Original Article

Hemodynamic Changes during Short Surgery Anaesthesia

Comparing the Hemodynamic Changes When Supraglottic Airway Devices Inserted with Propofol VS Sevoflurane During Short Surgical Procedures

Muhammad Zuhaib, Munir Ahmad, Hammad Rafiq and Aamir Furqan

ABSTRACT

Objective: To compare the hemodynamic changes when supraglottic airway devices are inserted with propofol versus sevoflurane during short surgical procedures.

Study Design: Our study is randomized controlled trial. Non-consecutive sampling technique was used to select a total of 54 patients.

Place and Duration of Study: This study was conducted at the Department of Anaesthesia, Nishtar Hospital, Multan from 15 March 2017 to 15 December 2017.

Materials and Methods: All the patients were randomly divided into two equal groups, one for propofol, Group-P and the other for sevoflurane, Group-S. Age, weight and height were documented. Electrocardiogram and non-invasive blood pressure monitors were used. After preparation, 2.5 mg/kg body weight of propofol was given to group-P, and a mixture of 8% sevoflurane in 8L/min flow rate of oxygen was used in Group-S. After evaluating the jaw relaxation, supraglottic airway devices were inserted. Pulse rate and mean arterial pressure were recorded before anesthesia, after inducing anesthesia, and at 0, 5 and 10 minutes after insertion of supraglottic device. Means were calculated and compared by applying the one way ANOVA, using SPSS v.23 software to analyze the data, considering $p \leq 0.05$ significant.

Results: In group-P and group-S, baseline pulse rate was 81.55±3.33/min and 89.48±4.34/min (p=0.000) at 5 minutes and 81.96±3.75/min and 85.00±3.11/min (p=0.002) at 10 minutes; and mean arterial pressure was 79.26±3.98 mmHg and 86.02±2.63 mmHg (p=0.000) at five minutes and 84.11±2.95 mmHg and 87.01±2.62 mmHg (p=0.000) at 10 minutes after insertion of supraglottic device, respectively. These differences were statistically significant in both groups.

Conclusion: It is concluded sevoflurane is a better agent as compared to propofol, in terms of stabilizing hemodynamics, for inducing anesthesia when supraglottic airway device is to be inserted.

Key Words: Hemodynamics, Propofol, Sevoflurane, Supraglottic Devices, Mean Arterial Pressure

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INTRODUCTION

Propofol is an intravenous anesthetic agent. It is used widely in surgical procedures because it results in good recovery from anesthesia and very few side effects[1]. Propofol anesthesia is associated with significant decrease in heart rate and mean arterial pressure[2]. Decrease in cardiac contractility, suppression of baroreflex response system and arterio-venous vasodilation all combined result in reduced vascular resistance and cardiac output and contribute to the hypotensive characteristics of propofol[3][4].

Department of Anaesthesia, Nishtar Hospital Multan.

Correspondence: Dr. Aamir Furqan, Assistant Professor. Department of Anaesthesia, Nishtar Hospital Multan.
Contact No: 0333-6203152
Email: draamir2009@hotmail.com

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Although the exact mechanism is not yet known, most of the propofol induced changes in the hemodynamics can be explained by the weakened sympathetic activity. On the contrary, lessened sympathetic response of heart due to propofol should result in decreased heart rate. Significant reduction in blood pressure and peripheral sympathetic activity has been caused by propofol anesthesia while the heart rate was high[5]. Anticholinergic prophylaxis has failed to avoid propofol-induced bradycardia as well asystole in healthy and adult patients. This reveals that the cardiac and peripheral autonomic activity is affected in a different way by propofol.

Sevoflurane is used for inducing and maintaining general anesthesia over a large scale. It is a volatile ether which has a high composition of fluorine gas. It is an aromatic and fire resistant agent[6]. Quick generation and appearance and rapid control of depth of anesthesia are the most wanted properties of sevoflurane. It decreases sympathetic nervous system

activity and contractility of heart but there is mild or no effect on peripheral neuronal activity[7] [8]. Ephedrine activates the sympathetic nervous system and increases heart rate. When anesthesia was induced with sevoflurane, is abolished the effects of ephedrine. His suggests that that sevoflurane suppresses the cardiac baroreflex response by blocking the efferent activity of vagus nerve. Block of peripheral autonomic neuronal activity causes a drop in blood pressure but simultaneous suppression of efferent vagal activity prevents the heart rate from rising in response to systemic hypotension.

Supraglottic airway devices are valuable for managing the common and problematic airways[9]. Classic type of laryngeal mask airway was introduced in 1980; and since then, the incidence of supraglottic airway devices use has been on the constant rise. Almost 56% of the general anesthesia procedures are managed by the use of such devices in UK. Both disposable and reusable forms of supraglottic airway devices are available for use. Different sizes of supraglottic airway devices are being manufactured keeping in view the patients' weight. Many types of supraglottic airway devices are available including classic laryngeal mask airway, laryngeal mask airway unique, laryngeal mask airway flexible, intubating laryngeal mask airway, laryngeal mask airway proseal, laryngeal mask airway supreme, combitube, i-gel, baska mask, 3gLM and SLIPA etc.[10]. When supraglottic airway devices are inserted, the pressure applied on the oral and pharyngeal mucosa is transmitted via glossopharyngeal, vagus and trigeminal nerve towards the vasomotor center of the brain and in response, sympatho-adrenal system is activated and catecholamines are released which cause an increase in heart rate, mean arterial pressure and consequently, the cardiac output[11].

As it is known that the supraglottic airway device insertion triggers sympathetic response whereas propofol and sevoflurane suppress the sympathetic cardiac responses to some extent. There is need to perform study about which one of propofol and sevoflurane attenuates the sympathetic activation -after supraglottic device insertion- in a better way. Or both of these drugs have equal effect on hemodynamics when supraglottic devices are inserted after inducing anesthesia with any of these agents.

MATERIALS AND METHODS

Our study was randomized controlled trial. Fifty four patients were selected using non-probability consecutive sampling technique; and the sample size was calculated using the study by Chavan SG et al.[12] as reference. This study was conducted over a time period from 15 March 2017 to 15 December 2017 in Departments of Anaesthesia, Nishtar Hospital, Multan. The consent was taken from the ethical committee of the Department.

All the patients were randomly divided into two equal groups, one for propofol, Group-P and the other for sevoflurane, Group-S. Informed consent was taken from each patient in written form. A pre-anesthetic assessment was done. After taking the patients to the operation theatre, intravenous wide bore lines were secured in the basalic and cephalic veins. Electrocardiogram and non-invasive blood pressure monitors were attached. Prior to anesthesia, ondansetron 4 mg and glycopyrrolate 0.2 mg were injected to all the patients and oxygenation was done with 100% oxygen at a flow rate of 8 liter per minute for at least 4 minutes. After that, injection fentanyl 2 mcg/kg and injection midazolam 1 mg were given and baseline pulse rate and mean arterial pressure were recorded. 2.5 mg/kg body weight of propofol was given to group-P, at a 40 mg per 10 sec rate. A mixture of 8% sevoflurane in 8 liter per minute flow rate of oxygen was used to induce anesthesia in Group-S. After assessing the jaw relaxation, supraglottic airway devices were inserted.

All the patients who did not consent, or suffered from ischemic heart disease, congestive heart failure, diabetes mellitus, any other disorder disturbing autonomic nervous system; and those taking medication that could affect the cardiovascular system, needing endotracheal intubation, undergoing head, neck or face procedures and the procedures which require muscle relaxation, were excluded from our study.

Age, weight and height was recorded and their means were compared. Pulse rate and mean arterial pressure were recorded before inducing anesthesia, just after inducing anesthesia and at 0, 5 and 10 minutes after insertion of supraglottic airway device. The data was entered on a pre-formed Performa. Their means were calculated and compared by applying the one way ANOVA test, using SPSS v.23 software to analyze the data. A value of p was considered significant if it was ≤ 0.05

RESULTS

A total of 54 patients were included in our study. All the patients were divided into two equal groups; group-P was anesthetized with propofol and group-S with sevoflurane. Mean age, weight and height of group-P were 36.33±4.10 years, 53.78±3.91 kg and 160.00±4.94 cm; and of group-S were 36.67±4.50 years, 54.78±4.04 kg and 159.37±5.48 cm, respectively. (Table-1)

In group-P and group-S, baseline pulse rate was 80.48±4.34/min and 80.48±4.34/min (p=0.663); after induction of anesthesia, 88.52±4.34/min and 84.25±3.98/min (p=0.000); and after insertion of supraglottic airway device at 0 min, 88.74±3.97/min and 88.78±4.04/min (p=0.973); at 5 min, 81.55±3.33/min and 89.48±4.34/min (p=0.000); at 10 min, 81.96±3.75/min and 85.00±3.11/min (p=0.002), respectively. (Table-2)

In group-P and group-S, baseline mean arterial pressure was 94.11±5.20 mmHg and 95.63±3.36 mmHg (p=0.209); after induction of anesthesia, 91.29±4.17 mmHg and 90.11±2.81 mmHg (p=0.226); and after insertion of supraglottic airway device at 0 min, 86.30±4.17 mmHg and 87.00±2.63 mmHg (p=0.462); at 5 min, 79.26±3.98 mmHg and 86.02±2.63 mmHg (p=0.000); at 10 min, 84.11±2.95 mmHg and 87.01±2.62 mmHg (p=0.000), respectively. (Table-3)

Table No.1: Demographic Characteristics

Variable	Group-P	Group-S
Age (years)	36.33±4.10	36.67±4.50
Weight (kg)	53.78±3.91	54.78±4.04
Height (cm)	160.00±4.94	159.37±5.48

Values are mean ± S.D

Table No.2: Pulse rate (beats/min)

Study Parameter	Group-P	Group-S	Test of Significance	
Baseline Pulse Rate	80.48± 4.34	80.48± 4.34	F=0.193	p=0.663
After Induction	88.52± 4.34	84.25± 3.98	F=14.12	p=0.000
At 0 min after Insertion	88.74± 3.97	88.78± 4.04	F=0.001	p=0.973
At 5 min	81.55± 3.33	89.48± 4.34	F=56.58	p=0.000
At 10 min	81.96± 3.75	85.00± 3.11	F=10.49	p=0.002

Values are Mean ± S.D; P≤0.05 is significant

Table No.3: Mean Arterial Pressure (mmHg)

Study Parameter	Group-P	Group-S	Test of Significance	
Baseline MAP	94.11± 5.20	95.63± 3.36	F=1.620	p=0.209
After Induction	91.29± 4.17	90.11± 2.81	F=1.502	p=0.226
At 0 min after Insertion	86.30± 4.17	87.00± 2.63	F=0.550	p=0.462
At 5 min	79.26± 3.98	86.02± 2.63	F=53.95	p=0.000
At 10 min	84.11± 2.95	87.01± 2.62	F=14.40	p=0.000

Values are Mean ± S.D; P≤0.05 is significant

DISCUSSION

Current study shows that inserting *supraglottic airway devices resulted in sudden rise of pulse rate in both group-P and group-S but there was a significant difference in group-P at 5 and 10 minutes after the insertion of device. Similarly, mean arterial pressure was relatively much stable in group-S as compared to the readings in group-P. Just after the insertion of the device, there was no significantly different affect on pulse rate and mean arterial pressure in both the groups. Pulse rate and mean arterial pressure were relatively stable in group-S but the differences were statistically significant in group-P.*

Chavan SG et al. [12] concluded in their study that sevoflurane was a better agent, in terms of effect over hemodynamics, for inducing anesthesia when supraglottic airway device was to be inserted. Propofol maybe the better agent in term of ease of insertion of device but not better in terms of stability of hemodynamics. In a study conducted by Hosseinzadeh H. et al. [13] in 2013, propofol resulted in hemodynamic instability and there were some undesired results in the form of decreased heart rate and low mean arterial pressure; and it was shown that propofol anesthesia was not associated with desirable results when supraglottic device was inserted.

A study by Erdogan MA et al. [14] disclosed that when patients were anesthetized with propofol and laryngeal mask airway was inserted, many patients required ephedrine to stabilize their hemodynamic status. Some patients even required higher doses of ephedrine. Ghafoor HB et al. [15] have established in their study that laryngeal mask airway insertion with propofol is coupled with hemodynamic instability and requires other measures to prevent adverse outcomes. According to study by Kanazawa M. et al. [16], clinical doses of propofol was unable to prevent the effects of supraglottic device insertion. Rather, drug like fentanyl was required to stabilize these effects.

Shao G. et al. [17], after conducting a study, came to a conclusion that that laryngeal mask airway insertion with propofol resulted in hypotension as compared to which, sevoflurane provided better control of hemodynamic stability, especially in elderly patients who have cardiovascular compromise. According to Topuz D. et al.[18], laryngeal mask airway insertion with sevoflurane anesthesia resulted in minimal change in hemodynamics as compared to propofol induction. So, sevoflurane appears to be a better alternative to propofol for supraglottic device insertion.

CONCLUSION

Current study reveals that sevoflurane was a better agent as compared to propofol, in terms of effect over hemodynamics, for inducing anesthesia when supraglottic airway device was to be inserted. It stabilizes the pulse rate as well as mean arterial pressure. On the other hand, propofol does not keeps the hemodynamics stable after insertion of supraglottic device. Sevoflurane is also useful in patients who are at risk of hemodynamic compromise.

Author's Contribution:

Concept & Design of Study:	Muhammad Zuhaib
Drafting:	Munir Ahmad
Data Analysis:	Hammad Rafiq, Aamir

	Furqan
Revisiting Critically:	Muhammad Zuhaib, Munir Ahmad
Final Approval of version:	Muhammad Zuhaib

Conflict of Interest: The study has no conflict of interest to declare by any author.

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