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Research Paper

Single Shot Dexmedetomidine Before Extubation Reduces The Emergence Agitation In Paediatric Age Group After Surgery Under General Anaesthesia With Sevoflurane

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ABSTRACT:
Background & aim:
Emergence agitation (EA) is a frequent phenomenon in children recovering from general anesthesia (GA), especially with Sevoflurane. It is characterized by self-limiting aggressive agitation that develops in the early phase of awakening from general anaesthesia after surgery. The rapid removal of residual Sevoflurane due to low blood solubility is proposed cause of emergence agitation. Dexmedetomidine, an alpha2 receptor agonist has analgesic and sedative properties that might be helpful in the management of EA. Our study aimed at finding out the efficacy of intra operative 0.3 mcg/kg bolus Dexmedetomidine on reducing the incidence of EA in 60 children aged 3–10 years scheduled for Sevoflurane based GA.
Objectives:
The objective of the present study is to evaluate the efficacy of dexmedetomidine in reducing emegence agitation after sevoflurane anaesthesia in children comparing two different groups namely group D for dexmedetomidine and group P for placebo.
Materials &Methods:
This study was carried out in the department of anaesthesiology after IEC approval and written informed consents of the parents of children posted for surgery . Sixty children belonging to ASA I and II in the age group 3-10 yrs were enrolled in this randomized single blinded study. The children were randomly assigned into Group D (Dexmedetomidine) or Group P (Placebo)through blind chit pick up method. Induction of Anaesthesia was done with IV Propofol, maintained with Sevoflurane and muscle relaxant . Dexmedetomidine 0.3mcg/kg diluted in 10 ml Normal Saline is administered I V after switching off sevoflurane and before extubation in test group and 10ml normal saline was given in Placebo group.Haemodynamics, PAED and OPS scales were evaluated every 10 mins unto 30 mins till the uneventful discharge from the PACU.
Results:
Dexmedetomidine was associated with significant reduction in the EA incidence comparedwith the control group on arrival PAED score in fig 4(p value <.001) and after 30min (p value <.002) and OPS scale fig 3 (p value <.001)
Conclusion: *We conclude in our study that single dose of dexmedetomidine before extubationsignificantly reduces the incidence of post sevoflurane EA in children without causing any hemodynamic instability and respiratory depression.*
Key words: ***Dexmedetomidine, Emergence agitation, Sevoflurane, General Anaesthesia***

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I. Introduction:

Emergence agitation (EA) is an acute confusion state during recovery from anesthesia; patients with EA may present with disorientation, hallucination, restlessness, and purposeless hyperactive physical behavior.[1] Dexmedetomidine effects the Alpha 2 adrenergic receptor in the Locus coeruleus in the brain stem which is responsible for the regulation of arousal from sleep.Sevoflurane is an inhalational anesthetic agent which is

presumed to cause EA because of its low blood solubility and early wash out.The incidence of EA in children of 3 to 10 yrs of age ranges from 30-80% and causes the occurrence of other complications in and delayed dischargefrom PACU.Dexmedetomidine, an alpha2 receptor agonist has analgesic and sedative properties that might be helpful in the management of EA. We studied the effects of intra operativebolus 0.3 mcg/kgDexmedetomidine on the incidence of EA in 60 children aged 3–10 years scheduled for Sevoflurane based GA.

Aim:

To establish single shot dexmedetomidine before extubation reduces the emergence agitation in paediatric age group after surgery under general anaesthesia with sevoflurane.

Objectives:

• The primary objective of the present study is to evaluate the efficacy of Dexmedetomidine in reducing emegence agitation after sevoflurane anaesthesia in children comparing two different groups namely group D for dexmedetomidine and group P for placebo.

• Secondary objective is to compare the hemodynamics and duration of stay in PACU by evaluating through PAED score and OPS scale.

II. Materials & Methods:

This study was carried out in the department of Anesthesiology after IEC approval and written informed consents of the parents of children posted for surgery.

Sixty children belonging to ASA I and II in the age group 3-10 yrs were enrolled in this randomized single blinded study.

The children were randomly assigned into Group D (Dexmedetomidine) or Group P (Placebo)through blind chit pick up method. Induction of Anesthesia was done with IV Propofol, maintained with Sevoflurane and muscle relaxant.

Dexmedetomidine 0.3mcg/kg diluted in 10 ml Normal Saline is administered I V bolus after switching off Sevoflurane and before extubating the patients in test group and 10ml of normal saline was given I V in Placebo group.

Haemodynamics, PAED and OPS scales were evaluated every 10 mins unto 30 mins till the uneventful discharge from the PACU.

Study population included patients of either sex,ASA Grade I and II patients of age group 3-10yrs.

Patients whose parents refused to give consent,diagnosed with any congenital heart disease or other co morbidities and patients with allergy to Dexmedetomidine or any other drugs were excluded from this study.

PAED score (Table 1)

Delirium Symptom	Not at All	Just a Little	Quite a Bit	Very Much	Extremely
Child makes eye contact with the caregiver	4	3	2	1	0
Child's actions are purposeful	4	3	2	1	0
Child is aware of his/ her surroundings	4	3	2	1	0
Child is restless	0	1	2	3	4
Child is inconsolable	0	1	2	3	4

Table 2

Hannallah *et al.*'s Objective Pain Scale (OPS)

Observation	*Criteria*	*Points*
Blood pressure	±10% of preoperative value	0
	>20% of preoperative value	1
	>30% of preoperative value	2
Crying	Not crying	0
	Crying, but stops with tender, loving care	1
	Crying without stopping, does not respond to tender, loving care	2
Movement	None	0
	Restless	1
	Thrashing around	2
Agitation	Asleep or calm	0
	Mild agitation	1
	Hysterical	2
Verbalization of pain	Asleep or states no pain	0
	States there is pain but cannot localize	1
	Can localize pain	2

III. Results:

The program SPSS for windows 13 were used for statistical analysis.

PRIMARY OUTCOME:

Dexmedetomidine was associated with significant reduction in the EA incidence comparedwith the control groupon arrival PAED score in fig 4(p value <.001) and after 30min (p value <.002) and OPS scale fig 3 (p value <.001)

SECONDARY OUTCOME:

Compared with saline Dexmedetomidine significantly reduced the requirement of rescue analgesic compared to control group(p value <.03), vide fig5.

There were statistically no significant difference between hemodynamics and discharge from PACU, MAP(P value<.77) Fig 1 and HR(P value <.0.8) videFig 2.

From the above-mentionedobservation, we have concluded that

• The age, weight, duration of surgery were comparable between both the groups but werestatistically insignificant.

• The length of stay in PACU and adverse events were similar in the two groups were statistically insignificant.

• Incidence and severity of agitation in the Dexmedetomidine group were lower than in the placebo group (p value < 0.05).

• The PAED score and OPS scale were higher in Group P compared to Group D (P value <0.002). Vide fig 4 &5.

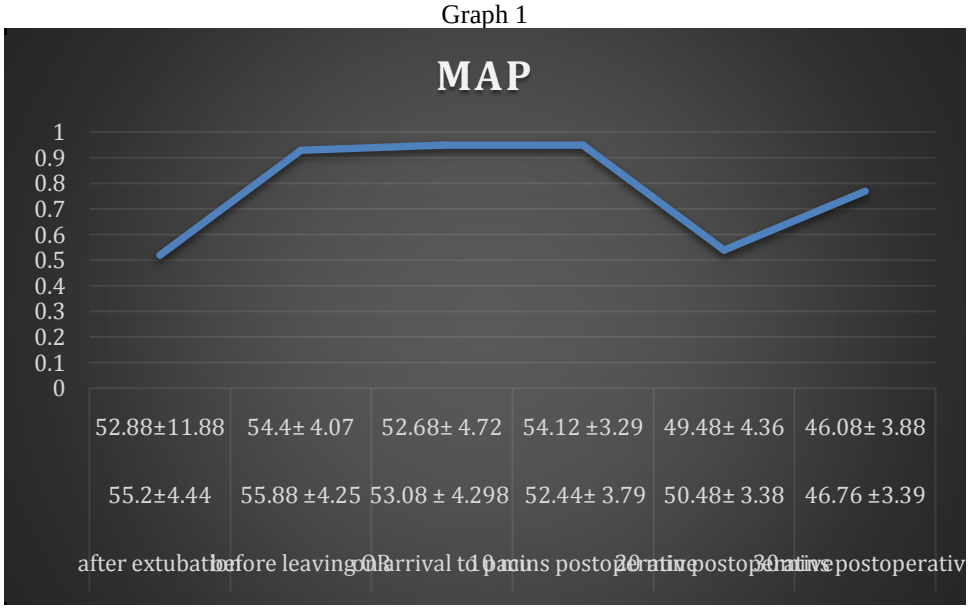
Fig. 1

MAP (mmHg)	Group P	Group D	P value
After extubation	55.2 ± 4.44	52.88± 11.88	0.52
Before leaving OR	54.84 ± 4.25	54.4± 4.07	0.93
On arrival to PACU	53.08 ± 4.29	52.68± 4.72	0.95
10 min.	52.44 ± 3.79	54.12± 3.29	0.95
20 min.	50.48 ± 3.38	49.48 ± 4.36	0.54
30 min.	46.76 ± 3.39	46.08 ± 3.88	0.77

Fig. 2

HR (mins)	Group P	Group D	P value
After extubation	113.24 ± 4.85	113.16 ± 9.09	0.06
Before leaving OR	98.28 ± 4.86	98.92± 5.52	0.005
On arrival to PACU	96.88 ± 5.67	95.96±6.47	0.03
10 min. postoperative	93.8 ± 3.89	93.84±4.59	0.8
20 min. postoperative	93.16 ± 3.7	93.04±4.07	0.9
30 min. postoperative	92.12 ± 3.05	92.64±4.57	0.8

Graph 1



Graph 2

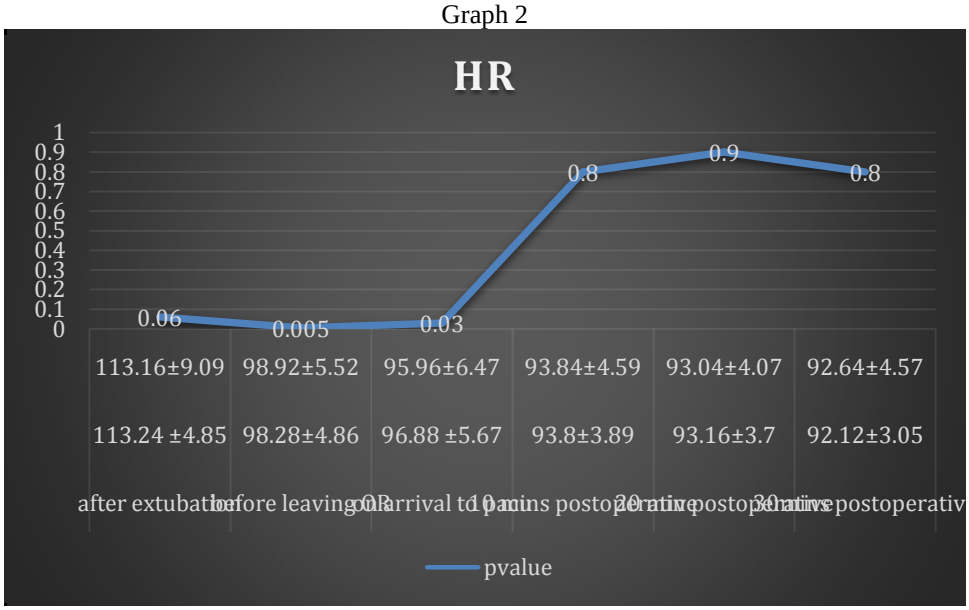
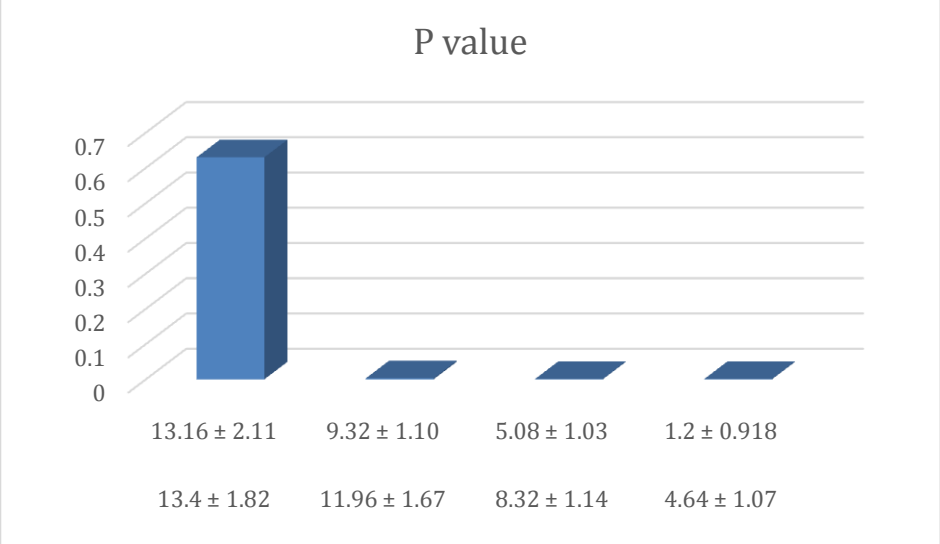
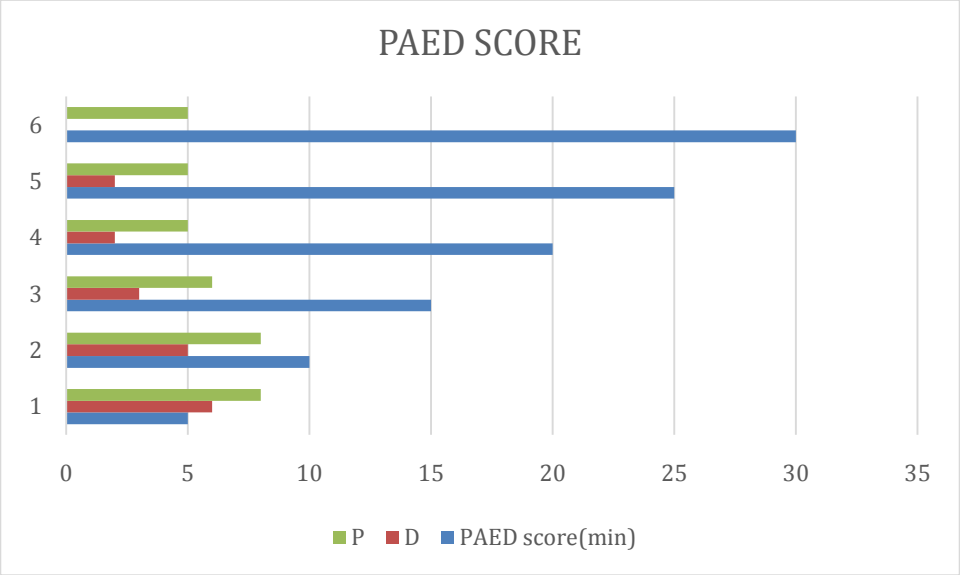


Fig. 3

OPS SCALE	Group P	Group D	P VALUE
On arrival to PACU	13.4 ± 1.82	13.16 ± 2.11	0.63
10 min	11.96 ± 1.67	9.32±1.10	0.003
20 min	8.32 ± 1.14	5.08±1.03	0.001
30 min	4.64 ± 1.07	1.2±0.918	0.001



GRAPH 3 – OPS SCALE

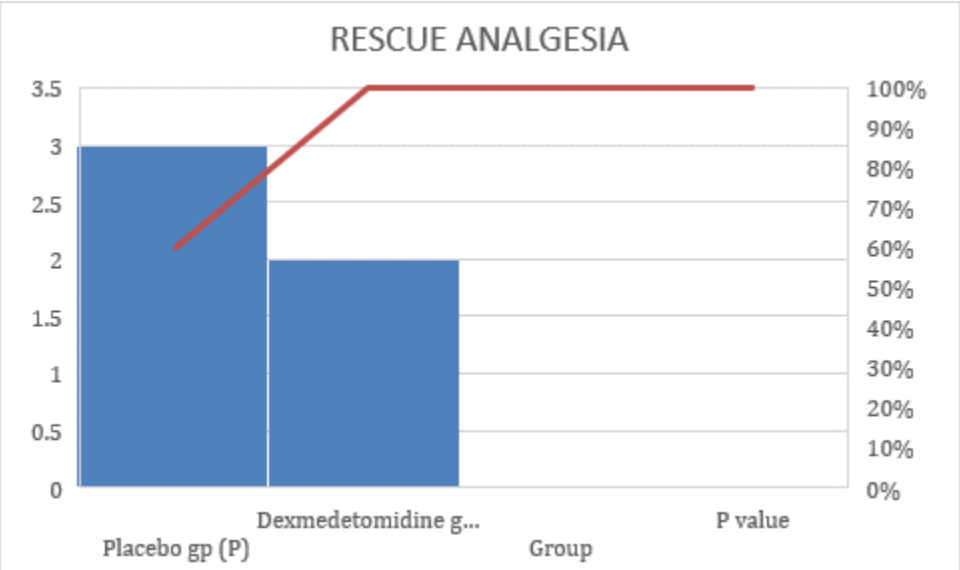


GRAPH 4– PAED SCORE

Table 3

Values in median [IQR] (range) or % (n)

Group	Dexmedetomidine gp (D)	Placebo gp (P)	P value	
Time to discharge from PACU(mins)	58 (47-71.25) (31-170)	46 (32-46) (18-85)	<.001	
Pain score in PACU	0 (0-0) (0-4)	0 (0-0) (0-6)	<.001	
Rescue analgesia used in PACU	2.40% 2	3.60% 3	<.03	



GRAPH 5 – RESCUE ANALGESIA

IV. Discussion:

Emergence agitation (EA) is a behavioral disturbance during the early post-anesthetic period, characterized by excitement, restlessness, disorientation, and other unusual behaviors, such as crying, shouting, kicking, inconsolability, and non-cooperation[2]. Emergence delirium (ED) is a condition in children under general anaesthesia with acute confusion, restlessness and purposeless hyperactive movement in PACU.Early post operative negative behavior(e-PONB) is a cognition changes in children undergoing general anesthesia which includes ED,EA and post operative pain[3,4]. The diagnosis is clinical and there are several scales for diagnosis of emergrence agitation and emergence delirium like PAED,WATCHA scale[5].

This scale evaluates 5 points, such as: degree of contact with the caregiver's eyes, awareness of the environment, if the child's actions are intentional, degree of consolation and agitation of the child. Risk factors include: pre-school age, anesthesia for ear, nose and throat surgery, anesthesia with sevoflurane or desflurane.Prevention measures are very well indicated in this complication and can be made with dexmedetomidine IV 0.2-1mcg/kg in the peri operative period.

In our study we have used Dexmedetomidine 0.3mcg/kg diluted in 10 ml Normal Saline is administered IV after switching off sevoflurane and before extubation in test group and 10ml normal saline was given in Placebo group[6,7].Dexmedetomidine activates the α2-adrenergic receptor located in the presynaptic and post synaptic membranes of the spinal cord and inhibits the peripheral nerve fibers A and C which may contribute to the decrease in the demand for a rescue analgesic[8].

Dexmedetomidine offers favorable analgesia and sedation, and may avoid restlessness, unusual behaviors, such as kicking, shouting, and crying in children, which might account for the reduced stay time in the PACU. Generally, dexmedetomidine is effective in preventing EA, without prolonging the time to discharge from the PACU.

• Our study shows dexmedetomidine reduces EA this is in agreement with the study Peng W, Et Al[9]

• Single bolus dose of dexmedetomidine in our study is accordance with the study by Ibacache M Et Al[10] Single-dose dexmedetomidine reduces agitation after sevoflurane anesthesia in children[11].

• Guller et al.[12]in their study reported no hemodynamic changes at a bolus dose of 0.3 -0.5mcg/kg, similarly in our study there was no significant hemodynamic changes but an increase in HR and MAP was noticed in group P during extubation which was attributed to higher degree of agitation in comparison to group D.

V. Conclusion:

We conclude in our study that single dose of dexmedetomidine before extubation significantly reduces the incidence of post sevoflurane EA in children without causing any hemodynamic instability and respiratory depression.

Limitations:

Our study is a single centre study and small number of cases also we did not evaluate the effects of different doses of dexmedetomidine as an ideal dose in this regard.

Conflict of interest: None

Glossary:

ANOVA:Analysis of variance
HR:Heart rate
Iv:intravenous
MAP:Mean arterial pressure
MAC:minimal alveolar pressure
PACU:postanaesthesia care unit
OPS:observational pain score
PAED:paediatricanaesthesia emergence delirium
SPO2:peripheral oxygen saturation

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