Laryngospasm in elective pediatric anesthesia: incidence and risk factors

Benabdi S, Amani M, Matmour D, et al.

Perioperative Care and Operating Room Management 2025; 40: 100543: ISSN 2405-6030.

Introduction

Laryngospasm is one of the most common anaesthetic emergencies that can lead to severe complications. This study, conducted in Algeria, aimed to examine the incidence of laryngospasm in paediatric patients undergoing elective surgery and to identify key risk factors associated with its occurrence.

Methods

This single-centre, prospective cohort study involved paediatric patients (aged 0–16 years) undergoing elective surgeries between July 2017 and August 2019. Patients with recent upper respiratory tract infections (within 2 weeks) or asthma attacks (within 30 days) were excluded. Laryngospasm was defined as SpO_2 <90% for ≥30 seconds, accompanied by inspiratory/expiratory stridor or other typical signs of airway obstruction. Three cases with missing data were excluded from the analysis. A range of patient, anaesthetic, and surgical details were collected, and statistical analysis was conducted using SPSS, including univariate and multivariate analysis to identify significant associations.

Results

The incidence of laryngospasm was 0.9% (12 out of 1,270 cases). Most incidents (58.33%) occurred during emergence, with the rest during induction. Significant risk factors for laryngospasm included age under 1 year (Relative risk 5.667) and a history of prematurity. In terms of anaesthetic and surgical associations, less experienced anaesthetists (less than a years' experience in paediatric airway management) and maxillofacial surgeries were associated with higher risk. The use of a laryngeal mask airway (LMA) was linked to a lower incidence of laryngospasm compared to use of endotracheal tubes or facemasks.

Take Home Points

- The incidence of laryngospasm in this study (0.9%) was lower than other reports, likely due to the lack of ENT and emergency cases included.
- Most episodes of laryngospasm occurred during emergence.
- High-risk groups include children under 1 year, those with a history of prematurity, and patients undergoing maxillofacial surgery. The risk decreased by 3% for each additional year of age.

Reviewed by Dr Hester Carter

Drugs for Procedural Sedation and Analgesia in Children: A Systematic Review and Meta-analysis

Hamdan S, Adelou S, Jungo S et al.

Drugs R D. 2025 Sep;25(3):179-193.

Introduction

Sedation is often necessary in paediatric practice to facilitate diagnostic or therapeutic procedures. This presents challenges due to communication barriers, anxiety and behavioural variability in children. Procedural success can be compromised by patient movement or lack of co-operation. An ideal sedative would have rapid onset and short duration of action, minimal side effects, with a good safety profile. The ideal drug or combination of drugs remains unclear.

Methods

This systematic review and meta-analysis examined randomised controlled trials (RCTs) comparing sedative drugs-midazolam, ketamine, dexmedetomidine, chloral hydrate and combinations of these in children aged 0-18 years. Databases and reference lists were screened, and a hand search was conducted. Primary outcomes were sedation success and behaviour during procedures; secondary outcomes were adverse events, procedural success, and satisfaction (clinician, parent, patient). Subgroup analysis explored dose, administration route, and procedure type in the 20.4% of studies deemed low risk of bias. The remaining studies were indeterminate or high risk of bias and were not included in subgroup meta-analysis.

Results

98 studies involving 9,161 children were reviewed; 50 were included in the meta-analysis. Mean age was 5.35 years. Dexmedetomidine showed greater association with sedation success compared to midazolam (OR 7.42, 95% CI 4.08–13.48) and ketamine with midazolam was superior to midazolam alone (OR 3.0, 95% CI 1.67–5.39). Intranasal dexmedetomidine at 2mcg/kg was more effective than 1mcg/kg. Side effects were minor across all studies; dexmedetomidine was associated with lower blood pressure than midazolam. Subgroup analyses supported these findings.

Take Home Points

- Intranasal dexmedetomidine 2mcg/kg or midazolam and ketamine in combination are effective options for paediatric procedural sedation with no major adverse effects seen in this systematic review.
- Further RCTs are required to determine optimum dose and route of dexmedetomidine as well as to compare this with midazolam and ketamine in combination.
- Variability in behaviour assessment limited inclusion in meta-analysis due to high heterogeneity.

Reviewed by Dr Hester Carter

Effects of Dexmedetomidine–Remifentanil on Neurodevelopment of Children after Inhalation Anesthesia: A Randomized Clinical Trial

Ji SH, Kang P, Cho SA, et al.

Anaesthesiology 2025; 142(4): 827-834

Introduction

Concern is growing regarding the potential toxic effects of anaesthesia on neurocognitive development in children. A pioneering animal study established a link between neurodegeneration and long-term learning difficulties on exposure to anaesthetic agents. This propelled further research investigating the link between anaesthesia exposure and cognitive outcomes in childhood.

Several landmark studies demonstrated no significant impact on neural function after brief anaesthetic exposure. Unease remains regarding repeated exposure and long-term neurodevelopment effects in children.

Dexmedetomidine has minimal neurotoxicity making it a potential safer option for children. The aim of the study was to compare intelligence and behavioural outcomes in children receiving sevoflurane only versus when combined with dexmedetomidine and remifentanil.

Methods

This was a prospective, double-blinded randomised controlled trial. Inclusion criteria were: ASA 1/2 children; <2 years; undergoing elective procedures; a single exposure to anaesthesia and deemed to have normal cognitive development by pre-operative screening.

Anaesthesia protocol was standardised for monitoring; drug dosing; airway management and analgesia. For maintenance, both groups received sevoflurane. The DEX-R group, received dexmedetomidine (1µg/kg loading dose; continuous infusion 1µg/kg^{-1}/h^{-1}) and remifentanil (0.1 to 0.2µg/kg^{-1}/min^{-1}) while the control group received similar volumes in saline.

Participants' intelligence and behaviour were assessed using standardised and validated tools at 28-30 months of age - Leiter International Performance Scale and Child Behaviour Checklist (CBCL).

Results

The final study included 343 completed assessments (169 control vs 176 DEX-R).

The mean end-tidal sevoflurane concentration was significantly lower in the DEX-R group (1.8% vs 2.6%; p<0.001). No significant difference was found between the groups in the intelligence tests (full IQ scores: control 102.5±11.5 *vs* DEX-R 103.6±11.5; *p*=0.442) and behavioural assessments (CBCL total problem scores: control 46.8±9.7 *vs* DEX-R 47.6±10.2; *p*=0.469)

Summary

Dexmedetomidine–remifentanil infusions combined with sevoflurane show no demonstratable effects on neurodevelopment in young children compared to sevoflurane alone.

Reviewed by Dr Karen Mackintosh

Inhaled isoflurane for sedation of mechanically ventilated children in intensive care (IsoCOMFORT): a multicentre, randomised, active-control, assessor-masked, non-inferiority phase 3 trial

Miatello J, Palacios-Cuesta A, Radell P et al.

The Lancet Respiratory Medicine, Volume 13, Issue 10, 897 - 910

Introduction

In the Paediatric Intensive Care Unit (PICU), patients requiring mechanical ventilation are usually sedated with a combination of intravenous (IV) drugs e.g. midazolam and opioids.
Inhaled sedation agents have been used for decades in paediatric anaesthesia. Their use in PICU has been limited by the availability of anaesthesia ventilators, except for specific conditions e.g. asthma.

Interest is growing to find alternative sedation agents for critically ill children. The aim of the IsoCOMFORT trial was to the compare the efficacy of inhaled isoflurane with IV midazolam during mechanical ventilation in children requiring intensive care.

Methods

IsoCOMFORT was a phase 3, multicentre, randomised, active-controlled, assessor-masked study designed to evaluate non-inferiority (19 sites across 4 countries).
Participants aged 3-17 years requiring ventilation for >12 hours were randomised electronically to receive inhaled isoflurane or IV midazolam for 48 hours then switched to local protocols. Children were initially assessed to determine a desired level of sedation using the COMFORT-B scale. The sedative agent was then adjusted to achieve and maintain this target. Patients were monitored up to 30 days after discontinuation.
The study measured the duration participants remained at their prescribed sedation level (light, moderate, or deep) without extra sedation, with checks every 2 hours for 12-48 hours and one allowed adjustment of the target level. The main outcome was assessed for non-inferiority.

Results

96 patients were recruited (isoflurane 63; midazolam 33) with 92 included in the final analysis.
The isoflurane group were in the target sedation range for 68·94% (95% CI 52·83–85·05) of the time vs 62·37% (44·70–80·04) for midazolam. The lower end of the confidence interval (–8.99%) was higher than the pre-set non-inferiority margin of –9.36% demonstrating non-inferiority.

Summary

Inhaled isoflurane is a promising alternative for sedating children in PICU compared to the more traditional use of midazolam.

Reviewed by Dr Karen Mackintosh

EEG-Guided Titration of Sevoflurane and Pediatric Anesthesia Emergence Delirium: A Randomized Clinical Trial

Miyasaka KW; Suzuki Y; Brown EN, et al.
JAMA Pediatrics 2025; 179(7): 704-712

Introduction

This single-centre, parallel group, 2-arm, superiority randomised controlled trial aimed to assess whether use of electroencephalography (EEG) monitoring can reduce the incidence of Paediatric Anaesthesia Emergence Delirium (PAED) by minimising exposure to sevoflurane.

Methods

Study sample: Following exclusions, 177 children aged 1-6 undergoing elective surgery were randomised on a 1:1 basis to the either the control group or the EEG-guided group. The sample size was calculated based on previous studies on PAED to ensure adequate powering. Procedures were restricted to either lower abdominal or extremity surgery as reliable analgesia could be provided in these cases thus minimising pain as a confounder for PAED. Other exclusion criteria included patient conditions that could hinder PAED scoring or EEG recording. 1 patient from the control group was excluded due to an adverse event (laryngospasm).

Interventions: Both groups were anaesthetised by a single researcher trained in EEG provided anaesthesia with supervision from a non-research study anaesthetist. The control group were anaesthetised by gas induction using 5% Sevoflurane in 66% Nitrous Oxide and maintained at 1.0 MAC for the duration of the procedure. The EEG-guided group were again anaesthetised by gas induction using 2% Sevoflurane - this was then titrated down in 0.1% increments to the minimum necessary to maintain a stable EEG pattern consistent with general anaesthesia (continuous stable alpha and slow-delta EEG pattern). Otherwise, anaesthesia was standardised across both groups.

Outcomes: Primary outcome was the presence of PAED - defined as a PAED score of ≥10. This was calculated by a separate researcher blinded to patient assignment on arrival to PACU, at 5, 10, 15 and 30 minutes or until emergence. Secondary outcomes included maximum PAED score, timing between events (such as intubation, extubation, emergence, start and end of surgery), arrival/discharge from PACU and processed EEG analysis up until emergence.

Results

There was a statistically significant reduction in PAED in the EEG-guided group (21%) compared with the control group (35%) - 96.65% CI. However, the researchers felt the reduction was marginal when compared with the substantial change in both Sevoflurane exposure (mean, [SD]: 0.8 [0.5] MAC-hours vs 2.1 [1.1] MAC-hours). The study also demonstrated a mean reduction in time to extubation (3.3 minutes), time to emergence (21.4 minutes) and PACU stay time (16.5 minutes). Pre-emergence EEG Analysis demonstrated a wider delta-band and increased activity in the beta range in the minute leading up to spontaneous eye opening, in patients who developed PAED.

Discussion
This study has demonstrated that EEG-guided general anaesthesia with sevoflurane results in a reduction in incidence of PAED and recovery times through reduced sevoflurane exposure. However, regarding EEG analysis, it also proposes that arousal in a delta-dominant state may be an independent risk factor for development of PAED.

Reviewed by Dr Steven Morrison

Effectiveness of suprazygomatic maxillary nerve block on postoperative opioid use in pediatric primary cleft palate surgery: A systematic review of the literature.

Wijnants N, Kappen IFPM, van Kuijk SMJ et al.
Journal of Plastic, Reconstructive and Aesthetic Surgery 2025; 106: 174-186

Introduction
This systematic review aimed to determine whether pre-operative suprazygomatic maxillary nerve block (SMNB) reduced postoperative opioid consumption in paediatric cleft palate surgery.

Methods
A comprehensive literature search across 3 major databases (PubMed, Embase, Cochrane) was conducted with subsequent screening by 2 independent researchers. Eligible studies were peer-reviewed and written in English. They included those that examined the use of SMNB in paediatric cleft palate surgery and whose outcome measures included post-operative pain control, analgesic consumption, anaesthetic complications and recovery parameters.

Full-text analysis was conducted by a single reviewer and bias was assessed using the ROBINS-1 and RoB-II tools. A narrative synthesis was conducted due to heterogeneity across the included studies. The primary outcome for the review was amount of post-operative opioid consumption. Secondary outcomes were time to oral feeding (hours) and LOHS (days).

Results
A total of 15 studies met the eligibility criteria for full-text analysis.

Primary Outcome:
Despite considerable heterogeneity within the review all 9 studies that compared the effects of SMNB to various control conditions demonstrated a reduction in post-operative opioid use. Of these, 7 demonstrated clinical significance (defined as 1.5 fold higher consumption in the control group) and 5 of these were statistically significance. However, 2 studies comparing SMNB vs. local infiltration reported minimal difference between the 2 groups suggesting that this may be an equally effective technique, but no definitive conclusions can be drawn to this regard. 2 Studies demonstrated a statistically significant reduction in opioid requirement and prolonged duration of analgesia with the addition of Dexmedetomidine to SMNB when compared with Bupivacaine alone. No clinical or statistical difference was found when comparing Levobupivacaine with Bupivacaine or between SMNB and distal nerve block (palatine).

Secondary Outcomes:
7 studies reported on mean time to oral feeding with only 2 demonstrating a statistically significant reduction in the SMNB group (5.53 vs. 10.27 hours; 9.3 vs. 22 hours). LOHS was reported in 4 studies with 1 demonstrating a significant reduction in the SMNB group (1.4 vs. 2.4 days).

Bias: 3 incidents of serious confounding bias and 1 incident of outcome measurement bias was noted in 3 of the non-randomised studies.

Conclusion
In summary, current evidence would suggest that SMNB is effective in reducing post-operative opioid consumption and hastens return to oral feeding after cleft palate surgery. However further research is required in order to establish it as a superior technique to alternatives (e.g. local infiltration).

Reviewed by Dr Steven Morrison

Edited by Dr Lisa Dewar

APAGBI Trainee Representative