

# Effect of induction with propofol-fentanyl and sevoflurane-fentanyl on postoperative nausea and vomiting after laparoscopic surgery: A comparative study

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## Abstract

**Introduction:** Post-operative nausea and vomiting is one of the very common complications after a surgery. Prevention of PONV in patients results in improved patient satisfaction and cost effective patient care.

**Materials and methods:** 50 patients were randomly divided into 2 groups, Group A were the patients who received Propofol- Fentanyl and group B, who received Sevoflurane – Fentanyl. Before surgery, the baseline conditions, such as the baseline pulse rate, blood pressure, SpO<sub>2</sub> were taken. Injection glycopyrolate 0.2 mg/kg was given intramuscularly half hour prior to the surgery. 100% oxygenation was given to all the patients for 3 minutes. During Preinduction, all the patients were given 1-1.5 mcg/kg IV Fentanyl.

**Results:** In the Group A most of the patients had no nausea post-surgery, while 5 of them had mild nausea. However. Out of the patients in Group B, 32% each had mild or no symptoms, but 7 (28%) PONV Grade III, which was significantly higher. In group A, 48% of the patients who were either overweight or obese had no nausea, while 16% of them had mild nausea, 12% had Grade III PONV. Of the patients with normal BMI in Group A, only 1 (4%) had mild nausea, while all the others had no symptoms. In group B, 7 (28%) of the overweight and obese Patients had grade III nausea i.e. 1-2 Vomiting's in 12 hours with nausea, while 2 (8%) had >3 vomiting in 12 hours with nausea. 6 (24%) each had mild nausea or no nausea.

**Conclusion:** Although the efficacy of both sevoflurane and Propofol is similar, Propofol is the more preferred drug due to the lesser amounts of cases of nausea and vomiting, thereby resulting in higher patient satisfaction.

**Keywords:** Propofol, sevoflurane, PONV

## Introduction

Post-operative nausea and vomiting is one of the very common complications after a surgery. This is true even after a laparoscopic surgery, many times leading to prolonged hospital stays and post-operative care <sup>[1, 2]</sup>. About 56-95% of the cases of PONV have been reported after the laparoscopic surgeries in the gynecological department <sup>[3-5]</sup>.

Prevention of PONV in patients results in improved patient satisfaction and cost effective patient care<sup>1</sup>. Of the drugs that are used to prevent emesis, Sevoflurane and Propofol are some

of the common ones. Sevoflurane is commonly used as anesthetic agent especially in the out patients and has minimal complications when used with nitrous oxide <sup>[6]</sup>. It is rapid in its onset and offset, with ability for induction and maintenance of anaesthesia with a single drug, without the IV access, while giving a better condition for laryngeal mask airway insertion. During pulmonary manipulations, unexpected cough reflex and lung movement maybe observed, which is successfully arrested by sevoflurane <sup>[7, 8]</sup>.

However, Sevoflurane is more often associated with post-operative nausea and vomiting compared to the propofol based drugs, which are normally administered intravenously <sup>[9]</sup>. Propofol is the preferred drug for the induction and the maintenance of general anesthesia and is administered IV. It is commonly used for total general anesthesia, in the intensive care unit as well as for endoscopy <sup>[10]</sup>. Although its exact mechanism of action is not well understood, it is estimated to act on the gamma-aminobutyric acid which is the major inhibitory neurotransmitter and increases its inhibitory tone <sup>[11]</sup>. It also inhibits the action of cytokines such as IL $\beta$ , IL-6 and Tumor necrosis factor, which play an important role in signaling pain <sup>[12]</sup>.

The studies with regard to Sevoflurane and Propofol and their effect against PONV are contradictory. This study was therefore done to compare the effect of sevoflurane – fentanyl and propofol-fentanyl against nausea and vomiting in patients who have undergone laparoscopic surgeries.

## Materials and Methods

This prospective comparative study was done by the department of Anaesthesia at Medciti Institute of Medical Sciences, Ghanpur-501401 during the period November, 2020 to July 2021 on 50 patients undergoing laparoscopic surgeries under general anesthesia. After attaining the clearance from the Institutional Ethical Committee, the nature of the study was explained in detail to all the patients and their attenders in details and informed consent was taken from all of them, before their inclusion into the study. All the patients were above 18 years of age, with ASA grade I or ASA Grade II, with no functional limitations. The patients were randomly divided into 2 groups, Group A were the patients who received Propofol-Fentanyl and group B, who received Sevoflurane-Fentanyl. Patients who had motion sickness or had a previous history of vomiting and nausea were excluded from the study.

Demographic details were taken from all the patients and all of them were subjected to a thorough clinical examination. The height and weight was taken and the Body Mass index was calculated for all of them. The patient was asked to come in fasting prior to the surgery. Before surgery, the baseline conditions, such as the baseline pulse rate, blood pressure, SpO<sub>2</sub> were taken. Injection glycopyrrolate 0.2 mg/kg was given intramuscularly half hour prior to the surgery. 100% oxygenation was given to all the patients for 3 minutes. During preinduction, all the patients were given 1-1.5 mcg/kg IV Fentanyl.

Patients in Group A were given 2 mg/kg Propofol while Graded concentration of Sevoflurane from (8% to 2%) was given to the patients in Group B till the pupil was centralized. Both the groups were further intubated with 0.6 mg/kg rocuronium injection. Oxygen, N<sub>2</sub>O levels were maintained and, Isoflurane, muscle relaxant and IPPV were continued. During the surgery, ECG was also maintained and observed and noted.

Post-surgery, the severity of nausea and vomiting were classified according to the PONV severity scale (Table: 1)

**Table 1:** PONV scale classification

Grade Type	Classification Details
Grade I	None
Grade II	Mild Nausea

Grade III	1-2 Vomitings in 12 hours with nausea
Grade IV	>3 vomitings in 12 hours with nausea

The data was analyzed on SPSS software depicted using charts and tables the comparison of the two groups was done using Chi Square test.

## Results

This study was done as a comparative study between 50 people undergoing elective laparoscopic surgeries. These patients were divided randomly into 2 groups of 25 each. Most of the patients in both the age groups were in between 46-55 years, followed by those between 36-45 years. The mean weight of the patients in the Group A was  $65.22 \pm 5.25$  Kgs and in Group B it was  $63.73 \pm 4.91$  Kgs. Most of the patients were overweight and the mean BMI for all the patients was  $3.77 \pm 2.74$  kg/m<sup>2</sup> among the Group A and  $25.37 \pm 4.19$  among Group B. It took  $4.73 \pm 13.74$  mins on an average in group A to complete the surgery, while it took  $82.36 \pm 17.88$  mins in Group B. In the Group A most of the patients had no nausea post-surgery, while 5 of them had mild nausea. However, Out of the patients in Group B, 32% each had mild or no symptoms, but 7 (28%) PONV Grade III, which was significantly higher. (Table: 2).

**Table 2:** Demographic characteristics and time duration of surgery among the patients

Characteristics	Group A (Propofol + Fentanyl)	Group B (Sevoflurane + Fentanyl)
<b>Age (in years)</b>	$48.83 \pm 5.99$	$49.38 \pm 8.52$
18- 25	1 (4%)	0 (0)
26 – 35	3 (12%)	2 (8%)
36 – 45	9 (36%)	7 (28%)
46 – 55	8 (32%)	10 (40%)
– 65	4 (16%)	5 (20%)
>65	0 (0)	1 (4%)
Weight in Kg (mean $\pm$ SD)	$65.22 \pm 5.25$	$63.73 \pm 4.91$
<b>BMI (kg/m<sup>2</sup>)</b>		
Normal	5 (20%)	4 (16%)
Over weight	14 (56%)	16 (64%)
Obese	6 (24%)	5 (20%)
Time of surgery (in mins)	$84.73 \pm 13.74$	$82.36 \pm 17.88$
<b>PONV Grade</b>		
Grade I	16 (64%)	8 (32%)
Grade II	5 (20%)	8 (32%)
Grade III	3 (12%)	7 (28%)
Grade IV	1 (2%)	2 (8%)

We compared the BMI levels of the patients with the severity of nausea. In group A, 12 (48%) of the patients who were either overweight or obese had no nausea, while 4(16%) of them had mild nausea, 3 (12%) had 1-2 Vomitings in 12 hours with nausea. Of the patients with normal BMI in Group A, only 1 (4%) had mild nausea, while all the others had no symptoms.

In group B, 7 (28%) of the overweight and obese Patients had grade III nausea i.e. 1-2 Vomitings in 12 hours with nausea, while 2 (8%) had >3 vomitings in 12 hours with nausea. 6 (24%) each had mild nausea or no nausea (Table: 3).

**Table 3:** Correlation between PONV scale and BMI

PONV scale	Group A		Group B	
	BMI < 25	BMI > 25	BMI < 25	BMI > 25
Grade I	4 (16%)	12(48%)	2 (8%)	6 (24%)
Grade II	1 (4%)	4 (16%)	2 (8%)	6 (24%)
Grade III	0 (0)	3 (12%)	0 (0)	7 (28%)
Grade IV	0 (0)	1 (4%)	0 (0)	2 (8%)

3 patients had either severe nausea even after 4 hours of completion of surgery with Grade III in 1 (2%) and grade IV in 2 (4%) of the cases. Out of the other 47 surgeries, 24 (48%) of them had no symptoms while 13 (26%) had mild nausea. 10 (20%) of the patients suffered from Grade III and Grade IV PONV severity within 4 hours of surgery. (Table: 4).

**Table 4:** Time after surgery and association with PONV

Grade I	24 (48%)	0
Grade II	13 (26%)	0
Grade III	9 (18%)	1 (2%)
Grade IV	1 (2%)	2 (4%)

## Discussion

This prospective comparative study was performed on 50 patients randomly assigned into 2 groups, who had come in for elective laparoscopic surgery. The mean age of the patients was  $48.83 \pm 5.99$  years among the patients who were given propofol with fentanyl and  $49.38 \pm 8.52$  years in patients who received sevoflurane with fentanyl.

The mean weight of the patients in the Group A was  $65.22 \pm 5.25$  Kgs and in the Group B it was  $63.73 \pm 4.91$  Kgs. Most of the patients, 56% in group A and 64% in Group B, were overweight while 24% and 20% in Group A and Group B respectively were obese. An association of obesity with PONV has been observed in another study by Chatterjee *et al.* [13]. This has been reported to be due to the increases intra-abdominal pressure as well as the pharmacokinetics of the lipophilic anaesthetic agents. However, another study by reported no correlation between PONV and BMI [14]. Another study by Erk *et al.* also reported a positive association between overweight and obese patients with PONV [15].

Significantly more number of patients who were given Sevoflurane had nausea when compared to those who were given Propofol with fentanyl. In a study by Joo *et al.*, a significantly higher number of people suffered from nausea and vomiting after intubation with sevoflurane when compared with those intubated with Propofol. It was also observed in this study that more number of people were dissatisfied [16]. In another study by Kumar G *et al.*, also observed Propofol to be lesser associated with vomiting and nausea compared to other inhaled anaesthetic agents [9]. Similar results were reported by Shinn *et al.* in their study also [17]. However, a study by Yang *et al.* observed no significant difference in the effect of the two drugs on PONV [18], similar results were observed by Campbell and Thomas, where in they reported Propofol to have no antiemetic effect [19].

Uncontrolled PONV in some of the studies had required readmission leading to increased hospitalization costs [20]. Studies have reported a reduction of emesis by 20% when Propofol was substituted by volatile anesthetics [21]. Studies have revealed delayed bowel movements, which resulted in longer hospital stay, thereby further increasing the costs. Wallden *et al.* reported an early postoperative gastric emptying using acetaminophen [22].

48% of the patients had no nausea or vomiting, but 46% of the patients had nausea and a few episodes of vomiting within 4 hours of surgery. Only 3 (6%) of the patients had the

symptoms after 4 hours of surgery and all of them were either G4grade III or Grade IV. A similar observation was seen by Erk *et al.* where more than 80% of the patients had nausea in the first 4 hours of surgery <sup>[16]</sup>.

## Conclusion

Although the efficacy of both sevoflurane and Propofol is similar, Propofol is the more preferred drug due to the lesser amounts of cases of nausea and vomiting, thereby resulting in higher patient satisfaction.

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