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Clinical Practice

Emergence delirium or pain after anaesthesia—how to distinguish between the two in young children: a retrospective analysis of observational studies

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Abstract

Background: Early postoperative negative behaviour in preschool children after general anaesthesia is a common problem. The distinction between emergence delirium (ED) and pain is difficult, but management differs between the two. The aim of the current analysis was to identify individual observational variables that can be used to diagnose ED and allow distinction from postoperative pain.

Methods: This retrospective analysis of data from three previous prospective observational studies included children undergoing general anaesthesia for elective adeno-tonsillectomy, sub-umbilical surgery, and MRI scanning. Two trained observers simultaneously applied the Face, Legs, Activity, Cry, Consolability Scale; the Children's Hospital Eastern Ontario Pain Scale; the Children's and Infants' Postoperative Pain Scale or the Paediatric Anaesthesia Emergence Delirium (PAED) scale. Data from each domain of the scales were available at awakening and at five, 10, and 15 min after anaesthesia. Each patient was analysed over time, and subsequently, each evaluation was considered as a single event. The descriptive behaviour items overlapping in the assessed scales were identified as dichotomous variable ('true/false') and then were applied for each evaluation.

Results: Children (n=512) were assessed for a total of 2048 evaluations. Most children (69%) displayed at least one episode of ED and/or pain. Almost 15% of children demonstrated both ED and pain. Children with ED showed 'no eye contact' and 'no awareness of surroundings'. Children with pain displayed 'abnormal facial expression', 'crying', and 'inconsolability'.

Conclusions: 'No eye contact' and 'no awareness of surroundings' identifies ED. 'Abnormal facial expression', 'crying', and 'inconsolability' indicate acute pain in children in the early postoperative period.

Key words: acute pain; anaesthesia recovery period; child; delirium; general anaesthesia

All three observational studies analysed, received approval from the institutional ethics committee (Ospedale San Gerardo, Monza, Italy, NCT 01096797; A.O. Ospedale Civile di Legnano, Italy, number 430; and Policlinico Universitario, Catania, Italy, number 318).

Early-postoperative negative behaviour (e-PONB) is a common problem in young children undergoing general anaesthesia.[1] Recognition and management of e-PONB in recovery room is still problematic despite the availability of multiple assessment tools and treatment options.[2–4]

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Editor's key points

- Emergence delirium and pain are difficult to distinguish in preschool children.
- Management strategies, and consequences of, the two conditions are different.
- The authors retrospectively analysed data from three studies during which four different clinical observational scales were used.
- Features specific to emergence delirium and pain were identified.

e-PONB may cause self-injury of the child or accidental removal of i.v. catheters, drainages, or dressing and may require extra nursing care, additional time in recovery room, and supplemental sedatives or analgesic drugs.[5 6] It also reduces parental and caregivers' satisfaction.[5 7 8] Short- and long-term psychological implications of e-PONB are unclear. Children with e-PONB may have a higher risk of developing separation anxiety, apathy, and sleep and eating disorders up to 30 days after surgery.[9–11]

The two clinical components of e-PONB, emergence delirium (ED) and postoperative pain, have divergent trends over time in the early postoperative phase.[12] However, children with ED may at the same time also suffer from pain, and pain-related behaviours could be rated as ED and *vice versa*.[2 3 13] This may lead to either a pharmacological treatment of a self–limiting disturbance (ED) or to an under or delayed treatment of postoperative pain.

The Paediatric Anaesthesia Emergence Delirium (PAED) scale, the only validated scale to quantify ED, and the most commonly used behavioural pain scales during the postoperative period, generates composite scores to characterize ED and pain. Moreover, the PAED scale[14] shares some descriptors with the Faces, Legs, Activity, Cry, and Consolability (FLACC) Scale[15]; Children's and Infants' Postoperative Pain (CHIPP) scale; or Children's Hospital of Eastern Ontario Pain (CHEOP) scale.[16–18] This may produce an artificial overlap with overestimation of pain and/or ED.

There is a clear clinical need of a simple strategy that allows reliable identification of the two major components of e-PONB (ED and pain) during the early post-anaesthesia period. However, the weight of the internal components of the scales on determining either ED or pain has not been defined clearly.[2 12]

The aim of this retrospective analysis was to identify individual observation domains of the commonly used PAED, FLACC, CHIPP, and CHEOPS scales, which can differentiate between ED and pain. A simple and reliable differentiation between ED and pain would allow the clinician optimal management of e-PONB in young children after receiving general anaesthesia.

Methods

A retrospective analysis of databases of three prospective observational trials involving preschool children (ages one to six yr) was performed. The complete database included the scores of postoperative observational scales of 150 consecutive children undergoing elective adenoidectomy and/or tonsillectomy; 200 consecutive children undergoing elective sub-umbilical surgery; and 162 consecutive children undergoing magnetic resonance imaging (MRI) scanning under general anaesthesia. All children received general anaesthesia without premedication, and a with all patients parents were present at induction.

In children undergoing adenoidectomy and/or tonsillectomy, anaesthesia was induced using sevoflurane (2–5%); propofol (2–7 mg kg^{-1}) and fentanyl (1.5–2 mcg kg^{-1}) administered before tracheal intubation. Anaesthesia was maintained using sevoflurane (2–3%), fentanyl was used as required, and paracetamol (15 mg kg^{-1} i.v.) was given intra-operatively. Children undergoing sub-umbilical surgery received general anaesthesia with sevoflurane and effective caudal anaesthesia before incision, using a 1 ml kg^{-1} of 0.2% ropivacaine. Children undergoing MRI scanning received propofol or sevoflurane anaesthesia. Induction was achieved with propofol (2–4 mg kg^{-1}) or sevoflurane inhalation (up to 7%). Propofol (continuous infusion of 60–100 mcg kg^{-1} min^{-1}) or sevoflurane (1–1.5%) was used for maintenance of anaesthesia with spontaneous ventilation.

Two trained observers simultaneously and independently determined each single item of FLACC, CHEOP, CHIPP, or PAED scales every five min during the first 15 min after awakening. All children awaked in the operating theatre or in the MRI room. The evaluation time started at awakening of each child defined as 'spontaneous eyes opening'. FLACC scales are routinely used clinically in the hospitals' participants. The CHEOP and CHIPP scales were included to increase the number of validated domains of pain behaviour in young children. No medication (sedatives or analgesics) was given for 15 min after they were admitted to the recovery room.

Patients were defined as having ED (if PAED score ≥10), pain (if FLACC score ≥four), both ED and pain (if PAED score ≥10 and FLACC score ≥four), or normal behaviour (if PAED score <10 and FLACC score <four). The onset of ED, defined as the first evaluation for each patient with PAED score ≥10, and the onset of pain, defined as the first evaluation with a FLACC score ≥four, CHIPP score ≥four, or CHEOP score ≥seven, were analysed over time.

Each evaluation was analysed as a single event to characterize ED and pain. The PAED, FLACC, CHIPP, and CHEOP scales include the following common 'overlapping' descriptive items: 'abnormal facial expression' (FLACC, CHIPP, and CHEOP); 'crying' (FLACC, CHIPP, and CHEOP); 'inconsolability' (FLACC and PAED); 'purposeful actions' (FLACC, CHIPP, CHEOP, and PAED); 'abnormal leg position' (FLACC, CHEOP, and CHIP); and 'restlessness' (PAED and CHIPP). The categories 'no eye contact' and 'no awareness of surroundings' are included only in the PAED scale and are considered as the most important items for ED identification.[4 13 14]

To prevent subjectivity of the weighting of the individual descriptors, two authors (M.S. and P.M.I.) retrospectively analysed the data and applied the dichotomous definition ('true/false') of the single evaluation using the following questions:

- Is the facial expression abnormal?
- Is the child crying?
- Is the child inconsolable?
- Is the activity normal and purposeful?
- Are the legs in a normal position?
- Is the child restless?
- Does the child make eye contact with the caregiver?
- Is the child aware of surroundings?

The observation scales considered have different numeric weighting methods. FLACC and CHIPP items with a score of zero identify normal behaviour, and items with scores of one or two points for each variable identify different grades of abnormal behaviour. PAED and CHEOP items with a score of zero or one identify normal behaviour; and items with scores of and two, three, or four points for each variable identify different grades of abnormal behaviour. Therefore, a true/false option was applied for the selected parameters as follows: each item of