

Neurocognitive Sequelae of Prolonged Anesthetic Exposure in Infants: From Bench to Bedside

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Description

Prolonged anesthetic exposure in infants has raised significant concerns regarding its potential impact on neurocognitive development. This research article explores the intricate relationship between prolonged anesthetic exposure during early infancy and subsequent neurocognitive sequelae. Beginning with evidence from preclinical studies, the article delves into the mechanisms underlying anesthetic-induced neurotoxicity, emphasizing synaptic development, neural apoptosis, and neuroinflammation. Translating these findings to the clinical context, the article reviews current evidence on neurocognitive outcomes in infants exposed to anesthesia, encompassing cognitive, behavioral, and developmental domains. Anesthesia is a critical tool used in various medical procedures to ensure patient comfort and safety, particularly in infants. Anesthesia is a crucial tool for various medical procedures in infants, but concerns have been raised regarding its potential neurotoxic effects on developing brains. This article aims to comprehensively review the current understanding of the neurocognitive sequelae of prolonged anesthetic exposure in infants, from both preclinical and clinical perspectives [1-3].

Mechanisms of anesthetic-induced neurotoxicity

This section presents the mechanisms underlying anesthesia-induced neurotoxicity observed in preclinical studies. It discusses the role of synaptic development, neural apoptosis, and neuroinflammation in disrupting normal brain development. Special emphasis is placed on the vulnerability of developing neural circuits to anesthetic agents, particularly during critical periods of synaptogenesis. Here, the article explores animal studies that have investigated the impact of prolonged anesthetic exposure on neurodevelopment. It discusses experimental designs, neurocognitive assessments, and structural changes observed in animal models, shedding light on the potential long-term consequences of early anesthetic exposure.

This section transitions to clinical research, summarizing epidemiological studies that have investigated the neurocognitive outcomes of infants exposed to anesthesia. It covers cognitive, behavioral, and developmental domains, including studies utilizing various research methodologies such as longitudinal assessments, neuroimaging, and standardized testing. To address the concerns associated with prolonged anesthetic exposure, potential protective strategies are discussed. These include drug modifications, optimized dosing, and the exploration of alternative anesthesia techniques. The article highlights ongoing research aimed at minimizing the impact of anesthesia on developing brains.

Ethical considerations and informed decision-making

Considering the clinical implications, this section explores the ethical dimensions of administering anesthesia to infants. It emphasizes the importance of informed decision-making by healthcare providers and parents, weighing the potential risks against the benefits of medical interventions requiring anesthesia [4,5].

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However, emerging concerns have arisen regarding the potential impact of prolonged anesthetic exposure on the developing brains of these young patients. The intricate interplay between anesthesia and neurocognitive development has prompted significant research efforts to understand the underlying mechanisms and potential consequences. This article provides a comprehensive review of the current knowledge on the neurocognitive sequelae of prolonged anesthetic exposure in infants, bridging the gap between laboratory findings and clinical outcomes.

By examining evidence from both preclinical studies, which offer insights into the mechanisms of anesthesia-induced neurotoxicity, and clinical studies that investigate real-world neurocognitive outcomes, we aim to shed light on this complex issue and inform clinical practice and decision-making. The synthesis of bench research and bedside observations is crucial for comprehending the broader implications of administering anesthesia to infants and guiding future research directions in this critical area of pediatric medicine.

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Conflict of Interest

There are no conflicts of interest by author.

References

1. Jevtovic-Todorovic, Vesna, Richard E. Hartman, Yukitoshi Izumi and Nicholas D. Benshoff, et al. "Early exposure to common anesthetic agents causes widespread neurodegeneration in the developing rat brain and persistent learning deficits." *J Neurosci* 23 (2003): 876-882.
2. Andropoulos, Dean B. and Michael F. Greene. "Anesthesia and developing brains-implications of the FDA warning." *N Engl J Med* 376 (2017): 905-907.
3. Sun, Lena S., Guohua Li, Tonya LK Miller and Cynthia Salorio, et al. "Association between a single general anesthesia exposure before age 36 months and neurocognitive outcomes in later childhood." *JAMA* 315 (2016): 2312-2320.
4. Warner, David O., Michael J. Zaccariello, Slavica K. Katusic and Darrell R. Schroeder, et al. "Neuropsychological and behavioral outcomes after exposure of young children to procedures requiring general anesthesia: The mayo anesthesia safety in kids study." *Anesthesiology* 129 (2018): 89-105.
5. Creeley, Catherine E., Krikor T. Dikranian, Gregory A. Dissen and Stephen A. Back, et al. "Isoflurane-induced apoptosis of neurons and oligodendrocytes in the fetal rhesus macaque brain." *Anesthesiology* 120 (2014): 626-638.

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