usage					0.243
Yes	80 (84.2%)	86 (89.6%)	48 (80.0%)	214 (85.3%)	
No	15 (25.8%)	10 (10.4%)	12 (20.0%)	37 (14.7%)	
Airway management					0.850
Mask	15 (15.8%)	5 (5.2%)	9 (15.0%)	29 (11.69%)	
LMA	6 (6.3%)	5 (5.2%)	6 (10%)	17 (6.8%)	
ETT	74 (77.9%)	86 (89.6%)	45 (75%)	205 (81.7%)	
Type of surgery					0.136
Urology	2 (2.1%)	3 (3.1%)	4 (6.7%)	9 (3.6%)	
General surgery	72 (75.8%)	73 (76.0%)	43 (71.7%)	188 (74.9%)	
Orthopedics	1 (1.1%)	3 (3.1%)	0 (0.0%)	4 (1.6%)	
Neurosurgery	1 (1.1%)	2 (2.1%)	2 (3.3%)	5 (2.0%)	
ENT	8 (8.4%)	11 (11.5%)	9 (15.0%)	28 (11.2%)	
Ophthalmology	8 (8.4%)	1 (1.0%)	0 (0.0%)	9 (3.6%)	
Plastic surgery	3 (3.2%)	3 (3.1%)	2 (3.3%)	8 (3.2%)	
Respiratory complications	8 (12.7%)	23 (36.5%)	3 2 (50.8%)	63 (25.1%)	0.001

LMA, laryngeal mask airway; ETT, endotracheal tube; ENT; ear, nose, throat.
Values given as means ± SD, the number of patients given as *n* and percent (%).

There was no statistically significant difference in intraoperative period for the complications desaturation, hypersecretion and cough. Although documented desaturation, hypersecretion and cough complications seen in significantly higher rates in patients exposed to tobacco smoke ($p < 0.05$). Desaturation developed in postoperative period in 2 patients for Group 1 and in 5 patients for Group 2 and there was no patient developed desaturation in control group. With these

Table 2 The distribution of intraoperative and postoperative respiratory complications depending on the passive exposure to tobacco smoke in the control and study groups.

Respiratory complications	Study groups			Control group ($n=95$)	Total ($n=251$)	p
	Group 1 ($n=96$)	Group 2 ($n=60$)	Total ($n=156$)			
Intraoperative	5 (5.2%)	6 (10.0%)	11 (7.0%)	0 (0%)	11 (4.4%)	0.005
Postoperative	18 (18.7%)	26 (43.3%)	44 (28.2%)	8 (8.4%)	52 (20.7%)	0.001
Total	23 (23.9%)	32 (53.3%)	55 (35.2%)	8 (8.4%)	63 (25.1%)	0.001

Number of patients given as *n* and percent (%).

Table 3 Distribution of respiratory complications between the groups.

Respiratory complication	Non-PSE	Group 1, *n* (%)	Group 2, *n* (%)	Total, *n* (%)	*p*
Laryngospasm					
Intraop.	0 (0%)	3 (3.1%)	3 (5.0%)	6 (2.4%)	0.117
Postop.	0 (0%)	1 (1%)	1 (1.7%)	2 (0.8%)	0.494
Bronchospasm					
Intraop.	0 (0%)	1 (1.0%)	1 (1.7%)	2 (0.8%)	0.494
Postop.	0 (0%)	0 (0%)	0 (0%)	0 (0%)	–
Breath holding					
Intraop.	0 (0%)	0 (0%)	0 (0%)	0 (0%)	–
Postop.	2 (2.1%)	3 (3.1%)	4 (6.7%)	9 (3.6%)	0.315
Desaturation					
Intraop.	0 (0%)	0 (0%)	0 (0%)	0 (0%)	–
Postop.	0 (0%)	2 (2.1%)	5 (8.3%)	7 (2.8%)	0.008
Hypersecretion					
Intraop.	0 (0%)	1 (1%)	1 (1.7%)	2 (0.8%)	0.494
Postop.	7 (7.4%)	16 (16.7%)	21 (35%)	43 (17.5%)	0.001
Cough					
Intraop.	0 (0%)	0 (0%)	1 (1.7%)	1 (0.4%)	0.202
Postop.	2 (2.1%)	7 (7.3%)	14 (23.3%)	23 (9.2%)	0.001

Intraop., intraoperative period; Postop., postoperative period; PSE, passive smoking exposure.

Table 4 Modified Aldrete's Score in PACU entry and the duration of recovery.

	Control group	Group 1	Group 2	Total	*p*
MAS	6 ± 1.8	7 ± 1.47	6 ± 1.28	6 ± 1.60	0.013
MAS ≥ 9 time (min)	30 ± 8.86	30 ± 8.50	35 ± 9.21	30 ± 8.97	0.005

MAS, Modified Aldrete's Score; PACU, postanesthesia care unit.
Values given as means ± SD.

results, postoperative desaturation was significantly higher ($p = 0.008$) in patients with tobacco smoke exposure.

Hypersecretion in postoperative period seen in 7 patients in control group. According to the degree of exposure, in Group 1 and 2 this complication seen in order 16 and 21 patients, and the results were statistically significant ($p < 0.01$).

Cough complication seen in 2 patients in the control group in postoperative period. According to the degree of smoke exposure, in order 7 and 14 patients in Group 1 and Group 2 had cough complication. Results were statistically significant ($p < 0.01$). We concluded that cough complications were more frequent in the postoperative period in tobacco smoke exposed patients (Table 3).

The MAS averages at admission to the PACU were 6 ± 1.8 in control group, 7 ± 1.47 in Group 1 and 6 ± 1.28 in Group 2. There was statistically significant difference between the groups ($p = 0.005$) (Table 4).

PACU stay (MAS ≥ 9) averages found 30 ± 8.86 min in control group, 30 ± 8.50 min in Group 1 and 35 ± 8.97 min in Group 2. The longest stay was in Group 2 when compared to other groups and the result was statistically significant ($p = 0.013$) (Table 4).

Discussion

Nowadays passive smoking is one of the top topics discussed with its medical consequences, legal and sociological aspects. Long term exposure to smoke give rise to changes in airways and this causes various complications in the perioperative period in general anesthesia. In these patients respiratory complications such as cough, laryngospasm, bronchospasm, desaturation, hypersecretion and breath-holding prevalence was significantly higher than non-smokers.[3–15]

In a study, researchers grouped the patients according to the tobacco smoke exposure intensity. They studied on 385 patients for perioperative complications and when demographic parameters such as weight, age, gender and ASA compared between the groups they did not find any significant difference.[3] Also there was no significant difference in our study for the demographic data as age, weight, ASA and educational attainment between the groups. Although male gender was significantly less in all groups ($p < 0.05$). This is because males are more active smokers. Also the passive tobacco smoke exposure victims are especially female and children in our country.

A study reported that female are more sensitive to tobacco smoke than male.[16] In our study the proportion of respiratory complications by gender is 11 (17.5%) patients male and 52 (82.5%) patients female. These results do not show a statistical significance but could support that female gender sensitivity to tobacco smoke leads to high rates of respiratory complications ($p > 0.05$).

Different studies compared surgical characteristics like; duration of anesthesia, duration of surgery, type of operation, perioperative analgesia, muscle relaxant consumption and airway control methods between the groups and they found similar results to our study.[3,6] Respiratory complications shown to be increased in intubated patients than LMA preferred patients.[3,6,13] Also we did not find statistically significant difference for the stated data in our study. The process of intubation is more likely to be invasive than laryngeal mask airway process and because of the passive tobacco smoke exposure making the airways more sensitive to stimuli respiratory complications expected to be more due to such invasive processes. We could not find significant results because there were not enough patients airway managed with LMA to compare with intubation.

A study reported that respiratory complication rate was 86.2% in passive tobacco smoke exposure group and 13.8% in the control group also other studies found similar results.[3] Another study involving 9297 cases show that passive tobacco exposure is becoming a risk factor for increased perioperative respiratory complications.[7] However, in a study COHb, PaO_2, $PaCO_2$ values evaluated during the anesthesia and post-surgical complications in 150 patients and did not found any significant differences between tobacco smoke exposure and non-exposure group.[17] The incidence of respiratory complications found to be increased with the degree of exposure in our study ($p < 0.05$). Passive smokers exposed more than 10 cigarettes per day experience significantly much more perioperative respiratory complications than patients who are exposed to less or few cigarettes and this shows also the degree of passive smoke exposure is very important.

There are studies showing that those exposed to tobacco smoke both in intraoperative and postoperative period has significantly increased incidence of respiratory complications also different studies report that these complications are becoming more likely in postoperative period.[3,10] In our study there is found any intraoperative complications in non-exposed group of patients but total 11 patients had complications in both of passive smokers group.

Postoperative respiratory complications seen in only 8 patients in non-exposed (control) group and 44 patients in both exposed groups and the results of our study are consistent with other studies. Those smoke exposed patients have high incidences of intraoperative and postoperative complications. Nevertheless while the degree of exposure to cigarette smoke increases the incidence of postoperative complications is increasing more.

The increased incidence of intraoperative laryngospasm and bronchospasm has been shown in many studies in tobacco smoke exposed patients. Laryngospasm risk is increased in smoke exposed patients.[6] A study revealed that laryngospasm incidence is becoming 4.9 times more with tobacco smoke exposure.[9]

Pediatric patients exposed to tobacco smoke are 10 times more prone to develop laryngospasm after the extubation.[14] In our study, intraoperative laryngospasm not seen in unexposed patients. Laryngospasm rate was 3.2% in total in patients with smoke exposure. In a study that made with pediatric patients reported laryngospasm rates were higher and this should be considered that the incidence of laryngospasm is higher in pediatric patients in normal conditions.[14] In our study, there was no significant difference between the intraoperative desaturation and hypersecretion complication incidences. In contrast depending on the degree of exposure to tobacco smoke the incidence of these complications found to be significantly increased in the postoperative period ($p < 0.05$).

Respiratory complications such as breath holding and coughing reported to be observed more frequently in the postoperative period in tobacco smoke exposed patients.[6,10] Tobacco smoke causes goblet cell metaplasia in the respiratory tract and excessive mucus production in trachea and proximal small airways. The secretions accumulated during the operation leads to hypersecretion and desaturation problems in intraoperative and in especially postoperative period. The incidence of these complications increasing with the degree of tobacco smoke exposure as different studies stated.[3,6,12] In our study in postoperative period there was no significant increase in breath holding complication but cough complication was significantly increased with the degree of tobacco smoke exposure ($p < 0.05$).

In our study MAS found to be significantly higher in PACU entry for the smoke exposed patients according to the degree of exposure ($p < 0.05$). We suggest that the increased incidence of intraoperative complications in these patients plays important role for the prolongation of recovery times.

There are also several studies showing that the PACU stay could be prolonged in patients according to their degree of exposure to tobacco smoke. In a study, prolonged PACU stays reported for smoke exposed patients, but they could not find any significant results.[3] Another study reported that passive smoke exposure is indirectly associated with the Prolongation of PACU.[9] In our study we found that the PACU stay prolonged with the increase of the exposure degree to the tobacco smoke ($p < 0.05$). The longest stays in PACU were in Group 2 which is the most tobacco smoke exposed group of the study. This situation could be explained with the need of high anesthetic drugs maintenance doses caused by the increased metabolic rates and increased postoperative respiratory complications in patients changing in severity correlated with the degree of smoke exposure.

Weaknesses of our study could be the lack of the measurement of the cotinine levels to assess the degree of passive exposure. Instead of taking patient's passive tobacco smoke exposure history, measurement of the cotinine levels as a major metabolite of nicotine found in hair, urine, blood, saliva is still a controversial subject. There are studies reflecting that the passive exposure to tobacco smoke is not associated with the patient's history,[18] however there are also studies showing that the history taking about passive tobacco smoke exposure is a practical and reliable method.[9] Another study reported that the patient history of passive smoking is correlated with urine cotinine levels.[6]

Cotinine levels, is affected from the prolongation of evaluation time of passive smoke exposure and levels of cotinine decreases over time. So the subject is controversial and being an expensive, time costing and uncomfortable method. We avoided assessment of preoperative cotinine levels in blood, urine, and saliva.

Passive exposure to tobacco smoke is a major cause of morbidity and mortality. Passive smoke exposed patients receiving general anesthesia are in increased risk of respiratory complications as active smokers. In conclusion, passive tobacco smoke exposed general anesthesia receiving patients also regarding to the degree of exposure having high rates of perioperative respiratory complications and prolongation of PACU stays when compared with unexposed patients.

Conflicts of interest

The authors declare no conflicts of interest.

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