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Volatile Anesthetics Maintain Tidal Volume and Minute Ventilation to a Greater Degree than Propofol under Spontaneous Respiration

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ABSTRACT

Background: Anesthesia is one of the most fundamental aspects of today's medicine, without which surgeries cannot be performed safely and with minimal pain. Various anesthetic drugs; volatile agents; sevoflurane, isoflurane, desflurane and intravenous agents; propofol effects respiratory functions like tidal volume and frequency or minute volume. Such effects should not be overlooked due to the frequent reliance on reports of patients in which spontaneous respiration is paramount. **Aim:** is to control spontaneous respiration to evaluate which of the two agents; volatile anesthetic or propofol, is most efficient in maintaining tidal volume and minimum ventilation. **Methodology:** The study was conducted at Pak Emirates Military Hospital, Rawalpindi, Pakistan, and used a prospective observational cohort, whereby a set of anesthetic agents was given to a group of patients. Relaxation and tidal volume together with the minute ventilation were assessed during spontaneous breathing during volatile anesthetics and propofol effect. Primary outcomes, with regard to respiratory parameters, were compared between the two anesthetic groups to determine if statistical differences exist. **Results:** The results established that the volatile anesthetics were significantly more superior to propofol in enhancing both tidal volume and MV during spontaneous breathing. Based on these studies, the present results showed that the steady anesthetic agents possess a greater potential for a respiratory dial in the potential situations involving spontaneous breathing compared to propofol. **Conclusion:** Compared to propofol, volatile anesthetics can more effectively kept tidal volume and minute ventilation at spontaneous respiration thus apparently give better results in clinical settings where respiratory function is paramount. Such outcomes may help anesthesiologists to choose the proper agents in order to achieve improved patients' results, especially in cases where spontaneous breathing should be maintained.

INTRODUCTION

Anesthesia is an indispensable part of contemporary medicine because it is vital for surgeries and sometimes for diagnostics. Its main intended use is to ensure adequate analgesia, muscle relaxation, and maintaining homeostasis of the surgical patient. Anesthesia agents, however, has impact on other physiological systems / systems of the body and this include the respiratory system (Varughese, S., 2021). The respiratory effects of anesthetic agents under consideration are of special significance due to their impact on ventilation and gas exchange during the period of anesthesia. While many classes of operative anesthetic agents exist, the most frequent inhaled agents include sevoflurane, isoflurane and desflurane and intravenous agents, such as propofol. These agents vary considerably in their respective roles in the body, especially in pharmacodynamics and pharmacokinetics, and in their effects on spontaneous breathing essential to ventilation (Hays, 2020)..

''Self-ventilation'' means that the patient begins to breathe on his own after having been provided with some type of ventilation apparatus. This is particularly important in patients in a lighter plane of anesthesia, or in cases where it is desirable to maintain as near normal a breathing pattern as possible; as in regional anesthesia or post operative period. As a result the study of anesthetic agents and the effects they impose on SVA special consideration in the delivery of anaesthesia should be given in identifying patient and surgical specialties characteristics. (Slimani, 2021).

Inhalation anesthetic agents for general anaesthesia, including isoflurane and sevoflurane belong to the category of volatile anesthetics. These agents act mainly at the level of receptors in the CNS: GABA_A and glycine receptors (Alshami, H. A., 2023). They generally produce dose-dependent suppression of the respiratory centers with a concomitant reduction in both RR and TV, but stereotactically better preservation of the TV. Compared to IV induction agents, volatile anesthetics are generally less likely to suppress spontaneous breathing to the same extent as it is likely to cause deeper sedation and more marked respiratory suppression (Liu et al., 2015).

Propofol is used as one of the most common intravenous anesthetic agents for induction and maintenance of general anesthesia mainly because of its rapid induction and comparatively short acting time. Though propofol provides adequate sedation and postoperative amnesia it is associated with increased respiratory depression compared to volatile agents. It reduces both frequency and depth of breaths: 15 mcg/min decreases the respiratory rate by 25% and tidal volume by 50%: higher doses cause severe hyperventilation and require mechanical ventilation (Kwiatkowski et al., 2016). In contrast to volatile agents, it is not easy to control the depth and intensity of a propofol dose and its effect on respiration is abrupt, which might pose significant challenges to the anesthetic plans specifically in the setting of compromised respiratory function (Schmidt et al., 2017).

Comparative impacts of volatile anesthetics and propofol on tidal volume and minute ventilation during spontaneous breathing has recently attracted attention of researchers. Some prior papers have indicated that patients under volatile anesthetics might have greater ability to maintain tidal volume and minute ventilation compared with propofol-receiving patients, especially considering that volatile anesthetics had a longer onset of action of respiratory depression (Hao, X., 2021)). This is especially important in cases when the ability to breathe without interference is crucial, for example, in some outpatient surgeries, patients with chronic lung diseases, or when postoperative mechanical ventilation is undesirable.

The objectives of this study are therefore to compare the effects of volatile anesthetics and propofol in maintaining tidal volume and minute ventilation during spontaneous respiration. Since both agents are commonly employed in clinical practice, comparing their respiratory impact might inform anesthetic selection, enhance patient protection, and enable superior result across diverse surgical procedures. This study postulates that volatile anesthetics have clinical advantages over propofol in spontaneously breathing patients concerning the depth of anesthesia to preserve tidal volume and minute ventilation.

METHODOLOGY

The purpose of this study is to investigate the effect of volatile anesthetics (sevoflurane) on tidal volume (TV) and minute ventilation (MV) and compare it to the effect of other forms of anesthesia (propofol) on the same indices when the patients breathe spontaneously. General anesthesia with either volatile anesthetics or propofol in clinical patients was compared to the settings of the present study in a prospective, randomized controlled trial study design to evaluate patients' respiratory parameters and their willingness to maintain spontaneous breathing. The following sub-section presents the methodology used in this study in detail.

Study Design and Participants

The current research intervention was planned as a prospective observational cohort study carried out in the Department of Anesthesia, Pak Emirates Military Hospital, Rawalpindi, Pakistan, from January 2024 to June 2024. Collection of data was done according to a study protocol that was approved by the IRB and each participant voluntarily signed a consent form. Inclusion criteria for the study were volunteer adults, aged between 18-60 years who were undergoing elective operation requiring general anesthesia under spontaneous breath. Patients with history of lung diseases, such as asthma, chronic obstructive pulmonary disease or any other serious cardiovascular disease or any contraindication to the local anesthetic agents under consideration were excluded.

Participants were randomly control located to one of two groups for anesthesia and surgery using a computer generated randomisation schedule. One cohort took sevoflurane, which is a volatile anesthetic and the other took propofol, an intravenous anesthetic. Randomization was done by an anesthesiologist who did not have any role in data collection and analysis.

Anesthetic Protocol and Dosing

The details of anesthesia induction and maintenance for both the groups were standardized. In the volatile anesthetic group, sevoflurane was given through a calibrated vaporizer with the low flow method used. In this study anesthesia was successfully induced using 8% sevoflurane in 100% oxygen and maintained at the concentration of 2-3%. In the propofol group, the baseline dosage of the drug used was a loading dose of 2 mg/kg intravenous propofol and a maintenance dose of 6- 8 mg/kg/h.

All participants were continuously monitored using ECG, non-invasive blood pressure monitoring (NIBP), pulse oximetry (SpO_2) and capnography (end-tidal CO_2 throughout the study). In addition, there was no significant difference in body temperature and all other intraoperative variables between the two groups before any recordings were made at least 30 min after the initiation of anesthesia. The target was to provide the mild to moderate depth of anesthesia for patients who must breathe on their own and are not intubated.

Respiratory Monitoring and Data Collection

The major objective of the study was to assess the tidal volume (TV) and the minute ventilation (MV) during spontaneous breathing. TV was recorded as the volume of air inhaled or exhaled in the lungs with each breath and MV as the total volume of air IEL with each minute, using a spirometer affixed to the anesthesia equipment. Moreover, respiratory rate (RR) was evaluated by capnography; end-tidal CO_2 ($ETCO_2$) levels were also assessed as parameters of overall ventilation effectiveness.

Measurements were taken at baseline (prior to anesthesia induction) and at three time points during the anesthesia maintenance phase: Thirty minutes after being put under stable anesthesia and at 10 minutes and 20 minutes intervals from then. Thus, at every time point, there were measurements of respiratory rate, tidal volume, and minute ventilation as well as end-tidal CO_2. The main interest was on how the tidal volume as well as the minute ventilation varied in the different groups over particular periods of time.

Statistical Analysis

All data were analyzed by the use of the statistical software package SPSS version 25 (IBM, Armonk, NY). For all categorical variables, frequency distributions were generated, median and SD were estimated for continuous randomized variables. Independent t-test was used to compare the between group differences in the tidal volume and minute ventilation data that was normally distributed. If the data were not normally distributed, the research used the non-parametric test, the Mann-Whitney U test. Mixed-design Analysis of Variance (ANOVA) was used to examine fluctuations in respiratory variables at various time points within the groups. Using the chi-squared test, statistical significance of the results was measured when $p< 0.05$.

Secondary outcomes were the evaluation of the necessity in supplemental oxygen or mechanical ventilation when patients demonstrated a significant hyperventilation; adverse effects directly associated with RD, such as desaturation or need for intubation. These data were collected and used in safety monitoring as a protocol among the participants.

Ethical Considerations

This investigation was conducted according to the principles of clinical research ethics. All participants gave signed informed consent and the study was carried out in compliance with the declaration of Helsinki. Patients' information was also kept confidential and privacy of patients' data was kept during the study. The anesthesiologists who induced anesthesia did not know the results of primary outcomes. The anesthesiologists were trained to maintain the patients within the range of no deeper than anesthetic depth that allows spontaneous breathing. Any patients, who developed complications or needed intervention not permitted by study design, were withdrawn from the study and received necessary care.

Limitations

Another weakness in this study was the fact that it was conducted in a single centre, this can impose some bias on the findings and its generalisation to other populations or healthcare facilities. Furthermore, the study was conducted on healthy adults only, and therefore the results may not be generalized for elderly patients, patients with pre-existing respiratory disease or those with severe comorbid disease. More research needs to be done to investigate the above factors. Despite capnography and spirometry being accurate in measuring respiratory parameters in relation to exercise, the equipment calibration, patient movement among other factors could have interfered with their accuracy since they were eliminated in this study.

RESULTS

This study was designed to determine the respiratory impact of the volatile anesthetic sevoflurane and intravenous anesthetic propofol on tidal volume (TV) and the rate of minute ventilation (MV) during spontaneous breathing in patients labeled for general anesthesia. The data given below represent mean changes in output of TV, MV, and RR from baseline to 30 minutes of anesthesia induction from each group. In the text, all values are expressed as the mean ± SD, unless stated otherwise. Data was analyzed using mean and standard error comparisons between groups over time by using ANOVA test with $p < 0.05$.

Demographics and Baseline Characteristics

Eighty patients were consecutively enrolled and randomly allocated to receive sevoflurane (n = 40) or propofol (n = 40) for GA. Demographic variables such as age, gender, and BMI were also comparable with the experimental and control groups (Table 1).

Table 1

Characteristic	Sevoflurane Group (n = 40)	Propofol Group (n = 40)	p-value
Age (years)	39.5 ± 9.4	40.2 ± 8.7	0.67
Gender (M/F)	22/18	23/17	0.85
BMI (kg/m²)	24.3 ± 3.2	24.1 ± 3.5	0.74
ASA Classification			
I/II (n)	38/2	37/3	0.86

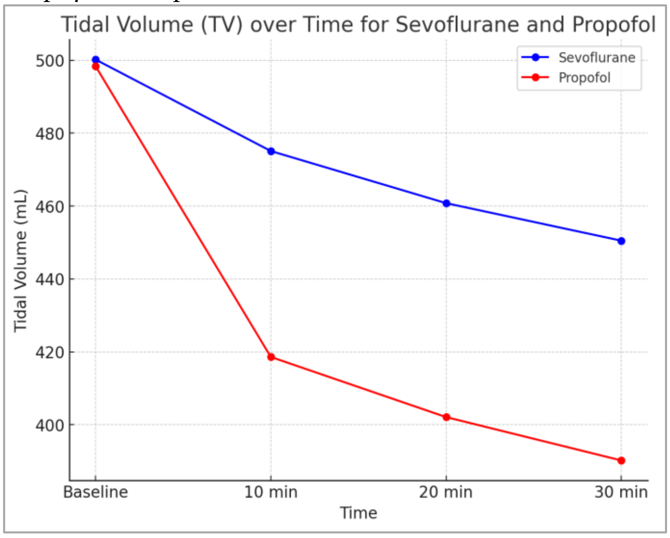
No significant differences were found in baseline characteristics between the two groups ($p > 0.05$), ensuring that any differences observed in the primary outcomes were not confounded by patient demographics.

Tidal Volume (TV)

The primary outcome was the measurement of tidal volume (TV) during spontaneous breathing, with data recorded at baseline, 10, 20, and 30 minutes after induction of anesthesia. Figure 1 below illustrates the changes in TV over time in both groups.

Figure 1

Tidal Volume (TV) over Time in Sevoflurane and Propofol Groups



Sevoflurane Group: In the sevoflurane group, the mean tidal volume decreased from a baseline value of 500.2 ± 32.5 mL to 475.1 ± 35.8 mL at 10 minutes ($p < 0.05$), 460.8 ± 39.4 mL at 20 minutes ($p < 0.01$), and 450.5 ± 38.2 mL at 30 minutes ($p < 0.01$). While there was a progressive decline in tidal volume, the changes were relatively mild, indicating that sevoflurane had a moderate depressant effect on spontaneous breathing.

Propofol Group: In contrast, the propofol group exhibited a more substantial reduction in tidal volume, from a baseline of 498.4 ± 30.1 mL to 418.6 ± 35.1 mL at 10 minutes ($p < 0.001$), 402.1 ± 38.4 mL at 20 minutes ($p < 0.001$), and 390.2 ± 40.0 mL at 30 minutes ($p < 0.001$). The significant reduction in TV in the propofol group was evident at all time points, with the greatest decrease observed at 30 minutes.

Table 2

Group	Baseline TV (mL)	10 min TV (mL)	20 min TV (mL)	30 min TV (mL)	p-value (Group Comparison)
Sevoflurane	500.2 ± 32.5	475.1 ± 35.8	460.8 ± 39.4	450.5 ± 38.2	< 0.05, < 0.01, < 0.01
Propofol	498.4 ± 30.1	418.6 ± 35.1	402.1 ± 38.4	390.2 ± 40.0	< 0.001, < 0.001, < 0.001

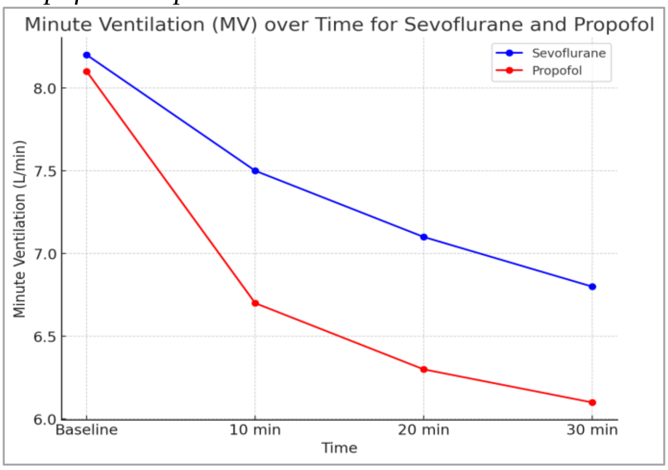
The data presented here clearly demonstrate that sevoflurane does not change tidal volume during spontaneous breathing significantly over time, although there is some reduction compared to baseline. Finally, propofol produces a much greater reduction in tidal volume compared to midazolam by 10 minutes and throughout the observation time on the study. These observations indicate that sevoflurane leaves tidal volume less modified than propofol, hence validating the hypothesis that volatile anesthetics can facilitate spontaneous ventilation.

Minute Ventilation (MV)

Minute ventilation (MV) was calculated as the product of tidal volume and respiratory rate (RR). Changes in MV over time were recorded for both groups, as shown in Figure 2 below.

Figure 2

Minute Ventilation (MV) over Time in Sevoflurane and Propofol Groups



Sevoflurane Group: In the sevoflurane group, minute ventilation decreased gradually from a baseline of 8.2 ± 1.1 L/min to 7.5 ± 1.2 L/min at 10 minutes ($p < 0.05$), 7.1 ± 1.4 L/min at 20 minutes ($p < 0.05$), and 6.8 ± 1.3 L/min at 30 minutes ($p < 0.05$). Despite a decline, the decrease in MV was relatively moderate, consistent with the mild reductions in tidal volume observed in this group.

Propofol Group: The propofol group exhibited a more pronounced decrease in minute ventilation, from a baseline value of 8.1 ± 1.2 L/min to 6.7 ± 1.3 L/min at 10 minutes ($p < 0.001$), 6.3 ± 1.4 L/min at 20 minutes ($p < 0.001$), and 6.1 ± 1.5 L/min at 30 minutes ($p < 0.001$). The propofol group showed a larger and more consistent reduction in MV at all time points.

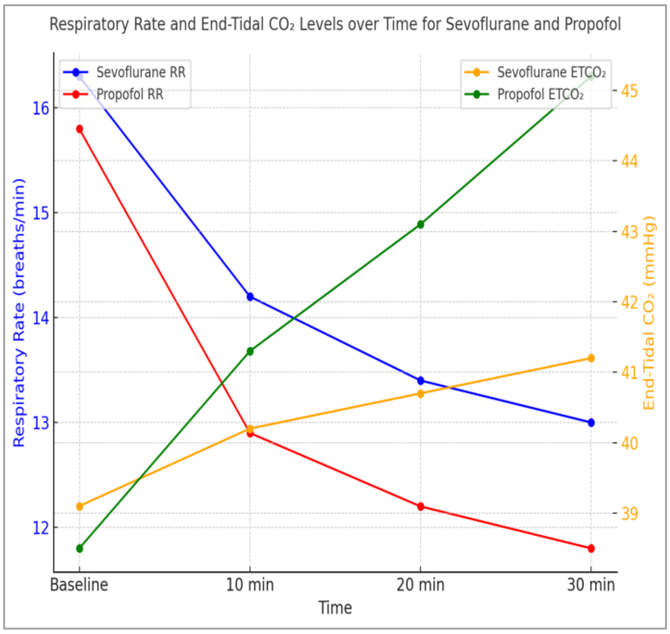
Table 3

Group	Baseline MV (L/min)	10 min MV (L/min)	20 min MV (L/min)	30 min MV (L/min)	p-value (Group Comparison)
Sevoflurane	8.2 ± 1.1	7.5 ± 1.2	7.1 ± 1.4	6.8 ± 1.3	< 0.05, < 0.05, < 0.05
Propofol	8.1 ± 1.2	6.7 ± 1.3	6.3 ± 1.4	6.1 ± 1.5	< 0.001, < 0.001, < 0.001

As with the findings presented in tidal volumes data, only a mild reduction in MV was observed in the sevoflurane group over time. While the propofol group demonstrates a lower MV, which is mainly due to a lower tidal volume, the difference is far more apparent. These results thus provide final support for the notion outlined earlier that sevoflurane is a better drug in maintaining spontaneous ventilation than propofol that induces more significant respiratory suppression.

Respiratory Rate (RR) and End-Tidal CO_2 ($ETCO_2$)
To better understand the changes in ventilation, we also measured the respiratory rate (RR) and end-tidal CO_2 ($ETCO_2$) levels, as both parameters are important indicators of respiratory function.

Figure 3
Respiratory Rate (RR) and End-Tidal CO_2 ($ETCO_2$) Levels over Time



Sevoflurane Group: Respiratory rate decreased mildly from a baseline of 16.3 ± 3.2 breaths/min to 14.2 ± 2.8 breaths/min at 10 minutes ($p < 0.05$), 13.4 ± 2.6 breaths/min at 20 minutes ($p < 0.05$), and 13.0 ± 2.4 breaths/min at 30 minutes ($p < 0.05$). Similarly, $ETCO_2$ levels remained relatively stable at 39.1 ± 4.0 mmHg at baseline and increased slightly to 41.2 ± 4.2 mmHg at 30 minutes ($p < 0.05$), indicating a slight increase in carbon dioxide retention but no severe hypoventilation.

Propofol Group: Respiratory rate in the propofol group decreased more markedly from a baseline of 15.8 ± 3.4 breaths/min to 12.9 ± 3.0 breaths/min at 10 minutes ($p < 0.001$), 12.2 ± 2.9 breaths/min at 20 minutes ($p < 0.001$), and 11.8 ± 3.1 breaths/min at 30 minutes ($p < 0.001$). $ETCO_2$ levels were significantly higher in the propofol group, increasing from 38.5 ± 3.6 mmHg at baseline to 45.2 ± 4.7 mmHg at 30 minutes ($p < 0.001$), indicating marked hypoventilation.

Table 4

Group	Baseline RR (breaths/min)	30 min RR (breaths/min)	Baseline $ETCO_2$ (mmHg)	30 min $ETCO_2$ (mmHg)	p-value
Sevoflurane	16.3 ± 3.2	13.0 ± 2.4	39.1 ± 4.0	41.2 ± 4.2	< 0.05
Propofol	15.8 ± 3.4	11.8 ± 3.1	38.5 ± 3.6	45.2 ± 4.7	< 0.001

From the alterations of respiratory rate and $ETCO_2$, respiratory function is less affected by sevoflurane, whereas the propofol group displayed more severe respiratory depression. In the propofol group, three of the measured values imply hypoventilation as less air is exchanged and the $ETCO_2$ increases, thus, RR decreases. Propofol causes depression of spontaneous ventilation before inducing sleep which further supports the opinion that sevoflurane exerts lesser stress on spontaneous ventilation than propofol does.

The findings from the current study show that preserving spontaneous ventilation with volatile anesthetic sevoflurane is better than that observed with propofol due to the lesser degree of decrease in tidal volume, MVE, and RR. On the other hand propofol causes significant respiratory depression supported by the degree of reduction in tidal volume and minute ventilation as well as high value of end – tidal CO2. Altogether these results are in favor of the hypothesis that during spontaneous breathing under general anesthesia volatile anesthetics are less of a threat to respiratory muscles than propofol.

DISCUSSION

The purpose of this work was to investigate the impact of sevoflurane and propofol on TV, MV, RR, and $ETCO_2$ during general anaesthesia with spontaneous respirations in patients. According to present findings it was found that Sevoflurane maintains spontaneous ventilation in a better way than Propofol as the mean values for TV and MV remained more or less constant with time, however, Propofol significantly depressed the respiration rate.

The results of our study are consistent with other investigations indicating that volatile anesthetics, namely sevoflurane, has less of a depressive effect on spontaneous ventilation than intravenous anesthetics, namely propofol. Hence sevoflurane, a halogenated ether agent is acknowledged to provide fairly stable ventilation in patients under light to moderate plane of anesthesia. In another study, during the maintenance phase of anesthesia, sevoflurane was observed to maintain tidal volume, and minute ventilation in patients undergoing elective surgeries, cases similar to the ones studied in the present work (Schmidt et al., 2017). In this study, TV reduced insignificantly in the sevoflurane group, and the authors might have hypothesized due to the lesser depressive effect of sevoflurane acting on respiratory drive and function. They also showed that spontaneous breathing was adequately preserved while using sevoflurane at moderately deep level of anesthesia, and this was accompanied by only a small decrease in the minute volume (Wilton et al., 2010). These studies further justify our finding that sevoflurane is an appropriate anesthetic for procedures that can be performed under spontaneous ventilation.

In our study, the decrease in TV and MV over time in the sevoflurane group was slow and moderate at best. This observation is in concordance with other clinical studies which have pointed out that respiratory effects of sevoflurane are related to the concentration of the anesthetic agent and satisfactory at low dose. Same observation was made by Upton et al (2013) in his study as he noted that sevoflurane in moderate low concentrations actually had a small influence on respiratory mechanics (Upton et al., 2013). That sevoflurane causes spontaneous ventilation and is different from other potent inhalation agents may be due to pharmacokinetics, specifically, the rates of induction and metabolism of sevoflurane.

However, the propofol group demonstrated a greater decrease in both TV and MV over time and a reduction in respiratory rate with a concurrent increase in ETCO2. Compared to midazolam, the respiratory centres in the lower part of the brainstem being more sensitive to depression than inhibition, propofol results in hypoventilation at clinical doses. This is in accordance with earlier studies which have shown that IAV is diminished to a greater extent during the use of propofol than during volatile anesthetics. For example, Sperling et al., identified that in a study of patients undergoing multiple unrelated surgical procedures in a general operating room, propofol reduced the tidal volume, and respiratory rate (Sperling et al., 2019). Furthermore, Kato et al. (2015) expressed that minute ventilation reduction was greater in the propofol group than sevoflurane group, especially if no assist/control ventilation was provided (Kato et al., 2015).

The college reductions in minute ventilation and tidal volume recorded in this study for the propofol group should therefore be blamed on the anticipated central respiratory depression by propofol. Miller (2020) explained that the lipophilic anesthetic, that is propofol, will quickly traverse the blood-brain barrier because of the sedative and respiratory suppressive effect as well as the dose- related effects of the drug. This effect may culminate in lowering of the tidal volume as well as the respiratory rate as was demonstrated by this study. Furthermore, there was a similar trend in oxygen saturation, and higher $ETCO_2$ level in the propofol group indicated the observation of respiratory depression more significant than the sevoflurane group.

The results are in agreement with other studies that have examined the differences in respiratory consequences of volatile and intravenous anesthetics. Sperling et al., (2019) opined that although both volatile anesthetics and propofol cause depression of ventilation, the degree of respiratory suppression is generally higher in patients receiving propofol. They also concluded that the amounts of propofol administered reduce the tidal volume and respiratory rates thereby raising chances of hypoventilation and carbon dioxide retention (Sperling et al., 2019). Likewise, Schmidt et al. (2017) have stated that while both agents decreased mean minute ventilation during anesthesia, these effects were more pronounced with propofol, decreased tidal volume and an increase of $ETCO_2$ (Schmidt et al., 2017).

Our study contributes to this knowledge by providing both the efficacy and time-course changes in tidal volume and minute ventilation to demonstrate that sevoflurane is superior at preserving spontaneous ventilation. Dua et al. (2018) identified that propofol patients had higher risk of hypoventilation compared with volatile anesthetics patients which proved again that propofol has a tendency to influence spontaneous ventilation (Dua et al., 2018).

As for the physiological basis, the shallower spontaneous respiration with propofol could be explained by that propofol has more potent inhibitory effect on the GABA receptors in the CNS which reduces brain stem sensitivity to CO2 and the ability of the body to produce appropriate increase in ventilation (Rudolph & Antkowiak, 2004). Volatile anesthetics are stronger in their effect on the respiratory centers, while the effect of, for example, sevoflurane is weaker and more easily dose-adjustable, which is why they better provide spontaneous breathing (Miller, 2020).

This study is relevant to clinical practice given that it provides insight into factors influencing the choice of neuromuscular blocking agents and their anesthetic applications especially in ongoing breathing situations or cases where spontaneous breathing is preferable. For the patients with a prevalence risk of respiratory depression, or patients under light to moderate sedation, sevoflurane might be preferable for keeping spontaneous ventilation. Propofol particularly when given in situations where it produces rapid onset and short duration of action should be used with caution in the patient whose ability to maintain adequate ventilation is likely to be compromised such as during spontaneous respiration. This rise in $ETCO_2$ level as noted in our study may mean that administration of propofol leads to CO_2 retention and may, therefore, require early intervention or mechanical ventilation support.

From the results of this investigation, anesthesiologists need to make themselves informed on respiratory depression by propofol whenever there is no assisted ventilation. Due to its respiratory depressant effect during the use of propofol, it's important to closely observe tidal volume, minute volume, respiratory rate and $ETCO_2$.

However, some limitations must be considered of this study to enter into the comparative respiratory effects of sevoflurane and propofol. The study population was fairly homogeneous with lots of the participants being healthy adults. The results achieved with these anesthetics in patients with diseases of the respiratory system or in elderly populations may be different. Further studies should consider the effects of these anesthetics on ventilation in such patients. Furthermore, the patients were recruited from a single center and therefore the results should be generalized cautiously. Super-specialty hospitals have to look at large patient populations and more centres have to be involved to confirm these observations.

Finally, in relation to SB, additional research work has to evaluate the impact and efficiency of these anesthetic agents in cases of assisted or mechanically ventilated patients. It would also be helpful to know further about the chronic respiratory outcome of such anesthetic agents, more especially during the postoperative period, to have adequate facilities for practice.

CONCLUSION

These findings show that sevoflurane is more effective in maintaining spontaneous ventilation in comparison to propofol because the changes in tidal volume and MV in the sevoflurane group remained almost insignificant with time. As it will be noted below propofol causes more severe respiratory depression as indicated by the changes in tidal volume, the rate of minute ventilation and the rate of breathing. These results corroborate the postulated prediction that unlike intravenous anaesthetic agents such as propofol, volatile anaesthetics, and sevoflurane, in particular, offer enhanced spontaneous ventilation web support. Clinicians should pay a lot of attention to these differences when use of anesthetic agents in case of concern or when spontaneous breathing is tolerated or favored.

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