Delirium-The Effect of Children Anesthesiology after Surgery

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ABSTRACT

Delirium of anesthesiology is a clinical phenomenon widespread in children. Although the pathophysiology is still uncertain, some factors seem to be involved, such as rapid awakening in an unknown environment, agitation during anesthetic induction, preoperative anxiety, environmental disorders, pre-anesthetic medication, and inhalational anesthetics. There remain unanswered questions and implications related to the emergence of delirium in children. Although we know that there are some predisposing factors to emergence delirium, we still cannot accurately identify those at most significant risk. Emergent delirium should be considered a 'vital sign,' which should be followed and documented in every child in the postanaesthesia recovery period. What should adopt standardized screening tools for pediatric emergence delirium (ED)

Introduction

Millions of children require anesthesia to undergo surgical and diagnostic procedures annually.1 Child has a higher risk of perioperative adverse event leading to increasing morbidity and mortality.1,2 The incidence of delirium is two to three times more common in children than in adults. Current data would suggest that the incidence of delirium varies from 20% to 80% of all pediatric anesthetics, with most of the literature offering it to be close to 20%. There are defined risk factors, and usually, symptoms occur within 30 min of termination of anesthesia and last for 15-30 min. However, delirium can be persistent and has been reported to continue for up to 2 days.3 While postoperative pain is highly expressive, delirium causes genuine distress to the child, parents, and staff in the recovery ward. It also changes the atmosphere within the postoperative unit and can precipitate sympathetic agitation in other postoperative children. The author would like to raise the awareness of delirium posed by a comprehensive review and safe anesthesia for children.

Children anesthesiology

The Anesthesia Practice in Children Observational Trial (APRICOT) reported a significantly higher incidence of perioperative severe critical events during anesthesia management of children.1,2,3 Known risk factors such as age, comorbidity, and physical status of the child have confirmed and identified other risk factors.1 Respiratory problems during anesthesia such as severe laryngospasm and bronchospasm are also more common in children than in adults.1 the conduct of anesthesia is associated with considering in children undergoing general anesthesia. Children are potentially exposed
to risks from physiological imbalance such as hypotension, hypocapnia, hypo/hyperglycemia, hypoxia/hyperoxia, and hyponatremia.\textsuperscript{1}

Strategies to minimize perioperative risks with prevention of anesthesia-associated morbidity and mortality reduce children’s health burden. Children under three years are at a more significant risk of serious adverse events while undergoing anesthesia. Preoperative anxiety is associated with adverse postoperative clinical outcomes, such as emergence delirium and increase analgesic requirements. Maintenance of physiological homeostasis is essential in delivering safe anesthesia. The goals are easier to achieve in older children as, at present, there is insufficient information on normal physiology and pharmacology in neonates and younger children. Further essential aspects are addressed below: minimizing preoperative anxiety, reducing awareness risk, avoiding hypotension, regular heart rate, normoxia, normocapnia, normonatremia, normoglycemia, normothermia, reducing postoperative discomfort (no pain), no postoperative nausea and vomitus, no emergence delirium.

**Emergence delirium in children**

Emergence delirium (ED) was first described by Eckenhoff and colleagues in the 1960\textsuperscript{e} and is defined in pediatric anesthesia as ‘a disturbance in a child’s awareness or attention to their environment with disorientation and perceptual alterations including hypersensitivity to stimuli and hyperactive motor behavior in the immediate post anesthesia period. ED is a diagnosis of exclusion: clearly, any child who emerges after anesthesia and surgery in distress could be in pain. It is essential to ensure the adequacy of analgesia with examination and appropriate treatment. In addition, other pathological causes of postoperative disorientation and agitation, such as hypoglycemia and hypoxia, need to be considered and eliminated before labeling the symptoms as ED.\textsuperscript{2,3,4}

For those focusing on the pathophysiology of this complication, ED is a challenging phenomenon. No important data supports the exact mechanism of this complication and its relation with fast-acting volatile agents. Current hypotheses about this complication derive from recent findings on action mechanisms of hypnotic agents.\textsuperscript{4}

Pediatric delirium remains vastly underdiagnosed both by pediatric and psychiatric teams. There are several challenges associated with accurately and systematically diagnosing pediatric delirium. The gold standard for identifying delirium is a diagnosis by a child and adolescent psychiatrist based on criteria of the Diagnostic and Statistical Manual of Mental Disorders.\textsuperscript{6,7}

Delirium in hospitalized children is characterized as hypoactive, hyperactive, or mixed. Signs of delirium can be difficult to detect and categorize in a critically ill child for many reasons, including the child’s developmental level and the overlapping of the indications of delirium with signs and symptoms associated with pain, sedation, and opioid withdrawal. Delirium occurs in infants as young as three months old and may not have upper or lower age limitations. In some instances, parents may describe their child’s behavior as “this is not my child” and should be taken seriously because this behavior change may be an additional indication of delirium.\textsuperscript{7}

Management of a child with delirium begins with identifying and modifying factors that contribute to the development of delirium in children, including hypoxia, medications such as anticholinergics and benzodiazepines, metabolic disturbances, pain, and anxiety.\textsuperscript{7}

**Anesthesia impact on emergency delirium**

Anesthesia emergence delirium (AED) is a transient state of irritation and dissociation, which occurs after discontinuation of anesthesia in some patients and is not responsive to consolation. Also known as post-anesthetic delirium, it is characterized by mental confusion, irritability, disorientation, inconsolable crying, and prolonged post-anesthetic recovery time.\textsuperscript{2} Regarding the associated factors,
many have been suggested as possible triggers of AED, such as rapid awakening in an unknown environment, agitation during anesthetic induction, preoperative anxiety, airway obstruction, environmental disorders, use of pre-anesthetic medication, anesthetic technique, type of anesthetic used (inhaled, venous), postoperative pain, and the underlying causation remains unknown. One exciting ED hypothesis involved the difference in clearance of volatile agents from the central nervous system leading to differential recovery rate from anesthesia of brain functions. This hypothesis has been supported by the increasing incidence of ED since the introduction of fast-acting volatile agents such as sevoflurane and desflurane. However, the rapidity of emergence from anesthesia was inconsistently found associated with a greater incidence of ED. Moreover, studies comparing propofol (a short-acting intravenous anesthetic agent, administered during the intraoperative period) and sevoflurane or desflurane found a preventive effect of propofol against ED.

A reasonable conclusion is that, rather than rapid emergence with the late onset of analgesia, the agents themselves have some neuropharmacological stimulus to postoperative agitation in the immature nervous system. Added to this is the effect of preoperative demeanor and anxiety.

The routine use of the ED scale can help identify and monitor the severity of ED once the alternative causes have been eliminated. Treatment at this stage is largely pharmacological and includes propofol 0.51 mg kg\(^{-1}\), fentanyl 12 mcg kg\(^{-1}\), or midazolam 0.1 mg kg\(^{-1}\) i.v. Although these measures have been studied as preventive strategies at the end of surgery, it is surprising that they have not been evaluated as treatments. All of these measures can delay discharge from PACU.

Nonpharmacological Management of Delirium is critically ill children are assaulted with unfamiliar sights, sounds, and smells during their stay in the PICU. They also experience excessive noise, bright lights, and ongoing activities that make it difficult to maintain a regular sleep-wake cycle. This sensory overstimulation, coupled with sleep interruptions, may further exacerbate a delighted child’s thought misperceptions, disorientation, and inattention. Normal sleep-wake homeostasis is essential in immunity, thermoregulation, and preventing a catabolic state, which are important for recovering from critical illness. Inadequate sleep quality and duration, often experienced by patients in the ICU, are associated with the development of delirium.

**Conclusion**

While there has been considerable progress in the neuroscience of anesthesia and the application of new pharmacological agents, the mystery behind the exact mechanism of ED is elusive. ED is a diagnosis of exclusion once other causes have been dismissed. The frequency of the ED phenomenon can be significantly reduced given that there are identifiable presurgical risks, which should prompt the adoption of a common ED anesthetic technique.

ED is a common complication in anesthetized preschool children, especially when using sevoflurane. Preventive strategies rely on preventing preoperative anxiety, treating postoperative pain, and administering propofol at the end of the surgery, intraoperative dexmedetomidine, and dexamethasone. When occurring, parents should be informed about the possibly postoperative maladaptive behaviors in weeks or months following surgery.

**References**


