

Is Anesthesia Safe for My Child?

Terri Voepel-Lewis, PhD, RN, Shobha Malviya, MD

FOR YEARS, WE HAVE ANSWERED this common parental question with a resounding “Yes”—as data pointed to overwhelming safe and effective outcomes of pediatric anesthesia after implementation of intraoperative and early postoperative monitoring. However, a growing number of studies have raised concerns that anesthetics may actually be neurotoxic to the developing brain, leading to long-term changes in memory and cognition that cannot be identified during the perioperative period. These concerns have been highlighted in recent editorials in *The New England Journal of Medicine*,¹ *The Journal of the American Medical Association*,² and in the lay press.³ Not surprisingly, parents are more frequently asking surgeons and anesthesiologists “*Will anesthesia hurt my child’s brain?*” Furthermore, nearly half of anesthesiologists in a recent survey have been asked about this important topic by their nonanesthesia colleagues, including pediatricians, surgeons, and radiologists.⁴ Although we do not know how often perioperative nurses are asked this question, it is important that we understand what is known and unknown about anesthetic neurotoxicity and be prepared to answer parental concerns in a knowledgeable and supportive manner.

Extent of Exposure

Every year, approximately 1.5 million infants and children younger than 5 years are exposed to

general anesthetics for a variety of elective, urgent, or emergent procedures.⁵ Given their presumed safety and the fact that these agents produce superior conditions for a successful procedure (ie, a quiet, still, and comfortable child), there has been a dramatic uptick in the use of general anesthetics for elective diagnostic and minor superficial procedures in healthy children. The variety of anesthetics available has made it possible to develop effective protocols that include the use of volatile anesthetics (sevoflurane, isoflurane, or desflurane), benzodiazepines, ketamine, and/or propofol. Given the published safety data in children, these agents are widely used in combination with analgesics to achieve good anesthesia and analgesia during painful and nonpainful procedures.

What is Known About Anesthetic Neurotoxicity

There are now a multitude of studies that have demonstrated neurodegenerative damage (ie, harm to neural cells and neural stem cells) and subsequent negative neurobehavioral changes, including memory deficits and learning disability when young animals, including nonhuman primates, are exposed to these agents. All the anesthetics that act either by antagonizing the *N*-methyl-D-aspartate receptors or by potentiating the transmission of γ -aminobutyric acid-ergic agents have been implicated, and, to date, safe medications, doses, and duration of exposure have not been well defined.

The studies suggesting an association between anesthetics and neurotoxicity in children have, to date, been mixed and derived entirely from retrospective data. In several cohorts from different settings, data suggest that exposure to anesthetics during infancy and toddlerhood may affect learning, speech, and language development and is associated with diagnoses of developmental or learning disorders.^{6,9} Studies controlling for comorbidities and surgery itself have suggested that these confounding factors did not help to

Terri Voepel-Lewis, PhD, RN, Associate Research Scientist, University of Michigan Medical School, Department of Anesthesiology, Section of Pediatrics, Ann Arbor, MI; and Shobha Malviya, MD, Professor of Anesthesiology, Department of Anesthesiology, University of Michigan, Ann Arbor, MI.

Conflict of interest: None to report.

Address correspondence to Terri Voepel-Lewis, University of Michigan Medical School, Department of Anesthesiology, Section of Pediatrics, Room 4917, Mott Hospital, 1540 E. Hospital Drive, Ann Arbor, MI 48109-4245; e-mail address: terriv@umich.edu.

© 2016 by American Society of PeriAnesthesia Nurses

1089-9472/\$36.00

<http://dx.doi.org/10.1016/j.jopan.2015.12.005>

explain the decreases in cognitive functioning associated with anesthetics.¹⁰ Importantly, single and short exposures to general anesthetics were not retrospectively found to have the same relationship with poorer neurocognitive outcomes, such as lower intelligence test scores or diagnosis of a learning disability, as did multiple cumulative exposures.¹¹ This earlier retrospective finding was recently supported with prospective data from a randomized controlled trial showing that a single short exposure (less than 1 hour) of sevoflurane anesthesia in infants undergoing hernia repair was not associated with lower scores on an intelligence test at 2 years, compared with the use of spinal anesthesia.¹²

What Children are at Risk?

The peak vulnerability to the neurotoxic effects of anesthetics occurs during the time when rapid synaptogenesis—i.e., the “brain growth spurt” is occurring.¹³ In humans, this period begins in utero and extends for several years after birth. Most researchers believe that children younger than 4 years are most susceptible. However, it is unknown whether a newborn is more or less vulnerable to neurotoxicity than a 4 year old.¹³ Because cumulative exposure to general anesthetics appears to be most associated with this outcome, infants and toddlers who require repeated or prolonged exposures are likely to be at greater risk. However, as of now, safe exposure durations remain entirely unknown.

Current Recommendations

Pediatric anesthesiologists are increasingly concerned about the potential for harming young children with the currently available anesthetics.^{9,14} It was recently acknowledged, that although the data are not as yet strong, even a modest effect of anesthetics on development could have a potentially profound effect on public health.¹⁰ The growing concern for harm has led the International Anesthesia Research Society to form a public-private partnership with the Food and Drug Administration called, SmartTots (Strategies for Mitigating Anesthesia-Related Neurotoxicity in Tots). SmartTots has released two consensus statements about the potential risks of anesthetics to the developing brain, and these have been endorsed by the Society for Pediatric Anesthesia,

the American Academy of Pediatrics, the American Society of Anesthesiologists, and other groups.

To Delay or Not to Delay

The most recent statement acknowledges that for most young children who are presented with the need for surgery, postponing the procedure may worsen an underlying health condition and is, therefore, not an option. It has been suggested that pediatric specialists, in collaboration with anesthesiologists, should carefully identify those surgical procedures that can typically be delayed without risk until children are older.¹⁵ Additionally, SmartTots recommends that parents, anesthesiologists, and surgeons should, together, carefully consider the urgency of the procedure and determine the risks or benefits of delaying. Surgery that is deemed to be not urgent or emergent should be avoided in children younger than 3 or 4 years.^{1,9} If delaying surgery is not an option, providers should make every attempt to minimize the number and duration of times a child is exposed to potentially harmful anesthetics. This means that perioperative efficiency is critical to improve safe outcomes for young children. Perioperative nurses play an important role in the efficiency of procedures. Because it would be unethical to withhold anesthetics for a young child undergoing a painful procedure, and until alternative and potentially less toxic options are studied and identified, SmartTots recognizes the need to give the currently available anesthetics and sedatives to the child who is undergoing surgery.

What Next?

Most experts agree that there is an urgent need for additional prospective studies to provide better guidance to ensure the safest anesthetic management of infants and children.^{8,16} There are currently several multicenter initiatives underway to examine long-term cognitive outcomes in children. Anesthesiologist researchers are studying new multimodal strategies that include combining regional techniques with newer purportedly less toxic sedatives and analgesics to determine whether surgery can be facilitated with less exposure to potentially toxic anesthetics. Perianesthesia nurses who provide care for children should stay abreast of current

Download English Version:

<https://daneshyari.com/en/article/2668244>

Download Persian Version:

<https://daneshyari.com/article/2668244>

[Daneshyari.com](https://daneshyari.com)