

A Comparison of Midazolam and Propofol in Prevention of Sevoflurane Induced Emergence Agitation in Children Undergoing Inguinal Herniotomy and Circumcision

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ABSTRACT

Aim: To compare the effect of midazolam and propofol in prevention of sevoflurane induced emergence agitation in children undergoing inguinal herniotomy and circumcision.

Study Design: Randomized double blind trial.

Methods: This randomized double blind study was conducted at Department of Anesthesia, DHQ teaching Hospital, Gujranwala from 10-01-2018 to 15-12-2018. In this study 268 healthy children were scheduled to undergo inguinal herniotomy and/or circumcision. The children were then allocated into two equal groups with random numbers by using a table generated by computer, the propofol group and midazolam group.) Induction of general anesthesia was done with 7-8 % sevoflurane. Incidence of emergence delirium was measured by using Aono's scale and proforma was filled.

Results: In propofol group, the mean age of the patients was 4.70 ± 2.38 years. In midazolam group, the mean age of the patients was 4.79 ± 2.44 years. There were more males in study. In comparison of propofol with Midazolam the sevoflurane induced emergence agitation conditions were found to be statistically significant postoperatively ($P < 0.1$) and midazolam showed less emergence agitation.

Conclusion: According to our study results midazolam is superior than propofol in prevention of sevoflurane induced emergence agitation in children who undergo surgery under general anesthesia.

Key words: Propofol, Midazolam, Inguinal Hernia, Circumcision, Emergence Agitation, Sevoflurane

INTRODUCTION

Emergence agitation is defined as a mental (psychomotor) disturbance that occurs in recovery phase after general anesthesia¹. Sevoflurane has widespread use in children due to its properties of short induction time, minimal pungency and smooth anesthesia with rapid recovery.⁽²⁻⁴⁻⁵⁾ All inhalation anesthetic agents cause emergence agitation but incidence with sevoflurane may be up to 10-80% after general anesthesia in children²⁻⁸. Although there is no clear cause of emergence agitation but sevoflurane induced excitation of brain tissues may be the responsible⁵.

The period of emergence agitation is very disturbing for children as well as for parents and needs to be prevented².

Propofol is phenol ring substituted and is used as hypnotic agent through its actions on GABA_A receptor^{2,4,5}. Because propofol has short duration of action so it is preferred for induction of general anesthesia as well as for sedation and it also decreases recovery time if administered timely. Studies show that 1 mg/kg dose of propofol at the completion of surgical procedure decreases the emergence agitation in children^{2,3,4}.

Midazolam belongs to benzodiazepines group and acts through same receptor GABA_A like propofol but at different site⁶. Midazolam is commonly used as premedication for sedation, to alleviate anxiety, provide amnesia and muscle relaxation^{5,8}. Previous studies show that 0.05 mg/kg dose of midazolam given intravenously decreases agitation but delays recovery^{8,12,13}.

Received on 03-01-2019

Accepted on 18-04-2019

MATERIAL AND METHODS

This study was conducted after approval and consent of ethic committee of DHQ teaching hospital Gujranwala, over a period of one year from 10-01-2018 to 15-12-2018 under the written informed consent from one of the parents, basic and demographical (age, gender, weight etc.) information was obtained. In this study 268 healthy children aged 2-9 years with American society of anesthesiologist (ASA) physical status I and II were scheduled to undergo inguinal herniotomy and/or circumcision.

The children were then allocated into two equal groups with random numbers by using a table generated by computer, the propofol group (Group P) and midazolam group (Group M). All children were preoperatively assessed and fasted for 6 hours and received 0.1 mg/kg nalbuphine intravenously as premedication for sedation, to decrease pain and minimize the fear of operation theatre. After shifting the patients in operation theatre an electrocardiogram, blood pressure cuff and pulse oximeter probe was attached.

Induction of general anesthesia was done with 7-8 % sevoflurane along with 100 % oxygen through T piece circuit and after loss of consciousness of the patient, laryngeal mask airway (LMA) of proper size was inserted. Anesthesia was maintained with 50% nitrous oxide (3-5 L/min) and 50% oxygen (3-5 L/min) supplemented by concentration of 2-3.5 % volume sevoflurane maintaining adequate depth of anesthesia with spontaneous or assisted ventilation. All children received 0.2mg/kg intravenous dexamethasone for control of postoperative nausea and vomiting and 10mg/kg intravenous paracetamol for postoperative pain.

Just five minutes before the completion of procedure, the children in group P received propofol 0.8 mg/Kg and children in group M received 0.04 mg/Kg midazolam slowly. At the completion of procedure nitrous oxide and sevoflurane was turned off and at the same time laryngeal mask airway (LMA) removed. Then children given 100% oxygen until the patient is awake and vitally stable with regular respiration. Then children were shifted to recovery unit and one of their parents's stayed with them until discharge.

An anaesthetist who was blinded to the treatment given, measured the incidence of emergence agitation using Aono's four point scale. ^{2,4,5} Score 1= calm, 2= not calm but consoled easily, 3= reasonably agitated or restless, not easily calmed, 4= aggressive, excited or disoriented. Score 1 and 2 measured as absence of emergence agitation and score 3 and 4 measured as the presence of emergence agitation. The incidence of emergence agitation measured upon admission to the post anesthesia care unit at 0 min (T0), 5 min(T5), 10 min(T10), 15 min (T15) , 20 min(T20), 25 min(T25), 30 min(T30), 35 min(T35) 40 min(T40) 50 min(T50) and 60 min(T60).

The data was analyzed in the SPSS version of 20. The quantitative variable like age was presented as mean ± standard deviation. Other variables like SPO₂, HR, duration of anesthesia, time of emergence from anesthesia, period of stay in recovery were analyzed by independent T test and qualitative variable like gender was presented as frequencies and percentages. Chi-square test was used for comparison of two groups with regard to incidence of emergence agitation, P values≤0.1 was taken as significant.

RESULTS

In our study when we compared the propofol with Midazolam in the sevoflurane induced emergence agitation. Midazolam group showed less emergence agitation 33.6% (45 patients) as compared to propofol group 45.5% (61 patients), the conditions were found to be statistically significant.

Table-1: Descriptive statistics of total duration of surgery (Mins)

Total duration of surgery (Mins)			
		Propofol	Midazolam
	N	134	134
	Mean	32.40	33.31
SD	10.51	10.61	

t-test value = 0.7054 p-value = 0.4812

Table-2: Descriptive statistics of Total period of sevoflurane anesthesia (min)

Total period of sevoflurane anesthesia			
		Propofol	Midazolam
	N	134	134
	Mean	42.18	42.60
SD	10.49	11.89	

t-test value = 0.305 p-value = 0.761

Table 3: Descriptive statistics of time of emergence from anesthesia (Mins)

Time of emergence from anesthesia			
		Propofol	Midazolam
	N	134	134
	Mean	5.21	6.04
SD	1.05	4.57	

t-test value = 2.045 p-value = 0.042

Table-4: Descriptive statistics of total period of stay in recovery (Mins)

Total period of stay in recovery room			
		Propofol	Midazolam
	N	134	134
	Mean	59.70	59.48
SD	2.10	2.23	

t-test value = 0.845 p-value = 0.399

Table-5: Comparison of emergence agitation conditions at baseline with study groups

		Group		Total	P-value
		Propofol	Midazolam		
T0	Calm	0	1	1	0.070
	Not calm but easily consoled	3	1	4	
	Moderately agitated	5	0	5	
T5	Calm	3	3	6	0.023
	Not calm but easily consoled	8	9	17	
	Moderately agitated	25	5	30	
T10	Calm	10	12	22	0.775
	Not calm but easily consoled	10	9	19	
	Moderately agitated	15	12	27	
T15	Calm	6	11	17	0.825
	Not calm but easily consoled	7	13	20	
	Moderately agitated	5	6	11	
T20	Calm	9	5	14	0.014
	Not calm but easily consoled	6	9	15	
	Moderately agitated	2	14	16	
T25	Calm	4	2	6	0.033
	Not calm but easily consoled	2	11	13	
	Moderately agitated	4	2	6	
T30	Calm	2	0	2	0.232
	Not calm but easily consoled	0	1	1	
	Moderately agitated	3	3	6	
T35	Calm	1	0	1	
	Not calm but easily consoled	2	2	4	
	Moderately agitated	1	1	2	
T40	Moderately agitated	1	2	3	
Total		134	134	268	

Table 6: Comparison of emergence agitation in both groups

		Group		Total
		Propofol	Midazolam	
Emergence agitation	Yes	61 (45.5%)	45 (33.6%)	106 (39.6%)
	No	73 (54.5%)	89 (66.4%)	162 (60.4%)
Total		134 (100%)	134 (100%)	268 (100%)

Chi-square test = 3.995 p-value = 0.046 (Significant)

DISCUSSION

This double blind randomized control trial was carried out at Department of Anesthesia, DHQ teaching Hospital, Gujranwala over a period of one year from 10-01-2018 to 15-12-2018 to

compare the effect of midazolam and propofol in prevention of sevoflurane induced emergence agitation in children undergoing inguinal herniotomy and/or circumcision.

In our study when we compared the propofol with Midazolam in the sevoflurane induced emergence agitation. Midazolam group showed less emergence agitation 33.6% (45 patients) as compared to propofol group 45.5% (61 patients), the conditions were found to be statistically significant.

In propofol group, the mean total duration of surgery was 32.40±10.51 min. In midazolam group, the mean total duration of surgery was 33.31±10.61 min. The difference between both groups was insignificant.

In propofol group, the mean total period of sevoflurane anesthesia was 42.18±10.49minutes. In midazolam group, the mean total period of sevoflurane anesthesia was 42.60±11.89minutes. The difference between both groups was insignificant.

In propofol group, the mean time of emergence from anesthesia was 5.21±1.05minutes. In midazolam group, the mean time of emergence from anesthesia was 6.04±4.57minutes. The difference between both groups was significant and propofol group showed early emergence.

In propofol group, the mean total period of stay in recovery room was 59.70±2.10minutes. In midazolam group, the mean total period of stay in recovery room was 59.48±2.23minutes. The difference between both groups was insignificant.

At T0, 10 children had emergence out of which 5 children in propofol group had EA, no child in midazolam group showed EA. At T5, 53 children had emergence, out of which 25 had EA in propofol group and 5 were from midazolam group. At T10, 68 children had emergence, out of which 15 had EA in propofol group and 12 were from midazolam group. At T15, 56 children had emergence, out of which 5 had EA in propofol group and 6 were from midazolam group. At T20, 45 children had emergence, out of which 2 had EA in propofol group and 14 were from midazolam group. At T20 increased agitation in midazolam group may be due to decrease in concentration of midazolam in blood with passage of time. At T25, 25 children had emergence, out of which 4 had EA in propofol group and 2 were from midazolam group. At T30, 9 children had emergence, out of which 3 had EA in propofol group and 3 were from midazolam group. At T35, 7 children had emergence, out of which 1 had EA in propofol group and 1 were from midazolam group. At T40, 3 children had emergence, out of which 1 had EA in propofol group and 2 were from midazolam group. The difference between both groups was insignificant, except at T5, T20 and T25 time of emergence and midazolam showed less emergence agitation. In table 10 only 3 scores of Aono's four point scale are used and 4th score is omitted because no our patient fell into 4th score.

In propofol group, 61 (45.5%) children had EA while in midazolam group, 45 (33.6%) children had EA. The difference between both groups was statistically significant (P<0.1).

Midazolam was found superior than propofol for prevention of sevoflurane induced emergence delirium in pediatric population. (13-14)

CONCLUSION

According to our study results midazolam is superior than propofol in prevention of sevoflurane induced emergence agitation in children who undergo surgery under general anesthesia. In future, we recommend the use of midazolam instead of propofol for prevention of sevoflurane induced emergence delirium in pediatric population.

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