COMPARISON OF SEVOFLURANE AND PROPOFOL FOR LARYNGEAL MASK AIRWAY INSERTION IN CHILDREN

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ABSRTACT: BACKGROUND- We want to compare the Laryngeal mask insertion in children under Sevoflurane versus Propofol
MATERIALS & METHODS- It was a prospective randomized controlled study, conducted 60 patients who were posted for surgical procedures below umbilicus lasting less than 60 minutes.
RESULTS - Propofol and Sevoflurane are equally effective for LMA insertion in children. However, Propofol has a faster insertion time due to early onset of jaw relaxation compared to sevoflurane and high success rate in 1st attempt for LMA insertion whereas Sevoflurane has better hemodynamic stability and less side effects compared to propofol

KEYWORDS- LMA-Laryngeal mask airway, Propofol, Sevoflurane

INTRODUCTION

The major responsibility of an anaesthesiologist is to provide adequate ventilation for the patient by providing unobstructed airway. An anaesthetic technique is safe only when diligent efforts are devoted to maintain an intact functional airway. To maintain airway in an anaesthetized or unconscious patient we have supraglottic devices like anatomical face mask, laryngeal mask airway, cuffed oropharyngeal airway and combitube. Laryngeal mask airway was invented by Dr. ARCHIE BRAIN, United Kingdom in 1981. The LMA is an ingenious supraglottic airway device that is designed to provide and maintain a seal around the laryngeal inlet for spontaneous ventilation and allow controlled ventilation at modest levels of positive pressure. In controlled ventilation peak inflation pressure should not exceed 25cm H2O. An outstanding feature of LMA is that it provides a rapid clear airway in vast majority of patients and it is both faster and easier to insert than a tracheal tube. LMA can be used for pediatric and adult patients undergoing daycare surgeries. Successful insertion of LMA requires sufficient depth of anaesthesia and depression of airway reflexes to avoid gagging, coughing and laryngeal spasm. Propofol is the induction agent most commonly used for insertion of LMA. Sevoflurane is a recently introduced volatile anaesthetic agent which allows rapid smooth inhalational induction with excellent recovery. This study was being conducted to compare Sevoflurane and Propofol for insertion of laryngeal mask airway in children.This study was carried out in Dept. of Anaesthesiology, SV Medical College, Tirupati, during the period of January 2020 to January 2021

AIM OF THE STUDY

The aim of the study is to compare the conditions of Laryngeal Mask Airway insertion in children after induction of anaesthesia with either inhalation of sevoflurane or intravenous propofol. The time taken for induction, time taken for jaw relaxation, time to LMA insertion, hemodynamic parameters, complications during induction and LMA insertion are compared.

INCLUSION CRITERIA:

1. ASA I and II physical status.
2. No predicted airway difficulty.
3. Elective minor surgical procedures below umbilicus lasting less than 60 min.

EXCLUSION CRITERIA:

1. Patients at risk of aspiration – upper GI surgery, gastroesophageal disease, not fasted.
2. Patients who require high positive pressure ventilation – eg. Pulmonary fibrosis.
3. Known allergy to any anaesthetic

MATERIALS AND METHODS

Sixty patients of ASA physical status 1&2 undergoing elective minor surgical procedures below umbilicus lasting less than 60 mins. were included in the study. Patients belonged to age group of 4 – 12 of both sexes. It was a prospective randomized controlled study. The study was approved by institutional ethical committee and parent provided written informed consent before induction.

MATERIALS:

1. Classic Laryngeal mask airways of appropriate size
2. Propofol 1%
3. Sevoflurane
4. Fentanyl and glycopyrrolate
5. Appropriate size oral airways
6. 2,5 and 10 ml syringes
7. Lubricant jelly.

PREPARATION OF THE PATIENT:
Informed consent from the parent obtained. All patients were fasted as per NPO guidelines.

PREMEDICATION:
Syp. Triclofos 60 mg/kg po given 45 min before shifting the child to operating room.

MONITORS:
Standard monitors –
1. ECG
2. Pulse oximeter
3. NIBP
4. Precordial stethoscope were used..

METHODS:
Basal heart rate, blood pressure and oxygen saturation were recorded. Intravenous access established. Inj. Glycopyrrolate 10µg/kg and Inj. Fentanyl citrate 2 µg/kg i.v. given on table. Preoxygenation with 100% O2 done for 3 min.

INDUCTION:
Group P- Propofol group. Patients were induced with Inj. Propofol 3 mg/kg i.v. bolus with simultaneous mask ventilation with N2O/O2 mixture 2:1. Group S- Sevoflurane group. Patients were induced with Sevoflurane 7% inhalation in N2O/O2 mixture 2:1. The time to loss of consciousness and eyelash reflex was noted. Mask ventilation was continued until jaw relaxation was attained. After jaw relaxation was attained, LMA insertion done with standard technique by single person in both groups. The size of the LMA selected according to the weight of the patient and cuff volume as per manufacturer's instructions. The sizes used in this study were 2 &2.5.

SIZE OF LMA	BODY WEIGHT	CUFF VOLUME
2	10-20Kg	10 ml
2.5	20-30Kg	14ml

The time taken for loss of eyelash reflex, time to jaw relaxation were noted. The time to LMA insertion and number of attempts required for successful insertion were noted. Heart rate, blood pressure and oxygen saturation were recorded after induction and LMA insertion. Any complications during induction or LMA insertion like coughing, gagging, regurgitation, vomiting, patient movements, laryngospasm, apnea, traumatic insertion or gastric distension were noted

TIME TO INDUCTION – time taken from the administration of induction agent to loss of consciousness and loss of eyelash reflex.

TIME TO JAW RELAXATION – time taken from the administration of induction agent to relaxation of jaw required to open the mouth.

TIME TO LMA INSERTION – time taken from the administration of induction agent to successful insertion of laryngeal mask airway. Once LMA was inserted, adequacy of seal was checked and presence of bilateral air entry, gastric distension if any, were noted. A bite block was placed and the LMA secured in position with tapes.

MAINTENANCE OF ANAESTHESIA:
Spontaneous ventilation with N20/O2 mixture 2:1 ratio + Sevoflurane 2% with modified Jackson Rees ciruit. Regional blocks were given for intraop and postop analgesia (ilioinguinal block for hernia and hydrocele, penile block for circumcision) after fixation of LMA.

LMA REMOVAL:
Sevoflurane and N2O were tapered and discontinued at end of surgery and the patient,was oxygenated for 3 to 5 mins, allowed for spontaneous recovery and LMA removed in awake state. Oropharyngeal suctioning was done in cases who had secretions and patient was put in recovery position and observed in operating room for 30 min and shifted to recovery room. Patients were observed in recovery room for 60 min and shifted to postoperative ward.

OBSERVATION AND RESULTS
The study was conducted in Paediatric Surgery Operation theatres, Dept. of Anaesthesiology, SV Medical College, Tirupati, during the period of January 2020 to January 2021

Table -1
TYPES OF SURGERIES

SURGERY	GROUP P	GROUP S	TOTAL
Herniotomy	**11**	**14**	**25**
PV sac ligation	**8**	**6**	**14**
Circumcision	**9**	**9**	**18**
Others	**2**	**1**	**3**

ASA GRADE:
All patients of both groups belonged to ASA Grade I and II.

DEMOGRAPHIC PROFILE:
The sample of 60 group was taken for study. Data was expressed as mean ±SD or absolute values. Qualitative analysis was compared with Fischer's exact two tailed test and quantitative analysis was compared with student 't' test. The level of statistics significant was set up at $p < 0.05$.

Table – 2
Comparison of Age distribution

Group	N	Mean (Yrs.)	S.D.	Student t-test
Sevoflurane	**30**	**7.3**	**2.39**	t=0.66, P=0.51
Propofol	**30**	**7.73**	**2.66**	Not significant

The mean age in Sevoflurane group is 7.3yrs. and in Propofol group is 7.73yrs. The data is stastically insignificant (p>0.05) and thus both groups are comparable in terms of age

Table – 3
Comparison of weight distribution

Group	N	Mean (Kg)	S.D.	Student t-test
Sevoflurane	**30**	**20.03**	**4.31**	t=0.21, P=0.82
Propofol	**30**	**19.8**	**3.93**	Not significant

The mean weight in Sevoflurane group is 20.03 kg and in Propofol group is 19.8 kg. The data is statistically insignificant (p>0.05) and thus both groups are comparable in terms of weight.

Table – 4
Comparison of Sex distribution

Group	Female	Male	Total
Sevoflurane	4	26	30
Propofol	9	21	30
Total	13	47	60

Table – 5
Comparison of time to induction

Group	N	Mean (Secs.)	S.D.	Student t-test
Sevoflurane	**30**	**39.1**	**6.30**	t=1.71, P=0.09
Propofol	**30**	**41.4**	**4.17**	Not significant

The mean time to induction in Sevoflurane group is 30.1 secs and in Propofol group is 41.4 secs. The data is stastically insignificant (p>0.05).

Table – 6
Comparison of time to jaw relaxation

Group	N	Mean (Secs.)	S.D.	Student t-test
Sevoflurane	**30**	**107.3**	**17.51**	t=17.23, P=0.0001
Propofol	**30**	**49.4**	**5.69**	Significant

The mean time to jaw relaxation in Sevoflurane group is 107.3 secs and in Propofol group is 49.4 secs. The data is statistically significant (p<0.05).

Table – 7
Comparison of time to LMA insertion

Group	N	Mean (Secs.)	S.D.	Student t-test
Sevoflurane	**30**	**117.9**	**19.2**	t=15.76, P=0.0001
Propofol	**30**	**59.3**	**6.8**	Significant

The mean time to insertion in Sevoflurane group is 117.9 secs and in Propofol group is 59.3 secs. The data is stastically significant ($p<0.05$)

Table -8
Comparison of Pulse Rate

Time	Group	N	Mean PR (bpm)	S.D.	Student t-test
Baseline	Sevoflurane Propofol	30 30	118.1 118.4	9.39 10.1	t = 0.14 p = 0.88 Not significant
Postinduction	Sevoflurane Propofol	30 30	120.4 106.8	9.64 9.26	t = 5.54 p = 0.0001 Significant
Postinsertion	Sevoflurane Propofol	30 30	120.3 109.8	8.92 9.23	t = 4.50 p = 0.0003 Significant

The mean base line pulse rate is comparable in both groups as there is no significant difference statistically ($p >0.05$).
There is statistically significant difference observed ($p<0.05$) in regard to pulse rate between both groups during induction and post insertion.

Table -8
Comparison of Mean Arterial Pressure

Time	Group	N	Mean (mm HG)	S.D.	Student t-test
Baseline	Sevoflurane Propofol	30 30	78.6 80.1	8.26 5.77	t = 0.79 p = 0.42 Not significant
Postinduction	Sevoflurane Propofol	30 30	69.2 69.9	7.69 5.81	t = 0.43 p = 0.66 Not Significant
Postinsertion	Sevoflurane Propofol	30 30	70.4 71.8	8.40 6.06	t = 0.75 p = 0.45 Not Significant

The mean base line mean arterial pressure is comparable in both groups as there is no significant difference statistically ($p >0.05$).
There is no statistical significant difference observed ($p >0.05$) in regard to mean arterial pressure between both groups during induction and post insertion.

Table - 9
Comparison of no. of attempts

Group	Successful insertion at 1st attempt	Successful insertion at 2nd attempt	Total cases	Fischer's Exact 2-tailed test
Sevoflurane	**25**	**5**	**30**	**P = 0.1945** Not significant
Propofol	**29**	**1**	**30**	

There is no statistically significant difference between two groups in regard to no. of attempts required for successful LMA insertion ($p>0.05$).

Table – 10
Comparison of complications

Complications	Sevoflurane group	Propofol group
Coughing	0	0
Gagging	0	0
Regurgitation	0	0
Vomiting	0	0
Patient movements	0	4
Laryngospasm	0	0
Apnea	4	0
Trauma(blood staining)	0	0
Gastric distentsion	0	1

DISCUSSION

The study shows that the time to induction is less in sevoflurane group compared to propofol group(Group S- 39.1 secs vs Group P- 41.1 secs). But this
is stastically insignificant(p-0.09). In related studies in adults, Divatia et al[1] and Siddik et al[2] achieved faster induction with propofol. The dose of propofol used by Divatia et al[1] was 2.45 mg/kg(mean) and the dose of propofol used by Siddik et al[2] was 3 mg/kg. The time to jaw relaxation is shorter with propofol in this study (Group P- 107.3 secs vs Group S- 49.4 secs). This is **stastically significant (p- 0.0001).** This correlates well with the study of Siddik et al[2] who had rapid jaw relaxation with propofol compared to sevoflurane. In this study, the time to LMA insertion is shorter with propofol (Group P-59.3 secs vs Group S-117.9 secs). **This is stastically significant (p- 0.0001).** This result can be correlated with the studies of Divatia et al[1], Siddik et al[2], Ti et al[3] who had similar results. But this contradicts the study of Lopez Gil et al[4], who achieved faster LMA insertion with sevoflurane compared to propofol.The dosage of sevoflurane and propofol used are identical to this study. The explanation given in their study was that the dose of propofol used would below.

The number of attempts required for LMA insertion was not statistically significant between the two groups (p- 0.19). The successful insertion at 1st attempt in group S is 83.3% compared to 96.7% in group P. Fewer attempts were required to insert LMA with propofol compared to sevoflurane was shown by Ti et al[3]. Divatia et al[1] found no difference between sevoflurane and propofol in regard to number of attempts. The hemodyanamic stability is maintained in both groups. There is statistically significant difference observed ($p<0.05$) in regard to pulse rate between both groups during induction and post insertion. There is reduction in pulse rate in propofol group. In sevoflurane group, rise in pulse rate from baseline is noted. The variations in the pulse rate are within acceptable limits though there is a statistically significant difference. There is no statistical significant difference observed ($p >0.05$) in regard to mean arterial pressure between both groups during induction and post insertion. Mori et al[6] also found only slight decrease in blood pressure when sevoflurane is used for induction. Lopez Gil et al[4] also found no differences in blood pressure and oxygen saturation among patients in the study comparing sevoflurane and propofol for induction and maintenance of anaesthesia using laryngeal mask airway in children. Four patients in sevoflurane group had transient apnea during induction. The patients recovered spontaneously on ventilation with bag and mask. Although it is a non irritant, pleasant smelling volatile anaesthetic agent, children rarely have breath holding like episodes with induction dose. In Mori et al[6] study, the incidence of breathholding and coughing was less with sevoflurane compared to halothane. Ti et al[3] also showed more incidence of apnea with propofol compared to sevoflurane. In this study, apnea is not noted in any cases in propofol group. Four patients in propofol group had movements during induction, which is common with the agent. This is correlating with the studies done by Ti et al[3] and Borgeat et al[5] who explained that the movements may be partially due to pain during injection of propofol. However, no cases had movements during induction or LMA insertion in sevoflurane group. One patient in propofol group had mild gastric distension while ventilating after LMA insertion. LMA was removed and reinserted and the surgery proceeded after confirming adequate seal but no regurgitation or vomiting occurred. In both groups no patient had coughing, gagging, regurgitation, vomiting, laryngospasm or desaturation during induction or LMA insertion.

CONCLUSION

We concluded that -

• We assessed the conditions for insertion of LMA in two groups of patient receiving either inhalational sevoflurane or intravenous propofol and the following observations were made.
• There were no significant differences between the two groups in demographic data.
• The time to induction is less with sevoflurane compared to propofol in this study, though statistically not significant.
• The time to jaw relaxation and the time to LMA insertion is less with propofol, with statistical significance.
• The insertion is more successful by 1st attempt in the propofol group. But this is not statistically significant.
• There are few cases who had movements during induction in propofol group and few cases had transient apnea during induction in sevoflurane group.
• There is no significant difference between both groups in the incidence of
coughing, gagging and laryngospasm.
• There is significant difference in pulse rate in both groups. The pulse rates in propofol group decreased from baseline but within acceptable limits. In Sevoflurane group pulse rate increased from baseline during induction and LMA insertion, within acceptable limits.
• The decrease in mean arterial pressure is observed in both groups and is not statistically significant

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