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Anesthesiology

"A STUDY OF EMERGENCE AGITATION IN PEDIATRIC PATIENTS UNDER GENERAL ANESTHESIA."

Dr. Trupti Yergude Assistant Professor, Dept. of Anesthesia, GMC, Chandrapur.

Dr. L. F. Vali Professor and Head, Dept. of Anaesthesia, GMC, Chandrapur.

ABSTRACT Postanesthetic emergence agitation is a common problem in pediatric postanesthetic care unit with an incidence ranging from 10 to 80%. This study was done to determine the prevalence of emergence agitation and associated risk factors in pediatric patients who underwent general anesthesia.

Methods : This cross-sectional descriptive and analytic study was performed on 747 pediatric patients aged 3- 7 years that underwent general anesthesia for various elective surgeries at a tertiary hospital in Central India between January 2016 and June 2017.

Results: One hundred thirty-four (17.9%) children had emergence agitation. The most frequent surgical procedures were ENT surgical procedures 315 (42.2%), abdominal surgery 177 (23.7%), orthopedic surgery 137 (18.3%), urology 97 (13%) and ophthalmic surgery 24 (3.2%). Otorhinolaryngological surgical procedures (P=0.001), pain (P<0.05) and induction behavior of children (P<0.005) were associated with higher rates of post anesthetic emergence agitation (P=0.001).

KEYWORDS : Emergence Agitation

Introduction:

EA has been described as a dissociated state of consciousness in which the child is inconsolable, irritable, uncooperative, typically thrashing, crying, moaning or incoherent[1]. Nowadays, about 4 million children undergo general anesthesia annually and EA has been identified as a significant problem in children at Postanesthetic Care Unit (PACU) with an incidence ranging from 10 to 80%[2]. EA as a postanesthetic problem interferes with child's recovery and presents a challenging situation for post-anesthesia care provider in terms of assessment and management[3]. Although, several factors have been identified as etiologies of EA, there is no entire description for emergence agitation. Many different causes have been suggested, such as rapid awakening in an unfamiliar environment, painful events like surgical wounds, agitation on induction, airway obstructions, environmental disturbances, the duration of anesthesia, hyperthermia, hypothermia, type and site of operation, premedication, inhaled and intravenous anesthetics and the anesthetic technique[2,4–6]. In addition, administration of sedative and analgesics is associated with increased recovery time and delayed PACU discharge[7–10]. Generally, treatment in all cases mentioned above is directed to the correction of causative agents[11]. Although, numerous medications have been studied to prevent or reduce EA in children, no special preventive method has been shown to be highly superior. So, this cross-sectional descriptive and analytic study had been undertaken to determine the prevalence of EA, evaluate the risk factors associated with and predictive of it, and describe the outcomes related to EA in children aged 3 to 7 years that underwent general anesthesia for elective surgical procedures.

Methodology: This cross-sectional descriptive and analytic study was performed on 747 pediatric patients aged 3- 7 years that underwent general anesthesia for various elective surgeries at a tertiary hospital in Central India between January 2016 and June 2017. A non-probability quota sampling technique was used. The presence of emergence agitation was recorded using Pediatric Anesthesia Emergence Delirium Scale. The factors linked with Emergence Agitation were recorded in a questionnaire and the questionnaire has been shown to have validity in a variety of studies and populations[13, 14]. The data were analyzed using SPSS software 16 and independent sample t-test, $\chi 2$ and binary logistic regression. P-values less than 0.05 were considered as significant.

Results

Seven hundred forty- seven children aged 3-7 years with ASA class I-II were enrolled over a one year period. One hundred thirty four children (17.9%) had EA. From total, 479 (64.1%) were males and 268 (35.9%) females. The mean age of the patients was 4.89±1.42 years. From 134 patients with EA, 89 (11.9%) were males and 40 (6.0%) females (P>0.05). The previous history of surgery and medical diseases were seen in 22 (2.9%) and 8 (1.1%) patients, respectively (P>0.05).

The mean duration of anesthesia was 34.40±28.46 minutes. The incidence of EA was higher in operative procedures less than one hour duration (P=0.022). The mean of awakening time from anesthesia in EA and non-EA patients was 6.20±2.98 and 4.85±4.06, respectively. A significant relationship was observed between mean of awakening time from anesthesia and incidence of EA (t=3.601 df=742, P<0.05).

The most frequent surgical procedures were ENT 315 (42.2%), abdominal surgery 177 (23.7%), orthopedic surgery 137 (18.3%), urologic surgery, 97 (13%) and ophthalmic surgery 24 (3.2%), respectively. Otorhino-laryngological surgical procedures were associated with higher rates of EA (P<0.05). There was no relationship between behavioral separation of the patients and EA (P>0.055), but their induction behavior had significant relationship with EA in PACU (P<0.005).

Discussion

Postoperative emergence agitation, also known as emergence delirium in international literature is a well-known clinical phenomenon with an incidence ranging 10-80%[15]. The incidence of EA in our study was 17.9% based on PAED score of ≥12. Most of EA occurred within the first 30 minutes of recovery at PACU. This finding is compatible with results obtained from previous studies[2, 10].

The present study showed that the children aged 4-6 years had a higher incidence of EA compared to children aged 7 years. It may be due to less psychological and physiological immaturity of young-aged children compared to school-aged children being less able to cope with rapid awakening in an unknown environment[16]. Similar results have been reported by Aono et al in 1977[17].

The association between preoperative anxiety and postoperative agitation has been reported in previous studies[18, 19]. Some early reports have suggested that otorhinolaryngological surgical procedures appeared to exhibit an increased incidence of agitation[3, 20]. When Eckenhoff et al first described the EA in 1961, attributed the increased incidence among otolaryngologic procedures to the "sense of suffocation"[1]. After that, in 2003, Voepel-Lewis in a prospective study has shown that the otolaryngologic procedures are independent risk factors for EA[3]

Postoperative pain appears to be an aggravating factor, and its behavioral manifestations may be confused with emergence agitation diagnosis[11]. Several studies have discussed that pain during impaired consciousness leads to severe EA in some children[21, 22]. However, a clear relationship has not been established[3]. Nevertheless, clinical experience and the review of the literature have suggested that when caring for children in PACU, it may not be necessary to differentiate EA from pain, especially because the treatment is similar for both of them[23].

Also, they observed a reduction in agitation when midazolam was used as premedication followed by sevoflurane as anesthetic[24]. However,

some authors have reported that emergence time was prolonged when midazolam was used[25]. Among the inhaled anesthetic agents used in this study, isoflurane was associated with 9.8% of EA compared with sevoflurane (2.5%) and halothane (0.7%). EEG changes caused by the effects of isoflurane and sevoflurane on the central nervous system have also been suggested as a possible causative agent of agitation[26, 27].

Propofol has been demonstrated to be effective as an adjunct to sevoflurane inhalational general anesthesia in reducing the incidence of EA[28, 29]. We have also found no relationship between Propofol and increased EA.

Among the intravenous anesthetics used in the present study, ketamine has been shown not to be associated with increasing risk of EA. Dissimilar result was reported by Eckenhoff et al with ketamine during emergence from anesthesia[1]. Conversely, Dalens et al showed that the administration of 0.25 mg/kg of ketamine at the end of the MRI in children reduced agitation with no delay in discharge[30]. On the other hand, the short duration of most surgical procedures could not be associated with such phenomenon.

Conclusions

This study has identified that multiple independent risk factors such as post-operative pain, short time awaking, anesthetic drugs including sufentanil, isoflurane, atracurium, and also ENT surgeries, as well as site of operation were the risk factors of EA in children aged 3-7 years.

Table 1: The relationship between type of surgical operation and presence of EA

Surgical operations	Presence of EA [n(%)]		*P.* Value
	Yes	No	
ENT (n=315)	11.4 (85)	230 (30.8)	<0.001
Ophthalmology (n=24)	5 (0.7)	19 (2.5)	0.7
Urology (n=97)	16 (2.1)	81 (10.8)	0.7
Orthopedics (n=137)	11(1.5)	126 (16.9)	0.001
Abdominal (n=177)	17 (2.3)	160 (21.4)	0.001

Table 2: Relationship between children's behavior in separation and induction times and EA

Behavior	EA	Calm & cooperate n (%)	slightly anxious & fearful: n (%)	Restless & uncooperative: n (%)	*P.* Value
Separation's	Yes	7 (0.9)	104 (13.9)	23 (3.1)	0.1
Behavior	No	27 (3.6)	520 (69.6)	66 (8.8)	
Induction's	Yes	96 (12.9)	33 (4.4)	5 (0.7)	0.001
Behavior	No	535 (71.8)	70 (9.4)	6 (0.8)	

Table3: The association between anesthetic agents and presence of emergence agitation

Anesthetic agents	Emergence Agitation			
	Yes [n (%)]	No [n (%)]	Total [n (%)]	*P.* Value
Atropine	9 (1.2)	13 (1.7)	22 (2.9)	0.004
Midazolam	126 (16.9)	575 (77.0)	701 (93.8)	0.9
Fentanil	77 (10.3)	313 (41.9)	390 (52.2)	0.2
Sufentanil	19 (2.5)	49 (6.6)	68 (9.1)	0.02
Alfentanil	3 (0.4)	22 (2.9)	25 (3.3)	0.4
Pethidine	7 (0.9)	47 (6.3)	54 (7.2)	0.3
Thiopental	91 (12.2)	352 (47.1)	443 (59.3)	0.02
Propofol	26 (3.5)	119 (15.9)	145 (19.4)	1
Ketamine	44 (5.9)	250 (33.5)	294 (39.4)	0.09
Halothane	5 (0.7)	6 (0.8)	11 (1.5)	0.02
Sevoflurane	19 (2.5)	105 (14.1)	124 (16.6)	0.4
Isoflurane	73 (9.8)	193 (25.8)	266 (35.6)	<0.001
Atracurium	92 (12.3)	304 (40.7)	396 (53.0)	<0.001
Succinylcholine	17 (2.3)	98 (13.2)	115 (15.5)	0.3

References

1. Eckenhoff JE, Kneale DH, Dripps RD. The incidence and etiology of postanesthetic excitement. Anesthesiology1961;22: 667-73.
2. Nasar VG, Hannallah RS.Emergence agitation in children: A Review. MEJ Anesth 2011;21(2):175-84.
3. Voepel-Lewis T, Malviya S, Tait AR. A prospective cohort study of emergence agitation in the pediatric postanesthesia care unit. Anesth Analg 2003;96(6): 1625-30.
4. Beskow A, Westrin P.Sevoflurane causes more postoperative agitation in children than does halothane. Acta Anaesthesiol Scand 1999;43(5):536-41.
5. Hollister GR, Burn JM.Side effects of ketamine in pediatric anesthesia. Anesth Analg 1974;53(2):264-7.
6. Brown R. Postoperative recovery. In: Nagelhout JJ, Zagalaniczny KL. Nurse Anesthesia.3rd ed. USA: Elsevier Sunders, 2005: Pp: 1148-9.
7. Nicholau D. Postanesthesia recovery. In: Stoelting RK, Miller RD. Basic of Anesthesia, fifth Ed. USA: Churchill Livingstone Elsevier, 2007; Pp: 572-3.
8. Olympio MA. Postanesthetic delirium: historical perspectives. J Clin Anesth 1991;3(1):60-3.
9. Veyckemans F. Excitation phenomena during sevoflurane anaesthesia in children. Curr Opin Anaesthesiol2001;14(3):339-43.
10. Vlajkovic GP, Sindjelic RP.Emergence delirium in children: many questions, few answers. Anesth Analg 2007;104(1):84-91.
11. Da Silva LM, Braz LG, Módolo NS. Emergence agitation in pediatric anesthesia: current features. J Pediatr (Rio J)2008;84(2):107-13.
12. Sikich N, Lerman J.Development and psychometric evaluation of the pediatric anesthesia emergence delirium scale. Anesthesiology 2004;100(5):1138-45.
13. Bajwa SA, Costi D, Cyna AM. A comparison of emergence delirium scales following general anesthesia in children. Paediatr Anaesth 2010; 20(8):704-11.
14. Voepel-Lewis T, Zanotti J, Dammeyer JA, Merkel S. Reliability and validity of the face, legs, activity, cry, consolability behavioral tool in assessing acute pain in critically ill patients. Am J Crit Care 2010;19(1): 55-61.
15. Lapin SL, Auden SM, Goldsmith LJ, et al. Effects of sevoflurane anaesthesia on recovery in children: a comparison with halothane. Pediatr Anesth 1999, 9(4):299-304.
16. Martini DR. Commentary: the diagnosis of delirium in pediatric patients. J Am Acad Child Adolesc Psychiatry2005;44(4):395-8.
17. Aono J, Ueda W, Mamiya K, et al. Greater incidence of delirium during recovery from sevoflurane anesthesia in preschool boys. Anesthesiology 1997; 87(6):1298-300.
18. Kain ZN, Mayes LC, O'Connor TZ, et al. Preoperative anxiety in children: predictors and outcomes. Arch Pediatr Adolesc Med 1996;150(12):1238-45.
19. Aono J, Mamiya K, Manabe M. Preoperative anxiety is associated with a high incidence of problematic behavior on emergence after halothane anesthesia in boys. Acta Anaesthesiol Scand 1999;43(5):542-4.
20. Galford RE. Problems in anesthesiology: approach to diagnosis.Boston, MA: Little, Brown & Company; 1992; Pp: 341-3.
21. Cohen IT, Finkel JC, Hannallah RS, et al. The effect of fentanyl on the emergence characteristics after desflurane or sevoflurane anesthesia in children. Anesth Analg2002;94(5):1178-81.
22. Cohen IT, Hannallah RS, Hummer KA. The incidence of emergence agitation associated with desflurane anesthesia in children is reduced by fentanyl. Anesth Analg2001;93(1):88-91.
23. Manworren RC, Paulos CL, Pop R. Treating children for acute agitation in the PACU: differentiating pain and emergence delirium. J Perianesth Nurs 2004; 19(3):183-93.
24. Lapin SL, Auden SM, Goldsmith LJ, et al. Effects of sevoflurane anaesthesia on recovery in children: a comparison with halothane. Paediatr Anaesth 1999; 9(4):299-304.
25. Viitanen H, Annila P, Viitanen M, Tarkilla P. Premedication with midazolam delays recovery after ambulatory sevoflurane anesthesia in children. Anesth Analg1999;89:75-9.
26. Constant I, Seeman R.Inhalational anesthetics in pediatric anesthesia. Curr Opin Anaesthesiol 2005; 18(3):277-81.
27. Aouad MT, Yazbeck-Karam VG, Nasr VG, El-Khatib. A single dose of propofol at the end of surgery for the prevention of emergence agitation in children undergoing strabismus surgery during sevoflurane anesthesia. Anesthesiology 2007;107(5):733-8.
28. Abu-Shahwan I. Effect of propofol on emergence behavior in children after sevoflurane general anesthesia. Paediatr Anaesth 2008;18(1):55-9.
29. Dalens BJ, Pinard AM, Letourena DR, et al. Prevention of emergence agitation after sevoflurane anesthesia for pediatric cerebral magnetic resonance imaging by small doses of ketamine or nalbuphine administered just before discontinuing anesthesia. Anesth Analg 2006;102(4):1056-61.
30. Cravero JP, Beach M, Thyr B, Whalen K: The effect of small dose fentanyl on the emergence characteristics of pediatric patients after sevoflurane anesthesia without surgery. Anesth Analg 2003;97:364-7.