Anesthesia in the Form of Audiovisual Distraction for a Child Requiring Surgery With End-Stage Cardiomyopathy: A Case Report

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Anesthetizing children with extreme cardiopulmonary illness can be especially challenging. In adults, a host of alternatives to general anesthesia for the labile patient are available. However, in children, these techniques may be challenging due to a lack of patient cooperation. Distraction techniques have been successfully used to reduce procedural pain. The patient whose case is reported here required surgery for inguinal hernia repair after repeated bowel incarceration. Due to severe end-stage cardiomyopathy, the risk of general anesthesia was deemed excessive. Distraction was used to usher the patient through an awake caudal block for avoidance of general anesthesia. (A&A Practice. 2019;13:346–9.)

Distraction is a minimal risk technique that may be used to augment procedural sedation and assist with pain control during a host of procedures.^{1,2} Specifically, in patients with extreme cardiopulmonary illness, distraction techniques may be used alone or in combination with sedation to improve patient comfort during procedures for which general anesthesia is not advisable. We present a case in which distraction with minimal sedation was used to facilitate caudal block placement in a child with end-stage biventricular cardiomyopathy. This technique allowed for avoidance of general anesthesia during a surgical procedure in a young child deemed to have excessive anesthetic risk.

Consent for Publication

Written consent for publication was obtained from the patient's parents.

CASE DESCRIPTION

Case Preparation

A 3-year-old, 11.5-kg child arrived for semielective repair of bilateral inguinal hernias due to recurrent bowel incarceration. The patient's medical history included arthrogryposis and severe kyphoscoliosis, in addition to complex congenital heart disease. Preoperative transthoracic echocardiography revealed severe biventricular hypertrophic cardiomyopathy with near-complete cavitory obliteration (Figure 1). The right ventricular outflow tract had combined severe subvalvar and valvar pulmonic stenosis with mean and peak gradients of 73 and 152 mm Hg, respectively, using continuous wave Doppler. Examination of the left ventricular outflow tract showed systolic anterior motion of the mitral valve with dynamic flow obstruction, with a peak

gradient of 89 mm Hg. There was significant flow acceleration across the aortic valve, with mean and peak gradients of 37 and 66 mm Hg, respectively. The marked left ventricular hypertrophy was noted to have a diastolic septal thickness consistent with a z-score of +19. Prominent reversal of flow was observed in the hepatic veins and inferior vena cava. However, the patient was wheelchair bound due to his arthrogryposis and was thus asymptomatic. Home medication included metoprolol.

Due to concern for significant anesthetic risk, including intraoperative malignant arrhythmias, acute heart failure, and obstructive circulatory arrest, the patient's primary cardiologist and heart failure specialist were consulted. It was decided that the patient was not an operative candidate for either septal muscle resection or orthotopic heart transplantation. In addition, discussion revealed the child to be an unsuitable candidate for extracorporeal support if an intraoperative cardiac arrest should occur. Because the cardiology, heart failure, and anesthesiology teams considered the patient to be a significant risk for a perioperative arrest, a decision was made to approach the family collectively. The surgeon suggested that the recurrent hernia incarcerations would nearly certainly continue to recur at 3 years of age. Concern from the family regarding the immediate risk of anesthesia was weighed against the patient returning to our peripheral campus with a potentially nonreducible and life-threatening bowel strangulation. The anesthesia plan was therefore to proceed with distraction techniques for both placement of a caudal block and throughout the surgical procedure. While for obstructive physiology, it is not recommended to reduce afterload, in children, caudal anesthesia does not precipitate the reduction in systemic vascular resistance as in adults. We discussed that if these techniques were unsuccessful during the intraoperative period, the team would proceed with sedation and/or general anesthesia. However, if the distraction and regional anesthetic failed before surgical incision, the family requested the procedure to be aborted.

Anesthetic Management

The patient was brought to the operating room with an in situ 22-gauge intravenous line. We enlisted the help of a child life specialist to focus solely on the distraction. Standard American Society of Anesthesiologists (ASA)

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Figure 1. Preoperative trans-thoracic echocardiography in parasternal long-axis view demonstrating severe RV and LV cavity obliteration from thickened ventricular free wall (A) and interventricular septum and dynamic obstruction of the LV outflow tract (B). LV indicates left ventricular; RV, right ventricular.

monitors were applied in addition to defibrillation pads. He was positioned in the left lateral decubitus position while watching his personal electronic tablet (Figure 2). Midazolam was given in 0.5-mg aliquots (2 mg total) over 10 minutes to augment procedural sedation. Topical vapor-coolant spray was applied over the sacrum to numb the skin (Gebauer Co, Cleveland, OH) followed by subcutaneous infiltration of 2% lidocaine using a 25-gauge needle. A caudal block was performed using a 22-gauge angiocatheter,

and injection was confirmed using ultrasound. Twelve milliliters of 0.25% bupivacaine with 1:200,000 epinephrine was injected into the caudal space. The angiocatheter was secured in place allowing for a continuous infusion of local anesthetic to be administered throughout the procedure. The patient was positioned supine with 10 minutes allowed to elapse for the block to “set up.” The drape was positioned to allow ample room for the patient to feel comfortable. The patient was administered dexmedetomidine in 2- μ g aliquots

Figure 2. Intraoperative images. A, Preoperative placement of caudal block using patient audiovisual distraction. B, Intraoperative patient positioning providing patient comfort and continued use of audiovisual distraction.

Table. Commonly Used Forms of Procedural Distraction by Patient Age

	Cognitive Distraction		Behavioral Distraction	
	Active	Passive	Active	Passive
Young children	- Audiovisual devices - Interactive games	- Music	...	...
Adolescents	- Singing - Counting aloud - Audiovisual devices	- Music	- Breathing	- Reimagination of pain - Emotive imagery

to a total of 12 µg for patient restlessness midway through the procedure. The bilateral hernias were repaired while the patient watched cartoons on his electronic tablet with a surgical time of 51 minutes. After an uneventful recovery in the postanesthesia care unit, the patient returned to the cardiology service for postoperative care and monitoring.

DISCUSSION

Patients with end-stage cardiopulmonary illness present a challenge for the anesthesia provider, especially in young children. Whereas older children and adults can cooperate with regional anesthetic techniques precluding the administration of general anesthesia, this is not the case in young children. In such cases in which the risk of general anesthesia is deemed prohibitive, distraction may be used in association with light sedation or as a solo means of “anesthesia” for performing a variety of procedures. Distraction techniques have most commonly been used for short yet uncomfortable procedures (ie, intravenous line placement), although distraction has been demonstrated to be effective in more complex procedures.^{1,3} In younger children, a degree of intravenous sedation may also be required. With proper planning, use of distraction, with or without mild supplemental sedation, may be efficacious in allowing the patient to tolerate complex procedures or even surgical intervention.⁴ Every attempt should be made to enhance

patient comfort (positioning, minimal operating room talk, and reduced monitor noise). Ideally, a separate person not involved in the clinical care should provide the distraction. This allows for continuous patient support without deviating the clinical care providers’ attention from monitoring.

Distraction theory relies on the limited ability of the brain to process incoming stimuli.⁵ By providing external sensory input, the ability to focus on other stimuli such as pain becomes significantly reduced.⁵ There are many forms of distraction, including cognitive techniques such as counting, listening to music, behavioral/active techniques such as breathing, and using electronic devices.¹ The best means of distraction is highly patient specific. However, younger children are better suited to active techniques (Table). Specifically, audiovisual distractors have been proven successful at reducing procedural pain in young children.^{6,7}

While preferable to defer cases that are not urgent or emergent, patients with severe cardiopulmonary disease often require a host of procedures. In this situation, while the patient’s cardiac care was ultimately palliative, there was significant concern for a fourth recurrence of bowel incarceration. Ideally, in patients with severe comorbid conditions, physicians most familiar to the family should be consulted. Luckily, the cardiologist with a 2-year working relationship with the patient and his family was available to counsel the family along with the anesthesiology and surgical teams.

Distraction should be considered a valuable alternative for patients with extremes of cardiopulmonary disease. In all cases, detailed discussion and preparation with the patient (when age appropriate) and family should occur. Ideally, an additional provider should be dedicated to focus solely on the patient and to provide continuous emotional support. The backup plan, if the nonpharmacological approach fails, should be discussed with the family in advance. With mild sedation and the use of audiovisual distraction in the form of an electronic tablet, the patient was able to undergo a surgical intervention without a general anesthetic. ■■

DISCLOSURES

Name: Adam C. Adler, MD, MS, FAAP, FASE.

Contribution: This author helped design the study, care for the patient, and prepare the manuscript.

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