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A Less Risky Anesthesia for Babies

More hospitals evaluate spinal anesthesia for surgeries that last 1½ hours or less



Infant Mira Barr with her parents Michael and Lisa Barr. The Barrs elected for Mira to have spinal anesthesia for two surgeries where doctors inserted and removed a feeding tube.

By Laura Landro
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For millions of infants and toddlers who get surgery every year, mounting concern about the risk of general anesthesia is leading more hospitals to consider an alternative: spinal anesthesia which leaves babies awake, immobilized and pain-free.

The spinal approach has been shown to have fewer breathing complications, quicker recoveries, and faster feeding, which enables families to take babies home sooner. It is used primarily for surgeries that last an hour and a half or less, and take place generally in the abdominal area and lower extremities.

Spinal anesthesia for infants was pioneered by the University of Vermont Children's Hospital in Burlington, Vt., four decades ago, but it never caught on widely. Many surgeons and anesthesiologists were reluctant to change traditional practices, or deal with babies that might squirm or fuss during a procedure. But in recent years animal studies have increasingly shown that exposure to anesthetics can cause memory loss, learning difficulties and other harmful changes in developing brains of young lab rats and monkeys, so researchers have begun to tackle the question of whether the same risks apply to children.

Hospitals around the world are now participating in multiple studies to determine whether exposure to anesthesia is associated with cognitive problems later on. The largest of those, known as the GAS study, includes 28 hospitals in the U.S., Canada, Europe, Australia and New

Zealand, and aims to measure intelligence at age 5 in 722 infants randomized to receive either general or spinal anesthesia for hernia repair surgeries.



Anesthesiologist Robert Williams with infant Mira Barr at the University of Vermont Children's Hospital in Burlington, Vt. Photo: University of Vermont Children's

An interim analysis, published online in October in the *Lancet*, found no difference in cognitive function at two years of age, which suggests a single short-duration exposure to general anesthesia may not be harmful. But lead investigator Andrew Davidson, medical director of the clinical trial center at Murdoch Children's Research Institute in Melbourne, Australia, says that until the study has completed its evaluation of children at age 5, in 2017, there can be no definitive answer as "some aspects of neurodevelopment cannot be assessed at two years of age."

The early results also don't rule out the possibility that longer exposure or multiple exposures to anesthesia in early childhood can cause changes in the brain, Dr. Davidson says. A new study he is developing will compare a combination of a type of spinal and light anesthesia against longer use of general anesthesia in surgeries lasting longer than one hour.

The GAS study is partially funded by the U.S. Food and Drug Administration, which launched a partnership with the International Anesthesia Research Society in 2010 called SmartTots to coordinate and fund research on safer anesthesia for children. Last month, after the interim results were published, SmartTots issued a statement, endorsed by 19 health organizations, including the American Academy of Pediatrics, the American Society of Anesthesiologists, and the Society for Pediatric Anesthesia, which said while the early results are encouraging that a single short-duration exposure to general anesthesia "may not be harmful," more questions remain.



Infant Mira Barr with her mother Lisa at the University of Vermont Children's Hospital. Photo: University of Vermont Children's Hospital

For example, the group noted, brain function is very complex, and can't be measured with a single test. Until more is known about general anesthesia's effects over time, parents and doctors should "consider the risks, benefits and timing of any treatment on very young children," including delaying surgery if possible and avoiding sedatives and anesthesia if pain isn't an issue, such as for diagnostic tests.

Kennith Sartorelli, a pediatric surgeon at the University of Vermont Children's Hospital, says there have been no major complications in the more than 2,500 surgeries the hospital has performed using spinal anesthesia for procedures on the lower extremities or abdominal area, which are tracked in a registry. Aftereffects may include headache or infection at the spinal needle insertion site but there has never been a serious infection such as meningitis, he adds.

Dr. Sartorelli says it can sometimes be challenging to work on a moving baby, and it is "learning curve," but often infants doze off because they are immobilized from the chest down. His colleague, anesthesiologist Robert Williams, may help keep the babies occupied.

"When I tell parents I don't need to place a breathing tube or an anesthesia mask on their baby, the sense of relief on a mother's faces is remarkable," Dr. Williams says. Babies are often "awake and holding my hand during surgery."

Spinal anesthetics are the first choice at the children's hospital for all infant surgeries in the mid-abdomen and below which last less than an hour, Dr. Williams says. The hospital still uses general anesthesia for cardiac or neurosurgery or for procedures that last longer than 90 minutes. Spinal anesthesia wears off after that.

Mira Barr, who was born three weeks early in November 2014, spent two weeks in the neonatal intensive care unit and needed a feeding tube surgically inserted at 12 days old in order to go home. Her parents, Lisa, a therapist for a community mental health center, and Mike, a licensed nursing assistant in an adult unit at the University of Vermont Medical Center, sat down first with Dr. Sartorelli, who explained the risks of general anesthesia and the option of having a spinal. "The idea of general anesthesia felt really scary," Mrs. Barr says, especially since Mira would need another procedure in six months to close the incision.

The first procedure went smoothly, with a lot of support from the NICU team, Mrs. Barr says. Six months later, another surgeon and Dr. Williams, the same anesthesiologist, reviewed the risks and benefits again. During the surgery, which went smoothly, [a video taken for educational purposes](#) for medical staff show Mira awake and sucking on her pacifier, holding Dr. Williams' finger.

"She went into the procedure very quickly and came out, and I was immediately able to hold her and breast feed her," Mrs. Barr says. "Any choice to have surgery is nerve-racking but for a baby that can't talk it is really difficult, and it decreased a lot of anxiety that she was able to suck her pacifier and look at people and not have the experience of being under."

Michelle Downes, a corporate project manager who lives in Burlington, says she was relieved to be offered spinal anesthesia when one of her twin sons, Felix, had surgery to repair club feet at

the University of Vermont Children's Hospital last May at 2 months old. Having just had general anesthesia herself for the first time to undergo surgery for post-birth complications, "it was a lot more intimidating" to think of her baby being put completely under in the same manner. The surgery on Felix was a success, with no complications.

Emmett Whitaker, a pediatric anesthesiologist and researcher at Nationwide Children's Hospital in Columbus, Ohio, started a spinal anesthesia program there after visiting the University of Vermont Children's last February, and has used it in 15 cases so far including surgery on undescended testicles, and orthopedic procedures. He says he has yet to have a parent say no when offered the spinal.

He is also enrolling children in a study to compare markers of inflammation after anesthesia, which may play a role in brain injury, comparing infants up to a year old who receive general anesthesia versus spinal anesthesia at 6 months and 1 year. While there is no conclusive evidence yet that general anesthesia isn't safe, Dr. Whitaker says, the spinal option should be offered where feasible, "so if we find out there are problems, we won't look back and say we wish we had offered an alternative."

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