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EFFECTS OF SEVOFLURANE, PROPOFOL, AND COMBINATION OF SEVOFLURANE AND PROPOFOL FOR CLASSIC LARYNGEAL MASK AIRWAY INSERTION IN ADULTS- A CLINICAL COMPARATIVE STUDY

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ABSTRACT

Background and Aims: Although LMA insertion is less invasive than endotracheal intubation, it also requires adequate mouth opening and blunting of minimal airway reflexes. Propofol is considered an appropriate IV agent for LMA insertion owing to its prompt induction and suppression of airway reflexes but induction doses required are often associated with hypotension, pain and apnea. Sevoflurane on the other hand, has minimal respiratory irritability, better hemodynamic stability and less apnea, but is associated with delayed jaw relaxation. Our hypothesis is that the combination of sevoflurane and propofol may be of better outcome whereby the insertion conditions of the LMA may be optimized adequately, at the same time the potential side-effects of individual drugs are effectively curtailed.

Methods: 90 patients aged 20-60yrs of ASA I and II, 30 in each group were induced with Propofol (2mg/kg) in Group P, 8% Sevoflurane in N_2O: O_2 (67%:33%) TVB technique in Group S and Group SP with additional propofol (1mg/kg) in Group SP after loss of eyelash reflex. Induction characteristics, hemodynamic parameters and complications were observed.

Results: 87% of the patients of Group SP had successful LMA insertion at first attempt, compared to 53% and 40% in Group P and Group S respectively, which was statistically significant. Less apnea was seen in Group SP(20%) as compared to Group P(60%), which was statistically significant.

Conclusion: Our study showed that the combination group stood out to be the best with highest successful LMA insertion at first attempt and less incidence of apnea.

INTRODUCTION

In anaesthesia, airway maintenance is of unquestionable importance yet it involves a great deal of anaesthetic prudence and dexterity. Of late, LMA has become a very popular tool due to its easy usability and swift insertion, even in the hands of a novice care provider with a success rate of 94% to 100%[1]. It has come into use in the emergency setting as an important accessory device for management of difficult airway.

In the year 1988, Dr. Archie Brain, a British anaesthesiologist, introduced Classic Laryngeal Mask Airway (CLMA)[2], which served to provide an alternative airway that is less invasive than endotracheal intubation and safer than mask ventilation for airway patency under anaesthesia. However, LMA insertion also requires adequate mouth opening and blunting of minimal airway reflexes such as coughing, gagging, or laryngospasm. Because of these reasons the search is on to find the most feasible anaesthetic agent or agents for LMA inseartion.

Among all anaesthetic agents, propofol and sevoflurane have been the most preferred IV anaesthetic and inhalational agent for LMA insertion respectively. Nevertheless, when used individually their side-effects like hypotension, apnea (propofol induction) and delayed jaw relaxation(sevoflurane induction), fails to make them an ideal agent. So, we hypothesised in our study that the combination of both the agents i.e., propofol and sevoflurane in calculated dosage may be of better result to meet the desirable insertion conditions while minimising some of the potential side-effects of the individual drugs effectively.

METHODS

After institutional ethical committee approval and written informed consent, study was carried out in Silchar Medical College and Hospital in 90 patients, aged 20-60yrs of ASA I and II undergoing elective procedures. All the patients were randomly allocated into three groups, 30 patients in each group.

1. Group $S_{n=30}$: patients were induced with sevoflurane 8% in N_2O and O_2 (67%:33%)
2. Group $P_{n=30}$: patients were induced with IV propofol (2mg/kg)
3. Group $SP_{n=30}$: patients were induced with sevoflurane 8% in N_2O and O_2 (67%:33%) and IV propofol (1mg/kg).

All the patients were pre-medicated with IV glycopyrrolate (0.2mg), ranitidine(50mg), ondansetron(4mg). IV fentanyl (1mcg/kg) were given 5 minutes prior to induction. All the patients in 3 groups were preoxygenated for 3 min with 100% oxygen.

- **In Group S**, patients were induced with circuit primed with inhalational anaesthetic mixture of sevoflurane 8% in N_2O:O_2 (67%:33%) and FGF at 8L/min with tidal volume breathing (TVB) technique. Patients were asked to breathe normally during induction of anaesthesia. The start of the induction was taken when the patients start taking breath from the circuit (time zero). Patients were asked to open their eyes every 10s. Failure to do so was taken as loss of consciousness, further confirmed by loss of eyelash reflex thereby time taken to loss of eyelash reflex was noted. After giving inhalation induction for 90s, the ease of mouth opening was assessed as adequate or inadequate. If adequate, time taken to jaw relaxation was noted. After adequate jaw relaxation CLMA of appropriate size was inserted and time taken to successful insertion was noted. If inadequate, attempts were made every 30s up to a maximum of 4. In between attempts, depth of anaesthesia was maintained with sevoflurane 8% in N_2O:O_2 (67%:33%) at 8L/min. And lastly number of attempts were noted.
- **In Group P,** patients were induced with IV propofol (2mg/kg) over 30s. While administering, patients were asked for feeling of pain on injection. Time to loss of

consciousness was noted from time of injection of propofol to the loss of eyelash reflex. 60s after induction, ease of mouth opening was assessed, if adequate CLMA of appropriate size was inserted and completion of successful attempt of insertion was noted. If inadequate, IV propofol (0.5mg/kg) was given every 30 s till maximum attempt of 4. In case of apnea during induction, ventilation was assisted manually between LMA insertion attempts.

- **In Group SP**, patients were induced with TVB technique same as Group S. Time taken to loss of consciousness was noted. After loss of eyelash reflex, the patients were given additional low dose propofol (1mg/kg) over 15s. 30s after giving propofol, ease of mouth opening was assessed. If inadequate, then additional propofol (0.5mg/kg) was given every 30s up to a maximum attempt of 4. In between attempts, depth of anaesthesia was maintained with sevoflurane 8% in N_2O:O_2(67%:33%) at 8L/min.

After insertion, the cuff was immediately inflated with air and positive pressure was applied to the reservoir bag in order to observe chest movement, to listen for leaks and to auscultate the lung fields, and to observe the end-tidal CO2 monitor. After confirmation of adequate bilateral air entry, LMA was fixed in position and connected to the anaesthesia machine and put on spontaneous ventilation. Anaesthesia was maintained with sevoflurane, N_2O and O_2 in Group S and SP whereas in Group P anaesthesia was maintained with intermittent bolus dose of propofol(0.5mg/kg), N_2O and O_2. For analgesia, inj. Paracetamol (15mg/kg) was given. Muscle relaxation was provided with IV Vecuronium(0.1mg/kg) as and when required.

RESULTS AND OBSERVATIONS

Data analysis was done from all the 90 patients of three groups. Age, sex, ASA and weight of the patients were comparable in all the three groups with p value of <0.005 as shown in Table 1.

The average time required for loss of eyelash reflex was 47.5±6.28 seconds in Group S, 38.8±5.79 seconds in Group P and 50.2±3.81 seconds in Group SP. Group S and SP showed longer time taken for loss of eyelash reflex, as compared with Group P which was found to be statistically significant with p value of <0.0001 as shown in Table 2.

The average time required for jaw relaxation was 47.5±6.28s in Group S, 38.8±5.79 s in Group P and 50.2±3.81s in Group SP. Group S and SP showed longer time taken for loss of eyelash reflex, as compared with Group P which was found to be statistically significant with p value of <0.0001 as shown in Table 3.

The average time required for successful LMA insertion was 193.53±6.30 s in Group S, 84.5±4.42s in Group P and 108.83±6.11s in Group SP as shown in Table 4. Time taken for successful LMA insertion was found to be longest in Group S when compared to Group SP or Group P and was also found to be statistically significant with p value of <0.0001.

The number of successful LMA insertion at first attempt was found to be more in Group SP as compared to Group S and Group P which was statistically significant with p value of 0.001as shown in Table 5. 87% of the patients of Group SP had successful LMA insertion at first attempt, 53% in Group P and 40% in Group S.

No significant changes were seen in heart rate, mean arterial pressure and SPO_2 at different intervals in all the three groups with p value of >0.05.

Out of all the side effects, apnea was mostly seen in Group P as compared to Group S and Group SP with p value of 0.003 which was statistically significant. 60% of the patients in Group P had episodes of apnea followed by 20% in Group SP and 10% in Group S as shown in Table 6. No laryngospasm were seen in all the three groups. Other side effects like gagging, coughing, excitatory movements and hiccups were seen in very few patients which was statistically insignificant.

Table 1: Demographic Profile Of Study Population

Category	Group S *(n=30)*	Group P *(n=30)*	Group SP *(n=30)*	p-Value
Age(in years) Mean ± SD	31.33±9.86	30.27±8.53	27.77±9.18	0.310**(NS)**
Sex:				
Male	14(46.7%)	15(50%)	15(50%)	0.999**(NS)**
Female	16(53.3%)	15(50%)	15(50%)	
ASA physical status:				
I	20(66.7%)	19(63.3%)	22(73.3%)	0.999**(NS)**
II	10(33.3%)	11(36.7%)	8(26.7%)	
Weight(in kg) Mean ± SD	59.8±6.99	61.43±6.03	60.8±7.41	0.649**(NS)**

*NS= not significant.

Table 2: Time Taken To Loss Of Eyelash Reflex (seconds) In Each Group

Time taken for loss of eye-lash reflex(seconds)	Group S *(n=30)*	Group P *(n=30)*	Group SP *(n=30)*	p-Value
Mean ± SD	47.5±6.28	38.8±5.79	50.2±3.81	<0.0001 (S)

*S=significant.

Table 3: Time Taken To Jaw Relaxation (seconds) In Each Group

Time taken for jaw relaxation (seconds)	Group S *(n=30)*	Group P *(n=30)*	Group SP *(n=30)*	p-Value
Mean ± SD	145.77±4.79	72.33±3.94	93.27±4.24	<0.0001(S)

Table 4: Time Taken To Completion Of Successful Insertion Of Clma (seconds) In Each Group

Time taken to completion of successful LMA insertion(seconds)	Group S *(n=30)*	Group P *(n=30)*	Group SP *(n=30)*	p-Value
Mean ± SD	193.53 ±6.30	84.5 ±4.42	108.83±6.11	<0.0001 (S)

Table 5: Number Of Attempts To Successful Lma Insertion In Each Group

Nos. of attempts to successful LMA-insertion	Group S *(n=30)*	Group P *(n=30)*	Group SP *(n=30)*	p-Value
1st	12(40%)	16(53%)	26(87%)	0.001(S)
2nd	11(36%)	12(40%)	4(13%)	
3rd	7(23%)	2(7%)	0	

Table 6: Comparision Of Side-effects In Each Group

Side-effects	Group S *(n=30)*	Group P *(n=30)*	Group SP *(n=30)*	p-Value
Apnea	3(10%)	18(60%)	6(20%)	0.003(S)
Laryngospasm	0	0	0	0.00
Gagging	1(3%)	0	1(3%)	1.000(NS)
Coughing	2(7%)	0	2(7%)	0.54(NS)
Excitatory movements	3(10%)	4(13%)	5(17%)	0.09(NS)
Hiccups	1	0	3(10%)	0.52(NS)

DISCUSSION

Several studies have been done to ascertain the perfect induction agent which shall provide excellent conditions for LMA insertion, while maintaining hemodynamic stability. In

our study, we compared the effects of sevoflurane and propofol individually and also compared with the combination of both the agents in providing optimal conditions for CLMA insertion and also the hemodynamic changes and side effects. All the three groups were comparable as regards to their demographic profile including age, sex, and weight.

We have found that the time taken for loss of eyelash reflex was 47.5±6.28 seconds and 50.2±3.81 seconds in Group S and SP respectively and it was longer than propofol group (38.8±5.79 seconds) with p value of <0.0001, which was significant. Our study was comparable to Sahar M Siddik-Sayyid et al study[3] where they found that the time taken for loss of eyelash reflex in group S and SP were 45±12s and 47±8s respectively which was longer than propofol group (39±9s) with p value=0.03, which was significant.

Time taken for jaw relaxation of sevoflurane, propofol and combination of sevoflurane and propofol were 145.77±4.79s, 72.33±3.94s and 93.27±4.24s respectively, which was longest in sevoflurane group with p value of <0.0001. Our finding was similar to Sahar M Siddik-Sayyid et al study, where they got 140±42s, 73±18s and 91±15s in group sevofurane, propofol and combination of sevoflurane and propofol respectively.

The time taken for successful insertion of LMA was 193.53±6.3s for sevoflurane group, 84.5±4.42s for propofol group and 108.83±6.11s for sevoflurane and propofol group, where propofol being the fastest with p value of <0.0001, which was significant. Our findings were comparable to Yamini Gupta et al study[4] where they got 202.70±20.41s in sevoflurane group, 93.50±31.92s in propofol group and 115.73±10.86s in the combination group.

The time taken for successful insertion of LMA was 193.53±6.3s for sevoflurane group, 84.5±4.42s for propofol group and 108.83±6.11s for sevoflurane and propofol group, where propofol being the fastest with p value of <0.0001, which was significant. Similar findings were observed in some other studies like Yamini gupta et al[4], Lian Kah Ti[5], Sivalingam et al[6], A. özgök, B.M. Dogan D. Kazanci[7], Udaybhaskar and Singam et al[8], Molloy et al[9] and Nellimarla Appalaraju et al[10].

Owing to its better performances as an inducing agent which takes less time of induction, providing faster jaw relaxation, propofol stands out to be a drug which takes less time to LMA insertion. This is also in perfect coherence to our study findings.

40% of LMA were inserted at first attempt in sevoflurane group, 53% in propofol group whereas 87% of successful first attempt insertion was found in combination group with p value of 0.001, which was significant. Similar to our study in Sahar M Siddik-Sayyid et al study, the percentage of patients who had successful LMA insertion at first attempt was larger in group SP as compared to groups S and P (P <0.001). First pass success rate of CLMA insertion in Yamini Gupta et al, Sahar M Siddik-Sayyid and A. özgök, B.M. Dogan, D. Kazanci et al study were 90%, 93% and 100% respectively.

There was no statistically significant difference in hemodynamic responses among the three groups.

Complications: Apnea was present in 60% of the patients in propofol group, which was statistically significant (p=0.003) as compared to sevoflurane (10%) and combination of sevofluane and propofol group (20%).

CONCLUSION

The combination of sevoflurane and propofol provided the right ingredient to our search for an ideal LMA inducing agent as it provided a fairly good inducing experience and is associated with the highest number of successful attempts at first insertion only with the least side effects of apnea across the three groups. Therefore, in our study, the combination groups of sevoflurane and propofol have stood out to be the best and the most ideal agent to provide the most conducive conditions for LMA insertion.

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