Original Research Article

Comparison of effect of sevoflurane vs total intravenous anesthesia on extubation response and hemodynamic changes during general anesthesia in spine surgery patients

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Abstract

Introduction: Extubation is a very critical part of airway management. Although problems that can arise during induction and intubation, the risk for complications can be more frequent during extubation of the trachea because extubation significantly gets less attention than intubation and there are no well-established strategies. Similar to intubation, recognition of difficult extubation and planning is an important process.

Aim of the study: To compare the effects of Sevoflurane vs Propofol as TIVA on extubation response and hemodynamic changes during general anesthesia in spine surgery patients.

Materials and methods: This study was conducted in the Year of 2018-2019 Madras Medical College and Hospital, RGGH. Forty patients of ASA physical status I and II undergoing elective spine surgical procedures which were done general anesthesia with endotracheal tube were selected for my study. Patients aged between 18 to 65 years of both gender taken for randomized prospective study by comparing sevoflurane and propofol as total intravenous anesthesia on cough and hemodynamic changes during emergence for Spine surgeries after obtaining ethical committee approval in our institution and informed consent obtained.

Results: Pre-operative MAP value should be comparable to get unbiased results. Using the same normality above this concluded as normally distributed. Also, it is a continuous data. Unpaired Student t-test applied. The p-value was 0.929. Hence, both groups were comparable. Using the same statistical test above for normality this variable concluded as normally distributed. Mean for Group P was 87 and Group S was 107. Unpaired student t applied. p-value was 0.00 (significant). Hence, Propofol maintenance reduces the post-extubation HR shoots up. We compared the lowest Spo_2 to see which group was desaturating. This variable was not normally distributed so Mann-Whitney used it as a diagnostic test and p-value was 0.568. Hence this was insignificant. Emergence cough was a primary objective and it was non-continuous data so Fisher's exact test used. The p-value of this test was 0.00 which was a significant value. Hence maintenance with Propofol reduces the emergence of coughing.

Conclusion: We concluded that maintenance of anesthesia with Propofol is associated with reduced MAP and HR shoot up during emergence and Prolonged emergence time than sevoflurane, with comparable intraoperative hemodynamics, neuromuscular agent dose requirements and lowest Spo_2 in both groups.

Key words

Propofol, Sevoflurane, Coughing, Tachycardia.

Introduction

Extubation is a very critical part of airway management. Although problems that can arise during induction and intubation, the risk for complications can be more frequent during the extubation of the trachea [1] because extubation significantly gets less attention than intubation. And there are no well-established strategies [2]. Similar to intubation, recognition of difficult extubation and planning is an important process. Despite these important factors, the literature on extubation is significantly less comprehensive than intubation [3]. Nearly one-third of reported major airway complications occurred during extubation. Extubation Complications include hypoventilation, upper airway obstruction, laryngospasm, bronchospasm, vocal cord damage, negative pressure pulmonary edema, pulmonary aspiration, coughing and hemodynamic alterations like tachycardia, hypertension, dysrhythmias, and increased intraocular, intrathoracic, intracranial, intra-abdominal pressures [4]. All these complications and hemodynamic changes are undesirable. Coughing during emergence from anesthesia even though a protective physiological effect will cause significant patient's discomfort and that leads to hemodynamic alterations [5]. Balanced anesthesia is achieved by smaller doses of two or more agents than the usual larger dose of a single agent. The smaller doses are considered safe [6]. Premedication to reduce pre-operative anxiety, to decrease somatic and autonomic responses while manipulating the airway, for stable hemodynamics, to reduce dose requirements of inhalational agents. Opioids reduce the requirements of Propofol or inhalation agents, while as single anesthetic agents they produce excessive hemodynamic depression [7]. Total intravenous anesthesia describes the provision of anesthesia by intravenous infusions alone. Anesthesia is induced and maintained either by a combination of hypnotic and analgesic agents or by infusion of a hypnotic alone [8]. Total intravenous anesthesia is a strict definition that refers to the induction and maintenance of anesthesia using intravenous agents and an Oxygen and air mixture, but nitrous oxide is sometimes used as an adjunct [9]. The IV agents may be given by manual infusion or by an infusion device that is programmed with a pharmacokinetic model to achieve a target either plasma (Target controlled infusion plasma) or brain (Target controlled effect) concentration of the drug. When using an infusion of intravenous agents there is no point-of-delivery measure of the target concentration equivalent to the end-tidal monitoring of inhalational agents [10].

Materials and methods

This study was conducted in the year of 2018-2019 at Madras Medical College and Hospital, RGGH. Forty patients of ASA physical status I and II undergoing elective spine surgical procedures which were done General anesthesia with endotracheal tube were selected for my study. Patients aged between 18 to 65 years of both gender were taken for randomized prospective study by comparing sevoflurane and propofol as total intravenous anesthesia on cough and hemodynamic changes during emergence for Spine surgeries after obtaining ethical committee approval in our institution and informed consent obtained.

Inclusion criteria: Age: 18 to 65 years, ASA: I, II, Surgery: Elective, Body Mass Index <30 who had given valid informed consent.

Exclusion criteria: Not satisfying inclusion criteria, Not willing (Patient refusal), Preexisting Respiratory disease like asthma, COPD or recent respiratory tract infections, Patients with an anticipated difficult airway, Risk of post-operative aspiration, Allergic to drugs used, Patients with severe cardiovascular, Endocrine, respiratory, renal, hepatic, Psychiatric diseases.

Methodology

All patients who were satisfying inclusion criteria were included in this study. Routine investigations like complete hemogram, random blood sugar, blood grouping, and cross matching, renal function test, ECG, Chest radiograph posteroanterior view were done. All these patients were randomized into two groups i.e. Group P and Group S and were informed about the procedure and written informed consent was obtained. Age, weight, and height were recorded. All patients were premedicated with Tab. Alprazolam on the night before surgery. Inj. Glycopyrrolate 0.2 mg I.M. was given 45 min before intubation. Patients were shifted inside the operating rom. Basic monitors such as $EtCO_2$, ECG, NIBP, Spo2 were connected and baselines readings were recorded. Intravenous access obtained with an 18G intravenous cannula. Inj. Fentanyl was given and induced with Inj. Thiopental according to the patient's weight. Inj. Succinylcholine used as a relaxant for intubation and Inj Atracurium was used for maintenance relaxants. After intubation Group S maintained along with oxygen and nitrous oxide in 33:67% along with Sevoflurane whereas in Group P anesthesia maintained with Inj. Propofol infusion started by Bristol method as per 10- 8 - 6 rule. Per kilogram dose of 100 to 300 mics/kg/min kept. Intra op vitals, muscle relaxants consumption, Post-operative maximum heart rate, BP shoot up, lowest saturation and emergence cough incidence were noted.

Statistical analysis

All results obtained were analyzed by SPSS statistical package version 16 and Microsoft Excel. All continuous data with normal distribution analyzed with independent student t-test and not normal distribution data had done with the mean rank-sum test and non-parametric test by the Mann Whitney U test. All nominal data were analzsed with fisher exact and chi-square test.

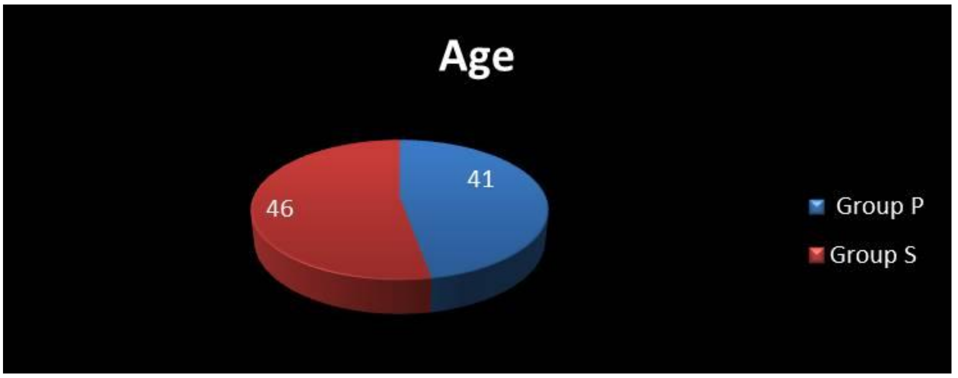
Results

Age between 18 to 65 years included in our study allotted into Group P and Group S. It was a continuous data. Distribution analyzed with the Kolmogorov-Smirnov test and Shapiro-Wilk concluded normally distributed. Since it was an ordinal variable with normal distribution also a small group Unpaired student t-test applied. P-value was 0.946 (insignificant). Sex was nominal data. There were 9 females and 11 males in Group P. and 11 females and 9 males in Group S. The statistical diagnostic test applies here was Fisher's exact test. P-value was 0.752 which was insignificant (**Graph – 1**).

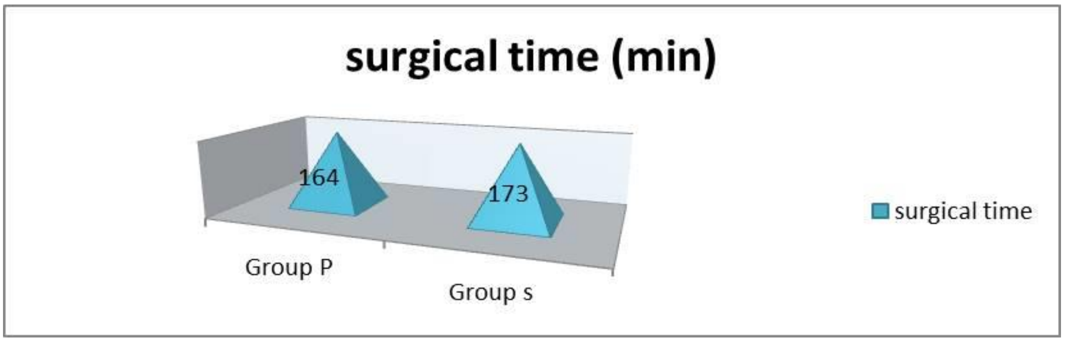
The duration of surgery was continuous data. Using the Shapiro-Wilk test and Kolmogorov-Smirnov test it was concluded as normally distributed. Hence, unpaired student t-test was applied. P-value was 0.407 (insignificant) as per **Graph - 2**.

Pre-operative MAP value should be comparable to get unbiased results. Using the same normality above this concluded as normally distributed. Also, it was a continuous data. Unpaired Student t-test was applied. The p-value was 0.929. Hence both groups were comparable. Same as Pre-operative MAP for pre-operative HR same statistical test applied. Using unpaired student t-test p valve obtained was 0.208. Hence both groups were comparable (**Graph – 3**).

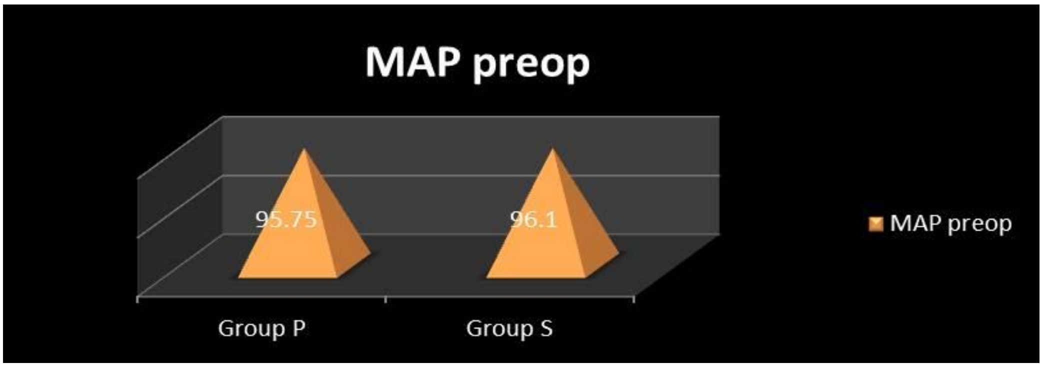
Graph – 1: Age distribution.



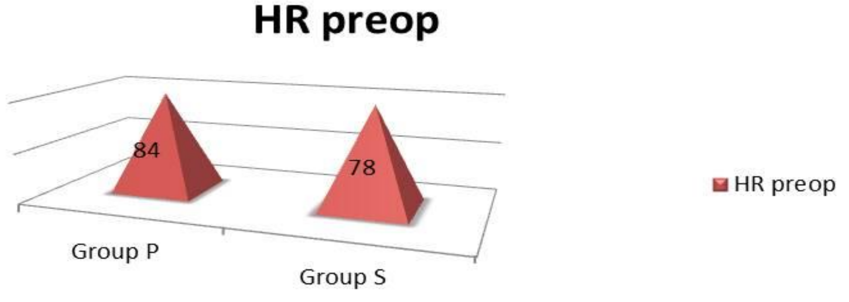
Graph – 2: Surgical time.



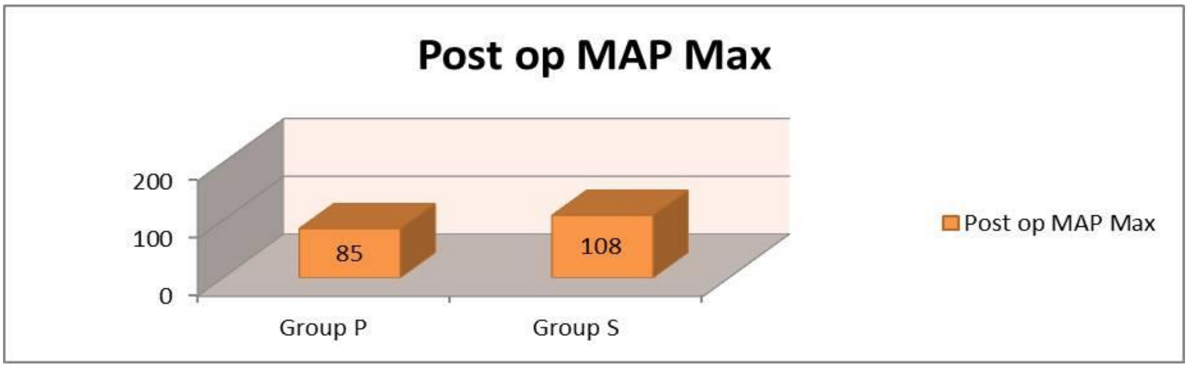
Graph – 3: Preoperative MAP.



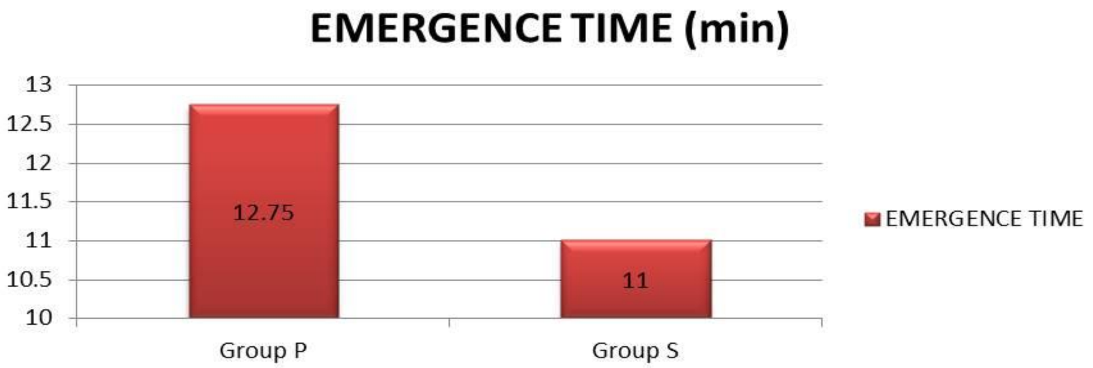
Graph – 4: Preoperative HR.



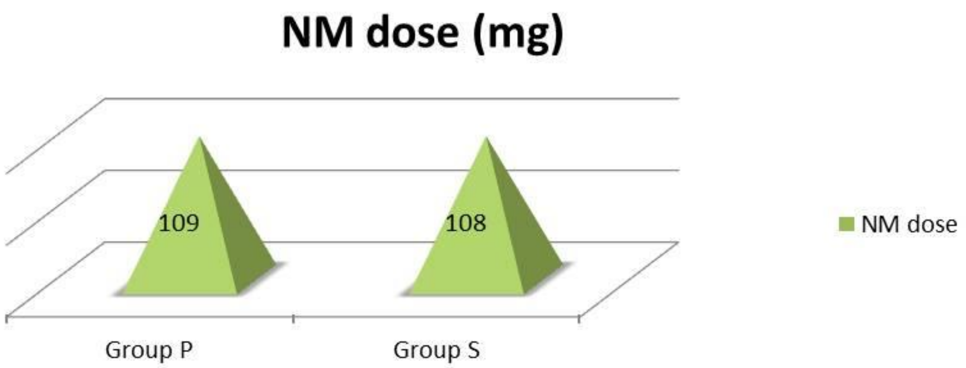
<u>Graph – 5</u>: Post-operative maximum MAP.



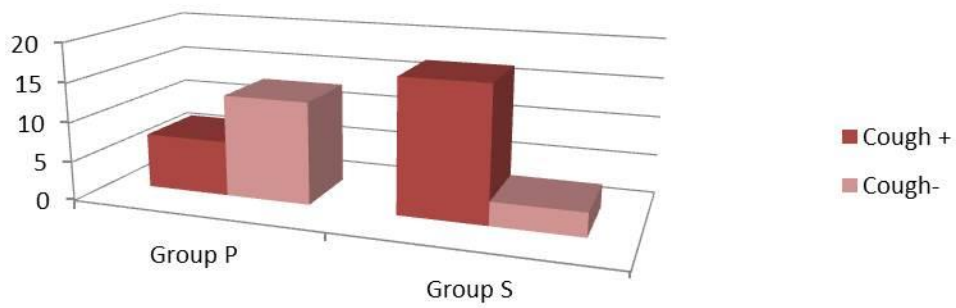
<u>Graph – 6</u>: Emergence time.



<u>Graph – 7</u>: NM dosage.



<u>Graph – 8</u>: Cough at emergence.



This was one of the primary objectives. Using the same statistical test above for normality this variable concluded as normally distributed. Mean for Group P was 87 and Group S was 107. Unpaired student t was applied. p-value was 0.00 (significant). Hence Propofol maintenance reduces the post-extubation HR shoots up (**Graph – 4**).

This was also one of our primary objectives with the same normality test for above continuous data used and concluded as normally distributed. Unpaired Student t-test was applied and concluded as significant (p-value 0.00). Hence, the propofol maintenance reduced the post-operative MAP shoot up (**Graph – 5**).

The emergence time was continuous data and as above it was concluded as normally distributed. Meantime for Group P was 12.75 min and Group S was 11 min. Unpaired t-test was applied. p-value was 0.04 (significant) as per **Graph – 6**.

This was continuous data and also normally distributed. The mean of Group P was 109 and Group S was 108. The unpaired student t-test was applied. The p-value was 0.565. Hence it was statistically insignificant (**Graph – 7**).

Emergence cough was a primary objective and it was non-continuous data so Fisher's exact test was used. The p-value of this test was 0.00 which was a significant value. Hence maintenance with Propofol reduced the emergence of coughing (**Graph – 8**).

Discussion

Extubation is a vital event and needs to manage carefully because of hemodynamic changes, bucking, coughing and vomiting. MAP, heart rate might get increased and if there is incomplete recovery Spo_2 might be decreased. And due to tracheal irritation from endotracheal tube patients may experience coughing [11]. Even though it's a protective reflex might cause distress to the patients and raise intra cranial, intrathoracic and intra-abdominal pressure. There are many methods to bring smooth emergence. In our study, we observed with TIVA with Propofol for the maintenance of general anesthesia in spine surgery patients [12]. A close study from Hughes MA, et al. who compared TIVA with a balanced anesthesia group and concluded the TIVA group has less cough emergence and hemodynamic changes than volatile. This author also has taken sevoflurane since it is less airway irritant than other volatile so it will be less biased when to compare cough emergence and the effects of smoking also taken to accounts [13]. Another study by Krasowski MD, et al. compared sevoflurane with Propofol to only sevoflurane in combined epidural with general anesthesia posted for gastrointestinal surgeries. On contrary to previous study awakening time shorter with sevoflurane and Propofol group than sevoflurane only group. He also concluded that lower cough and agitation and lower emergence Spo_2 in combined sevoflurane and Propofol group [14]. Forman SA, et al. did a study in spine surgery patients with Propofol alone for maintenance with conventional inhalational anesthesia with isoflurane. He concluded that post-operative nausea vomiting is reduced with the Propofol group also this group associated with clear awakening than isoflurane group [15]. Application of TIVA as maintenance for general anesthesia, in smooth emergence and intra operative hemodynamic and to avoid interruption by shifting from TIVA induction to volatile anesthesia maintenance during intubation. As we observed in our study TIVA group had subtle hemodynamic changes during emergence than the sevoflurane group and also emergence cough response is suppressed [16]. This might be very helpful in surgeries that might get affected by coughing like neurosurgery where the intracranial pressure will rise [17]. Although there is a chance that this might lead to inadequate recovery so careful post-operative monitoring is essential in these cases [18]. Also, anesthesia with Propofol will reduce postoperative nausea and vomiting compared to volatile agent maintenance because of the antiemetic action of this drug even in subanesthetic dose [19, 20].

Conclusion

In our prospective randomized comparative study to evaluate the effect of Sevoflurane vs Propofol as total intravenous anesthesia on extubation response and hemodynamic changes during emergence from anesthesia in spine surgery patients. We conclude that maintenance of anesthesia with Propofol is associated with reduced MAP and HR shoot up during emergence and Prolonged emergence time than sevoflurane, with comparable intraoperative hemodynamics, neuromuscular agent dose requirements and lowest Spo_2 in both groups.

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