



OPTIMAL TIMING FOR INSERTION OF INTRAVENOUS CANNULA IN CHILDREN PRE-MEDICATED WITH ORAL MIDAZOLAM AND INDUCED WITH SEVOFLURANE, OXYGEN, AND NITROUS OXIDE

Anesthesiology

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ABSTRACT

Background and Aim: Inhalational induction is necessary in children planned for surgery without intravenous catheter already placed. We aimed to determine optimum time for intravenous catheterization following induction with sevoflurane, oxygen and nitrous oxide in pediatric population who were premedicated with oral midazolam. **Method:** A total of 34 patients, aged 2-6 years, with ASA grade I – II, undergoing inhalational induction without intravenous access were enrolled in the study. The circuit was flushed and filled with sevoflurane (8%) and nitrous-oxygen (50:50) for 30 seconds at high fresh gas flow (6 L/min). The children were premedicated with oral midazolam 0.5 mg/kg (maximum 20mg). Time is counted when the face mask was placed on the child's face for inhalational induction. The intravenous cannulation was performed after loss of eyelash reflex and considered successful if there is no movement, cough, laryngospasm or required positive pressure ventilation. **Result:** In the present study in which a total of 34 patients were included, the effective cannulation time was found to be 50.4 ± 1.2 s (95% confidence limits, 49.97-50.81s) in 50% of the patients, and the effective cannulation time was found as 87.75 ± 2.62 s (95% confidence limits, 86.82-88.66 s) in 95% of the patients. **Conclusion:** In premedicated children following induction with sevoflurane, oxygen and nitrous oxide optimum effective time for intravenous cannulation was found to be 1 minute and 50 seconds past the loss of eyelash response.

KEYWORDS

Intravenous, Cannulation, Children, Sevoflurane, Duration

INTRODUCTION

Early attempts in placing an intravenous line immediately after loss of consciousness may result in movement and respiratory complications like coughing and laryngospasm. Whereas, delay may impede early and effective management of complications like hypotension, apnea and bradycardia.

In this study, gas induction was carried out with sevoflurane, oxygen and nitrous oxide in children premedicated with oral midazolam before attempting placement of intravenous catheter.

Aims and Objectives

The objective of this study is to determine the optimum time for intravenous catheterization in children premedicated with oral midazolam after induction of anaesthesia with sevoflurane, oxygen and nitrous oxide.

LECUNAE:

- Observer bias..
- Due to small sample size we can not extrapolate the findings on large population.

METHODS AND MATERIALS

- **Place of Study:** Department of Anaesthesiology, AMC&H, Dibrugarh, Assam.
- **Study Design:** Observer blinded, prospective, up-down, sequential, allocation study.
- **Study Population:** Children aged 2-6 years undergoing elective procedures under inhalational induction.
- **Study Period:** 6 months.
- **Sample Size:** For the present study, sample size is calculated to be 34.
- **Ethical Clearance:** Obtained from Institutional Ethics committee of AMC&H.
- **Consent:** Written and informed consent were taken from parents of all children.

Inclusion Criteria:

- Age : 2-6 years.
- ASA status –I & II
- Scheduled for elective procedures under inhalational induction.
- Without any intravenous access.

Exclusion Criteria:

- Active LRTI in last 3 weeks.
- History of chronic respiratory disease.

- Abnormal airway.
- Patient undergoing treatment with sedatives and anticonvulsants.

Methodology Proper

Children were premedicated with oral midazolam (0.5 mg/kg), 30 min prior to induction.

The same Datex Ohmeda workstation was used in all children with the same circuit volume.

The circuit was flushed and then filled with sevoflurane (8%) and nitrous oxide–oxygen (50 : 50) for 30 s, at a high fresh gas flow (6 l/min).

On arrival in the operation theatre, oxygen saturation was monitored.

The timer started once the facemask was applied on to the child's face.

Standard monitoring e.g. ECG, NIBP etc. were connected following induction.

Once the loss of eyelash reflex was established, the time was noted.

Sevoflurane concentration decreased to 4-5% and a timer was restarted. The time for attempting intravenous cannulation for the first child was set at 4 minutes from the loss of eyelash reflex.

All intravenous cannulations were performed on the dorsum of the hand by same experienced anesthesiologist, using a 22-gauge stainless steel guide cannula.

The inhalational induction was continued until pupils reached the mid-position.

The intravenous cannulation was considered unsuccessful if there was any movement, cough or laryngospasm. The procedure was considered successful in the absence of any of these reactions.

Primary Outcome Measures

- Optimum time for IV catheterization was assessed by using Dixon's up-and-down sequential method (starting at 4 minutes with 15 seconds as the step size).
- The time for cannulation was:
 - ☐ Increased by 15 seconds if the attempt in the previous child was considered unsuccessful;

- Conversely, it was decreased by 15 seconds if the attempt was successful in the previous child.
- Other datas such as age, gender, weight, and the time required for the loss of eyelash reflex were also recorded.

An independent observer, blinded about the predetermined time, noted the movement at the time of cannulation attempt according to a scale:

- 0 = no movement,
- 1 = slight extremity tension,
- 2 = extremity withdrawal, and
- 3 = generalized movement.

Mask acceptance during anesthesia induction was graded using a 4-point scale:

- 1: combative, crying,
- 2: moderate fear of the mask, not easily calmed,
- 3: cooperative with reassurance, and
- 4: calm, cooperative or asleep.

Sample Size Calculation

Assuming the level of significance (α) = 0.05, power of the study = 0.90 (β = 0.10) and effect size 0.7, sample size for our study was calculated using G*Power software version 3.1.9.7 and found to be 34.

Statistical Analysis

Demographic and clinical data are expressed as mean $\pm$ standard deviation (SD).

Probit test was used to analyze the up-and-down sequence to calculate the optimum time for intravenous cannulation in 50% and 95% of patients with 95% confidence limits (CL) of the mean.

The data were evaluated using the SPSS (IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.) statistical software.

Table 1: Demographic Data

Gender	No	Percentage
Male	15	44.12
Female	19	55.88
	Mean	SD
Age	3.41	1.67
Weight	13.6	2.42

Table 2: Results Of Study

Time To Loss Of Eyelash Reflex(S)	42.82 $\pm$ 2.43
Time To Pupil In Midposition (S)	187.68 $\pm$ 5.74
Time For Effective Intravenous Catheterisation In 50% Patients(S)	50.4 $\pm$ 1.20
Time For Effective Intravenous Catheterisation In 95% Patients(S)	87.75 $\pm$ 2.62

RESULTS AND OBSERVATIONS

- 38 children were recruited, 4 of which refused to take the whole dose of premedication and were excluded from the study.
- Mask acceptance score was 1 in 6 patients, 2 in 4 patients, 3 in 4 patients and 4 in 20 patients.
- A total of 24 patients had no movement on IV catheterization out of which:
 - - 4(11.46%) patients had mask acceptance score 1,
 - - 3(8.82%) patients had score 2,
 - - 3(8.82%) patients had score 3, and
 - - 14(41.18%) had score 4.
- A total of 10 patients reacted to IV catheterization attempts of which, 6 exhibited slight extremity tension and 4 exhibited extremity withdrawal.
- As analyzed by the probit test, the time for effective intravenous cannulation in our study:
 - In 50% patients was calculated to be 50.4 $\pm$ 1.20 seconds, and
 - In 95% of patient was found to be 87.75 $\pm$ 2.62 seconds.
- Therefore, we think, one should wait for 1 min 50 seconds (110secs, rounded for the ease of calculation) after the loss of eyelash reflex before attempting intravenous catheterization.

DISCUSSIONS

- Our study attempted to calculate the time required to achieve an adequate depth of anesthesia for successful intravenous cannulation following oral midazolam premedication and induction with sevoflurane, nitrous oxide, and oxygen.
- The optimum time according to our study was 50.4 seconds in

50% patients and 87.75 seconds in 95% of children with a mean age 3.41 $\pm$ 1.67 of years.

- In comparison to A Hasan et al³'s study in unpremedicated children, we obtained shorter effective IV cannulation time along with better patients' mask acceptance scores. It is plausible as our children were premedicated with oral midazolam prior to induction.
- Joshi et al² found 3.32 minutes (twice as ours) as the optimum time for IV cannulation after induction with sevoflurane alone. This may be due to our addition of N₂O to sevoflurane which has been shown to reduce excitatory movements and the time to loss of consciousness.
- Dubois et al¹ evaluated the induction with incremental sevoflurane with O₂ + N₂O (50:50). The addition of N₂O resulted in a faster loss of eyelash reflex and reduced time to pupil in midposition. This further supports our hypothesis of N₂O reducing the optimum time for IV cannulation.

CONCLUSION

In conclusion, we found that placement of intravenous cannula didn't cause movement, coughing, or laryngospasm in 95% of our midazolam premedicated study population (children, aged 2–6 years) when carried out 1.0 min 50 secs after loss of the eyelash reflex following induction carried out with sevoflurane in a mixture of oxygen and nitrous oxide

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