Red Blood Cell Transfusion in Pediatric Orthotopic Liver Transplantation: What a Difference a Few Decades Make

Tran LT, Mazariegos GV, Damian D and Davis PJ Anesth Analg 2019; 129(4):1087–92.

This is an observational retrospective study of RBC transfusion data in 271 pediatric patients undergoing 278 liver transplants at a single institution The Children's Hospital of Pittsburgh from 2008-2017. There were 259 primary transplants, 15 second retransplants, and 4 third retransplants. Average age at transplantation was 6.9 years. Total mortality was 4.8% (1.5% during transplant admission and 3.3% subsequently).

Analysis showed 27.3% of cases did not require RBC transfusions. Among those transfused, 89.6% required less than one blood volume (BV). The median BV transfused among all cases was 0.21. Higher volume transfusions occurred in infants (0.46 BV compared to 0.12 BV in >12 months of age), patients with TPN–related liver failure (3.41 BV) and patients undergoing re-transplantation (third transplants median 2.71 BV, second transplants 0.43 BV and primary transplants 0.18 BV). Living reduced liver transplantations were associated with the highest median blood loss (0.35 BV), followed by cadaveric reduced liver (0.3 BV), cadaveric whole (0.08 BV) and living whole (0.08 BV) liver transplants.

Take Home Message

It's not surprising that smaller infants, split donor livers and retransplants require proportionally higher blood volume transfusions.

This study is compared to one done 34 years ago by Borland in the same institution that reported average transfusions of 5.4 blood volumes and mortality of 34% within 60 days. All these patients had underwent cadaveric whole organ transplantation.

Blood transfusions have been shown to be associated with increased graft failure rates and mortality, so it's clearly good that improvements in surgical techniques coupled with advances in perioperative care have dramatically changed the intraoperative RBC requirements of pediatric patients undergoing liver transplantation and made our job as anaesthetists easier than they were 34 years ago.

Reviewed by Dr Graham Knottenbelt

Propofol use in children with allergies to egg, peanut, soybean or other legumes

Sommerfield DL, Lucas M, Schilling A et al. Anaesthesia 2019 Oct, 74(10):1252–1259

This is a retrospective, single-centre study from Western Australia looking for incidence of propofol allergy in patients with egg, peanut, soybean and other legume allergy from a 10-year period (2005-2015) that received propofol as part of their general anaesthetic (there were 304 children identified

who received 648 propofol exposures). The control group of 892 non-allergic children with 1 propofol exposure each was selected prospectively from their database of research participants.
10 patients from the study group was found to meet the criteria for a possible allergic reaction – a non-allergic explanation is deemed likely for 8 of these; 1 was thought to be provoked by combination of prior exposure to intralipid in TPN and propofol during anaesthesia causing minor peri-oral and peri-orbital swelling 2 hours after the propofol exposure; and 1 was an asthmatic patient who develop shortness of breath and desaturation to 85% on room air in the recovery area thought to be most likely due to bronchospasm and atelectasis although propofol allergy cannot be excluded.

Of the control group, possible allergic reactions were identified in 124 procedures and none required follow-up for allergic symptoms. On review, these reactions were thought unlikely to be caused by propofol.

Comments
This study is the first one with a large cohort that looked at peanut and legumes in addition to egg, which are all major additives used in formation of emulsified propofol. One possible limitation of the study is the lack of discussion of whether the propofol used in the study group is the same as the propofol used in the control group with regards to variation in areas such as manufacturer technique, other drug additives and evolution of industrial practices. Also, it was not clear how the control group were selected – was the whole database of non-allergic research participants included? Is this why the control group was almost 3 times the number of the study group? Nevertheless, these do not detract from the findings of the study.

Take home message
This large study confirms the commonly held perception among anaesthetists that serious propofol allergy is rare. We now also have some evidence propofol allergy is not reliably predicted by history of food allergy.

Reviewed by Dr K.C. Law

Perioperative management of esophageal atresia/tracheoesophageal fistula: An analysis of data of 101 consecutive patients.

van Hoorn CE, Costerus SA, Lau J et al. Pediatric Anesthesia. 2019;29(10):1024–1032

This is a retrospective cohort analysis of electronic data in 101 neonates undergoing open and thoracoscopic surgical repair of esophageal atresia type C in one institution in the Netherlands between 2007 to 2017. It looks at the perioperative courses of vital and metabolic parameters.
Not surprisingly, the study found correction of TOF/OA is associated with periods of severe derangement of pH, pO2 and pCO2, BP and O2 saturation. The severities of metabolic disturbances did not differ between the different surgical approaches.

Intraoperative acidosis (pH<7.35) was found in 62 patients; severe acidosis (pH<7.20) in 33 patients, with four cases pH<7.0 (lowest value 6.83). The median PaCO2 reached an upper level of

7.5kPa; in 13 cases above 10.0kPa, with a peak value of 25.8kPa. The median PaO2 level reached an upper level of 16.9kPa, in 22 cases above 20.0kPa, with a peak value of 50.0kPa. These high levels fluctuated with lowest measured PaO2 levels of median 8.3kPa; the lowest PaO2 value was 4.7kPa. Hypoxemic events (peripheral saturations<90%) were recorded for 75 of the 101 patients, which were severe (sats<80%) in 28 patients. In total 22 patients had one or more hypertensive events and 14 patients had one or more hypotensive events. 44 patients received vasoactive drugs.

Take Home Message
Given the impressive number of cases, the study adds valuable information on demographics (cardiac comorbidities, prematurity), surgical and anaesthetic data (times, use of flexible and rigid scopes, need for inotropes, post-operative hospital and PICU stays) and complication rates (including mortality) to that already in the literature.

Independent of the surgical technique used, most patients in the study experienced periods of severe intraoperative acidosis, hypercapnia, hypocapnia, hyperoxia, hypoxemia and hypertension. Vigilance and checking for metabolic changes at regular intervals during the operation, preferably with arterial blood gas analysis, is recommended.

There still is no general consensus on a preferred surgical technique (open vs thoracoscopic). This study does not favour one against the other in terms of physiological derangement and it is likely that management is still decided in light of comorbidities, experience of the surgeon, distance between the two ends of the oesophagus, surgical and anesthesiologist preference and local hospital practice.

Reviewed by Dr Graham Knottenbelt

Prospective External Validation of the Pediatric Risk Assessment Score in Predicting Perioperative Mortality in Children Undergoing Noncardiac Surgery

Valencia, Staffa, Faraoni et al. Anesthesia and Analgesia, 2019;129(4):1014-1020

The purpose of this study is to provide external validation to a tool that can be used to predict mortality risk in children undergoing non-cardiac surgery. The Paediatric Risk Assessment (PRAm) has been derived from an American Paediatric Surgical Quality Improvement Database (NSQIP). There are five variables in the score: whether the procedure was urgent (+1 point), whether there was at least one comorbidity (+2), whether the child had features of critical illness (mechanical ventilation, inotropes, preoperative CPR) (+3), age less than 12 months (+3) and procedures in those with neoplasm (+4).

Having devised the score, the authors (from Boston Children's Hospital) applied it prospectively to all non-cardiac surgical patients presenting between July 2017 and July 2018 at their hospital, a total of 13,530 cases. The primary outcome was 30-day all-cause mortality.
The incidence of mortality was found to be 0.21%, notable as this is lower than what was reported in the nationally reported incidence from which the score was derived (0.7%). The PRAm score was

determined to have extremely good discriminatory capacity, with an AUC of 0.956 and several other complex statistical calculations confirming its ability to discriminate between patients with and without mortality. The authors thus concluded that the score was well validated.

Take Home Message

It seems this score is effective at predicting mortality in children undergoing non-cardiac surgery. The ability to accurately predict mortality in children undergoing non-cardiac surgery is not without its benefits, but given how rare 30-day mortality is, it is not likely to have a high degree of day-to-day clinical utility. A more useful score might look at risk of or need for post-operative ICU, length of hospital stay or even cardiac or respiratory adverse events. Also, this score does not take into account the type of surgery being performed, even though the authors found a significant correlation between certain types of surgery and mortality. The question is whether widespread implementation of this score can be used to improve mortality outcomes, which needs more work. The score does suggest that children with cancer carry significantly higher risk, also that small babies are much higher risk and that critically ill children remain challenging – none of which is a surprise to those who anaesthetise children regularly.

Reviewed by Dr Amanda Dalton

Perioperative Outcomes and Surgical Case Volume in Pediatric Complex Cranial Vault Reconstruction: A Multicenter Observational Study From the Pediatric Craniofacial Collaborative Group.

Fernandez A, Reddy S, Gordish-Dressman H et al. On behalf of The Pediatric Craniofacial Collaborative Group Anesth Analg 2019 Oct; 129(4):1069-78.

Summary

- Retrospective multicentre observational study of paediatric patients undergoing complex cranial vault reconstruction across 33 North-American institutions
- Institutions were categorised into low, middle or high surgical case volume
- Low surgical case volumes were associated with increased total blood donor exposures and increased perioperative transfusion volumes
- There was no difference in hospital length of stay or major post-operative outcomes

Take Home Message

- The authors claim their findings highlight the opportunity for improvement in perioperative blood management in lower volume centres for craniofacial surgery
- Although this may be true and the findings were statistically significant, the actual difference in blood volumes transfused between different sized institutions were small
- This study does not explain whether the differences in transfusion volumes reflects surgical experience and technique, institutional differences in transfusion triggers or whether there is better multidisciplinary perioperative blood management in larger centres
- Reducing blood transfusions is logical and in the ideal world we would have a consistent approach to blood management across institutions

- Achieving this is complex and expensive and this paper alone does not prove that lower transfusion rates result in better outcomes with regards to major complications and length of hospital stay

Reviewed by Dr M. Tan

Assessment of Common Criteria for Awake Extubation in Infants and Young Children.

Templeton TW, Goenaga-Diaz EJ et al. Anesthesiology 2019; 131(4):801-8

In this prospective observational study, the value of commonly used predictors of fitness for extubation were measured in 600 infants and young children under the age of 7 who had undergone general anaesthesia for a variety of surgical procedures using volatile anaesthesia.

Separating the study population into those successfully extubated from those requiring minor and major airway intervention, the authors have highlighted several predictors that reached statistical significance. These included: facial grimace, purposeful movement, conjugate gaze, eye opening and tidal volume greater than 5 ml/kg. Those patients with a recent upper respiratory tract infection, midazolam premedication or elevated end tidal carbon dioxide at extubation were all more likely to require airway intervention post-extubation. While these findings may not be surprising to many, they also conclude that using multiple predictors increases the likelihood of success rather than relying on singular signs.

While the anaesthetist involved with the care of children on a daily basis will be very familiar with the extubation of young children, there will be those whose practice is part-time or occasional who may benefit from the findings of this study which has nicely defined a number of predictive signs for successful extubation following inhalational anaesthesia.

However there are a number of limitations that should be considered. This was a single centre observational study with the conduct of the anaesthetic left to the discretion of the anaesthetist. The study findings apply to those children under 7 years having inhalational anaesthesia and do not address the increasing use of total intravenous anaesthesia, other sedatives such as alpha 2 agonists and ketamine. It also excludes those patients electively extubated ‘deep’, those administered propofol prior to extubation or the use of laryngeal topical local anaesthesia.

Getting the timing right relies on clinical judgement and previous experience and although this may be more straightforward for the regular paediatric anaesthetist the article does provide a more objective approach to the decision making process.

Reviewed by Dr Phil Wolstencroft

Edited by Dr Su May Koh