COMPARISON OF HAEMODYNAMIC CHANGES AFTER LARYNGEAL MASK AIRWAY INSERTION WITH PROPOFOL VERSUS SEVOFLURANE

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ABSTRACT

Objective: To compare haemodynamic changes on Laryngeal Mask Airway (LMA) insertion using tidal volume induction technique with sevoflurane at high concentration versus an intravenous induction with propofol.

Study Design: Randomized Controlled Trial (RCT).

Place and Duration of study: The study was carried out at Department of Anaesthesiology, Intensive Care and Pain Management, Military Hospital Rawalpindi from May 2006 to April 2007.

Patients and Methods: One hundred patients were enrolled after written informed consent. Patients were divided in two groups. Group A received propofol and group B received sevoflurane for induction of general anaesthesia. Heart rate and mean arterial pressure (MAP) were recorded one minute before induction of anaesthesia and three minutes after induction and LMA placement. Independent sample "t-test" was applied to compare means for MAP and mean heart rate in both the groups and p value was inferred to judge the significance.

Results: In group A 20 males and 30 females were enrolled for the study while in group B there were 16 males and 34 females. The mean age of the patients in group A was 30.5 ± 4.8 years while in group B was 28.4 ± 5.2 years. Mean weight was 60.5 ± 5.8 and 62.2 ± 4.7 kilograms respectively in both groups. Twenty two patients were ASA I and 28 were classified as ASA II in group A while 27 were ASA I and 23 were ASA II in group B.

In the group A, MAP was recorded to be 90 ± 5.3 mmHg before induction and 79.9 ± 7.5 mmHg after LMA placement following propofol induction. Whereas MAP in Group B before induction of anaesthesia and after LMA placement were 90 ± 4.8 and 84.2 ± 7.03 mmHg respectively. The fall in MAP was found to be significant in Group A when compared to Group B after induction and insertion of LMA (p value < .005).

In group A, mean HR was recorded to be 79.1 ± 4.3 before induction and 82.2 ± 8 per minute after LMA placement following propofol induction. While mean HR in Group B was 78.1 ± 7.8 before induction and 83.3 ± 8.0 per minute after LMA placement following sevoflurane induction. Hence, we found no significant difference in terms of change in mean HR between the two groups (p value > 0.4) before and after LMA insertion.

Conclusion: Considering more fall in the MAP following propofol induction in group A and as there was no significant change in MAP and heart rate before and after sevoflurane induction, we conclude that sevoflurane provided better haemodynamic stability than propofol for LMA insertion.

Keywords: Propofol, sevoflurane, laryngeal mask, tidal volume technique.

INTRODUCTION

Laryngeal mask Airway (LMA) is used in anaesthesia and in emergency medicine for airway management. It consists of a tube with an inflatable cuff that is inserted into the pharynx. It causes less haemodynamic stress response, pain and coughing than an endotracheal tube, and is much easier to insert[1]. A standard LMA does not protect the lungs from aspiration, making it unsuitable for use in such settings. However, for the last fifteen years LMA has been safely and effectively used for controlled and spontaneous ventilation[2,3]. The LMA can be successfully inserted after the suppression of airway reflexes by deep anaesthesia[4,5].

Among the available intravenous anaesthetic agents, propofol is the most appropriate agent for LMA insertion as it has a rapid induction, abolishes the airway reflexes and has some antiemetic activity[6]. However propofol has its own side effects, the most concerning for the anaesthetist is its

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Received: 24Dec 2009; Accepted: 16 April 2010

cardiovascular suppression. Among the other side effects are pain and excitatory phenomenon on induction[7]. Like all other intravenous anaesthetic agents, its use is not advisable in patients with airway obstruction[8].

Sevoflurane is an inhalational anaesthetic agent. It is considered superior to other inhalational anaesthetic agents as it is not irritant to airways like isoflurane and desflurane. Unlike halothane it does not cause significant bradycardia at higher doses. These characteristics make it the drug of choice when inhalational induction is required. It can also be used as an alternative to propofol for LMA placement because of its said profile and rapid induction and recovery characteristics[9,10]. It has a smoother transition to maintenance phase without the period of apnea. Use of sevoflurane is safe both in paediatric and adult patients because of lack of nephrotoxicity and minimum metabolism in liver[11]. However, sevoflurane is associated with delayed jaw relaxation and longer time for insertion of LMA[12]. Both tidal volume and vital capacity induction can be achieved with sevoflurane. In tidal volume induction, patient is asked to breath in the face mask with a mixture of 6% sevoflurane, 60% nitrous oxide and 40% oxygen and induction can be achieved in less than three minutes. In vital capacity induction, patient is asked to expire fully and then inhale a mixture of 8% of sevoflurane in 60% nitrous oxide and 40% oxygen through face mask to full extent and then hold breath which induces induction.

Our study was designed to test the hypothesis that tidal volume inhalation induction with high concentration sevoflurane could provide better haemodynamic stability when compared to propofol for LMA insertion in adults.

PATIENTS AND METHODS

This randomized controlled trials (RCT) was carried out at Anaesthesia Department Military Hospital Rawalpindi from May 2006 to April 2007, after seeking permission from the Hospitals Ethics Committee.

One hundred patients of the American Society of Anaesthesiology (ASA) physical status- I and II, aged between 15-40 years were enrolled in the study. Patients with cardiovascular, pulmonary, renal and liver dysfunctions were excluded. Similarly women who were either pregnant or breast feeding were also not included in the study. Informed written consent was taken from all patients selected for the study. Each patient was visited in the ward, the evening before surgery for detailed pre-anaesthesia evaluation. Using random number table patients were either placed in Group A (Propofol Anaesthesia) or Group B (Sevoflurane Anaesthesia) of fifty patients each.

In the operation theatre intravenous line was established using an 18 gauge cannula. Patients of both groups received 0.03 mg/kg of midazolam as premedication 20 min before induction. Standard monitoring which included non-invasive blood pressure (NIBP), electrocardiography (ECG) and pulse oximeter were attached to the patient. Heart rate (HR) and mean arterial pressure (MAP) of the patients were recorded one minute before induction of anaesthesia.

Patients in group A received propofol (2.5mg/kg) at 4ml/10sec and patients assigned to Group B received sevoflurane 6% in 60% nitrous oxide and 40% oxygen through face mask. Patients were asked to open their eyes every 5 seconds while their breathing was still normal. Loss of consciousness was determined by patients no longer opening their eyes and this condition was assured with eyelash reflexes. The LMA was inserted after the eyelash reflex was lost and when patient showed no movement on forward jaw thrust. Anaesthesia was maintained with 2% sevo-flurane in 60% nitrous oxide and 40% oxygen mixture. LMA insertion was confirmed by chest wall expansion, auscultation and capnography. Pulse and mean arterial pressure were recorded three minutes after the LMA placement.

Statistical Analysis

Statistical analysis has been carried out by entering all the data in Statistical Package for Social Sciences (SPSS) version 17.0. Mean and

standard deviation of different variables were calculated and then independent sample t- test was applied to compare means and

P value <0.05 was considered was significant.

RESULTS

Group wise demographic characteristics and ASA classification of patients in both groups are shown in table.

In the group A, MAP before induction of anaesthesia was 90 ± 5.3 mmHg and after propofol induction and LMA placement was recorded to be 79.9 ± 7.5 mmHg (Fig.1). Whereas MAP in Group B was 90 ± 4.8 mmHg before induction of anaesthesia and 84.2 ± 7.03 mmHg after sevoflurane induction and LMA placement (Fig. 2). The difference in fall in MAP in group A was found to be 8.7± 2.1 mmHg and in group B was found to be 4.2±1.4 mmHg. The fall in MAP was found to be significant in Group A when compared to Group B after induction and insertion of LMA (p value<.005).

In the group A, mean HR before induction of anaesthesia was 79. 1 ± 4.3 per minute and after propofol induction and placement of LMA was recorded to be 82.2 ± 8 per minute. While mean HR in Group B was 78.1 ± 7.8 per minute before induction of anaesthesia and 83.3 ± 8.0 per minute after sevoflurane induction and LMA placement. The mean change in heart rate was found to be 2.5 ± 1.1 beats per minute in group A while in group B it was calculated to be 2 ± 1 beats per minute. Hence, there was no significant difference in terms of mean HR between groups (p value>0.4) before and after induction of anaesthesia and LMA insertion.

Both groups exhibited stable haemodynamic profiles, although propofol produced a larger decrease in mean blood pressure compared with sevoflurane.

DISCUSSION

Maintenance of airway is always the primary concern for the anaesthetist. Endotracheal intubation is usually carried out for the maintenance of general anaesthesia. However endotracheal intubation is also associated with haemodynamic stress response.

Table: Demographic Data and ASA Classification of the patients in both groups

		Group A (n=50)	Group B (n=50)	P values
Male : Female		20 : 30	16 : 34	0.404
Age (years)		30.5 ± 4.8	28.0 ± 5.2	>0.05
Weight (kilograms)		60.5 ± 5.8	62.2 ± 4.7	>0.05
ASA Status	**ASA I (n)**	22	27	0.317
	ASA II (n)	28	23	

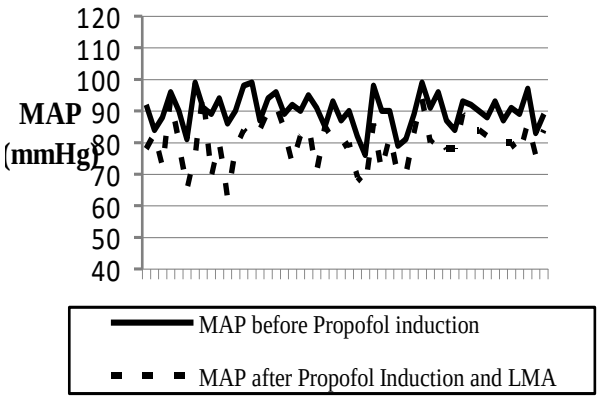

Figure 1: Value of MAP for each Patient in Group A. Dotted line showing significant fall in MAP after induction and LMA placement.

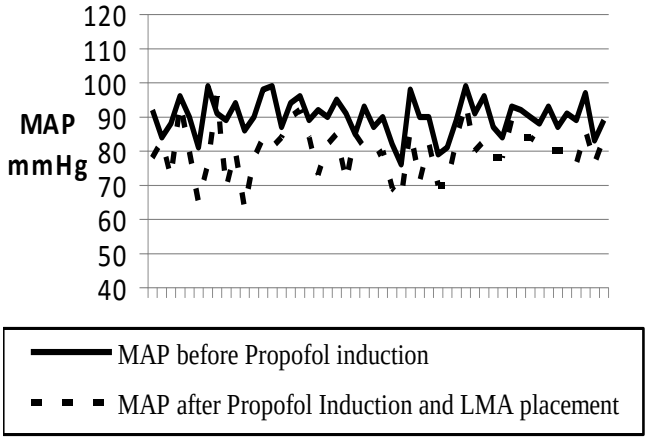

Figure 2: Value of MAP for each Patient in Group B. Dotted line showing a less fall in MAP after sevoflurane induction and LMA placement.

This stress response might not be of concern in young healthy patients, but in patients with limited cardiovascular reserves, this can be very detrimental and totally unacceptable. LMA is a good alternative to endotracheal intubation in such patients to minimize this response[13,14]. It has been seen that the insertion of the LMA causes a smaller increase in MAP and HR than endotracheal tube in healthy normotensive adults. It is likely that direct stimulation of the trachea by an endotracheal tube results in this stress response. There are many studies conducted throughout the world which have compared the number of parameters like ease of insertion, hiccupping, airway obstruction, laryngospasm, cough and odour perception after LMA placement with propofol or sevoflurane. But we did not find a single study which solely compared the haemodynamic changes after LMA insertion with propofol or sevoflurane. This study was designed to find out the ideal drug which would cause minimal haemodynamic changes on LMA insertion.

Propofol, a phenol derivative, is considered to be the drug of choice for LMA insertion as it abolishes laryngeal reflexes and prevents laryngospasm also having some antiemetic quality[15]. However it causes a fall in blood pressure mainly due to vasodilatation which is even more pronounced than pentathol[16].

Sevoflurane is an alternative anesthetic induction agent to propofol[17,18] as it has a pleasant odour, does not irritate the airways, provides a rapid induction, easy titration and has fewer side effects[19]. Though sevoflurane is used in high concentrations as compared to other inhalational anaesthetic agents it provides anaesthesia without any problems because of its pleasant odour[20,21].

If sevoflurane provided better haemodynamic stability than propofol, then it can be used for LMA placement especially in cardiac patients where even a little haemodynamic instability can be detrimental. The major finding in the this study was the significant fall in MAP after propofol induction as compared to sevoflurane, with an insignificant difference in the increase in heart rate in both groups. In terms of haemodynamic changes Jellish et al[22], Thwaites et al[23], and Shao G et al[24] had detected significant decrease in MAP and insignificant rise in heart rate after propofol induction as compared to sevoflurane group. These results are similar to our study where the fall in MAP after propofol induction was significant (p value < 0.005) when compared with sevoflurane. Similarly there was no significant difference between two groups in terms of heart rate (p value >0.4).

Our study is in contrast to Kati I et al[20] who detected no significant difference between groups in terms of mean arterial pressure (MAP). However within both groups there was a significant decline in MAP values after induction when compared to the pre-induction values (p<.01). In the terms of heart rate they did not detect any significant difference between groups; these results however match our study.

Similarly Fredman et al[19] detected some different results. They deducted a decrease in MAP and HR in comparison to pre-induction values in both groups. Decrease in heart rate in sevoflurane group was more significant than propofol group whereas decrease in MAP in propofol group was more significant than sevoflurane group. The fall in MAP was in accordance to our study but the results of the other parameter (heart rate) did not match our study.

CONCLUSION

In terms of haemodynamic stability, sevoflurane is a better induction agent than propofol for the placement of LMA. This fact can be of huge advantage in patients with compromised cardiovascular status. As compared to sevoflurane, the patient receiving propofol showed a significant decrease in MAP after placement of LMA. Both the groups had an increase in heart rate after LMA placement, but that increase was insignificant. Although standard practice of using Propofol as a drug of choice in patients selected for LMA placement as for maintenance of anaesthesia, our recommendation would be to replace it with Sevoflurane as induction agent in patients who have a limited cardiovascular reserves.

COMPETING INERESTS

I declare that I have no competing financial, professional or personal interests that might have influenced the performance or presentation of this work described in this manuscript.

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