



Propofol Infusion Syndrome: a structured literature review and analysis of published case reports

Hemphill S et al, British Journal of Anaesthesia April 2019, 122(4): 448-459

This article analysed 168 case reports of propofol infusion syndrome published in 108 papers. The authors have attempted to identify clinical features that are diagnostic for propofol infusion syndrome and associated with mortality.

The authors were unable to find a single clinical feature that was found in all the reported cases analysed. Metabolic acidosis (80% of both children and adults), ECG changes (75% of children and 63% of adults) were the 2 most common features. Using logistic regression analysis, they were able to demonstrate a statistically significant association between cumulative dose of propofol and predicted mortality in adults, but not in children. Using univariate analysis, they established that fever, hepatomegaly and cumulative dose of propofol > 240mg/kg increased risk of mortality in children.

Take home message

The authors suggest that the definition of propofol infusion syndrome should be updated to a syndrome that occurs in critically ill patients receiving high doses (>5mg/kg/hr) or long duration of infusion (>48 hours) and characterised by one or more of otherwise unexplained metabolic acidosis, rhabdomyolysis, or ECG changes, with or without acute kidney injury, hyperkalaemia, lipidaemia, cardiac failure, fever, elevated liver enzymes or raised lactate.

This paper reassures proponents of TIVA that use of propofol infusions may be safe in children who are not critically unwell. It also reminds us that we can use propofol in combination with other agents, such as remifentanyl and dexmedetomidine, to reduce the risk in patients who are at risk.

Reviewed by Dr Scott Ma

A new way to determine correct depth of central venous catheter insertion using a real-time ultrasound guided insertion technique in pediatric patients

Yamamoto T & Schindler E, Pediatric Anesthesia April 2019, 29(4):368-376

In this paper, the authors have attempted to determine a practical way to predict the ideal CVC depth of insertion using an ultrasound-guided insertion technique. They retrospectively analysed the data from 386 patients with congenital heart defects undergoing surgery. Children had been cannulated using either the right internal jugular vein approach, left supraclavicular approach or right supraclavicular approach. The skin was punctured at the level of the thyroid cartilage in the right internal jugular vein approach. The puncture for the supraclavicular approaches occurred as close to the probe using the long-axis (in plane) view keeping the confluence of the internal jugular and ipsilateral subclavian vein in the centre of the image. The ideal CVC depth in this study

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was determined to be that whereby the CVC tip is at the level of the carina on the first post-operative chest x-ray.

The study demonstrated that the insertion depth using the right internal jugular and left supraclavicular approaches were similar, whereas the depth for the right supraclavicular approach was significantly shorter. The authors were able to identify an ideal insertion depth as a percentage of the patient's height for every 10cm increase in body height (see Figure 3 within the article).

Take home message

This study shows that there is a relationship between the body height and insertion depth of CVCs in children with congenital heart defects having cardiac surgery. While children with no cardiac disease were not studied in this paper, the graph in figure 3 may be used as a guide for those who do not regularly insert CVCs in children.

Reviewed by Dr Scott Ma

Randomised controlled trial of dexmedetomidine sedation vs. general anaesthesia for inguinal hernia surgery on perioperative outcomes in infants

Bong CL et al. *British Journal of Anaesthesia*, May 2019, 122(5): 662-670

This study is a RCT from a tertiary paediatric centre in Singapore comparing infants undergoing inguinal hernia surgery having either dexmedetomidine with a caudal or sevoflurane with a caudal block.

Methods

104 infants 26-52 weeks post-conceptual age having bilateral inguinal hernia repairs were randomised into two arms; caudal block with dexmedetomidine sedation and oxygen via nasal prongs vs. caudal block with sevoflurane anaesthesia and endotracheal intubation.

Primary outcome was deemed "success" of the technique (a constellation of assessment criteria devised by the authors including perioperative conditions, haemodynamics and adverse events). Allocation to study group was concealed until day of surgery, parents were blinded unless they insisted on knowing, surgeons/anaesthetists/assessors were not blinded.

The dexmedetomidine arm received nasal prong supplemental oxygen at 0.5 l/min and 2 mcg/kg dexmedetomidine intravenously over 10 mins followed by 1 mcg/kg over 10 mins then 0.2-1 mcg/kg/h. Suboptimal conditions were supplemented with sucrose. Addition of opioids, sevoflurane, and/or N2O was considered violation of protocol (but analysis by intention to treat was performed). The GA arm received sevoflurane with atracurium and intubation.

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Results

In the DEX group 46 infants (90.2%) had their surgery completed solely under this technique, 2 (3.9%) required conversion to general anaesthesia and intubation and 3 (5.9%) required brief N₂O or low dose sevoflurane. Overall 96.1% of the DEX group did not require intubation. Dexmedetomidine took 6.9 mins longer to start surgery but because time at end of surgery was shorter, there was no overall difference in total time. Perioperative conditions were noted to be similar in both groups. The dexmedetomidine group spent longer in PACU by 13.5 mins.

Take Home Message

Although this is a great idea conceptually and the dexmedetomidine technique evidently achievable with overall intraoperative success the description of dexmedetomidine anaesthesia suggested a relative lack of fluidity compared to GA (e.g. longer time to get started, bradycardia, oversedation, breath holding etc.). Importantly, the authors did not measure post-operative outcomes besides time spent in PACU and dichotomous outcomes of requiring intubation/ICU admission. An assessment of post-op apnoeas between the two arms would have strengthened the results.

Reviewed by Dr Philip Cheung

High inspired oxygen fraction impairs lung volume and ventilation heterogeneity in healthy children: a double-blinded randomised controlled trial.

Grandville B et al. British Journal of Anaesthesia, May 2019, 122(5): 682-691

In this double-blinded RCT, 58 children scheduled for elective surgery were assigned to 2 groups:

1. FiO₂ of 100% during induction and emergence and 80% during maintenance
2. FiO₂ 80% induction/emergence and 35% maintenance

Functional residual capacity, lung clearance index (ventilation inhomogeneity), airway resistance and respiratory tissue elastance were measured pre-operatively, after discharge from recovery and 24 hours post-operatively.

FRC was decreased in the high FiO₂ group after recovery discharge but not at 24 hours. Ventilation inhomogeneity increased in both groups after recovery discharge but persisted to 24 hours in the high FiO₂ group.

The authors suggest that FiO₂ >80% be avoided during anaesthesia in children with healthy lungs. This study does not address the unhealthy lung or suggest what an optimal FiO₂ would be. It supports the findings in adult studies that hyperoxygenation can impair ventilation in the immediate post-operative period. Consideration should be given to the risks/benefits of using an increased FiO₂ in each individual patient and situation.

Reviewed by Dr Stephanie Aplin

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Anesthetic technique and cancer outcomes: a meta-analysis of total intravenous versus volatile anesthesia

Yap A et al. Canadian Journal of Anaesthesia, May 2019, 66(5): 546-561

This meta-analysis of comparative studies looking at the effect of inhalational anaesthesia versus propofol-based TIVA on cancer outcomes included 10 studies.

The 6 studies looking at recurrence-free survival included breast, oesophageal and non-small cell lung cancers and showed improved survival in the TIVA group. All 8 studies looking at overall survival (in breast, colorectal, gastric, oesophageal, non-small cell lung and mixed cancers) showed improved survival with TIVA.

This meta-analysis suggests that TIVA when compared with volatile anaesthesia may be associated with improved cancer-free and overall survival across numerous cancer types. Anaesthesia has been demonstrated in pre-clinical studies to have a potential effect on cellular immunity and cancer spread.

There was only one RCT included in this meta-analysis. The other studies were retrospective. There were also different “blends” of TIVA and volatile anaesthesia used across the different studies. More prospective RCTs are needed and are underway.

These were adult studies and adult cancer types, so the relevance to paediatric practice may be questionable. However there is a growing body of evidence to suggest that as anaesthetists we can influence cancer outcomes with our choice of technique.

Reviewed by Dr Stephanie Aplin

Patterns of neuropsychological changes after general anaesthesia in young children: secondary analysis of the Mayo Anesthesia Safety in Kids study

Zaccariello MJ et al. British Journal of Anaesthesia, May 2019, 122(5): 671-681

The MASK study looked at the impact of children unexposed, singly exposed, and multiply exposed to general anaesthesia on their full scale IQ, and showed no difference in this primary outcome. However, multiple other domains of neuropsychological function were tested, and this paper by the MASK group demonstrates that multiply exposed children show specific patterns of deficits in certain domains, in a secondary analysis. Confounding is reduced by aspects of their analysis, but cannot be eliminated, nor can direct causality be determined. This paper is a complex one to read and fathom, unless one has an epidemiological/statistics degree, using factor analysis and clustering methods on the study data.

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Plain language summary – Children exposed to multiple general anaesthetics show reduced scores in certain aspects of neuropsychological tests. Factors predicting which children develop these deficits are still unknown. Watch this space.

Reviewed by Dr Justin Skowno

Edited by Dr Su May Koh

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