EFFECT OF SMOKING ON NAUSEA, VOMITING AND PAIN IN THE POST-OPERATIVE PERIOD

Kulsoom Farhat[1], Akbar Waheed[2], Anwar Kamal Pasha[3], Javeid Iqbal[4], Qaisar Mansoor[5]

[1,2] Army Medical College (National University of Sciences & Technology), Rawalpindi - Pakistan.
[3] Classified Anesthetist Combined Military Hospital Rawalpindi - Pakistan.
[4] Baluchistan University, Quetta - Pakistan.
[5] Institute of Biomedical and Genetic Engineering, Islamabad - Pakistan.
Address for correspondence:
Dr. Kulsoom Farhat
Assistant Professor, Department of Pharmacology and Therapeutics, Army Medical College (National University of Sciences & Technology)
E-mail: kulsoompasha@yahoo.com
Date Received:
February 24, 2014
Date Revised:
June 27, 2014
Date Accepted:
June 30, 2014

ABSTRACT

Objective: To determine the effect of smoking on the post-operative nausea and vomiting (PONV) as well as severity of pain in the post-operative period.

Methodology: A total of 147 patients undergoing elective laparoscopic cholecystectomy under general anesthesia were divided into 2 groups of non-smokers (n=75) and smokers (n=72). In the first 24 hours after surgery the frequency of PONV and the severity of pain on Visual Analogue Score were assessed.

Results: The group of non-smokers had statistically more nausea and vomiting (n=59, 78.6%) as compared to that of smokers (n=20, 27.7%) [$p<0.05$]. However there was no significant difference in the maximum pain scores in both the groups ($p>0.05$).

Conclusion: We conclude that frequency of PONV is less in smokers as compared to non-smokers.

Key Words: Post-operative nausea and vomiting (PONV), pain, smoking, laparoscopic cholecystectomy.

This article may be cited as: **Farhat K, Waheed A, Pasha AK, Iqbal J, Mansoor Q. Effect of smoking on nausea, vomiting and pain in the post-operative period. J Postgrad Med Inst 2014; 28(3):277-81.**

INTRODUCTION

Postoperative nausea and vomiting (PONV) and pain are among the major concerns for patients presenting for surgery. These are the limiting factors in the early discharge of patients after surgery and are marked as the leading cause of unanticipated hospital stay. They can lead to increased recovery room time, extended nursing care, and potential hospital admission—all factors that may increase total health care costs. Equally important are the high levels of patient discomfort and dissatisfaction associated with these complaints.

The etiology of both PONV and pain is complex and is related to a number of established risk factors[1-4]. One such factor is smoking. Smoking poses a number of relevant medical and social problems. Smokers while on one hand experience an increased incidence of peri-operative and post-operative complications; a protective and favorable effect of smoking in PONV has also remained a focus of debate for long. The etiology of this action is however still not completely known. Multiple studies have speculated that smokers are more tolerant to anesthetic gases and other toxins than nonsmokers and consequently have a lower incidence of PONV. The anti-emetic effect of smoking has been confirmed by many studies[5-9]. However there are controversies regarding the protective effect of smoking in preventing post-operative pain. Some studies have shown that smoking reduced the incidence of postoperative pain[10] but others have negated the observation[11, 12] depicting enhanced occurrence of pain in smokers. Impact of smoking on PONV and pain may be of significance for surgical patients, who are prompted to abstain from cigarettes before operation. We have carried out this study to investigate the effects of smoking on postoperative nausea and vomiting as well as on postoperative pain.

METHODOLOGY

The protocol of the study was approved by Ethical Committee of Centre for Research in Experimental and Applied Medicine (CREAM), Army Medical College, Rawalpindi, Pakistan. The clinical data collection was done at Operation Theatre, Combined Military Hospitals Rawalpindi. All the patients included in the study provided a written informed consent. We included 157 adults both males and females patients (ASA I/II) undergoing laparoscopic cholecystectomy (between August 2012 – January 2013) under general anesthesia.

Patients were randomly divided into two groups using computer generated random table. Group A (n=75) included non-smoking patients and group B (n=72) included smokers. In the group B; 21 patients were "heavy smokers"(i.e. patients smoking more than 20 cigarettes daily) and 51 patients were "smokers" (i.e. patients smoking less than 20 cigarettes daily) for at least one year. None of the patients included in the study have had any concomitant medication that may influence the study results. The groups were further randomized to thiopentone or propofol as the anaesthetic induction agent.

Patients were premedicated with diazepam 10 mg and meperidine 100 mg i.m. one hour before surgery. Induction was carried out with 2–3 mg/kg thiopental or propofol 1.5-2 mg/kg. Endotracheal intubation was carried out with 0.5-0.6 mg/kg atracurium. Anesthesia was maintained with the maintenance doses of the volatile anesthetic agent isoflurane and 60 percent nitrous oxide in oxygen. The vitals of the patient including electrocardiography, noninvasive blood pressure and pulse oximetry were monitored continuously during anesthesia. At the end of the procedure, isoflurane was discontinued; neuromuscular blocking agent's effect was pharmacologically reversed with the standard reversal doses of neostigmine bromide 0.05 mg/kg in atropine sulphate 0.02 mg/kg. The patients were given 100 percent oxygen till the consciousness was regained and the patients started following verbal commands. At that point endotracheal tubes were removed after gentle suction of secretions through the tube. The patients were fully recovered in the recovery room and thereafter were shifted to the wards.

All the patients were visited 24 hours postoperatively in the respective wards and were asked about the presence of nausea, vomiting and pain in a non-leading manner by the investigators who was not included in rest of the study. These investigators were to carry out the sampling and were directly dealing with the subjects, and explained the study protocol. PONV was recorded in accordance with the questionnaire. Any complaint of nausea and/or vomiting was treated with 10 mg metoclopramide i.v. The visual analogue scale (VAS) was used to evaluate the intensity of postoperative pain with a range from 0 – 10, where: 0 – no pain, 10 – most severe pain[10]. The mean of maximum score in each study group was recorded. Meperidine in a dose of 1 mg/kg I/M was given for postoperative analgesia to only those complaining of pain in the post-operative period.

The data was analyzed using Statistical Package for the Social Sciences (SPSS) 16.0. The data was analyzed using the chi-square test. Continuous and discrete data are reported as mean (±standard deviation) and analyzed using the two-sided t-test. A p value <0.05 was considered significant.

RESULTS

A total of 147 patients were included in the study. Of these, 75 were non-smokers and 72 were smokers. Both the groups were similar in terms of the demographic characteristics (Table 1).

The frequency of nausea, vomiting and both nausea and vomiting was significantly lower in group B as compared with group A (p=0.03, 0.04 and 0.001) regardless

Table 1: Demographic characteristics of the study groups (mean±SD)

	Group A (n=75)	Group B (n=72)
Age	42.67 (± 11.08)	46.66 (± 13.3)
Weight	76.56 (± 14.87)	71.43 (± 11.06)
Gender (M/F)	29/46	20/52
ASA Grade I /II	61/14	56/16
Opioid consumption (ug/Kg)	5.8 (± 0.17)	7.1 (±0.11) *
Duration of Anesthesia (min)	65 (±13.54))	60(±12.76)

p<0.05*

of which induction agent was used (Table 2). The influence of induction agent (thiopentone and propofol) on PONV is summarized in Table 3.

The overall frequency of PONV is lower in the propofol group in both group A and B. The results regarding the relationships between the number of the cigarettes smoked daily and the frequency of PONV are listed in Table 4.

No statistically significant differences have been observed between heavy smokers and smokers with respect to the occurrence of PONV most probably due to the small sample size of heavy smokers. However the frequency of PONV was found to be lower in heavy smokers. The maximum post-operative pain score was recorded in both the groups.

There was insignificant difference in the maximum post-operative pain score in group A and group B which was 2.97 (±2.1) and 2.32 (±2.3) respectively.

Table 2: The frequency of PONV in study groups

	Group A (n=75)	Group B (n=72)	p value
Nausea	31 (41.3%)	14 (19.4%)	0.03*
Vomiting	28 (37.3%)	16 (22.2%)	0.04*
Nausea and vomiting	59 (78.6%)	20 (27.7%)	0.001*

p<0.05*

Table 3: The effect of thiopentone and propofol as induction agent on the frequency of PONV in study groups

		Group A (n=38)	Group B (n= 36)	p value
Thiopentone	Nausea	19 (50%)	3 (8.3%)	0.001*
	Vomiting	15 (39.4%)	8 (22.2%)	0.109
	Nausea and vomiting	34 (89.4%)	11 (30.5%)	0.001*
Propofol		**Group A (n=37)**	**Group B (n= 36)**	**p value**
	Nausea	10 (27.02%)	2 (5.5%)	0.01*
	Vomiting	15 (40.5%)	7 (19.4%)	0.04*
	Nausea and Vomiting	25 (67.5%)	9 (25%)	0.0002*

p<0.05*

Table 4: The frequency of PONV in two smokers groups

	Heavy smokers (n=21)	Smokers (n=51)	p value
Nausea	3 (14.2%)	4 (7.8%)	0.401
Vomiting	1 (4.7%)	12 (23.5%)	0.059
Nausea and Vomiting	4 (19.04%)	16 (31.3%)	0.288

DISCUSSION

It is a general perception by the anesthetists that smokers are more susceptible to perioperative and postoperative complications[13]. However simultaneously it has been documented that the smoking status protects against the PONV and a non-smoking status, roughly doubles the patient's risk of PONV[14]. This anti-emetic effect of smoking is a recent discovery[10]. We

in our study have demonstrated that the PONV was significantly decreased in patients who were smokers. The similar results were observed by Chimbira and Sweeney where a significant difference was seen in the occurrence of PONV among smokers and non-smokers[5]. This PONV is as poorly understood as the nausea and vomiting of pregnancy. In an epidemiological study by Gadsby et al it was seen that women who smoked during pregnancy were affected to a much lesser degree than those who did not[15]. We in our study had also observed that the overall frequency of PONV was lower in the patients who were induced by propofol. This may be attributed to the direct anti-emetic effects of propofol[16]. Gauger and his colleagues came up with similar findings where the PONV was significantly less likely in the propofol group[17]. We also demonstrated that the antiemetic effect may be related to the number of cigarettes smoked as the frequency of PONV was found to be lower in heavy smokers. But we could not work out a statistical conclusion probably because of a small sample size of heavy smokers. The same has been observed by Ionescu and colleagues[10].

Some studies have postulated that enzyme induction of CYP1A2 and CYP2E1 caused by chemicals and pollutants in cigarette smoke be the most likely reason for this anti-emetic effect[18,19]. These changes in enzyme pathways in the form of enzyme induction would mean increased metabolism of drugs that are metabolized through these pathways. One such group of drugs is opioids[18] and the increased metabolism would demand increased intraoperative opioid requirements. Our results have also shown an increased requirement for opioids mepridine in the smokers. Previous data has also demonstrated an increased requirement for meperidine and morphine in smokers[20]. If we have a mechanism which can explain the improvement in patient well-being postoperatively and possibly affect the incidence and severity of the nausea and vomiting, it might be possible to utilize known mechanism advantageously.

Considering the possibility that pain itself may be a contributing factor in the genesis of the PONV, we observed the intensity of pain in both the groups. We used a visual analogue scale for recording the intensity of pain. Since this scale correlate well with other measures of pain. We observed that the non-smokers had more maximum post-operative pain score as compared to the smokers but the difference between the two groups was not significant. This finding however was not as documented by Chimbira and Sweeney where both the smokers and non-smokers had a similar incidence of pain requiring similar amounts of pain relief[5]. Association between smoking and pain perception is complex. It has been observed that the smoking releases endogenous opioids in the brain that produced analgesic effect in mice and rats[21,22]. It has also been suggested that the calcium channels may be involved in mediating nicotine-induced analgesia[22].

The volume of narcotics may contribute to the frequency of PONV, by activating the vomiting center and increasing the sensitivity of the emetic reflex[23]. We observed that the smokers had consumed more opioids than the non-smokers. This requirement of opioids in smokers group for ameliorating pain was statistically more in smokers than in the non-smokers group and the reason may be the increased metabolism of opioids by enzyme induction.

CONCLUSION

Smoking significantly reduced the frequency of PONV after laparoscopic cholecystectomy identifying the protective effect of smoking against PONV. The determination of analgesic effects of smoking necessitates the requirement of more efforts in this direction. There is considerable scope for anesthetists to utilize different tools in their armamentarium to improve outcome measures. This may be of particular benefit in the specific areas of anesthesia where PONV may lead to delayed discharge and other adverse effects of anesthesia.

REFERENCES

1. Cohen MM, Duncan PG, De Boer DP, Tweed WA. The postoperative interview: assessing risk factors for nausea and vomiting. Anaesth Analg 1994;78:7-16.
2. Koivuranta M, Laara E, Snare L, Alahunta S. A survey of postoperative nauseaand vomiting. Anaesthesia 1997;52:443-9.
3. Hough MB, Sweeney BP. The influence of smoking on postoperative nauseaand vomiting. Anaesthesia 1998;53:932-3.
4. Apfel CC, Laara E, Koivuranta M, Greim CA, Roewer N. A simplified risk score for predicting postoperative nausea and vomiting. Conclusion from crossvalidation between two centers. Anasthesiology 1999;91:693-700.
5. Chimbira W, Sweeney BP. The influence of smoking on postoperative nausea and vomiting. Anaesthesia 2000;55:540-5.
6. Apfel CC, Korttila K , Abdalla M, Kerge H, Turan A, Vedder I, et al. A factorial trial of six interventions forthe prevention of postoperative nausea and vomiting. N Engl J Med 2004;350:2441-51.
7. Sinclair DR, Chung F, Mezei G. Can postoperative nausea and vomiting bepredicted? Anaesthesiology 1999;91:109-18.

8. Sumer C, Erhan OL, Ozer AB, Yildiz F. Effects of etomidate on blood cortisol, insulin, and glucose levels and PONV rates in smokers. Turk J Med Sci 2012;42:810-5.

9. Pierre S, Benais H, Pouymayou J. Apfel's simplified score may favorablypredict the risk of postoperative nausea and vomiting. Can J Anesth 2002;49:237-42.

10. Ionescu D, Bădescu C, Maican D, Acalovschi I. Does smoking have an influence on post- operative nausea and vomiting? South Afr J Anaesth Analg 2007;13:29-32.

11. Warner DO. Tobacco control for anesthesiologists. J Anesth 2007;21:200-11.

12. Weingarten TN, Podduturu VR, Hooten WM, Thompson JM, Luedtke CA, Oh TH. Impact of tobacco use in patients presenting to a multidisciplinary outpatient treatment program for fibromyalgia. Clin J Pain 2009;25:39-43.

13. Scholes RL, Browning L, Sztendur EM, Denehy L. Duration of anaesthesia, type of surgery, respiratory co-morbidity, predicted VO2max and smoking predict postoperative pulmonary complications after upper abdominal surgery: an observational study. Aust J Physiother 2009; 55:191–8.

14. Pierre S, Whelan R. Nausea and Vomiting After Surgery. Cont Edu Anaesth Crit Care Pain 2013;13:28-32.

15. Gadsby R, Barnie-Adshead AM, Jagger C. Pregnancy nausea related to women's obstetric and personal histories. Gynaecol Obstet Inv 1997; 43: 108-11.

16. Visser K, Hassink EA, Bonsel GJ, Moen J, Kalkman CJ. Randomized controlled trial of total intravenous anesthesia with propofol versus inhalation anesthesia with isoflurane-nitrous oxide: postoperative nausea with vomiting and economic analysis. Anesthesiology 2001;95:616-26.

17. Gauger PG, Shanks A, Morris M, Greenfield ML, Burney RE, O'Reilly M. Propofol decreases early postoperative nausea and vomiting in patients undergoing thyroid and parathyroid operations. World J Surg 2008; 32:1525-34.

18. Chang GWM, Kam PCA. The physiological and pharmacological roles of cytochrome P450 isoenzymes. Anaesthesia 1999;54:42-50.

19. Zevin S, Benowitz NL. Drug interactions with tobacco smoking. Clin Pharm1999;36:425-38.

20. Miller LG. Cigarettes and drug therapy: pharmacokinetic and pharmacodynamic considerations. Thor Rev 1990;9:125-35.

21. Carstens E, Anderson KA, Simons CT, Carstens MI, Jinks SL. Analgesia induced by chronic nicotine infusion in rats: differences by gender and pain test. Psychopharmacol 2001;157:40-5.

22. Block RC, Chin CW, Wu W, Zbuzek VK. Nicotine-induced analgesia in rats: the role of calcium and the diversity of responders and non-responders. Life Sci 1993;53:195-200.

23. Apfel C, Roewer N, Korttila K. How to study postoperative nausea and vomiting. Acta Anaesthesiol Scand 2002;44:470-4

CONTRIBUTORS

KF planned the study, and wrote the manuscript. AW has substantial input in the conception of the study. AKP helped in sampling and data collection. JI helped in drafting the manuscript. QM helped in statistical analysis and data interpretation. All authors contributed significantly to the final manuscript.