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# Is anesthesia bad for children's brains?

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I recently received a call from a father whose four-year-old daughter was scheduled to receive general anesthesia for a surgical procedure expected to last about two hours. He was concerned about the risk of exposing her to general anesthesia for that long. “Will it affect her brain”? “Could there be any long-lasting effects?” These are important concerns for parents in light of the many recent media reports about possible long-term harm from exposure to general anesthesia during childhood. Those reports cited two types of studies: some that purposely exposed animals to large overdoses of anesthesia, and some that studied large populations of adult humans who were exposed to general anesthesia during childhood. The results were mixed but nonetheless worrisome. Some of the animals exposed to general anesthesia developed brain abnormalities if the exposure occurred before a certain developmental age, and the human studies demonstrated that if the adults received anesthesia while very young, they were more likely to have subtle deficits in cognitive function years after the exposure. But these studies were flawed because the animals received large overdoses in uncontrolled conditions, and the human studies were performed retrospectively, looking back in time. For the humans, the researchers were not able to determine whether it was the anesthesia itself that caused the deficits, or other medical conditions that caused the subjects to require anesthesia in the first place.

These results were deeply concerning for the pediatric anesthesia community. Therefore, research studies were launched to determine the truth and answer important questions such as, “Does exposure to general anesthesia cause brain abnormalities? If so, what aged children are vulnerable? How much anesthesia is too much? Which types of anesthesia drugs are the safest?” And so on.

Two studies released this year by leading medical journals show promising results. These studies are important because they were performed prospectively, the right way to answer these crucial questions. (As a disclaimer, my colleagues and I at The Children’s Hospital of Philadelphia were partly involved in both studies.) The first study was released in January 2016 in the journal, *The Lancet*. It encompassed a group of young infants who required hernia surgery in different centers throughout the world, and were randomly assigned (in other words, like flipping a coin) to receive either general anesthesia or local (spinal) anesthesia for the procedure. When tested at two years of age, the children who received general anesthesia were no more likely to have

developed deficits in brain development than the children who received local anesthesia. Further evaluation is expected when the children are five years old to confirm these findings.

The second study was released just last week in the Journal of the American Medical Association. In this study, healthy children that received general anesthesia for hernia surgery before the age of three years were compared with their healthy siblings that were never exposed to general anesthesia. When all children were then tested sometime between 8 and 15 years of age, the two groups showed no differences in IQ scores.

Although encouraging, these recent studies do not tell the complete story. For example, we do not yet know if multiple exposures to general anesthetics result in subsequent harm, nor do we know whether some anesthetics are safer than others. But, keep in mind, that a child only receives general anesthesia because they need a medical procedure that wouldn't be possible while they are awake. This is obviously important whether the child needs a surgical procedure such as hernia repair, or an MRI to make an important diagnosis early in life. It's a dilemma no parent wants to face. But, given the choice of foregoing an important medical procedure that will certainly impact the health of the child, or avoiding general anesthesia, with its current unknowns about long-lasting harm, the choice is easy.

Through a public-private partnership between the International Anesthesia Research Society and the FDA, an organization called Smart Tots was created to cohesively “coordinate and fund research with the goal of ensuring safe surgery for the millions of infants and young children who undergo anesthesia each year” (Smarttots.org). Parents whose children require general anesthesia can follow the progress of these studies at the Smart Tots website, and should talk to their child's anesthesiologist about these important issues.

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