Which One Is Better Anesthetic For Laparoscopic Cholecystectomy: Desflurane, Sevoflurane or Propofol?

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Citation

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Abstract

Background: Laparoscopic techniques, having rapidly increased in popularity because of its various benefits. They are widely used in day-case surgical operations and extensively published issue. However, postoperative nausea vomiting (PONV) is a commonly observed phenomenon after laparoscopic procedures. Its occurrence can increase with anesthetic techniques. Despite that the use of propofol and new low solubility inhalation anesthetics lead to faster induction and recovery, their effects on PONV is not sufficiently known. Therefore, in this study, we aimed to compare the effects of different anesthetic drugs on recovery characteristics and PONV.
Methods: After their informed consent, 300 ASA I-III patients scheduled for laparoscopic cholecystectomy were investigated in this study. Anesthesia was induced by fentanyl 1.5 μgkg^{-1}, midazolam 0.03 $mgkg^{-1}$, propofol 1.5 $mgkg^{-1}$ and vecuronium 0.01 $mgkg^{-1}$ for all patients. Anesthesia was maintained with desflurane in group D (n=100), sevoflurane in group S (n=100) and propofol infusion in group P (n=100), beside 50 % N_2O/O_2 ventilation. All patients were given 4 mg ondansetron and 8 mg dexamethazone iv for preventing PONV, ten minutes before the end of surgery. At the end of the operation, times for extubation, eye opening, orientation, sitting and walking, and the need of ondansetrone in post anesthetic care unit were recorded. Also, PONV was observed and recorded as early period (first 4 hours) and late period (4-24 hours).
Results: Extubation and eye opening times were meaningfully lower in group D. However, no significant differences were observed in orientation, sitting and walking times and PONV among the groups. We recognize that all the patients who had PONV were women and it has been found that there is a correlation between PONV and body weight.
Conclusions: As a conclusion, even tough there were no statistically significant differences among the groups on PONV, the number of patients who had PONV in group P was lower. Early recovery time was shortest in group D, while delayed recovery time had no differences. It may be said that these anesthetic drugs have no statistically significant difference for PONV and delayed recovery.

INTRODUCTION

Postoperative nausea and vomiting (PONV) is known to become more frequent depending on anesthetic methods, personal characteristics of patient and operation, even tough the actual rationale have not been identified yet ([1]). Since PONV, observed with 40-75 % occurrence rate after laparoscopic surgery, is increasing the postoperative stay in hospital, the determination of antiemetic and anesthetic methods for its prevention and treatment has become a focus for recent research activities ([2,3,4,5]).

For day-case anesthesia applications, the use of anesthetics that provide fast and smooth induction, allow fast changes in intensity while maintaining anesthesia and early recovery, and that have no postoperative side effects are suggested ([6]). Considering these characteristics, for fast induction and early recovery based on low blood/gas partition coefficients, new inhalation agents are being used as alternatives to propofol in day-case anesthetic applications ([6,7]). Despite that there are many comparative studies with propofol and inhalation agents, for the effects of PONV and on recovery criterias ([1,6,7,8]); there aren't much with desflurane, sevoflurane and propofol ([3]).

In this study, effects of desflurane, sevoflurane and propofol, as frequently used agents in day-case surgery, on recovery and PONV in laparoscopic cholecystectomy has been comparatively investigated.

MATERIALS AND METHODS

For the study, after the consent of hospital ethic committee, 300 case, in ASA I-III classification, scheduled for

laparoscopic cholecystectomy, has been randomly divided into three groups of 100. No case with motion disease, history of PONV, obesity or menstruation is included in the study.

To decrease the intraoperative and postoperative opioid need which increases the PONV risk, all cases were administered with diklofenak sodium intramuscularly for providing preemptive analgesia, 30 minutes prior to operation. Ten minutes before the operation, 0.03 $mgkg^{-1}$ iv midazolam and sedative premedication has been administered.

For all cases, anesthesia is induced by fentanyl 1.5 μgkg^{-1} iv , propofol 1.5 $mgkg^{-1}$ iv and vecuronium 0.1 $mgkg^{-1}$ iv and then endotracheal entubation is carried out. For removing the contents of stomach, a suctioning catheter has been placed at the end of the operation and contents were removed by aspiration.

Anesthesia has been maintained by 6 $mgkg^{-1}$ hr^{-1} (100 μgkg^{-1} min^{-1}) propofol infusion and 50 % N_2O/O_2 ventilation in group P (n=100), and by sevoflurane and desflurane in concentrations providing an average of 1.3 MAC value together with 50 % N_2O/O_2 ventilation in groups S (n=100) and D (n=100), respectively. While maintaining anesthesia, if the hemodynamic values of patients varies more than 15 % from pre-induction values, anesthetic concentrations and infusion rates are changed (propofol $50^{-1}50$ μgkg^{-1} min^{-1} , desflurane 2-8 % and sevoflurane 0.5-3 %) to keep them within ± 15 % range ($_3$).

In all cases, 5 minutes before the extubation, ondansetron 4 mg iv and dexametazone 8 mg iv is administered and nausea-vomiting prophylaxis is carried out ($_9$).

To minimize the risk of residual neuromuscular blockage risk after the operation, decurarization has been provided by neostigmin 0.01 $mgkg^{-1}$ and atropin 0.01 $mgkg^{-1}$ ($_9$).

Times for extubation, eye opening as early recovery criteria, place and time orientations determined by querying the patient on date of birth and whereabouts as intermediate recovery criteria, and sitting and walking without help as late recovery criteria, measured from the time of termination of anesthetic gas applications and propofol infusion, has been recorded.

Postoperative nausea and vomiting has been recorded in two stages as early period (0-4 hours) and as late period (4-24 hours) for nausea and vomiting separately.

Patients with nausea were asked to identify the level of their nausea on a scale of 0 to 10. Patients who scaled their feelings as level 4 or more were administered ondansetron 4 mg iv . Cases with vomiting were also administered ondansetron 4 mg iv and their postoperative antiemetic needs were recorded.

In statistical evaluation, average values of the groups were used with ±SD values. In statistical analysis of recovery criteria, differences among groups were investigated by ANOVA variant analysis. For criteria identified as different for groups, Duncan test is used to determine the group which creates the difference.

While the postoperative nausea-vomiting and postoperative antiemetic needs are analyzed with Chi-Square test, Mann-Whitney U test is used to determine the relation between the PONV and weight, age and gender, regardless of applied anesthetic method.

RESULTS

Demographic data with no identified statistical differences among groups were given in Table I.

Figure 1

Table 1: Demographic data

	Group P (n=100)	Group D (n=100)	Group S (n=100)	P Value
Age (year)	54.08□13.6	50.28□12.34	51.28□14.08	0.584
Weight (kg)	71.16□12.3	72.12□12.6	71.08□12.8	0.948
Sex (F/M)	55/45	46/54	47/53	
Operating time (min)	58.76□25.19	75.76□26.52	71.32□20.91	0.058
Bile leak spillage (n)	%16 (n=16)	%0 (n=0)	%4 (n=4)	0.062

In this study, recovery criteria were considered in three stages as early, intermediate and late recovery. As it can be seen in Table II, while, as early recovery criteria, the times for extubation and eye opening upon verbal stimulation measured after termination of anesthetic application display differences among groups, no differences were observed among the times for correct declaration of place and time orientation as intermediate recovery criteria, and among the times for sitting and walking without help as late recovery criteria. The times for extubation and eye opening were meaningfully longer for group P cases than groups S and D ($p<0.05$).

Even tough postoperative antiemetic need was observed as 8 % (n=8) in group P, 28 % (n=28) in group D and 20 % (

n=20) in group S; statistically significant differences were not identified (Table II).

Figure 2

Table 2: Recovery times and need for antiemetic treatment

	(min)	GrupP(n=100)	GrupD(n=100)	GrupS (n=100)	P value
Early Recovery	Extubation	6.24□3.15	2.27□1.6	4.16□2.87	0.00
	Eye opening	9.44□4.16	6.44□2.55	8.04□3.59	0.01
Interm. Rec.	Orientation	15.56□7.28	13.04□5.34	16.72□8.66	0.19
Late Recovery	Time to sit	54.80□16.92	58.00□24.36	54.00□24.86	0.80
	Time to walk	539.80□279.87	496.64□218.80	430.32□215.75	0.27
Need for antiemetic (n)		8 (%8)	28 (% 28)	20 (%20)	0.18

, : p<0.05; Compared with the other groups

Similarly, while early period (0-4 hr) postoperative nausea was observed 16 % (n=16) in group P, 32 % (n=32) in group D and 36 % (n=36) in group S, no statistically significant differences were identified (p>0.05) (Table III). Postoperative nausea is decreased in late period (4-24 hr) to 4 % (n=4), 8 % (n=8) and 4 % (n=4) for groups P, D and S, respectively, but no differences among groups were identified (p>0.05) (Table III).

Figure 3

Table 3: Ratio of PONV

		Group P (n=100)	Group D (n=100)	Group S (n=100)	Total (n=300)	P Value
0-4 hr	Nausea	16 (%16)	32 (%32)	36 (%36)	84 (%28)	0.249
	Vomiting	4 (%4)	16 (%16)	12 (%12)	32 (%10.7)	0.376
4-24 hr	Nausea	4 (%4)	8 (%8)	4 (%4)	14 (%5.3)	0.768
	Vomiting	0	4 (%4)	4 (%4)	8 (%2.7)	0.598

Vomiting was observed by 4 % (n=4) in group P, 16 % (n=16) in group D and 12 % (n=12) during early period (0-4 hr), and by 0 %, 4 % (n=4) and 4 % (n=4) in groups P, D and S, respectively, during late period (4-24 hr) with no identified statistical differences.

Upon determination of all vomiting patients were women, relation between the PONV and age, weight and operation length were analyzed independently from anesthetic methods by using Mann-Whitney U test. While no relations were identified between the PONV and age and operation length; possibility of increase in PONV by increase in weight statistically determined (p<0.05).

DISCUSSION

Popularity of day-case procedures, which comprises more than 50 % of all operations, increases everyday ([10,11]). Some of the important reasons of popularity are the rapid early and late recovery, fast return to normal activities and early discharge ([12]). Although there were many studies on the subject, no consensus was achieved on most suitable agent and technique ([10]).

Propofol is mentioned as the agent that provides the fastest and the earliest recovery ([10]). In a study that uses propofol-propofol, propofol-sevoflurane and sevoflurane-sevoflurane combinations for inducing and maintaining the anesthesia, respectively, no differences were found among the groups in terms of early, intermediate and late recovery ([13]). In most of the studies that used propofol-propofol and propofol-desflurane combinations for inducing and maintaining anesthesia, desflurane groups were found to have faster early and intermediate recovery than propofol groups, while no differences were found among groups in late and psychomotor recovery ([4,15]).

In our study on the most suitable anesthetic method for PONV and recovery in laparoscopic cholecystectomy, despite that the desflurane group leaded to early recovery with respect to other groups, no differences were observed among groups in terms of intermediate and late recovery criteria. If it is agreed that the patients eye openning on 5th. or 6th. minute does not mean much unless it reduces the time for transfer of patient to II. stage recovery unit or time for discharge ([10]), these three anesthetics have no differences in recovery from laparoscopic cholecystectomy.

Although PONV never become a chronic problem and become a threat to life, it may become a significant complication by reducing the patient's satisfaction and increasing the cost. When the patients being prepared for the operation are inquired about their worries, PONV is the first answer with 49 % and postoperative pain is second with 27 % ([5,16]).

Although thiopental, metohexital and propofol can be used in daily anesthetic applications, propofol is preferred more due to low PONV incidences ([12,17]). Beside the propofol, new, short duration, inhalation anesthetics are also preferred in daily cases for their minimal side effects and fast recovery characteristics. Song et. al. ([3]), in their study on effects of these three anesthetics on PONV and recovery, concluded similar to our study that while fastness of early recovery is statistically significant for desflurane, late recovery characteristics display no differences among groups. Also similar to our study, they observed more PONV cases in

desflurane group without any statistical significance.

While the postoperative nausea and vomiting ratio is reported to be around 70 % in laparoscopic surgery ([2,18]), both in Song's ([3]) and in our study, the ratio did not exceed 35 % on the average. In another study of Song et. al.([4]), in which proflactic antiemetics were not used, they used propofol-sevoflurane and propofol-desflurane techniques in laparoscopic cholecystectomy cases and reported postoperative nausea and vomiting rates as 60 % and 47 % for sevoflurane and 55 % and 47 % for desflurane, respectively, with no significant differences among groups. The use of combined profilactic antiemetic treatment as it was suggested in literature may be considered as effective reason of low observance rate of PONV both in our study and Song et al ([4,9,19]).

PONV, observed 3-4 times more for women than men, has been reduced from 73 % to 34 % in laparoscopic surgery by the use of proflactic antiemetic treatment ([18]). In our study, all the cases of vomiting were women, and an early overall evaluation disregarding the groups revealed that the nausea and vomiting ratios are kept as low as 28 % and 10.7 %, respectively.

It has been suggested that PONV risk may be reduced by propofol in ambulatory surgery, but it has not been statistically shown ([10]). Tramer ([20]), reported that propofol may reduce PONV risk in the absence of proflactic antiemetic treatment for high PONV risk cases. In this study, in which proflactic antiemetic treatment is used for high risk groups, PONV is observed less in propofol group without any statistical difference.

Consequently, even tough early recovery is faster with desflurane in laparoscopic cholecystectomy operations, it should be considered that these three anesthetics have no differences in terms of late recovery and PONV. However, as it was reported by Pollard et. al. ([10]), it should be kept in mind that propofol may reduce PONV risk.

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