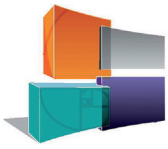
Anaesth Crit Care Pain Med xxx (2018) xxx–xxx



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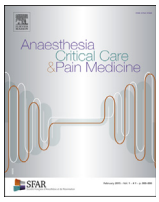

Original Article

Anxiety during inhalation induction in paediatrics: Sitting versus supine position, a randomised trial

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ARTICLE INFO

Article history:
Available online xxx

Keywords:
Sitting position
Inhalation anaesthesia
Paediatric anaesthesia
Anxiety
Mask

ABSTRACT

Study objective: We evaluated if the sitting or supine positions affect anxiety levels induced by the application of a facemask in children.
Design: Prospective, randomised study.
Setting: Paediatric hospital, operating room.
Patients: Two to twelve years old children, 1–3 ASA status, undergoing inhalation anaesthesia for elective surgery.
Intervention: Children were randomly assigned to a sitting or supine position. After monitoring equipment was established, inhalation was inducted by the application of the mask.
Measurements: Child anxiety was then assessed with the modified Yale Preoperative Anxiety Scale (mYPAS) before the application of the facemask and following mask application.
Main results: Overall, 99 children in the sitting group and 103 in the supine group were analysed. The mYPAS score was not different in both groups before the application of facemask (40 [28–51] versus 40 [28–53]; $P = 0.99$). It increased ($P = 0.005$) to a similar extent in both groups following mask application without difference between groups (48 [38–60] versus 48 [35–63]; $P = 0.95$). Side effects were not different between both groups.
Conclusion: In children undergoing inhalation induction, sitting or supine positions did not modify anxiety induced by the application of a facemask, nor adverse effects; therefore, children should be allowed to choose their preferred position.

1. Introduction

Paediatric anaesthesia must balance strict safety requirements with the management of patients who do not always comply with instructions in the operating room. Inhalational induction is the standard method for paediatric anaesthesia. The anxiety generated by hospitalisation, whether in an inpatient or outpatient setting, is at its most severe when the mask is applied to the patient's face [1]. Indeed, preoperative stress level gradually increases from the parent and child's separation to mask induction (when it peaks). Stress level declines gradually following the operation but may last several days [1]. A high level of preoperative anxiety in children is correlated with a high occurrence of postoperative behavioural problems, including sleep disorders, apathy or aggressiveness and fear of separation. A high level of preoperative anxiety in children is also correlated with increased pain scores and analgesics consumption [1].

Many drug and non-drug related procedures have been designed to reduce children anxiety and agitation. Premedication is common in paediatric anaesthesia [2]. It effectively reduces preoperative anxiety and increases children compliance during induction. Non-drug-related strategies address both children and their parents, but are not as effective as premedication [3]. Such strategies include:

- an educational pre-anaesthesia consultation (dedicated sessions, illustrated booklets, videos, etc.) [4]; environment modification (anaesthesia induction out of the operating room);
- distraction (games or clowns in the operating room) [5];
- children reassurance (presence of one or both parents in the operating room) [6].

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https://doi.org/10.1016/j.accpm.2018.02.010
2352-5568/

Complementary techniques proposed by caregivers have also been evaluated, including conversational hypnosis [7]. All of these approaches limit anxiety when children arrive in the operating room. However, they do not always effectively prevent the stress peak that occurs when the facemask is applied.

There is currently no recommendation regarding the position of the patient during anaesthesia induction: the supine position is routinely used during induction in both adults and children. However, the sitting position is also used in children. Some children appear less anxious in the sitting position than in the supine position. Both positions are currently used in our Paediatric Anaesthesia Service, according to the discretion of the attending anaesthetist.

This prospective, randomised study aimed to determine whether the sitting or supine positions affect the anxiety levels during inhalation induction among 2 to 12 years old children undergoing elective surgery.

2. Methods

2.1. Patients

The study was proposed to 2 to 12 years old children hospitalised between July and November 2012 in our paediatric hospital. These children underwent elective ENT, plastic, digestive, urological or orthopaedic ambulatory surgery with inhalational induction. This study was approved by the local ethics committee (A01832-43) and registered on www.ansm.sante.fr. Exclusion criteria were:

- emergency surgery;
- intravenous induction;
- heart surgery;
- neurosurgery;
- behavioural problems.

During preoperative anaesthesia assessment, oral and written information were obtained from parents and children. The possibility of sitting or lying down during induction was explained. The facemask was introduced to the children to familiarise them with it. The child's wishes were not asked.

2.2. Protocol

Most of the children arrived on the morning of the intervention. They waited in their room with their parents. Optional premedication was prescribed during the pre-anaesthesia evaluation, at the physician discretion. It was administered one hour before transition into the operating room. Two drugs were used: midazolam (0.3 mg/kg, maximum dose of 8 mg) administered orally mixed with fruit syrup or hydroxyzine (1 mg/kg). The child and his parents were greeted in the airlock chamber of the operating room. Then, the child was handed over to the anaesthesia team. All caregivers were specialised in paediatric anaesthesia. The child was transferred to the operating room while walking or carried in arms, without their parents. A randomisation list assigned each child to either the induction when sitting (sitting group) or the induction when lying down (lying group). In the operating room, the child was placed on the operating table in the predetermined position. He was covered with a forced-air warming blanket (Bair Hugger™). A cardiac monitor, a pulse oximeter and a blood pressure cuff adapted for the size of the child (Datex Ohmeda – GE Healthcare™) were established. Then, anaesthetic induction began. A caregiver applied a non-flavoured facemask adapted to the size of the child (disposable facemask; Intersurgical™). The child inhaled sevoflurane in a mixture of 50% oxygen, 50% nitrous oxide. Its initial inspired fraction of 6% was adapted to ensure that the end-tidal sevoflurane fraction did not exceed 5%. The fresh gas flow rate was 6 L/min. There was no additional non-pharmacological standardised intervention. The study protocol ended when the ciliary reflex was lost.

The anxiety of the child was measured with "The modified YALE preoperative anxiety scale" (mYPAS) [8]. The mYPAS contains 21 items divided into five categories:

- activities;
- vocalisation;
- expressing emotions;
- state of arousal;
- interaction with family members.

In this study, the last category of the score was changed to "interaction with caregivers" because the parents were not present during induction [8]. The mYPAS score ranges from 25 (no anxiety) to 100 (very intense anxiety). The mYPAS score was assessed by an investigator in the operating room, who participated neither in anaesthesia induction nor in surgery. Only four members of the medical staff participated in this rating. They received a short training in the assessment of this score. Child's anxiety was evaluated with the mYPAS at 2 time points: after the establishment of the monitoring equipment, just before the application of the facemask (T1) and 30 seconds after the facemask was applied (T2). Some children were very agitated and refused to apply the mask. In these cases, caregivers held children in the chosen position until he fell asleep. These cases corresponded to children with a motor activity component of the mYPAS score greater than or equal to 3.

The following information were recorded in addition to the anxiety score:

- demographic data (age, weight and gender);
- premedication;
- duration of induction;
- expired fraction of sevoflurane upon the loss of the ciliary reflex;
- adverse effects ($SpO_2 < 96\%$, laryngospasm, falls) [9];
- type of surgery (visceral, plastic, urological, orthopaedic or ENT);
- history of inhalation anaesthesia;
- presence of a comfort blanket (which depended on the free choice of the child and his parents);
- professional status of the caregiver who placed the mask on the child's face (anaesthetist, resident, nurse, medical student).

2.3. Statistical analysis

According to the mYPAS values of the control group published by Golan [5]: 93 patients per group were required to demonstrate a 10 point difference (20%) in mYPAS score after the application of the mask (power = 90%, $\alpha = 0.05$). We planned to randomise 105 patients per group to take into account possible missing data. The order of the positions (sitting or lying) was randomised electronically (Rundom Pro 3.14). GraphPad Prism 5.0 software (©2007 GraphPad Software, Inc.) and used for statistical analysis.

The data distribution was examined with the D'Agostino–Pearson test. Related and unrelated quantitative variables were compared using Mann–Whitney and Wilcoxon tests. Multiple group comparisons were carried out with the Kruskal–Wallis test. Proportions were compared using Chi-square tests.

Results are expressed as the median and interquartile range [25–75]. A P value < 0.05 was considered statistically significant.

3. Results

3.1. Main results

Of the 210 children included, 6 were excluded due to missing data (4 in the lying group and 2 in the sitting group) and 2 due to

Please cite this article in press as: Cohen B, et al. Anxiety during inhalation induction in paediatrics: Sitting versus supine position, a randomised trial. Anaesth Crit Care Pain Med (2018), https://doi.org/10.1016/j.accpm.2018.02.010