Use of Propofol and Emergence Agitation in Children: A Literature Review

Emergence agitation (EA) during recovery from general anesthesia has been identified as a frequent problem in the pediatric population. In children,EA has been described as a mental disturbance that consists of confusion, hallucinations, and delusions manifested by moaning, restlessness, involuntary physical activity, and thrashing about in bed (Sikich & Lerman, 2004). The overall rate for EA in children is in the range of 10% to 67%, (Aouad & Nasr, 2005), which includes a period of severe restlessness, disorientation, and/or inconsolable crying during anesthesia emergence (Cole, Murray & McAllister, 2002). The age at which children are more likely to display signs of EA ranges from 2 to 5 years old and then begins to decline at age 62 months (Pryzbylo, Martini, Mazurek, Bracey, Johnsen & Cote, 2003). Additionally, the incidence of EA may be affected by individual variations in developmental level within an age group, mental disease, or neurologic conditions (Aouad & Nasr, 2005; Aouad, Yazbeck-Karam, Nasr, El Khatib, Kanazi, & Bleik, 2007; Bortone, Ingelmo, Grossi, 2006). These age groups are defined by the American Academy of Pediatrics (2008) in its Recommendations for Preventive Pediatric Health Care. Definitions are as follows: early childhood (15 months to 4 years old), middle childhood (5 to 10 years old), and early adolescence (11 to 12 years old). In this literature review, the most information was available on EA in the age groups of early and middle childhood, with additional studies that included early adolescents.

Clinical Factors Related to Development of Emergence Agitation

Populations studied for EA included the following characteristics: sex, age, ethnicity, type and active psychological status, and ASA class. Most studies failed to differ in male and female populations. Some studies did separate age cohort higher rate of EA has been seen in preschool boys anesthetized with sevoflurane compared with school-aged boys (Aouad & Nasr, 2005). The age of the child has been considered to be a factor in the development of EA postoperatively, perhaps because of the expected confusion and fright in this age group in response to perioperative events. Aono et al. (1999) concluded that preschool-aged boys showed a higher rate of emergence agitation than did school-aged boys when anesthetized with sevoflurane. Voepel-Lewis et al. (2003) noted that young age and anxiety level preoperatively were associated with EA. Many studies have confirmed that a younger age is a contributing factor in the development of EA, and most studies now target the ages of 2 through 6 years old when studying EA (Aouad & Nasr, 2005).

When EA was first described by Eckenoff in 1961, it was speculated that patients were undergoing head and neck procedures may have a sense of suffocation during emergence from anesthesia, thus increasing the chance of EA. Surgical procedures that have been found to increase the risk of developing EA are otorhinolaryngology, ophthalmology, and neck procedures, all of which may produce a sense of suffocation (Aouad & Nasr, 2005; Vlajkovic & Sindjelic, 2007; VoepelLewis, Malviya, & Tait, 2003). The length of surgery in at least one study was found to be a factor associated with increased incidence of EA (Voepel-Lewis, Malviya, & Tait, 2003). In most studies, patients have been excluded if they were above ASA classes I and II, which is one limitation of the current literature (Baum, Yemen, & Baum, 1997). Exclusion criteria also included children with psychological or emotional disorders, developmental delay, and patients who needed sedative medication before induction (Abu-Shahwan, 2008).

Propofol TIVA techniques have also demonstrated a reduction in EA in children. In the study by Cohen et al. (2003) of sevoflurane inhalational anesthesia versus a propofol TIVA technique, there were of EA in the sevoflurane group subtopic has its own compared with the propofol group In the study by Picard et al. (2000) then "proven" through of the quality of recovery in children anesthetic and propofol research publications. TIVA techniques were compared, with a reduction in EA rates observed in the propofol TIVA group (46% versus 9%, respectively). A reduction in EA from 42% to 11% was seen in children 2 to 5 years of age with propofol TIVA compared with sevoflurane inhalational general anesthesia (Nakayama, Furukawa, & Yanai, 2007).

The studies summarized in table A rates in sevoflurane alone, propofol TIVA alone compared with findings that demonstrate that in researching either using propofol adjunctively or using results in lower rates of EA compared with either sevoflurane alone or sevoflurane with adjunctive propofol.

According to the literature evidence base, there is an advantage to either propofol TIVA or adjunctive propofol with sevoflurane (compared with sevoflurane alone). We conclude, based on the current evidence, that the use of propofol is associated with a reduction in the incidence of emergence agitation.

Conclusion

The reviewed literature suggests that there are advantages to the use of propofol TIVA techniques and adjunctive propofol anesthetics when combined with a sevoflurane inhalational technique. This reduction in EA with propofol use in conjunction with or separately from sevoflurane has been widely documented throughout the literature (Aouad et al., 2007; Abu-Shahwan, 2008). A major limitation of this literature is that numerous EA assessment scales are used to compare various anesthetics. If future studies use the same validated assessment scale (such as the PAED), results can be more easily compared and strengthened. To better delineate the pathophysiology and causative factors regarding EA, more structured and multicenter studies with larger populations should be performed. Current research supports the use of propofol as discussed above; however, a continuation of current research with consistent and strengthened methodologies will help justify its use and application to clinical practice