

Effect of Caffeine on the Acceleration of Emergence from General Anesthesia with Inhalation Anesthetics in Children Undergoing Inguinal Herniorrhaphy: A Randomized Clinical Trial

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What's Known

- In general, a number of studies have been performed on mice to investigate the effect of sleep-reversing drugs and accelerate emergence. Among them, caffeine citrate has responded positively with its inhibitory effect on the adenosine receptor in the central nervous system and the elevation of intracellular cyclic adenosine monophosphate.
- Despite the positive effects of caffeine on animal models, only one study was conducted on adults with acceptable results.

What's New

- Owing to the importance of anesthesia and its subsequent emergence in the pediatric population, we decided to conduct a study for the first time based on ethical and scientific principles.
- In children undergoing inguinal herniorrhaphy under general anesthesia, 10 mg/Kg of caffeine could not accelerate awakening after general anesthesia. However, caffeine did not increase the blood pressure and heart rate in the children, and there were no significant side effects.

Abstract

Background: Awakening following general anesthesia (GA) is one of the most important concerns of anesthesiologists in their daily work. Previous studies on adult humans found that caffeine could accelerate awakening after anesthesia. This study aimed to determine whether or not caffeine can accelerate awakening after anesthesia in children undergoing inguinal herniorrhaphy under GA.

Methods: In this randomized clinical trial, we enrolled 18 children undergoing inguinal herniorrhaphy under GA with inhaled anesthetics from June 2019 to September 2019 in the tertiary hospital affiliated with Shiraz University of Medical Sciences (Shiraz, Iran). These children were randomly allocated to two groups. In group A, the children received intravenous caffeine (10 mg/Kg) at the end of the surgery, and in group B, the children received intravenous normal saline at the end of the surgery. The primary outcome was laryngeal mask airway (LMA) removal time at the end of anesthesia. Intra-operative hemodynamic data and side effects such as nausea, vomiting, dysrhythmia, cyanosis, and seizures in the recovery room were recorded and compared between the two groups. We used the independent-samples *t* test, Fisher's exact test, and repeated measures ANOVA for analyzing the data. P values < 0.05 were considered statistically significant.

Results: There were no significant differences in terms of demographic characteristics and hemodynamic data between the two groups. Furthermore, the time from the induction of anesthesia to laryngeal mask removal was 44.77 ± 7.87 min in the placebo group and 44.55 ± 10.68 min in the caffeine group. Therefore, there was no significant difference between the two groups ($P=0.961$).

Conclusion: In children undergoing inguinal herniorrhaphy under GA, 10 mg/Kg of caffeine could not accelerate awakening from GA. However, caffeine did not increase the blood pressure and heart rate in the children, and no significant side effects were observed.

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anesthesia vary for adults and children. Hence, there may be a need for higher drug dosage. This difference may be due to pharmacokinetics and pharmacodynamics differences between the children and adults.¹⁶ Therefore, although caffeine could not accelerate awakening from GA in our study, in contrast with the findings of Fong and colleagues, caffeine may induce faster awakening from anesthesia in adults.⁴ Thereby, probably if we had used a higher caffeine dose in our study, we may have been able to accelerate awakening from GA and find the same results as Fong and colleagues.⁴

According to our study findings, caffeine administration in children did not increase their blood pressure or heart rate, and these findings were in line with the results reported by Fong and colleagues regarding hemodynamic changes following caffeine administration.⁴ Furthermore, in our study, we did not find any complications such as nausea and vomiting, dysrhythmia, cyanosis, and seizures in the caffeine group during the study. Therefore, according to these findings, caffeine is a safe drug to use in children.

This study had certain limitations. First, we should have used higher caffeine doses to better evaluate the effect of caffeine on emergence in children following GA. Secondly, we should have surveyed the effect of caffeine on awakening in children following a long duration of surgery and anesthesia, because anesthesiologists are more concerned about delayed awakening after long durations of anesthesia, and in such a condition, maybe the accelerating effect of caffeine on awakening from GA would become more prominent. In future studies, these limitations should be taken into consideration.

Conclusion

According to the findings of our study, caffeine administration (10 mg/Kg) did not accelerate awakening from GA in children, who underwent inguinal herniorrhaphy under GA. However, we did not find any hemodynamic changes, such as tachycardia or hypertension in children who received caffeine for the acceleration of emergence from GA. Furthermore, in our study, we did not find any complications with caffeine either. Therefore, caffeine (10 mg/Kg) is a safe drug to use in children.

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Authors' Contribution

S.E: study conception, proposal writing, Acquisition of data, drafting the manuscript; A.P: study conception, proposal writing, drafting and revising the manuscript; S.Sh.H: study design, acquisition and analysis of data, drafting the manuscript; M.A.A: proposal preparation, analysis of data and drafting and revising the manuscript; All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of Interest: None declared.

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