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Anaesthesia

Comparison of Emergence Agitation with Desflurane versus Sevoflurane Anaesthesia in Children

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Abstract **Original Research Article**

A child with Emergence Agitation (EA) is in a dissociated state of consciousness in which the child is irritable, uncooperative, incoherent and inconsolably crying, kicking or thrashing. The Watcha scale is a simple tool used to identify EA in children. This study compares the Emergence Agitation in children with desflurane versus sevoflurane anaesthesia, using the Watcha Scale. A Randomized Controlled trial was conducted which included 60 patients. Patients were divided into 2 groups with 30 patients in each group. All patients were given general anaesthesia with the inhalational agent of choice as sevoflurane in one group and desflurane in the other. The time to extubation from the stoppage of the inhalation agent was noted and the behaviour of the child was monitored post-extubation in accordance with the watcha score for next 2 hours. The incidence of emergence agitation with sevoflurane anaesthesia (36.7%) and desflurane anaesthesia (23.3%) was similar and statistically not significant. However, the time to extubation from the stoppage of the inhalational agent was 4-7mins in the sevoflurane group while it was 3-5mins in the desflurane group which was statistically significant. Thus, sevoflurane and desflurane can both be used in paediatric anaesthesia but patients should be watched for emergence agitation post-operatively with both agents.
Keywords: emergence agitation, sevoflurane, desflurane.

INTRODUCTION

A child with Emergence Agitation (EA) is in a dissociated state of consciousness in which the child is irritable, uncooperative, and incoherent and inconsolably crying, kicking or thrashing. Emergence agitation is not a new phenomenon and has been identified since the 1960s [1]. It was first described by Eckennoff.*et al*. in 1961.

With the introduction of newer drugs that can be provided for rapid, smooth anaesthesia and rapid emergence, the role of anaesthetic emergence has taken on clinical significance.

This is especially true for paediatric anaesthesia in which the frequent incidence of emergence agitation especially in pre-school children is a major disadvantage and even raises the question about the 'quality' of the anaesthetic agent[2].

Although Emergence Agitation is usually self-limited and occurs within the first 30-minutes post-surgery, it can last up to 2 days [3].

The difference in the recovery time and incidence of emergence agitation with desflurane and sevoflurane have not been clearly elucidated in children, although the difference in recovery times between the 2 agents in adults is well known [4].

Therefore, we aimed to investigate the incidence and severity of Emergence Agitation with desflurane and sevoflurane anaesthesia using the Watcha scale, which is a simple scale to assess emergence agitation [5].

MATERIALS AND METHODS

After ethical committee approval, the study was conducted at the attached tertiary care teaching hospital from 2016 till January 2018.

Study design

The study was Prospective Randomized comparative study.

Consent

A written consent was taken from each parent, in the language he or she understands.

Selection of patients

Sample size of 60 patients of ASA I/II.

Inclusion criteria

The study included all ASA grade I/II patients between the age of 3-8 years undergoing surgical procedures lasting 60 minutes or more under general anaesthesia

Exclusion criteria

Children with a history of airway disease sleep apnoea, developmental delay and psychological disorders were excluded from the study.

Methodology

Our study included 60 children in the age group of 3 to 8 years belonging to ASA I and II groups, undergoing surgical procedures lasting 60 minutes or more.

The children were randomly divided into 2 groups of 30 each. Group S included children maintained with Sevoflurane. Group D included children maintained with Desflurane

Pre-anaesthetic check-up of all patients was done as routine and all patients were kept "nil by mouth" 6 hours prior to surgery.

After obtaining a bilingual written informed consent from parents of each patient (i/v/o patients being children), intravenous injection glycopyrrolate 0.004 mg/kg and injection midazolam 0.05mg/kg were given as pre-medication once the patient is inside the operating room.

Anaesthesia was induced with injection propofol 1-2mg/kg. Intubation with appropriate size Endotracheal (E.T.) tube was done under the effect of injection vecuronium 0.08mg/kg.

Anaesthesia was maintained with 50% nitrous oxide and 50% oxygen and either desflurane or sevoflurane (according to random allocation). Desflurane and sevoflurane dial concentrations were maintained according to the depth of anaesthesia and fresh gas flow was standardized and kept at 6L/min to 8L/min. Injection paracetamol 20mg/kg was given to provide adequate analgesia.

At the end of the procedure, the volatile anaesthetic agent and nitrous oxide were turned off and 100% oxygen was given. Time from the discontinuation of sevoflurane/ desflurane to tracheal extubation was noted as well as the total duration of sevoflurane/desflurane used and duration of surgery was noted.

In the post anaesthesia care unit (recovery room) monitoring was done using the watcha scale to observe for emergence agitation.

Monitoring was done every 10 minutes up to 1 hour after arrival to PACU then every 15 minutes up to 2 hours or till the time of discharge from PACU (whichever came first). The presence of any adverse effects was also noted.

Watcha Scale

Behaviour	Score
Asleep	0
Calm	1
Crying, but can be consoled	2
Crying, cannot be consoled	3
Agitated and thrashing around	4

Data Analysis

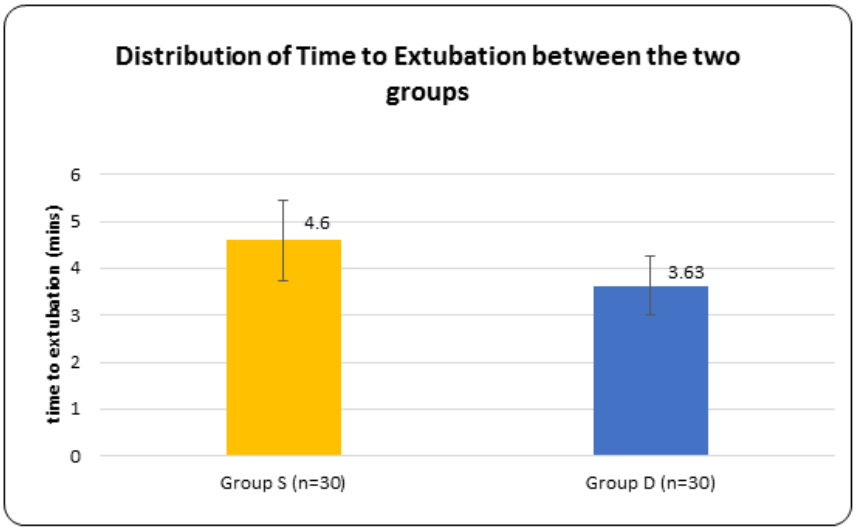
Statistical analysis was performed using the SPSS statistical package (version 17.0.). Distribution of data was not normal so mean (min-max) were used for continuous variables. Categorical variables were expressed as frequencies (%). Differences between groups were assessed with Chi-square for categorical variables. P value of <0.05 was taken as significant.

OBSERVATIONS AND RESULTS

The demographic data of our study population i.e. age, gender, duration of surgery and duration of agent used did not show any significant statistical difference between the two study groups

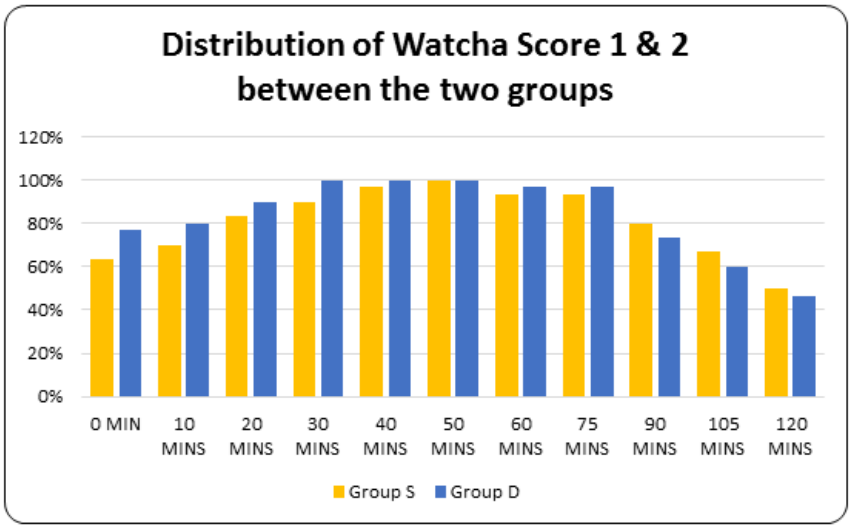
Table-1: The demographic data- age, gender, duration of surgery and duration of agent used between the two study groups

	Group S (N=30)	Group D (N=30)	P Value
Age (yrs.)	4.60 ± 1.45	4.87 ± 1.53	0.491
Sex male/female	13/17	15/15	0.605
Duration of Surgery (mins)	102.33 ± 30.22	92.07 ± 26.72	0.170
Duration of Agent Used (mins)	109.83 ± 31.39	102.00 ± 31.17	0.336



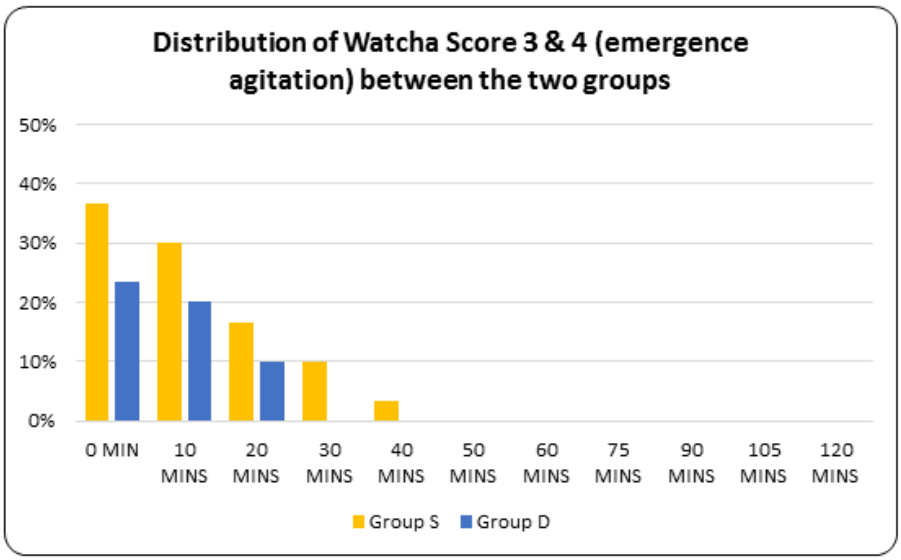
Graph-1: The distribution of time from discontinuation of the agent to extubation between the two study groups

1) The mean time from discontinuation of the agent to extubation was 4.60 ± 0.86 minutes for sevoflurane group and 3.63 ± 0.62 minutes for desflurane group.
2) The comparison of mean time from discontinuation of the agent to extubation was statistically significant in the two study groups (P-value<0.001).



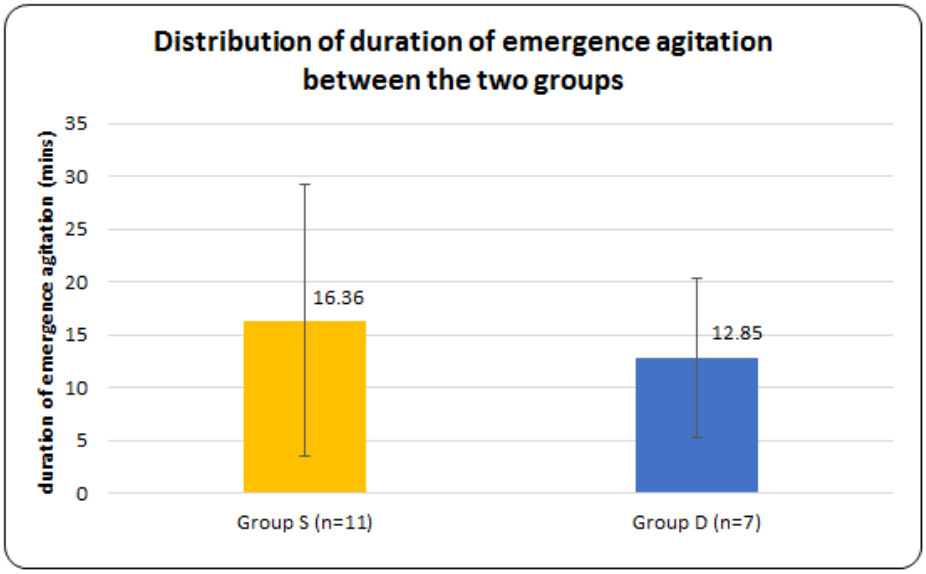
Graph-2: The distribution of the incidence of watcha score 1 and 2 in the cases studied between two study groups in the post anaesthesia care unit at various time intervals

1) The incidence of watcha score 1 and 2 did not differ significantly at any time interval between two study groups. (P-value>0.05).



Graph-3: The distribution of the incidence of watcha score 3 and 4 (EMERGENCE AGITATION) in the cases studied between two study groups in the post anaesthesia care unit at various time intervals

1) The incidence of watcha score 3 and 4 (EMERGENCE AGITATION) did not differ significantly at any time interval between the two study groups (P-value>0.05).



Graph-4: The distribution of mean duration for which the emergence agitation lasted in the cases studied between the two studies groups in the post anaesthesia care unit

1) The distribution of mean duration for which emergence agitation lasted did not differ significantly between the two study groups (P-value>0.05).

DISCUSSION

Emergence agitation is a well-documented phenomenon occurring in children and adults in the immediate post-operative period and is a major cause of worry, though there is no clinical evidence that it has any long-term psychological outcomes and is a short-term event [1].

Our study compared the time to extubation from the time of discontinuation of the inhalational agent. In the sevoflurane group (group S) the time to extubation was 4.6 $\pm$ 0.86 minutes and was 3.63 $\pm$ 0.62 minutes in desflurane group (group D). This was highly significant with a p-value of <0.001. Thus the time to extubation with desflurane anaesthesia is significantly shorter than with sevoflurane anaesthesia in our study with a comparable duration of surgery and duration of agent used. This is similar to the studies done by Welborn LG, *et al*. in 1996 and Byung Gun Lim, *et al*. in 2016 showing faster recovery from desflurane as compared to sevoflurane [6,7].

We compared the incidence of emergence agitation as indicated by a watcha score of 3 or 4 between the two groups, where the child is crying and cannot be consoled as per score 3 and is agitated or thrashing around as per score 4. The data was statistically not significant. Thus, the incidence of emergence agitation with sevoflurane anaesthesia (36.7%) and desflurane anaesthesia (23.3%) was similar and statistically not significant.

Similarly, a meta-analysis done by Byung Gun Lim, *et al*. in 2016 comparing the incidence of emergence agitation between desflurane and sevoflurane anaesthesia in children in various studies showed no significant difference in the incidence of emergence agitation with the 2 agents[7].

Also, Singh R, *et al*. in 2012 and S. Sethi, *et al*. in 2013 in their respective studies showed a similar incidence of emergence agitation with both sevoflurane and desflurane[8,9].

Also, in our study, the average duration of emergence agitation in the two groups was statistically not significant (p-value of 0.525) with a mean duration of emergence agitation with sevoflurane group being 16± 12.86 minutes and with desflurane group being 12.85± 7.56 minutes.

This corresponds to the study by Jeremy N. Driscoll, *et al*. in 2017, which also showed an equal duration of emergence agitation with both sevoflurane and desflurane[10].

CONCLUSIONS

Our study concludes that-

- The time to extubation from the stoppage of inhalational agent between the two groups was significantly shorter with desflurane.
- The incidence and duration of emergence agitation were comparable between the two inhalational agents.

Thus, sevoflurane and desflurane can both be used in paediatric anaesthesia but patients should be watched for emergence agitation postoperatively with both the agents.

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