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Pediatric Anesthesia Abstracts

Contents

Anesthesia management for pediatric intestinal transplant– single-centre ten-year review

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58

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INTRODUCTION

Pediatric intestinal transplantation (ITx), performed either in isolation or in combination with the liver or multivisceral transplantation, is an uncommonly performed surgery that is complex and challenging. It is the main treatment modality for progressive intestinal failure- associated liver disease, progressive loss of central vein access and repeated admissions requiring critical care management.[1] Previously reported challenges for the anesthesiologist include establishing vascular access, managing hemodynamics, and fluid and electrolytes management.[2] Existing literature mainly report perioperative anesthesia management of ITx in the adult population[2–4] with scattered cases reports of the pediatric ITx anesthesia management experience.[5] In this case series, we aim to evaluate a tertiary pediatric hospital's perioperative management of patients undergoing ITx between 2012 to 2023 and identify best practices to optimize perioperative anesthetic care.

METHODS

We received approval from the hospital's Research Ethics Board, who granted a waiver for written consent. Cases were identified from the intestine transplant patient list which tracks all children who have received ITx (isolated, combined liver-intestine or multivisceral) between January 2012 to August 2023. Data was obtained from a combination of the intestine transplant patient list and electronic medical records. Demographic information such as recipient and donor age, weight, height, sex was collected. Patients' electronic medical records were interrogated for 1) preoperative data comprising comorbid or etiologic information, indication for transplant, pretransplant laboratory and pathological investigations, 2) intraoperative information including operative timings, choice of anesthetic and pain management modalities, volume of fluids and blood products administered, maximal doses of vasopressors and inotropic agents, number of central and peripheral vascular access, duration of postreperfusion

syndrome (30% reduction in mean arterial pressure for at least one minute within ten minutes of unclamping), perioperative cardiac and respiratory complications, hypothermia, and 3) postoperative length of intensive care unit (ICU) stay, days to extubation, 30-day return to the operating room (OR), and one-year graft and patient survival. Data reporting consisted of median [interquartile range (IQR)] for continuous variables, and number (percentage) for categorical variables.

RESULTS

Eleven patients, median age 9.2 yr [range, 0.7–13.3] underwent ITx between 2012–2023. Eighty-one-point eight percent were male. Predominant diagnosis was Gastroschisis (45.5%) while progressive liver disease (54.5%) was main indication for transplant. Forty-five-point five percent had isolated ITx, 36.4% multivisceral transplant, 18.2% liver and intestine transplant. All patients had at least one central venous catheter placed by interventional radiologist. Median volume of red cells transfused was 24.4 $mL \cdot kg^{-1}$ [IQR, 21.4–74.3], FFP 40.3 $mL \cdot kg^{-1}$ [IQR, 21.4–7.8]. Median volume of crystalloids was 65.2 $mL \cdot kg^{-1}$ [IQR, 48.8–98.6], colloids 36.2 $mL \cdot kg^{-1}$ [IQR, 12–49]. For analgesia, all patients had opioid infusion. Thirty-six-point four percent patients received bilateral transversus abdominis plane block. Twenty-seven percent of patients were extubated in OR with median ICU stay of 3 days [range, 1–17]. One patient had post reperfusion syndrome at five minutes, while most (72.7%) patients were hypothermic ($T < 35$ °C). To date, one-year patient and graft survival is 100%.

DISCUSSION

Isolated and combined ITx in pediatric patients involves a high-risk population and poses significant challenges to the anesthesiologist. The anesthetic management should focus on: 1) preoperative planning for establishment of central and peripheral intravenous access with consideration for involvement of interventional radiology; 2) consider regional techniques for optimal analgesia; 3) anticipation of potential PRS by titrating inotropes prior to unclamping to raise mean arterial pressure 20% above baseline; 4) careful fluid management with crystalloids as the main fluid of choice; and 5) maintenance of intraoperative normothermia.

REFERENCES

1. *Kaufman SS, Avitzur Y, Beath SV, et al.* New insights into the indications for intestinal transplantation: consensus in the year 2019. Transplantation 2020; 104: 937–46. https://doi.org/10.1097/tp.0000000000003065
2. *Planinsic RM.* Anesthetic management for small bowel transplantation. Anesthesiol Clin North Am 2004; 22: 675–85. https://doi.org/10.1016/j.atc.2004.06.007
3. *Dalal A*. Intestinal transplantation: the anesthesia perspective. Transplant Rev (Orlando) 2016; 30: 100–8. https://doi.org/10.1016/j.trre.2015.11.001
4. *Zerillo J, Kim S, Hill B, et al.* Anesthetic management for intestinal transplantation: a decade of experience. Clin Transplant 2017; 31. https://doi.org/10.1111/ctr.13085

5. *Karaman Y, Cakmak M, Gunturk S, Aydin G, Guvenli Y.* Current anesthetic management in a 20-month-old pediatric patient with intestinal transplantation due to microvillous inclusion disease. Exp Clin Transplant 2023; 21: 992–5. https://doi.org/10.6002/ect.2020.0385

Enhancing caregiver recall in pediatric anesthesia consent: a randomized trial comparing standard verbal methods to visual aid-assisted consent

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52

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INTRODUCTION

In pediatric anesthesia, caregiver comprehension is crucial for informed consent, given the unique challenges of assuming responsibility in the absence of patient consent. Consent relies on disclosure, comprehension, and voluntary choice; yet research in pediatric consent highlights a gap in caregiver comprehension and retention.[1] Ineffective consent can limit informed health care decisions and reduce trust in providers, impacting patient satisfaction and anesthesia outcomes.[2] Prior studies have demonstrated visual aids (VA) to be effective in various hospital settings, such as for procedural sedation in the pediatric emergency department, yet their impact in pediatric anesthesia remains understudied.[3,4] Caregivers were most uncertain about common side effects, major complications, postoperative planning/pain management, and reasons for fasting guidelines.[5] This study aims to develop and evaluate a visual aid for pediatric anesthesia consent, with the anticipation of enhancing caregiver understanding and recall of risks associated with general anesthesia.

METHODS

This randomized controlled trial involves caregivers of pediatric patients undergoing noncomplex elective surgeries under general anesthesia. Patients were randomly assigned to one of two groups: those undergoing the anesthesia consent process through standard verbal methods and those receiving verbal consent facilitated by a visual aid. The VA design describes general anesthesia with a pictorial representation of 15 common events and risks of anesthesia tailored to the pediatric population. Patients randomized to the standard consent method spoke with anesthesia providers based on their own personal practices, however, with an emphasis on common events/risks highlighted in the visual aid. After the consent process, a standardized questionnaire was administered to gather patient and caregiver characteristics and to evaluate caregiver recall and satisfaction, employing a 5-point Likert scale. Exclusion criteria: major or emergency surgery, American Society of Anesthesiologists Physical Status IV or V, non-English speaking, pediatric patients consenting themselves, and caregiver refusal. Complex procedures were excluded because of differing risk profiles associated with

anesthesia, and because of the possibility of excess preoperative anxiety confounding recall rates. Statistical analysis includes descriptive statistics, *t* tests, and linear regression.

RESULTS

In the preliminary data, 96 patients participated (52 assigned VA, 44 assigned standard). Parents consented with VA demonstrated significantly higher recall of risks and events than those consented using standard methods (mean, 4.3 *vs* 1.8; difference, 2.5; 95% confidence interval, 1.7 to 3.4). Seven-point-seven percent did not recall any risks/events in the VA group *vs* 25% in the standard group ($P < 0.05$). Both groups overwhelmingly found the information easy to understand and nonthreatening, reporting an excellent overall experience and agreeing the time allocated to consent to be appropriate. Despite exploring variables such as patient age, history of anesthesia exposure, caregiver education, gender, and caregiver's own exposure to anesthesia, linear regression models did not reveal any significant correlations with recall rates and these variables. A multivariate model incorporating these predictors yielded an adjusted R^2 of 0.241.

DISCUSSION

Integrating visual aids proves promising, as this study reveals significant disparities in recall rates between the VA and standard anesthesia consent groups. Despite good comprehension of the anesthesia process, a substantial proportion of caregivers in the standard consent group failed to recall crucial information, highlighting the limitations of verbal communication alone. Future efforts should focus on optimal delivery methods, with consideration to timing, and medium, online, or physical aids, to enhance caregiver comprehension and allow time to plan questions for the day of surgery. Adapting the VA for self-consenting pediatric patients holds the potential for broader application.

REFERENCES

1. *Kadam RA*. Informed consent process: a step further towards making it meaningful Perspect Clin Res 2017; 8: 107–12. https://doi.org/10.4103/picr.picr_147_16
2. *Atsaidis Z, Robitaille S, Guadagno E, Wiseman J, Emil S, Poenaru D.* "Your child needs surgery": a survey-based evaluation of simulated expert consent conversations by key stakeholders. J Pediatr Surg 2023; 58: 902–7. https://doi.org/10.1016/j.jpedsurg.2023.01.024
3. *Farrell EH, Whistance RN, Phillips K, et al.* Systematic review and meta-analysis of audio-visual information aids for informed consent for invasive healthcare procedures in clinical practice. Patient Educ Couns 2014; 94: 20–32. https://doi.org/10.1016/j.pec.2013.08.019
4. *Lin YK, Yeh YS, Chen CW, et al.* Parental educational intervention to facilitate informed consent for pediatric procedural sedation in the emergency department: a parallel-group randomized controlled trial. Healthcare (Basel) 2022; 10: 2353. https://doi.org/10.3390/healthcare10122353
5. *Rai E, Chen RY, Noi CS, Hee HI*. Evaluation of anesthesia informed consent in pediatric practice—an observation cohort study. J Anaesthesiol Clin Pharmacol 2019; 35: 515–21. https://doi.org/10.4103/joacp.joacp_74_18

Is an abdominal compression test useful to predict fluid responsiveness in children undergoing general anesthesia?

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87

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INTRODUCTION

Intraoperative hypovolemia is a leading cause of cardiac arrest during pediatric surgery.[1] Successful resuscitation is more likely when the underlying etiology is addressed making rapid and accurate etiological diagnosis critical.

Patients with improved cardiac output after intravascular volume resuscitation are termed fluid responsive, with fluid responsiveness generally defined by an increase in cardiac output by more than 15% in response to a bolus of intravascular fluid.[2] The abdominal compression test (ACT) is used in some pediatric intensive care units to determine if a patient is fluid responsive.[3] The test is based upon the reversible increase in cardiac preload with external pressure applied over the liver.[4] Despite its common use, the ACT has limited study in children, with no identifiable previous studies in children during the intraoperative period.[3] This study aimed to determine whether the abdominal compression test can accurately identify fluid responsive pediatric patients undergoing general anesthesia.

METHODS

A prospective, self-controlled, observational, diagnostic study was conducted following local Research Ethics Board approval. Consenting eligible participants included: ages between three months to 17 yr, American Society of Anesthesiology Physical Status I–III, undergoing elective procedures under general anesthesia scheduled for at least 30 min. Participants were excluded if they had hepatosplenomegaly, portal hypertension or an abdominal wall abscess.

The ACT included manually applying sustained 20–25 mm Hg pressure (calibrated using a sphygmomanometer) over the patient's right upper quadrant for approximately ten seconds. Two ACTs were performed on each patient during general anesthesia: first prior to the surgical procedure and before intravascular fluid administration (Time 1), second after procedure completion, intravascular fluid loading, and prior to anesthesia emergence (Time 2). Ultrasound cardiac output assessment (Zonare ZS3 Ultrasound System, C9-3 probe; San Jose, CA, USA) was assessed by velocity time integrals (VTI) measured at the left ventricular outflow tract before

and after each ACT. All ultrasound images and measurements were reviewed by a pediatric cardiologist to ensure adequate quality.

The primary outcome was % VTI change before and after each ACT, stratified by study assessment (Time 1 and 2); secondary outcomes included the assessment of ACT diagnostic accuracy to diagnose fluid responsiveness.

RESULTS

Thirty-eight patients were enrolled in this study including 23 males and 15 females, median age 52 months [IQR, 28.0–80.3], median weight 17.2 kg [IQR, 12.4–22.9], median preprocedural fast 235 min [IQR, 169–571], median intravenous fluids administered between first and second ACT 14.5 $mL \cdot kg^{-1}$ [8.7–20.3], median time between first and second ACT 44.4 min [IQR, 31.7–70.4).

At Time 1 (before intravascular fluid administration) the median VTI increase with ACT was 19.1% [IQR, 8.2–23.8]; at Time 2 (after fluid administration) the median VTI increase with ACT was 5.7% [IQR, 3.3–9.7] (Figure). The diagnostic accuracy of the ACT to assess fluid responsiveness as evaluated by the area under the receiver operating characteristic curve is 0.91 (0.81 to 1.00).

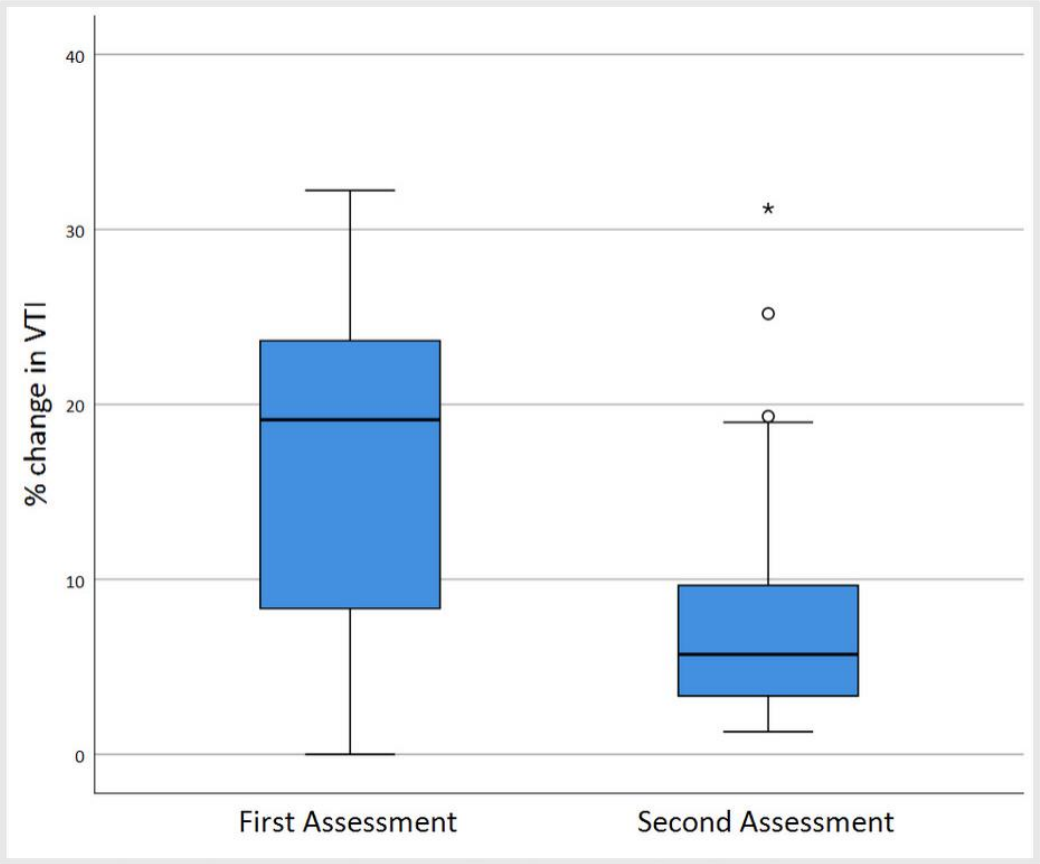
DISCUSSION

In a controlled operative room environment of otherwise healthy children, the ACT increased cardiac output to a greater extent in relatively hypovolemic children (Time 1) compared with the children who are generally volume replete (Time 2). The area under the receiver operating characteristic curve assessment of ACT to diagnose fluid responsiveness is 0.91 (0.81 to 1.00); a measurement described as excellent diagnosis accuracy.[5] Our findings suggest the abdominal compression test is a simple, useful clinical bedside tool to identify fluid responsive patients, although further study is warranted.

REFERENCES

1. *Lee JH, Kim EK, Song IK, et al.* Critical incidents, including cardiac arrest, associated with pediatric anesthesia at a tertiary teaching children's hospital. Pediatr Anaesth 2016; 26: 409–17. https://doi.org/10.1111/pan.12862
2. *Gan H, Cannesson M, Chandler JR, Ansermino JM.* Predicting fluid responsiveness in children: a systematic review. Anesth Analg 2013; 117: 1380– 92. https://doi.org/10.1213/ane.0b013e3182a9557e
3. *Jacquet-Lagreze M, Tiberghien N, Evain JN, et al.* Diagnostic accuracy of a calibrated abdominal compression to predict fluid responsiveness in children. Br J Anaesth 2018; 121: 1323–31. https://doi.org/10.1016/j.bja.2018.06.030
4. *Beigel R, Goland S, Siegel RJ.* Comparison of the effect on right atrial pressure of abdominal compression versus the Valsalva maneuver. Am J Cardiol 2014; 113: 183–6. https://doi.org/10.1016/j.amjcard.2013.09.040
5. *Šimundić AM*. Measures of diagnostic accuracy: basic definitions. EJIFCC 2009; 19: 203–11.

Figure Box and whisker plot of percent change in velocity time integral (cardiac output assessment) from pre- to postabdominal compression tests at first (time 1) and second (time 2) study assessments



The boxplots contain the median (dark line in middle of boxes), interquartile range (upper and lower edges of the box), and upper and lower limits (1.5 interquartile range). This is also mentioned in a comment in the abstract.