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Comparison between propofol and sevoflurane for insertion of the laryngeal mask airway.

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ABSTRACT

Objectif: The aim of our study was to compare Sevoflurane and Propofol for laryngeal mask airway (LMA) insertion.
Materiels and methods: This is a comparative observational prospective study carried out in the central block of the Military Hospital Instruction Mohammed V, including 44 patients proposed for programmed surgery. Patients are divided into 2 groups: Group P (21 patients) receiving propofol at the time of induction and Group (S) receiving sevoflurane. In both groups, a dose of opioids (3µg/kg) was administered.
The comparison between the two groups focused on demographic characteristics of the patients, delay of loss of the ciliary reflex, quality of the relaxation, presence or not of spasm, hemodynamic repercussion especially variations of heart rate and blood pressure and respiratory repercussion.
Results: The delay of loss of the ciliary reflex was shorter in group P versus group S, muscle relaxation was better in group P compared to group S, the spasm concerned two patients of group
S. The hemodynamic repercussions were more marked in group P than in group S. Propofol offers better insertion conditions, Sevoflurane provides less hypotension during insertion, but insertion conditions remain suboptimal.
Conclusion: The use of sevoflurane can be proposed in the coronary insufficiency and the cardiac insufficiency apart from any contraindication of the establishment of the laryngeal mask airway and the use of sevoflurane.

KEYWORDS :
Laryngeal mask airway (LMA); Propofol; Sevoflurane; Insertion; Hemodynamic instability.

MAIN ARTICLE

INTRODUCTION

The laryngeal mask airway (LMA) is a supraglottic airway device designed to provide and maintain a seal around the entrance to the larynx for spontaneous ventilation and allow controlled ventilation at modest levels of positive pressure [1]. It then brings greater security of airway control and frees the hands of the anesthetist. The drawback is the need for deep induction anesthesia for placement [2].

Propofol is considered the drug of choice for the insertion of LMA during induction of anesthesia due to its depressant effect on airway reflexes [3]. However, propofol has been associated with several side effects, including hypotension, apnea, pain on injection [4], and excitatory movements [5].

Single vital capacity breath (VCB) inhaled induction of anesthesia with sevoflurane has been used as an alternative to IV induction in adults. It's rapid, with good hemodynamic stability and little excitatory phenomena [6].

In this study, we compared the quality and speed of the relaxation, presence or not of spasm, hemodynamic repercussion especially variations of heart rate and blood pressure and respiratory repercussion.

MATERIAL AND METHODS:

This was a prospective comparative observational study. It was carried out in the anesthesiology department of the Mohamed V Military Instruction Hospital in Rabat over a period of 06 months from February 2017 to August 2017.

In this study, after institutional ethical approval and written informed consent from all patients, were included consecutively the patients classified ASA I and II admitted for a planned surgery under a LMA. Were excluded from the study patients classified more than ASA II (ASA III, IV), those requiring the use of the laryngeal mask as a second-line treatment, patients allergic to sevoflurane and / or propofol, patients refusing this laryngeal mask technique and those requiring rapid sequence induction; and patients with predictive factors of difficult airway management.

Patients in the sample were randomized into two groups.

All patients were fasted for over 6 h and premedicated with oral Hydroxizine (1mg/kg).

Intraoperative monitoring included electrocardiogram, noninvasive blood pressure, oxygen saturation, end-tidal carbon dioxide, and airway pressure.

After an IV access with 18-gauge indwelling cannula was established, a slow infusion of crystalloid was started. Prior to induction, all patients inspired oxygen 100% at 6 L/min via a loosely applied face mask.

Patients were randomized into one of two groups for induction of anesthesia:

Group Propofol (Gr P): patients in this group (21 patients), induction was made with propofol at a dose of 3 mg / kg over 1 min. Lidocaine 1%, 2 ml, was mixed with each 20 ml syringe of propofol. Time to loss of consciousness was calculated from the time we started injection of propofol until loss of eyelash reflex and inability to open eyes upon verbal command. Thirty seconds after the completion of propofol induction, ease of mouth opening was assessed and if impossible, attempts were repeated up to 4 tries, each attempt preceded by propofol bolus 0.5 mg/kg IV.

Group Sevoflurane (Gr S): patients in this group (23 patients), induction was done with sevoflurane. A circle CO2 absorber circuit with a 3L reservoir bag was used. The circuit was primed with sevoflurane 6% in a 2:1 ratio of nitrous oxide to oxygen at a fresh gas flow of 6 L/min for 1 min. While breathing 100% oxygen from a separate breathing system, the patients were asked to take a deep breath and then exhale to residual volume. The mask with the primed circuit was then placed firmly over the patient's face. The patients were instructed to inhale a VCB (vital capacity breath) and hold it as long as possible. If necessary, a second breath was taken. The start of induction was taken as the point at which the patients completed their VCB. While holding their breath, the patients were asked to open their eyes every 10 s. Failure to do so was taken as loss of consciousness. This was confirmed by testing for the loss of eyelash reflex. Ninety seconds after completing the VCB to achieve equilibrium between the alveolar concentration of sevoflurane and the brain, the ease of mouth opening was assessed (possible or impossible). If mouth opening was impossible, another attempt was made every 30s up to a maximum of 4 tries. Between attempts, anesthesia was maintained with sevoflurane at a dial concentration of 6% in a 2:1 ratio of nitrous oxide to oxygen at 6 L/min.

In patients of both groups, a dose of opioids (3 μg/kg) was administered.

Once mouth opening was possible, insertion of the LMA was attempted and the degree of attenuation of laryngeal reflexes was assessed.

A size 3 or 4 LMA was used for patients weighing <70 kg or >70 kg, respectively, regardless of gender.

LMA was inserted by an experienced anesthesiologist (five years of clinical experience), using the technique recommended in the Intavent® LMA manual (Berkshire, UK). The cuff

was inflated with air in 3 ml increments until the LMA tube was seen to rise slightly out of patient's mouth.

LMA insertion was evaluated using the following criteria: mouth opening, ease of LMA insertion, swallowing, coughing, patient movements, and laryngospasm. This was classified as full when the LMA was inserted smoothly; partial when insertion was accompanied by gagging, coughing or involuntary movement; or poor when LMA insertion was impossible. Optimal ventilation was assessed by the following criteria: adequate chest expansion, square wave capnography, and stable oxygenation.

Time taken from induction and number of attempts taken were noted in both study groups. After 4 failed attempts, the patient's trachea was intubated. In case LMA insertion took more than 20 s or more than 4 attempts were required, it was considered as failure and the case was excluded from statistical analysis.

Noninvasive blood pressure, electrocardiogram lead II, pulse oximeter, ETco2, were recorded every minute for 5 min.

After fitting the LMA, maintenance of the anesthesia was performed by a mixture of nitrous oxide and sevoflurane with a MAC 2% and a fresh gas flow rate of 2L/min.

All patients received an analgesic protocol at the end of the operation. The choice of analgesics was made according to the sites and the type of surgery. The choice of mask size was made by the anesthesiologist.

The comparison between the two groups focused on: The demographic characteristics of the patients, time to loss of ciliary reflex (defined by the time between the start of anesthetic induction until the loss of ciliary reflex), quality of the release (was judged in three grades: good, average, and low), presence of spasm or not, hemodynamic repercussions, namely variations in heart rate and blood pressure, and respiratory repercussions.

Tachycardia was defined as a change in heart rate more than 30% from the values before anesthetic induction. Bradycardia was defined as a decrease in rate less than 45 beats/min. Arterial hypertension was defined as an increase in arterial pressure of more than 30% compared to preoperative values. Arterial hypotension was defined as a decrease in blood pressure of more than 30% compared to preoperative values. Desaturation was defined as a decrease in saturation below 95%.

At the end of the operation, the AMLs were removed with the patients still anesthetized. Once fully awake, the patients were evaluated by a blind investigator who asked them if they found the induction of anesthesia pleasant and if they had nausea or a sore throat.

Statistical analysis was performed using SPSS Statistics Base 22.0 software. We used student's t test for the study of quantitative variables, and a chi-square test for the study of qualitative variables. A difference is considered significant when $p < 0.05$.

RESULTS:

Our study was carried out in the central block of the Mohammed V Military Instruction Hospital, including 44 patients proposed for scheduled surgery.

Table 1 shows the various preoperative data of age, gender, Mallampati score, thyromentonial distance and mouth opening.

Loss of eyelash reflex time was 44.71 ± 1.34 seconds in the P group, shorter in the S group; 58.91 ± 3.36 seconds, the difference was significant ($p < 0.001$).

The jaw relaxation was good in 13 patients in group P versus 3 patients in group S, 6 patients in group P had average relaxation compared to 12 patients in group S, and 2 patients had poor relaxation compared to 8 in group S, the difference between the 2 groups was significant ($p = 0.003$).

Insertion of the LMA was considered very easy in 15 patients in group P against 3 patients in group S, easy in 6 patients in group P against 15 patients in group S, and difficult in 5 patients in group S. No cases of difficult insertion in group P were noted. The difference was significant with $p < 0.001$.

No patient presented a spasm in group P, against 2 reported cases of laryngeal spasm in group S, with no significant difference between the two groups ($p = 0.48$). (Table 2)

The incidence of arterial hypotension (arterial pressure less than 65mmHg) was higher in group P (10 patients) compared to group S (6 patients), but the difference was not was not significant ($p = 0.21$).

Heart rate was higher in group P with an average of 69.65 ± 5.02 beats per minute, compared to 75.61 ± 7.15 beats per minute in group S, the difference was significant ($p = 0.002$).

Two patients in group P presented desaturation with pulsed oxygen saturation <95% compared to 6 patients in group S. the difference was not significant ($p = 0.24$).

Three patients in group P presented with a cough at the time of insertion, compared to 6 patients in group S, with no significant difference between the 2 groups ($p = 0.46$). (Table 3)

DISCUSSION:

Several studies have compared the effectiveness of Propofol and Sevoflurane to insert the laryngeal mask airway, based on a number of parameters.

Regarding the time required for the abolition of the eyelash reflex, propofol has shown its marked speed compared to sevoflurane, these data are reported in several studies:

The study by Fredmann ad al [7] which included 146 patients, 98 patients in the propofol group and 48 patients in the sevoflurane group, observed an eyelash reflex abolition time of 90 ± 53 seconds in the Propofol group and 153 ± 100 seconds in the Sevoflurane group.

kati et al [8], in a study of 100 patients, 50 patients in each group, showed an eyelash reflex loss time of 50 ± 10 seconds in the Propofol group against 120 ± 30 seconds in the Sevoflurane group.

The study by Thwaites et al [9] found the same results on a sample of 102 patients, 51 patients in the propofol group and 51 patients in the sevoflurane group

Smith et al [10] have shown in a large study of 221 patients: 72 patients in the Propofol group, 69 patients in the Sevoflurane group and 70 patients in the Propofol-Sevoflurane mixture group an eyelash reflex loss time of 58, 3 seconds in the Propofol group against 84.1 seconds in the Sevoflurane group.

Tolba et al [11] objected in a study of 90 patients: 30 patients in the Propofol group, 30 patients in the Sevoflurane group and 30 patients in the Propofol-Sevoflurane mixture group, an eyelash reflex loss time of 65, 9 seconds in the Propofol group against 150.6 seconds in the Sevoflurane group.

In our study, abolition was faster in the propofol group compared to the sevoflurane group.

The study by Shirishkumar et al [12] on 60 patients, 30 patients in the propofol group and 30 patients in the Sevoflurane group showed superior relaxation in the propofol group compared to the sevoflurane group. Priya et al [13], in a study which involved 50 patients, 25 patients in each group, showed good relaxation in the propofol group compared to the sevoflurane group.

The study carried out by kati et al [8] showed that propofol offers better quality of relaxation compared to sevoflurane, and this in 100 patients, split equally between the two groups.

Our study objectified the same results with a superiority of propofol compared to sevoflurane for relaxation.

Fleishmann et al [14] in a study of 40 patients: 20 patients in the propofol group and 20 patients in the Sevoflurane group reported ease of insertion of the laryngeal mask in the propofol group versus the sevoflurane group,

The same results were reported in the studies by Shirishkumar et al [12] and Priya et al [13] While the study by kati et al [8] did not describe any difference between the two groups.

In our study, insertion was easier using propofol compared to sevoflurane. Laryngospasm has been described above all with sevoflurane and this in studies by molloy et al [15] on 88 ASA I and II patients, 44 patients in each group (propofol and sevoflurane), by Ti et al [16] on 38 patients in the Propofol group and 38 patients in the Sevoflurane group, a total of 76 patients, yurino and kimura [17] [18], reported the same results in two studies published in 1992 and 1993 on 60 patients, 30 patients in each group, while the work of kati et al [8] did not objectify any case spasm in both groups.

In our study, the two observed cases of laryngospasm concerned the sevoflurane group. However, no case of spasm was observed in the propofol group.

In our study, cough was clearly frequent in the sevoflurane group compared to the propofol group, which was indeed described in smith et al [10], molloy et al [15], yurino and kimura [17] [18] and kati et al [8].

The decrease in SpO2 at the time of insertion was observed in a single study by Rama Siva Naik D et al [19] on 60 patients, divided into two groups of 30 patients: the propofol group and the sevoflurane group, and that reported no case of desaturation in the two groups mentioned above, in our study the decrease in SpO2 was more frequent in the sevoflurane group. Sevoflurane showed its clear superiority in hemodynamic stability after induction compared to propofol in studies by soomro et al [20] on 60 patients: 30 patients in the propofol group and 30 patients in the Sevoflurane group.

Samina Aslam et al [21] on a study of 90 patients, 45 patients in the propofol group and 45 patients in the sevoflurane group, the same results are found in the study by kati et al [8]. And Mahananda Sarkar [22]. Our study objectified the same results.

Soomro et al (20)[20], Mahananda Sarkar [22], Samina Aslam et al [21] and kati et al [08] showed that tachycardia was more frequent in the sevoflurane group compared to the propofol group, and our study objectified the same result.

CONCLUSION

In our study, it was shown that insertion of the laryngeal mask using sevoflurane was associated with good hemodynamic stability compared to propofol. The choice between sevoflurane and propofol, for the insertion of the LMA, is made according to the patient's background, the presence of contraindications and the practitioner's experience.

TABLES :

Table I: Various preoperative data.

Parameters	Group P (n=21)	Group S (n=23)	P
Age (years) (m ± sd)	28,76 ± 5,10	30,13 ± 6,10	0.42
Gender (n)			0.14
Male	14	10	
Female	7	13	
Mallampati score (n)			0.9
1	14	15	
2	7	8	
Thyromentonial distance (n)			0.76
>6 cm	13	13	
5-6 cm	8	10	
Mouth opening (n)			0.50
>3 cm	14	18	
2-3 cm	7	5	

P: propofol, S: Sevoflurane, m: mean , sd : standard deviation, n: number.

Table II: LMA insertion conditions.

Parameters	Group P (n=21)	Group S (n=23)	P
Loss of eyelash reflex (sec) (m ± sd)	44,71±1,34	58,91±3,36	<0.001
Jaw relaxation (n): Good Average Poor	13 6 2	3 12 8	0.002
Insertion (n): Very easy Easy Difficult	15 6 0	3 15 5	<0.001
Laryngospasm (n): Yes No	0 21	2 21	0.48

LMA: Laryngeal mask airway , P: propofol, S: Sevoflurane, m: mean , sd : standard deviation, n: number,

Table III: The impact of induction and insertion of LMA

Parameters	Group P (n=21)	Group S (n=23)	P
MAP < 65mm Hg (n): Yes No	 10 11	 6 17	0.21
Heart rate (beat/min) (m± sd)	69,65 ± 5.02	75,61 ± 7,15	0.002
Desaturation (n): Yes No	 2 19	 6 17	0.24

LMA: Laryngeal mask airway , MAP: Mean arterial blood pressure, P: propofol, S: Sevoflurane, m: mean , sd : standard deviation, n: number,

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The authors declare that they have no conflicts of interest.

REFERENCES

[1]. Hagberg CA, Artime C. Airway management in the adult. Mill Anesth. 2015;8:1647-58.

[2]. Ferson DZ, Brimacombe J, Brain AI, Verghese C. The intubating laryngeal mask airway. Int Anesthesiol Clin. 1998;36:183-210. https://doi.org/10.1097/00004311-199803620-00013

[3]. McKeating K, Bali I, Dundee J. The effects of thiopentone and propofol on upper airway integrity. Anaesthesia. 1988;43:638-40. https://doi.org/10.1111/j.1365-2044.1988.tb04146.x

[4]. Sebel PS, Lowdon JD. Propofol: a new intravenous anesthetic. J Am Soc Anesthesiol. 1989;71:260-77. https://doi.org/10.1097/00000542-198908000-00015

[5]. Ho K, Chui P. The use of mini-dose suxamethonium to facilitate the insertion of a laryngeal mask airway. Anaesthesia. 1999;54:686-9. https://doi.org/10.1046/j.1365-2044.1999.00852.x

[6]. Yurino M, Kimura H. Induction of anesthesia with sevoflurane, nitrous oxide, and oxygen: a comparison of spontaneous ventilation and vital capacity rapid inhalation induction (VCRII) techniques. Anesth Analg. 1993;76:598-601. https://doi.org/10.1213/00000539-199303000-00026

[7]. Fredman B, Nathanson MH, Smith I, Wang J, Klein K, White P. Sevoflurane for outpatient anesthesia: a comparison with propofol. Anesth Analg. 1995;81:823-8.
https://doi.org/10.1213/00000539-199510000-00028

[8]. Kati I, Demirel CB, Huseyinoglu UA, Silay E, Yagmur C, Coskuner I. Comparison of propofol and sevoflurane for laryngeal mask airway insertion. Tohoku J Exp Med. 2003;200:111-8.
https://doi.org/10.1620/tjem.200.111

[9]. Thwaites A, Edmends S, Smith I. Inhalation induction with sevoflurane: a double-blind comparison with propofol. Br J Anaesth. 1997;78:356-61.
https://doi.org/10.1093/bja/78.4.356

[10]. Smith I, Terhoeve P, Hennart D, Feiss P, Harmer M, Pourriat J, et al. A multicentre comparison of the costs of anaesthesia with sevoflurane or propofol. Br J Anaesth. 1999;83:564-70.
https://doi.org/10.1093/bja/83.4.564

[11]. Tolba M, El-kassem MS, Agameya HM. Comparison between the induction of anesthesia using sevoflurane-nitrous oxide, propofol or combination of propofol and sevoflurane-nitrous oxide using laryngeal mask airway (LMA) in hypertensive patients. AJAIC. 2006;1:1-8.

[12]. Chavan SG, Mandhyan S, Gujar SH, Shinde GP. Comparison of sevoflurane and propofol for laryngeal mask airway insertion and pressor response in patients undergoing gynecological procedures. J Anaesthesiol Clin Pharmacol. 2017;33:97.
https://doi.org/10.4103/joacp.JOACP_313_15

[13]. Priya V, Divatia J, Dasgupta D. A comparison of propofol versus sevoflurane for laryngeal mask airway insertion. Indian J Anaesth. 2002;46:31-4.

[14]. Fleischmann E, Akca O, Wallner T, Arkilic CF, Kurz A, Hickle RS, et al. Onset time, recovery duration, and drug cost with four different methods of inducing general anesthesia. Anesth Analg. 1999;88:930-5.
https://doi.org/10.1213/00000539-199904000-00046

[15]. Molloy ME, Buggy DJ, Scanlon P. Propofol or sevoflurane for laryngeal mask airway insertion. Can J Anaesth. 1999;46:322.
https://doi.org/10.1007/BF03013222

[16]. Ti LK, Chow MY, Lee TL. Comparison of sevoflurane with propofol for laryngeal mask airway insertion in adults. Anesth Analg. 1999;88:908-12.
https://doi.org/10.1213/00000539-199904000-00041

[17]. Yurino M, Kimura H. Vital capacity breath technique for rapid anaesthetic induction: comparison of sevoflurane and isoflurane. Anaesthesia. 1992;47:946-9.
https://doi.org/10.1111/j.1365-2044.1992.tb03195.x

[18]. Yurino M, Kimura H. Induction of anesthesia with sevoflurane, nitrous oxide, and oxygen: a comparison of spontaneous ventilation and vital capacity rapid inhalation induction (VCRII) techniques. Anesth Analg. 1993;76:598-601.
https://doi.org/10.1213/00000539-199303000-00026

[19]. D.V. Rama, Siva Naik, Dr. Vishala. Comparison of propofol and sevoflurane for insertion of p lma. Indian Journal of Applied Research. 2015;5:2.

[20]. Soomro A. Comparison of propofol and sevoflurane for laryngeal mask airway insertion. J Rawalpindi Med Coll. 2013;17:268-70.

[21]. Aslam S, Firdous R, Ahmad H. Comparison of mean arterial pressure (MAP) changes on laryngeal mask airway insertion with propofol and sevoflurane. J Univ Med Dent Coll. 2014;5:18-22.

[22]. Sarkar M, Swaika S, Bisui B, Mandal MC, Sengupta S, Sheet J, et al. A comparative study of vital capacity breath inhalation with sevoflurane versus intravenous propofol to aid laryngeal mask airway insertion in adults. Int Surg J. 2016;1:73-6. https://doi.org/10.5455/2349-2902.isj20140804