Editorial

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Dexmedetomidine as premedication in children: Status at the beginning of 2017

An ideal premedication for children should have anxiolytic, sedative, analgesic and antisialagogue action when administered non-parenterally, with rapid onset, short duration of action, and devoid of adverse haemodynamic and respiratory effects. Premedication should allow easy parental separation, good mask acceptance, excellent cooperation during intravenous (IV) cannulation, reduce anaesthetic requirement and decrease the incidence of post-operative emergence delirium.

Dexmedetomidine (DEX), an alpha 2 agonist, has many good pharmacological properties. However, the onset time is 30–45 min. It has cardiovascular effects such as bradycardia and hypotension. In 2011, Mason and Lerman[1] wrote 'As a premedication, DEX does not hold great promise. Its slow and unpredictable onset and maintenance of anxiolysis, regardless of route of administration, together with its prolonged offset make it an unsuitable substitute for oral midazolam'.

In next 5 years, multiple studies were done. Peng *et al*.[2] performed a meta-analysis of 13 randomised controlled trials up to April 2014 involving 1190 patients. When compared with midazolam, premedication with DEX resulted in an increase in satisfactory separation from parents (risk difference [RD] =0.18, 95% confidence interval [CI]: 0.06–0.30, $P = 0.003$) and a decrease in the use of post-operative rescue analgesia (RD = −0.19, 95% CI: −0.29–−0.09, $P = 0.0003$). Children treated with DEX had a lower heart rate before induction. The incidence of satisfactory mask induction, emergence agitation (EA) and post-operative nausea and vomiting did not differ between the groups. DEX was superior in providing satisfactory IV cannulation as compared to placebo.

In this issue of IJA, Kumar *et al*.[3] have shown that intranasal DEX at a dose of 1 μg/kg produced superior sedation scores at separation and induction but normal behavioural scores in comparison to oral midazolam 0.5 mg/kg in paediatric patients. It is not clear from the figures presenting haemodynamic data about onset and duration of changes, sample variability and significance levels at all time points.

In a Cochrane database of systematic reviews, Costi *et al*.[4] investigated effect of DEX on incidence of sevoflurane-induced EA. Twelve studies investigating this intervention found a large overall reduction in risk of EA, with $I^2 = 0$ (relative risk = 0.37, 95% CI = 0.29–0.47). An additional four studies reported lower EA scores for this intervention. However, only in one study, DEX was administered orally. In ten studies, IV DEX was used.

There is a very limited literature available for the use of DEX as oral premedication.[5-8] In this issue of IJA, Kavya Prabhu and Mehandale[9] have compared oral DEX 4 μg/kg versus oral midazolam 0.5 mg/kg for the incidence of EA, following sevoflurane anaesthesia. The study has limitations including small sample size (45 patients in each group), wide variety of surgeries, and use of two different types of airway devices, i.e., endotracheal tube or supraglottic device. Two different scales were used for the measurement of EA. This makes definitive interpretation of the results difficult.

In all, so far, there is good evidence that intranasal DEX 1 μg/kg as premedication provides good to excellent separation from parents. However, there is not sufficient evidence showing benefits of oral premedication with DEX on the incidence and severity of EA with modern inhalational agents.

An ideal premedication needs to be simple, safe and effective. Future research needs to be directed on following aspects:

1. Effect of intranasal DEX on quality of mask acceptance and IV cannulation. Ultimately, these are the two most important aspects for smooth conduct of anaesthesia
2. Determine the effective dose (ED) 50 and ED 95 of intranasal DEX for various age groups. Zhang *et al*.[10] determined the ED 50 for rescue sedation using intranasal DEX after failed chloral hydrate sedation for magnetic resonance imaging in children. ED 50 was 0.4 μg/kg (95% CI = 0.34–0.50) in children aged 1–6 months, 0.5 μg/kg (95% CI = 0.48–0.56) in children aged 7–12 months, 0.9 μg/kg (95% CI = 0.83–0.89) in children aged 13–24 months and 1.0 μg/kg (95% CI = 0.94–1.07) in children aged 25–36 months
3. A study with large homogenous sample for assessing effect of oral DEX is required. A dose finding study is also essential. The current dose selection is empirical. This is necessary as bioavailability of DEX following orogastric route is 16%, as compared to intranasal 65%, buccal 82% and intramuscular 104%[11,12]
4. Effect on haemodynamics for a longer length of time. This can be best carried out during procedural sedation where other confounding factors are eliminated. This is essential to prepare discharge criteria when patient has received DEX as premedication.

Few cautions need to be exercised:

1. Simplicity of non-IV administration may lead to widespread use by non-anaesthesiologists and nursing staff. Accuracy of dose calculation, administration and vigilant monitoring of haemodynamics is warranted
2. DEX interferes with thermoregulation by diminishing shivering, vasoconstriction and non-shivering thermogenesis. Activation of hypothalamic adrenergic receptors decreases centrally mediated metabolic heat production.[13] There is danger for developing hypothermia. Incidence of bradycardia following hypothermia has been reported. Use of external warming devices is recommended particularly for infants.[14]

If these precautions are exercised, intranasal DEX has very good potential as a premedication in the paediatric age group.

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REFERENCES

1. Mason KP, Lerman J. Review article: Dexmedetomidine in children: Current knowledge and future applications. Anesth Analg 2011;113:1129-42.
2. Peng K, Wu SR, Ji FH, Li J. Premedication with dexmedetomidine in pediatric patients: A systematic review and meta-analysis. Clinics (Sao Paulo) 2014;69:777-86.
3. Kumar L, Kumar A, Panikkaveetil R, Vasu KB, Rajan S, Nair GS. Efficacy of intranasal dexmedetomidine versus oral midazolam for paediatric premedication midazolam for paediatric premedication. Indian J Anaesth 2017;61:125-30.
4. Costi D, Cyna AM, Ahmed S, Stephens K, Strickland P, Ellwood J, *et al.* Effects of sevoflurane versus other general anaesthesia on emergence agitation in children. Cochrane Database Syst Rev 2014;CD007084.
5. Zub D, Berkenbosch JW, Tobias JD. Preliminary experience with oral dexmedetomidine for procedural and anesthetic premedication. Paediatr Anaesth 2005;15:932-8.
6. Ray T, Tobias JD. Dexmedetomidine for sedation during electroencephalographic analysis in children with autism, pervasive developmental disorders, and seizure disorders. J Clin Anesth 2008;20:364-8.
7. Özcengiz D, Gunes Y, Ozmete O. Oral melatonin, dexmedetomidine, and midazolam for prevention of postoperative agitation in children. J Anesth 2011;25:184-8.
8. Mountain BW, Smithson L, Cramolini M, Wyatt TH, Newman M. Dexmedetomidine as a pediatric anesthetic premedication to reduce anxiety and to deter emergence delirium. AANA J 2011;79:219-24.
9. Kavya Prabhu M, Mehandale SG. Comparison of oral dexmedetomidine versus oral midazolam as premedication to prevent emergence agitation after sevoflurane anaesthesia in paediatric patients. Indian J Anaesth 2017;61:131-6.
10. Zhang W, Fan Y, Zhao T, Chen J, Zhang G, Song X. Median effective dose of intranasal dexmedetomidine for rescue sedation in pediatric patients undergoing magnetic resonance imaging. Anesthesiology 2016;125:1130-5.
11. Anttila M, Penttilä J, Helminen A, Vuorilehto L, Scheinin H. Bioavailability of dexmedetomidine after extravascular doses in healthy subjects. Br J Clin Pharmacol 2003;56:691-3.
12. Iirola T, Vilo S, Manner T, Aantaa R, Lahtinen M, Scheinin M, *et al.* Bioavailability of dexmedetomidine after intranasal administration. Eur J Clin Pharmacol 2011;67:825-31.
13. Blaine Easley R, Brady KM, Tobias JD. Dexmedetomidine for the treatment of postanesthesia shivering in children. Paediatr Anaesth 2007;17:341-6.
14. Finkel JC, Quezado ZM. Hypothermia-induced bradycardia in a neonate receiving dexmedetomidine. J Clin Anesth 2007;19:290-2.

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