



Original Research Article

Comparing two different doses of propofol after sevoflurane induction for intubation in paediatric patients without use of neuromuscular blocking agents

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ABSTRACT

Introduction: In the practice of paediatric anaesthesia, intubation of trachea without using neuromuscular blocking agents is becoming commoner more so in conditions in which muscle relaxants are not preferred. Different combinations of drugs including opioids, intravenous agents and inhalational agents are being used for facilitating endotracheal intubation when muscle relaxants are not used. In this study we compared intubating conditions in paediatric patients after sevoflurane induction and propofol in two different doses.

Materials and Methods: 80 children of 2 to 12 years age undergoing elective surgeries were divided into two groups P2 and P3 of 40 each. After sevoflurane induction and fentanyl 2mcg/kg I.V. group P2 received propofol 2mg/kg and group P3 received propofol 3mg/kg I.V. The two groups were compared with respect to intubating conditions and haemodynamic parameters.

Results: Clinically acceptable intubating conditions were seen in all patients in both groups. Excellent intubating conditions were more in group P3 (87.5%) than group P2 (80%). Haemodynamic parameters showed no significant difference between the two groups.

Conclusion: In paediatric patients, endotracheal intubation can be comfortably performed without muscle relaxants by using propofol and fentanyl with sevoflurane induction with no respiratory or haemodynamic adverse events. Propofol in a dose of 3mg/kg gives better intubating conditions than 2mg/kg without adverse haemodynamic effects, although 2mg/kg propofol also gives acceptable intubating conditions.

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1. Introduction

The most definitive method for airway management in children is endotracheal intubation. Neuromuscular blocking agents have made the technique of tracheal intubation easier, but these drugs are not without potential risks to the patients.¹

Until 1990, the only drug used for endotracheal intubation was succinylcholine, the reason being rapid onset and ultra-short duration of action. But there are many potential adverse effects including myalgias, hyperkalemia, masseter muscle spasm, malignant hyperthermia, prolonged apnoea, raised intraocular and intracranial tension.^{2,3}

Non-depolarizing muscle relaxants can be safer alternatives to succinylcholine, but they have a slower onset and prolonged duration of action, and also it is not possible to quickly reverse their effect in case airway management is not possible by endotracheal intubation or mask ventilation.³

Thus there may be situations in anaesthetic practice where muscle relaxant use could be undesirable or contraindicated.⁴ In such kind of situations, it is preferable to use only anaesthesia induction agents without muscle relaxants to provide good intubating conditions.⁵

Introduction of potent opioids, newer intravenous and inhalational drugs that help to suppress airway reflexes, has helped researchers to conduct multiple studies for evaluating endotracheal intubation without using

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neuromuscular blocking agents.¹

The most favourable drug for this purpose is propofol because it profoundly depresses the airway reflexes.⁶ Induction using propofol is rapid as well as smooth, and it has a faster recovery time.⁷ Sevoflurane is the inhalational agent which provides favourable intubating conditions with its pleasant odour and lesser airway irritability.^{8,9}

With all these factors in mind, we conducted this study to compare the intubating conditions in paediatric age group with sevoflurane induction followed by two different doses of propofol.

2. Objectives of the Study

1. Evaluation and comparison of the intubating conditions using sevoflurane induction with two doses of propofol without muscle relaxants in children.
2. Assessment of haemodynamic variables associated with induction and endotracheal intubation.
3. Adverse effects, if any, associated with induction and intubation.

3. Materials and Methods

The study was conducted in 80 children aged 2 to 12 years, posted for elective surgery under general anaesthesia at Indira Gandhi Institute of Child Health, Bangalore. Approval was obtained from the institutional ethical committee.

3.1. Inclusion criteria

1. Children posted for elective surgical procedure under general anaesthesia with endotracheal intubation.
2. Children belonging to ASA class I & II.
3. Age 2 – 12 years.

3.2. Exclusion criteria

1. Patient refusal for the procedure.
2. Children with a history of recent upper respiratory tract infection.
3. Children with anticipated difficult airway.
4. Children having allergy to any of the study drugs.

3.3. Methods of collection of data

1. During the above said study period 80 children aged 2 to 12 years posted for elective surgical procedure under general anaesthesia were randomly selected and allotted to one of the two groups: Group P3-children receiving 3 mg/kg I.V. propofol, Group P2- children receiving 2 mg/kg I.V. propofol, each group having 40 patients.
2. Parents/guardians of children were explained about the procedure and written/informed consent was

obtained.

3. All children were fasted according to fasting guidelines.
4. All children were pre-medicated with Midazolam 0.05 mg/kg I.V. 10 minutes before induction.
5. On arrival to operation room, baseline heart rate, oxygen saturation and non-invasive blood pressure were measured.
6. Induction of anaesthesia was done using circle system with inhalation of 8% sevoflurane in an oxygen flow of 6 l/min. After loss of consciousness was achieved, concentration of sevoflurane was reduced to 2%.
7. After that fentanyl 2 mcg/kg I.V. was given, followed by propofol 3 mg/kg or 2 mg/kg, as per the group allotment.
8. After 60 seconds of propofol injection, laryngoscopy and tracheal intubation with an appropriate sized uncuffed endotracheal tube was performed with the help of a suitable Macintosh laryngoscope.
9. Assessment of intubating conditions was done with Steyn's modification of Helbo Hansen intubating condition scoring system³ (Table 1).
10. Assessment was done using these five factors: laryngoscopy, position of vocal cords, coughing, jaw relaxation, and limb movements.
11. Intubating conditions were considered excellent if all parameters scored 1, if any parameter scored 2 intubating conditions were considered acceptable, and unacceptable if even a single parameter scored > 2.
12. Maintenance of anaesthesia was done using oxygen with air and 1% isoflurane.
13. Continuous monitoring of heart rate, blood pressure and oxygen saturation was done and recorded at baseline, after induction, and after intubation at 1, 3, 5 and 10 minutes.
14. Time taken to intubation and number of attempts taken to intubate was also recorded.
15. Surgical stimulus as well as any other stimulus was avoided for 10 minutes after intubation.

Statistical analysis of data was performed using student t test (z test) for parametric data and Chi square test for non-parametric data.

4. Results

The demographic data (age, weight and gender) did not show any significant difference between the two groups (Table 2).

The intubating conditions were shown to be clinically acceptable in all patients in both groups. Excellent intubating conditions were shown to be in more number of patients in group P3 than in group P2. In group P2, excellent intubating conditions were seen in 80% children and acceptable intubating conditions in 20% children,

Table 1: Scoring of intubating conditions

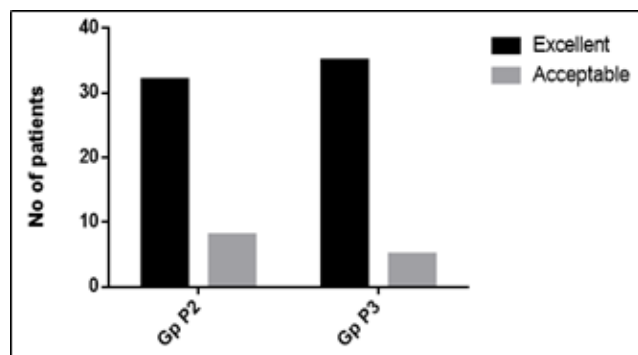
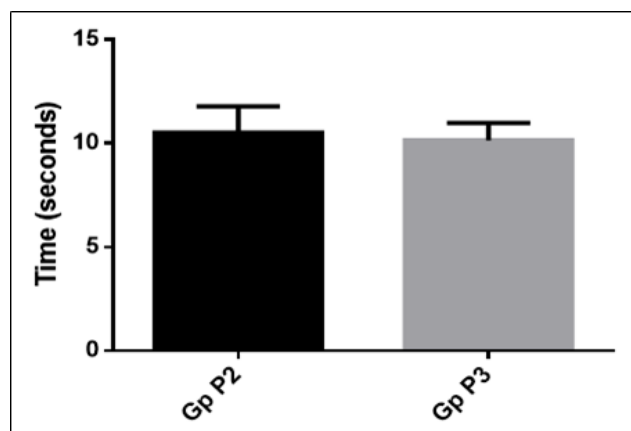
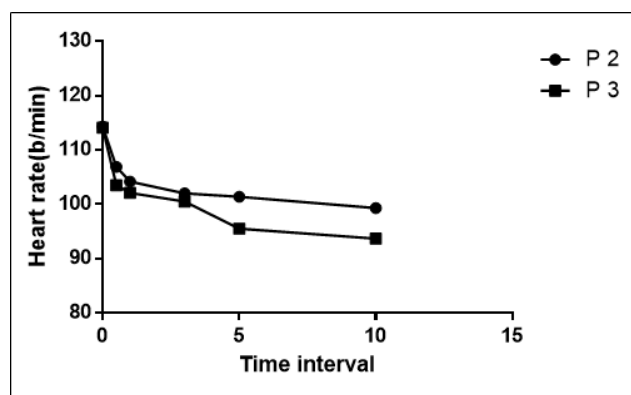
Points	1	2	3	4
Laryngoscopy	Easy	Fair	Difficult	Impossible
Vocal cords	Open	Moving	Closing	Closed
Coughing	None	Slight	Moderate	Severe
Jaw relaxation	Complete	Slight	Stiff	Rigid
Limb movements	None	Slight	Moderate (Jerky)	Severe

Table 2: Demographic variables

	Group P2	Group P3	p value
Mean Age (years)	4.65 +/- 0.45	5.05 +/- 0.49	0.65 (not significant)
Mean weight (kg)	14.75 +/- 0.89	15.28 +/- 1.01	0.42 (not significant)
Gender (M/F)	21/19	23/17	0.29 (not significant)

whereas group P3 shows excellent intubating conditions in 87.5% and acceptable intubating conditions in 12.5% children. None of the children in any group showed poor intubating conditions, and no patient in any group required rescue muscle relaxant for intubation. All patients were intubated in the first attempt only. Time taken to intubation was between 9 to 12 seconds in all patients and was comparable in both groups (Figure 2).

The haemodynamic parameters showed no significant difference between the two groups at any point of time. Also there was not a significant variation of haemodynamics from baseline in any of the groups. In group P3 heart rate was lower than that of group P2 at 5 and 10 minutes after intubation, although it was not statistically significant (Figure 3). Systolic blood pressure did not show difference between the two groups at any point of time (Figure 4). At 1, 3, 5 and 10 minutes after intubation diastolic blood pressure showed lesser values in group P3 as compared to group P2, again not showing statistical significance (Figure 5). Both the groups did not show any surge in heart rate as well as blood pressure on intubation. Also, there was no statistically significant difference with respect to oxygen saturation at any time between the two groups. Intubation was uneventful in all patients in both groups.

**Fig. 1:** Intubating conditions**Fig. 2:** Time taken to intubation**Fig. 3:** Mean heart rate

5. Discussion

Endotracheal intubation under deep inhalation anaesthesia without muscle relaxants is being practised from the beginning of anaesthesia practice. It is mostly done in paediatric anaesthesia practice and sometimes for patients with difficult airway and airway obstruction.¹⁰ In literature, many techniques of successful endotracheal

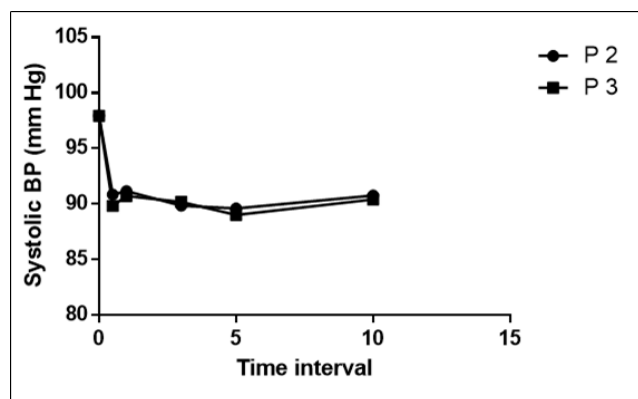


Fig. 4: Systolic BP

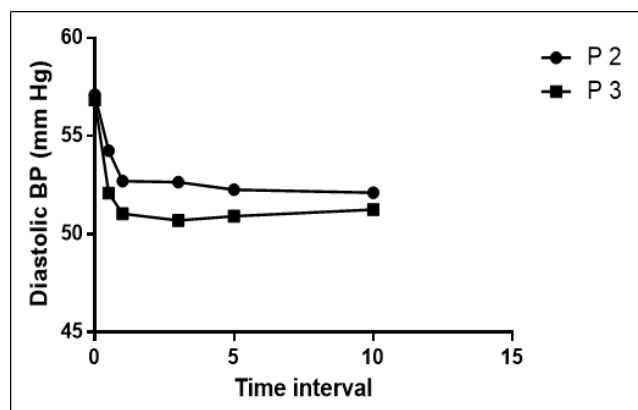


Fig. 5: Diastolic BP

intubation without the use of muscle relaxants have been mentioned. This gives a useful alternative in such conditions when neuromuscular blocking drugs are undesirable or contraindicated.¹¹ Various combinations of drugs have been formulated by anaesthesiologists to facilitate tracheal intubation avoiding muscle relaxants, without any serious adverse effects.¹²

Inhalational induction is widely used in paediatric anaesthesia, sevoflurane being the inhalation induction agent of choice in children. Propofol is the agent in common use for intravenous induction and maintenance of anaesthesia. In 2005, Oberer et al¹³ have mentioned that propofol reduces laryngotracheal response and muscle tone, hence allowing ease of intubation. The successful combination of sevoflurane and propofol can be explained by the complementary effects of these two drugs on laryngeal responsiveness. In 2002, Politis et al¹⁴ reported that induction of anaesthesia with propofol in the dose range of 2.5 and 4mg/kg have yielded less ideal intubating conditions than those obtained using sevoflurane with adjuvants.¹⁵ Keeping these factors in view, we have chosen sevoflurane induction followed by intravenous propofol for our study.

In the current study, the use of propofol 3mg/kg resulted in greater incidence of excellent intubating conditions as 87.5%, in comparison with 80% excellent intubating conditions with propofol 2mg/kg. The remaining patients in both groups had acceptable intubating conditions. In a study by Hazem an Ghada¹⁶ propofol 3mg/kg after sevoflurane induction showed acceptable and excellent intubating conditions in 90% and 83.3% patients respectively. Kumar et al¹⁷ in their study used fentanyl 1mcg/kg premedication, sevoflurane induction followed by propofol 1mg/kg in 150 children. Intubating conditions were reported to be excellent in all patients, but in 15 patients second attempt for intubation had to be made. All patients needed second attempt for exchange of proper sized endotracheal tube. In our study, no patient require a second attempt for intubation and airway was secured in all patients with the appropriate sized endotracheal tube in the first attempt only. Gore et al¹² in their study compared 3 doses of propofol 2mg/kg, 2.5mg/kg and 3mg/kg and the results showed clinically acceptable intubating conditions in 96.7% patients with propofol 2.5mg/kg, and 100% patients with 3mg/kg.

Our study did not show any significant changes in haemodynamic parameters. Our study results did not show any surge in blood pressure and heart rate at the time of laryngoscopy and intubation. Kumar et al¹⁷ in their study have not shown any significant haemodynamic changes. Their results are in agreement with those of our study. Gore et al¹² had compared propofol in 3 doses, 2mg/kg, 2.5mg/kg and 3mg/kg. There was a significant increase in mean arterial pressure and heart rate during laryngoscopy and intubation with propofol 2mg/kg which returned to baseline after 5 minutes, the other two groups showing no significant increase.

The advantages of this practice of endotracheal intubation without the use of muscle relaxants is that it is a very safe practice and does not involve any complications. In addition, this technique can also be tried in anticipated difficult airway as an initial assessment.

6. Conclusion

In paediatric patients, endotracheal intubation can be comfortably performed without muscle relaxants by using propofol and fentanyl with sevoflurane induction with no respiratory or haemodynamic adverse events. After comparing propofol in two doses, we conclude that propofol when given in a dose of 3mg/kg gives better conditions for endotracheal intubation as compared to when given in a dose of 2mg/kg without adverse haemodynamic effects, although 2mg/kg propofol also gives acceptable intubating conditions.

7. Limitations of the Study

Limitation of this study is that it does not include infants and children less than 2 years old.

8. Source of Funding

None.

9. Conflict of Interest

None.

References

1. Sabapathy VA, Thilaak P, Gopal SSM, Pongiyandar S. Endotracheal intubation without muscle relaxants in children undergoing cleft lip, palate and alveolar surgery. A comparative study of sevoflurane and propofol. *J Clin Diag Res*. 2011;5:1421–5.
2. Srivastava U, Kumar A, Gandhi NK, Saxena S, Agarwal S. Comparison of propofol and fentanyl with thiopentone and suxamethonium for tracheal intubation in children. *Ind J Anaesth*. 2001;45:263–6.
3. Steyn MP, Quinn AM, Gilpense JA, Miller DC, Best CJ, Morton NS. Tracheal intubation without neuromuscular block in children. *Br J Anaesth*. 1994;72(4):403–6.
4. Braga A, Braga FS, Poterio GM, Filier PR, Cremonesi E. The effect of different doses of propofol on tracheal intubating conditions without muscle relaxants in children. *Eur J Anaesthesiol*. 2001;18:384–8.
5. Volkan H. Tracheal intubation without use of muscle relaxants: Comparison of remifentanyl and alfentanil. *Anesth Pain*. 2012;1:210–11.
6. McKeating K, Bali IM, Dundee JW. The effects of thiopentone and propofol on upper airway integrity. *Anaesth*. 1988;43(8):638–40.
7. Kumar AA, Sanikop CS, Kotur PF. Effect of the priming principle on the induction dose requirement of propofol- A randomized clinical trial. *Ind J Anaesth*. 2006;50:283–7.
8. Thwaites AJ, Edmonds S, Tomlinson AA, Kendall JB, Smith I. Double-J blind comparison of sevoflurane vs propofol and succinylcholine for tracheal intubation in children. *Br J Anaesth*. 1999;83:410–4.
9. Inomata S, Yamashita S, Toyooka H, Taguchi M, Sato S. The anaesthesia induction time for tracheal intubation by using sevoflurane or halothane in children. *Anaesth*. 1998;53:440–5.
10. Sneydjir O, Sullivan E. Tracheal intubation without neuromuscular blocking agents: is there any point? *Br J Anaesth*. 2010;104:535.
11. Woods AW, Allam S. Tracheal intubation without the use of neuromuscular blocking agents. *Br J Anaesth*. 2005;94(2):150–8.
12. Gore MS, Kalpana D. Evaluation of intubating conditions with varying doses of propofol without muscle relaxants. *J Anaesth Clin Pharmacol*. 2011;27:27–30.
13. Oberer C, Ungem-Sternberg BSV, Frei FJ, Erb TO. Respiratory reflex responses of the larynx differ between sevoflurane and propofol in pediatric patients. *Anesthesiol*. 2005;103:1142–8.
14. Politis GD, Frankland MJ, James RL, Ville JFR, Rieker MP, Petree BC. Factors associated with successful tracheal intubation of children with sevoflurane and no muscle relaxant. *Anesth Analg*. 2002;95:615–20.
15. Aouad MT, Yazbeck-Karam VG, Mallat CE, Ezzo JJ, Siddik-Sayyid SM, Kaddoum RN. The effect of adjuvant drugs on the quality of tracheal intubation without muscle relaxants in children: a systematic review of randomized trials. *Pediatr Anesth*. 2012;22(7):616–26.
16. Hazem MF, Ghada MS. Induction of anesthesia and endotracheal intubation in children without muscle relaxant: A comparative study on addition of fentanyl or propofol to sevoflurane. *Ain-Shams J Anesthesiol*. 2016;9:39–44.
17. Kumar N, Galante D, Shetty KB. Tracheal intubation in children using sevoflurane without muscle relaxant. A novel approach using apnea as clinical indicator. *Ped Anesth Crit Care J*. 2015;3:53–60.

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