Research article

A comparison of sevoflurane versus propofol for tracheal intubation in children

Dr.Viren Darji*, Dr. Gauri Panjabi**
*Senior resident ,**Assistant professor, Dept. of Anesthesia
Smt.Shardaben general hospital, Smt NHL Municipal Medical College;Ahmedabad

Abstract:
The study was conducted in 60 ASA I Children, 4-12 years of age, of either sex undergoing elective surgery. All patients were premedicated with I.V. Midazolam 0.02 mg/kg, Inj. Fentanyl 2µg/kg and Glycopyrolate 0.05mg/kg. 10 minutes before surgery. Patients were randomly divided into two groups. Group S (SEVOFLURANE 8%+40% O₂+60%N₂O) and Group P (I.V. Propofol 1%w/v).Centralization of pupils and miosis were used as end points for intubation. Anesthesia was maintained with O₂, nitrous oxide and sevoflurane. Induction time, Quality of Intubation, Hemodynamic response and complications during endotracheal intubation in children with inhalational induction with Sevoflurane versus and complications during endotracheal intubation studied.

Conclusion: In premedicated children both sevoflurane and propofol provides good quality of anesthesia for intubation. Induction time and Hemodynamic response was less in propofol than sevoflurane. Quality of intubating condition was better with propofol than sevoflurane. So Propofol is better than Sevoflurane for tracheal intubation in Children. However Sevoflurane is acceptable alternative in patients with difficult venous access

Key words: Sevoflurane, Propofol, Tracheal intubation, Children.

Introduction:
Endotracheal intubation is frequently facilitated by the administration of depolarizing muscle relaxant such as succinyl choline. Children are more susceptible than adults to cardiac arrhythmias, hyperkalemia, myoglobinemia, masseter spasm & malignant hyperthermia after administration of succinyl choline. Routine use of succinyl choline for tracheal intubation in children is being criticized following some reports of cardiac arrest & death in young children.

Non depolarizing muscle relaxants are alternative to succinyl choline but they are slower in onset, have longer duration of action, and need to reverse neuromuscular block. Further it may be associated with undesirable effect due to immaturity of neuromuscular junction such as prolonged neuromuscular blockade.

For this reason a method of providing good intubating condition without use of muscle relaxants has been soughted by a number of investigators. Inhalational induction with Sevoflurane & Intravenous induction with Propofol are two alternatives most commonly studied for intubation in children without use of muscle relaxants.

Present study was designed for comparison of Induction time, Quality of Intubation, Hemodynamic response and complications during endotracheal intubation in children with inhalational induction with Sevoflurane versus intravenous induction with Propofol.

Aims of study: 1) Induction time, 2) Quality of Intubation, 3) Attempts for intubation 4) Hemodynamic response and 5) complications during endotracheal intubation.

Material and methods
This study was conducted in 60 ASA 1 children aged between 4 to 12 years, of any sex scheduled for elective surgery. All patients were preoperatively assessed and written informed consent taken. Children with upper respiratory infection or known to be allergic to any of the study drug were excluded from our study.

All patients were premedicated with I.V. Midazolam 0.02 mg/kg, Inj. Fentanyl 2µg/kg and Glycopyrolate 0.05mg/kg. 10 minutes before surgery. Patients were randomly divided into two groups. Group S and Group P. Centralization of pupils and miosis were used as end points for intubation.

Following preoxygenation for 3 minutes, induction of anesthesia was achieved with (Group S) SEVOFLURANE 8%+40% O₂+ 60%N₂O or (Group P) I.V. Propofol (1%w/v) 3mg/kg i.v. (4 ml/10 sec) Additional increments of 0.5 mg/kg propofol i.v. were administered until end point for intubation.

Anesthesia was maintained with oxygen, nitrous oxide and Sevoflurane. Patient’s vitals were measured just after induction, immediately after
intubation and then at intervals of 3, 5, 8 and 10 min after intubation. Induction time, Quality of Intubation, Attempts for intubation, Hemodynamic response and complications i.e. apnoea >30sec., coughing/gagging, laryngospasm/bronchospasm, patient's movement during endotracheal intubation were noted. Intubating conditions were graded using Cooper's score in to excellent (Score 8-9), good (Score 6-7), poor (Score 3-5) or inadequate (Score 0-2), considering the criteria of jaw relaxation, condition of vocal cords and response to intubation. Excellent & good (Score>5) were considered as clinically acceptable condition. Vital parameter were noted at pre induction, after induction, just after intubation and then at intervals of 3, 5, 8 and 10 minutes after intubation.

Next day patients were interviewed for postoperative complications like pain at injection site, excitatory phenomenon, sore throat, coughing and nausea/vomiting.

**Observation and results**

**Demographic data**

The study was done in 60 ASA grade I children between 4-12 years of age, of either sex, undergoing elective surgery. Average duration of surgery was around 1-2 hrs.

**Induction time**

Time to loss of eyelash reflex was taken as mean induction time; it was around 84.36±13.24 sec.in Group S and 32.5± 7.70sec. in Group P.

Time for achievement of end points for intubation was 139.2± 17.73 sec. in Group S and 58.9± 8.5 sec. in Group P.

**TABLE 1: Response to intubation according to cooper’s scoring system**

<table>
<thead>
<tr>
<th>Cooper’s Score</th>
<th>Jaw Relaxation</th>
<th>Vocal cord</th>
<th>Response to intubation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Group S</strong> (No. of Pts.)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Group P</strong> (No. of Pts.)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 2: Intubating condition according to Cooper's score**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Score 8-9</th>
<th>Score 6-7</th>
<th>Score 3-5</th>
<th>Score 0-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>S (n=30)</td>
<td>24 (80%)</td>
<td>6 (20%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>P (n=30)</td>
<td>28 (93.3%)</td>
<td>2 (6.7%)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Jaw relaxation was good in all the patients in both the groups. In Group S 2 (6.7%) patient’s vocal cords were moving, so intubation was not possible and required 2nd attempt while in Group P vocal cords were completely relaxed and fully open in all patients and so all were intubated in first attempts. In both the groups intubating condition was found to be clinically acceptable (Score>5) according to Cooper's score. Excellent/Good intubating condition was (80%/20%) in Group S and (93.3%/6.7%) in Group P.

**Complication during intubation**

During intubation 18 patients (30%) & 6 Patients (20%) developed apnoea (>30 sec.) in Group P & Group S respectively. Coughing/Gagging was noted in 6 (20%) & 2 (6.7%)in Group S and Group P respectively. while patient movement was observed only in 2 patients (6.7%) in Group S. Laryngospasm/ Bronchospasm was not observed in any patient.

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Heart rate & MAP decreases after induction in both the groups but heart rate & MAP was greater in Group S than in Group P. Hemodynamic response to intubation was noted. Just after intubation heart rate is increased more in Group S (119.1±6.7) than in Group P (114±11.8) & MAP increased in Group S (84.6±10.8) while it decreased in Group P (73.1±6.2). ECG & Spo2 showed no significant changes.

**Postoperative complication**

The incidence of postoperative complications were less and mild in nature. In Group S excitatory phenomenon was noted in 7 (23.3%) patients and in Group P pain at injection site was noted in 12 (60%) patients. Nausea was observed in 4 (13.3%) patients in Group S and in none in Group P.

**Discussion**

The development of new anesthetic agents like Sevoflurane & propofol has reduced the need for muscle relaxant for tracheal intubation in Children. Sevoflurane is a halogenated inhalational anesthetic with low blood gas solubility. It is non-pungent and non-irritant to airway. It provides rapid, smooth induction and rapid emergence from anesthesia which makes it suitable for induction and intubation in pediatrics patients. Shinchi Inomata, Sieji Watanbe, Masakazo Tagudi, Minako Akada (1994) have studied end tidal concentration for tracheal intubation. They concluded that Sevoflurane appears to be suitable for use in Pediatric patients as an induction.

Sarner JB, Levin M., Davis PJ, et al. (1995) have studied the clinical characteristics of Sevoflurane in children. They concluded that Sevoflurane with nitrous oxide provides satisfactory anesthetic induction and intubating condition.

Propofol is a short acting intravenous anesthetic agent providing rapid and smooth induction and rapid recovery. It also decreases laryngotracheal reactivity and muscle tone. The observation that Propofol causes suppression of laryngeal reflexes renewed interest in the use of relaxant free technique of tracheal intubation. Tracheal intubation without use of muscle relaxant is a technique which has been wildly studied and practiced following the work of MC Keating, Bali and Dundee.
condition for laryngoscopy were superior after induction with Propofol than Thiopentone. Scheller MS, Zomow MH, Saidman L..(1992) have done study on tracheal intubation without use of muscle relaxants in children with a technique using Propofol and varying dose of Fentanyl. They concluded that in premedicated healthy children, tracheal intubation may be accomplished using a combination of Fentanyl and Propofol when muscle relaxants are to be avoided. The study was undertaken in 60 children of ASA 1 in the age group of 4- 12 yrs. Children were randomly divided in to two groups (S- Sevoflurane, P-Propofol) of 30 patients each. There was no significant difference in demographic data for both the groups. All the patients were premedicated with midazolam 0.02 mg/kg and fentanyl 2µg/kg. Mean time required for loss of eyelash reflex and time for achievement of end points for intubation was shorter in Propofol group than in Sevoflurane group, which is extremely significant.(p< 0.0001) The results are comparable with the earlier study done by George D. Politis et al. Intubation condition was clinically acceptable in all the patients of both groups .Overall intubating condition was excellent in 80% and good in 20% patients in Group S while it was excellent in 93.3% and good in 6.7% patients in Group P. Hemodynamic response to intubation noted. Heart rate was decreased after induction and increased after intubation; Heart rate increase was more in sevoflurane group than propofol group. The result was comparable with the study done by Dr.Hanna Vitanen et al. They showed that heart rate decrease after induction and increased after intubation in both groups, Heart rate in sevoflurane group was more than in propofol group after intubation.Mean arterial B.P. was decreased after induction and after intubation in both groups. Propofol group showed more decrease in MAP than sevoflurane group. Results of our study were comparable with the study done by A Thwaities S. Edmends, A.A. Tomlinson, J.B. Kendall and I. Smith. They observed that induction of anesthesia with propofol was associated with decreased in MAP approximately 20 MM OF Hg. While it was 10 mm of Hg. with sevoflurane group. There was no significant change in Spo2 and ECG in both groups. The incidence of postoperative complications were less and mild in nature in both groups.

Conclusion
To conclude with, the present study was undertaken to highlight the benefits of avoiding muscle relaxants using Sevoflurane or propofol for intubation in children. In premedicated children both sevoflurane and propofol provides good quality of anesthesia for intubation. Induction time and Hemodynamic response was less in propofol than sevoflurane. Quality of intubating condition was better with propofol than sevoflurane. So Propofol is better than Sevoflurane for tracheal intubation in Children. However Sevoflurane is acceptable alternative in patients with difficult venous access.

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2. Shinchi Inomata, Sieji Watanbe, Masakazo Tagudi, Minako Akada (1994) have studied end tidal concentration for tracheal intubation.