

CLINICAL INVESTIGATION

Mother's recorded voice on emergence can decrease postoperative emergence delirium from general anaesthesia in paediatric patients: a prospective randomised controlled trial

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Abstract

Background: Emergence delirium (ED) is a behavioural disturbance after general anaesthesia in children that can distress patients, parents, and primary caregivers. We hypothesised that listening to the mother's recorded voice can reduce ED compared with listening to a stranger's recorded voice.

Methods: This prospective, double-blind, randomised study was conducted in 2- to 8-yr-old patients who had undergone general anaesthesia. Sixty-six patients were randomly assigned to listen to either the mother's voice (Group M, $n=33$) or a stranger's voice (Group S, $n=33$). The primary outcome was the initial paediatric assessment of emergence delirium (PAED) score on arrival at a postanaesthesia care unit (PACU). Other outcomes were the incidence of ED; Watcha, PAED, and pain scores; PACU stay time; durations between cessation of anaesthetics and bispectral index (BIS) levels of 60, 70, and 80; eye opening time; extubation time; and total consumption of analgesics during the PACU stay.

Results: The mother's voice reduced the initial PAED score compared with a stranger's voice [mean (standard deviation), 9.8 (2.5) vs 12.5 (4.1); $P=0.002$]. The incidence of ED during the PACU stay was higher in Group S than in Group M [60.6% vs 24.2%, odds ratio (95% confidence interval): 4.88 (1.7–13.9); $P=0.006$]. The BIS >60 time was shorter in Group M than in Group S ($P=0.006$).

Conclusions: The mother's voice reduced emergence delirium scores and the incidence of emergence delirium in paediatric patients compared with a stranger's voice after general anaesthesia.

Clinical trial registration: NCT 02955680.

Keywords: child; emergence delirium; anaesthesia; mothers; voice

Editor's key points

- Emergence delirium is common after sevoflurane anaesthesia.
- Parents know that babies and children are easily pacified by the voice of their mother.
- The authors randomised children to be played the sound of their mother's voice or a stranger's voice.
- The sound of mothers' voices, played to children in the recovery room, reduced the incidence of emergence delirium.

Emergence delirium (ED) is a well-known early postoperative negative behaviour after general anaesthesia, which is reported in up to 80% of the paediatric population.¹ Although it usually resolves spontaneously, it can cause self-injury, dressing disruption, surgical dehiscence, and the removal of i.v. catheters, and can lead to difficulties in nursing and monitoring of patients. Moreover, children with ED are at greater risk of having a maladaptive behavioural change at up to 1 week after the surgery.^{2,3}

Various methods have been investigated to reduce ED during the perioperative period; however, the results remain conflicting.^{4–7} Amongst them, auditory stimuli were proposed as one of the simple and effective tools.^{7,8} One of the most powerful auditory stimuli, the mother's voice, induced not only enhancing involuntary attention, but also stronger activation of specific brain regions, than an unknown voice.^{9–11} Taken together, it is expected that a mother's voice has a strong impact on both behavioural and neuronal responses in children. However, there are few studies on the effect of a mother's voice on her child during anaesthetic emergence. Therefore, we compared the mother's voice and a stranger's voice on a postoperative clinical course in paediatric patients after general anaesthesia.

Methods

This prospective, single-centre, parallel-arm, double-blind, randomised, controlled trial was approved by the Institutional Review Board (IRB) of Daegu Catholic University Medical Centre (CR-16-139-L), The protocol was registered at ClinicalTrials.gov (NCT02955680) before enrolment and published.¹² This trial was conducted in a tertiary university hospital between November 2016 and September 2017. We followed Good Clinical Practice guidelines and the principles of the Declaration of Helsinki.

Participants

Paediatric patients aged 2–8 yr with an ASA physical status (PS) of I or II, who were to undergo ophthalmology or otorhinolaryngology surgery requiring general anaesthesia, were enrolled. Written informed consent was obtained from all of the parents or the legal guardians of the participants at outpatient clinics or during preoperative visits before surgery. The exclusion criteria were as follows:

- ASA PS III or IV;
- presence of developmental delays or neurological diseases;
- deafness or hearing impairments;

- history of allergies or contraindications to the use of ketamine (increased intracranial pressure, open-globe injury, or a psychiatric or seizure disorder);
- maternal mutism;
- absence of the mother.

Randomisation and blinding

Subjects were randomly assigned to listen to the mother's voice (Group M) or a stranger's voice (Group S) with a 1:1 ratio (Fig. 1). A random sequence was generated using a computerised online tool (www.Randomization.com) and kept within sealed opaque envelopes by an assistant not involved in this study. On the morning of the surgery, the assistant opened a sealed envelope and prepared the recorded voice file according to the group allocation. The voice recorder was delivered to the operating room after the patient arrived and was connected to noise-cancelling headphones before surgical draping. Both the anaesthesiologist and outcome assessor were blinded to the allocation.

Anaesthesia

In the preoperative waiting room, patients received atropine 0.02 mg kg⁻¹ and ketamine 1 mg kg⁻¹ i.v. in the parental surveillance. After a patient entered the operating theatre, standard monitoring (electrocardiography, non-invasive arterial blood pressure, and pulse oximetry) and a bispectral index (BIS; VISTA™ monitoring system; Aspect Medical Systems Inc., Norwood, MA, USA) were applied. The BIS value was included if the electromyography score was <50% and the Signal Quality Index was >75%. Anaesthesia was induced with sevoflurane 5.0–6.0% via a scented facial mask. Rocuronium 0.6–0.8 mg kg⁻¹ was administered to facilitate intubation. Anaesthesia was maintained with fentanyl 1 µg kg⁻¹, sevoflurane 2.0–4.0%, and 50% oxygen, with a BIS target range of 40–60. All patients received prophylactic antiemetics with dexamethasone 0.1 mg kg⁻¹ and ondansetron 0.1 mg kg⁻¹ 10 min before the end of the surgery. At the end of the surgery, all anaesthetics were stopped, and the neuromuscular block was antagonised with pyridostigmine and glycopyrrolate.

Intervention

Voice recording was done before the operation by an investigator who did not know the group allocation. In a calm environment, the mother or a woman who did not know the child was asked to speak the following sentences in her usual tone of voice:

'OO (name of child), wake up. Let's go home with mommy. OO, wake up. Open your eyes. Take a deep breath.'

At the end of the operation, the recorded mother's voice (Group M) or a stranger's voice (Group S) was delivered through the noise-cancelling headphones. The pre-recorded message was repeated with 10 s intervals, and the volume set to a normal speech level (50–60 dB) using a sound level metre. The patients were stimulated to wake up by light patting on the shoulder and the recorded voice. No other stimulation was allowed. After gentle suctioning of oral secretions from the oropharynx, extubation was carefully performed when the participants were able to breathe spontaneously and obey

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