

## A Price for Bliss: The Risks and Benefits of the Use of Anesthesia for Children

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WRITER'S COMMENT: *As a science major, I have spent most of my time studying subjects ranging from the biochemistry of the origins of life to the prospects of stem cell research. So, Dr. Milton's UWP 104F course was refreshing in that it enabled me to explore controversial issues, while developing my literary and writing skills. Dr. Milton challenged my class to explore a controversy in medical treatment. I recalled my friend's experiences with multiple pediatric surgeries, wherein he was foregone anesthesia during a painful procedure. I began to explore the medical literature in trying to understand when anesthesia is recommended. Initially, I had anticipated that anesthesiologists would have a very fixed protocol that correlated the dose of anesthetics with patient pain. However, not only did I learn that anesthesia dosing is subjective, but that the use of anesthesia altogether had significant risks and benefits. I fleshed out the medical literature and believe that I presented a comprehensive evaluation of anesthesia, while highlighting the complexity of the issue.*

INSTRUCTOR'S COMMENT: *For this assignment, J.P. had to write a reflective case study, which evolved out of his case study of a patient who had been treated for an interesting medical problem. J.P. had to reflect on a topic of significance that would engage a general audience while also supporting his ideas with recent, relevant scholarly research. Because the person he interviewed had undergone multiple surgeries and procedures as a young child, J.P. chose to write about the problem of giving anesthesia to young children who are incapable of articulating their level of pain. J.P. humanizes this fascinating issue and does an excellent job writing for a general audience. Rather than oversimplifying the issue, J.P. thoughtfully explores the complexities of the medical and ethical ramifications of both giving and withholding anesthesia, showing that there are no easy answers.*

—Heather Milton, University Writing Program

The childhood of a patient with club feet is tough. It was even more so for James Thompson\*, an infant—born five weeks prematurely—who suffered from a severe case of club feet. His condition, called “bilateral congenital talipes equinovarus” or CTE, presented with huge deformities in the positioning of his feet; they were bent downward at the ankle and twisted backward to nearly 180 degrees. On top of that, the toes of his right foot were curled inward. The condition was so severe that James would never be able to walk properly without a great deal of treatment.

Within the first hour after birth, James began his long treatment process. His feet were placed in casts that extended above the knees. The aim was that by placing new casts on a weekly basis, James’s feet would gradually straighten out and take on the proper shape. However, nine months of the regimen were unsuccessful, so James underwent three surgeries over the course of the next seven years. The first surgery released tension from the Achilles tendons by elongating them. It partially repaired the deformity, having rotated the feet into their proper forward-facing orientation. However, the feet were still bent downward.

Another operation was performed when James was five years old. This time the surgeons repaired the downward bend of the feet by reorienting the major tendons in the feet. After the operation, the patient’s feet were again placed in casts that extended above the knees. To stabilize the tendons, thick metallic pins were placed that penetrated through James’s feet at the ankle and exited at the heel. After six weeks, James’s wounds had healed, and it was time to remove the cast and the pins. Dr. Kenner, an orthopedic surgeon, removed the pins without administering any anesthesia at all. Not even Lidocaine—a local anesthetic routinely used to numb surface tissues—was used. He claimed that the child would not remember any pain since he was so young. He was wrong. Twenty-one year old James still vividly remembers the misery.

Based on my experiences, I find it hard to understand why Dr. Kenner did not give James anesthesia. At the age of 10, I was “accidentally” pushed into a wall while playing basketball and a large screw tore a deep gash in my right thigh. I was rushed to the emergency room. There, Dr. Kim, an Emergency Medicine resident, cleaned out the wound with a saline wash. She then decided that the wound needed to be stitched closed. She pulled out a suture that more closely resembled a dagger

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\* All names have been changed for privacy.

than a needle. Noticing the cringe on my face, she pulled out a vial of Lidocaine and said, “Don’t worry; I’m not gonna torture you.” The little stick of the Lidocaine needle (much smaller in comparison) was all I felt for the rest of the procedure. Before I knew it, my wound was closed, and I was discharged. Anesthesia, to me, was a miracle.

If it is such a wonder drug, then why did Dr. Kenner forego using anesthesia? To accurately answer this question, we need to have an understanding of how doctors evaluate pain. For an adult, the doctor can adjust the dose of anesthetic by asking the patient of her discomfort. Unfortunately, the situation has not been so simple for young children. And the complexity is all founded in the notion that they do not feel pain.

But, do young children really not feel pain? Beginning in the 19<sup>th</sup> century, doctors believed that infants and young children did not experience pain. For operations, doctors only gave the children muscle paralytics to relax, but no anesthetics<sup>1</sup>. However, research in the late 20<sup>th</sup> century began to contradict this notion. In 1987, a Harvard Medical School team conclusively established that infants can feel pain. They also pointed out that painful events have long lasting effects on an infant’s behavior, often disrupting her ability to adapt to her environment and impeding parent-infant bonding.<sup>2</sup> James’s doctor practiced at a prestigious academic hospital, so it seems likely that he was familiar with this research. Then why did Dr. Kenner torture him?

Doctors consider much more than pain when determining whether a patient is to be given anesthesia. If you were to ask any practicing anesthesiologist what their greatest fear was, he or she would say, “overdosing a patient.” It turns out that determining the proper dosage of anesthesia for each patient is quite a feat. In a study examining over forty thousand patients, clinicians—led by Professor Vourch of the Institut National de la Sante in France—determined that anesthesia-related complications happened at a rate of 1 in every 1,000 operations<sup>3</sup>. Often these complications led to death. If you consider that only 1 in 10,000 automobile drivers are killed in car crashes each year, you can see how frequent anesthesia-related complications really are<sup>4</sup>.

The risk of overdosing a patient with anesthesia lies in its effects of decreasing the breathing rate and increasing blood carbon dioxide levels<sup>5</sup>. This risk can be understood when one looks at the mechanism by which anesthetics work. Anesthetics prevent the transmission of nervous

signals by inhibiting certain receptors in neuronal synapses. However, this general inhibition is not limited to pain signals. Higher doses become very dangerous since signals that coordinate breathing also become inhibited. For James, one would suspect that his doctor likely wanted to avoid an unnecessary risk.

The risks of anesthesia do not end there, but have evolved with an increased understanding of the mechanism by which the drugs work. In addition to suppressing breathing, anesthetics have been shown to increase a child's risk for a developmental disorder, such as Attention-Deficit Hyperactivity Disorder (ADHD) and other learning disabilities. In 1999, a team led by John Olney of Washington University demonstrated that the administration of anesthesia to young mice caused neuron cell death<sup>6</sup>. They suspect that the drug's ability to suppress nervous signals actually causes neurons to die. These studies were expanded to primates. Olney's team found that six-day old monkeys that were treated with anesthesia suffered a 13-fold higher rate of neuron cell death than the control group that was not given anesthesia<sup>7</sup>. Olney suggested that the loss of neurons in infants treated with anesthesia can prevent the proper development of the brain.

Furthermore, evidence of neural defects in human patients was established in 2009 when a team led by Guohua Li of Columbia University showed that giving anesthetics to young children significantly increased their risk for developing a disorder. The team followed 383 children who were given anesthesia for hernia repair operations. Compared to the control group, these children were twice as likely to be later diagnosed with developmental disorders<sup>8</sup>. At this point, anesthesia seems to be a case of a Catch-22: both pain and the drug used to relieve pain place a child at risk for a behavioral disorder. Doctors might as well just flip a coin.

Tyler Wilkins had the misfortune of being born with a defect in his heart's anatomy. He had a hole connecting the atria of the left and right heart, which reduced the efficiency with which the heart was able to nourish the rest of his body. As a close friend of his parents, I saw how difficult it was for them to see their five-month-old baby undergo two open heart surgeries. During the first year of his life, Tyler spent more time in the Intensive Care Unit than at home with his parents. Although the operations were successes, Tyler was given large amounts of anesthesia over the course of the year. As a result, he has had to live his life not only with a weak heart, but also with an increased risk for a behavioral disorder.

Tyler's parents asked whether reduced doses of anesthesia would be

enough to ease his pain without placing him at too much of a risk for a disorder. In theory, that would work. However, a study conducted by Anand et al. in 1992 demonstrated that children receiving deep anesthesia during cardiac operations had a much reduced rate of complications than did those who only had low doses. In fact, they showed that pain increased the risk for many diseases, including blood clotting<sup>9</sup>.

The complexity of the effects of anesthesia prompts one to ask, when is it rational to use the drugs? In 2008, McGowan and Davis reflected on the Pros and Cons of this issue and devised guidelines for pediatricians. Whenever possible, they explain, an operation should be delayed until older ages as long as no additional risk is incurred by waiting<sup>10</sup>. On a broader scope, they stress the pediatrician's duty to alleviate pain as a priority, but do recommend that anesthesia be foregone whenever possible. This conclusion leaves space for a pediatrician's subjective evaluation of a patient's need and indicates that there is no clear cut-off for when anesthesia is to be used.

Without an absolute consensus among physicians, it becomes the right of the parents to have a say in what they feel is best for their child. Therefore, parents should factor in the risks and benefits in answering when anesthesia is to be used. For Tyler, the answer is relatively simple. Since he absolutely needed the heart surgeries, Tyler was better off receiving deep anesthesia. With this, he forwent the immediate risk of blood clotting for a later risk of ADHD. On the other hand, James's situation was less straightforward. James's procedure for removing the pins was less traumatic than Tyler's operation. So, foregoing anesthesia may not have been so risky. Thus, Dr. Kenner may have been justified after all.

James's parents demonstrated their opinion when he had his third and final operation to repair his club feet. The operation aimed to repair the curling of the toes of his right foot. They decided to allow for complete use of anesthetics to alleviate James's pain. That is, deep anesthesia was used during the surgery and Lidocaine was used for subsequent procedures. Is their decision justified? Retrospectively, yes. James's feet were repaired successfully, and he was not subjected to unnecessary pain during the treatment process. Moreover, now at the age of 21, he not only does not suffer from any behavioral disorders, but also excels in his academics. For James, the use of anesthesia did not jeopardize his well-being. As for Tyler, time will tell.

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