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Delirium and Anesthesia Procedure in Children: A Narrative Literature Review

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A B S T R A C T

A child has a higher risk of perioperative adverse events leading to increased morbidity and mortality. The incidence of delirium is two to three times more common in children than in adults. This review aimed to describe the delirium anesthesia procedure in children. Known risk factors of perioperative anesthesia, such as age, comorbidity, and physical status of the child, have confirmed and identified other risk factors. Respiratory problems during anesthesia, such as severe laryngospasm and bronchospasm, are also more common in children. Emergence delirium (ED) is a challenging phenomenon for those focusing on the pathophysiology of this complication. 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. In conclusion, preventive strategies for delirium in children 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 possible postoperative maladaptive behaviors in weeks or months following surgery.

1. Introduction

Millions of children require anesthesia to undergo surgical and diagnostic procedures annually. A child has a higher risk of perioperative adverse events leading to increased morbidity and mortality. 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%.[1,2] There are defined risk factors; symptoms usually occur within 30 minutes of termination of anesthesia and last for 15-30 minutes. However, delirium can be persistent and has been reported to continue for up to 2 days. While postoperative pain is highly expressive, delirium causes genuine distress to the recovery ward's child, parents, and staff. It also changes the atmosphere within the postoperative unit and can precipitate sympathetic agitation in other postoperative children.[1-4] This review aimed to describe the delirium anesthesia procedure in children.

Perioperative anesthesia in children

Known risk factors of perioperative anesthesia, such as age, comorbidity, and physical status of the child, have confirmed and identified other risk factors. Respiratory problems during anesthesia, such as severe laryngospasm and bronchospasm, are also more common in children than adults. The conduct of anesthesia is associated with consideration in children undergoing general anesthesia. Children are potentially exposed to risks from physiological imbalances, such as hypotension, hypocapnia,

hypo/hyperglycemia, hypoxia/hyperoxia, and hyponatremia.[3]

Strategies to minimize perioperative risks by preventing anesthesia-associated morbidity and mortality reduce children's health burden. Children under three years are at more risk of serious adverse events while undergoing anesthesia. Preoperative anxiety is associated with adverse postoperative clinical outcomes, such as the emergence of delirium and increased 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, normonatremic, normoglycemia, normothermia, reducing postoperative discomfort (no pain), no postoperative nausea and vomitus, no emergence delirium.[4-6]

The emergence of delirium in children

Emergence delirium (ED) is a challenging phenomenon for those focusing on the pathophysiology of this complication. No crucial 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 the action mechanisms of hypnotic agents. 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 the diagnostic and statistical manual of mental disorders criteria.[7,8]

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. Managing 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.[8]

Anesthesia impact on emergence delirium

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. The increasing incidence of ED has supported this hypothesis since introducing fast-acting volatile agents such as sevoflurane and desflurane. However, the rapidity of emergence from anesthesia was inconsistently 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. These agents have some neuropharmacological stimulus to postoperative agitation in the immature nervous system. Added to this is the effect of preoperative demeanor and anxiety.[9,10]

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 mainly pharmacological and includes propofol 0.51 mg kg^{-1}, fentanyl 12 mcg/kg, or midazolam 0.1 mg kg^{-1} intravenous. Although these measures have been studied as preventive strategies at the end of the surgery, it is surprising that they have yet to be evaluated as treatments. All of these measures can

delay discharge from PICU.[11]

Nonpharmacological management of delirium in 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, making it challenging to maintain a regular sleep-wake cycle. This sensory overstimulation and 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 is vital for recovering from critical illness. Inadequate sleep quality and duration, often experienced by patients in the ICU, are associated with the development of delirium.[12]

2. Conclusion

Preventive strategies for delirium in children 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 possible postoperative maladaptive behaviors in weeks or months following surgery.

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