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COMPARATIVE EVALUATION OF TIMING OF DEXMEDETOMIDINE ADMINISTRATION FOR PREVENTION OF SEVOFLURANE RELATED EMERGENCE AGITATION IN PEDIATRIC OPHTHALMIC SURGERY

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ABSTRACT

Introduction: The term "emergence agitation" has been used interchangeably with "emergence delirium" in the literature but there are differences in definitions and clinical presentations. Agitation, which is described as excessive motor activity, is a nonspecific symptom that incorporates discomfort, pain and anxiety1. Delirium on the other hand, is an acute state of confusion accompanied by cognitive impairment including perceptual disturbances and hallucinations.

Aims and Objectives : Our aim was to Comparatively Evaluate the Timing of Dexmedetomidine Administration for Prevention of Sevoflurane Related Emergence Agitation in Pediatric Ophthalmic Surgery.

Materials and Methods: Randomized control trial was done for comparing the Timing of Dexmedetomidine Administration for Prevention of Sevoflurane Related Emergence Agitation in Pediatric Ophthalmic Surgery after approval of Institutional ethical committee. 300 Patients were randomly assigned into two groups by computer generated random numbers for comparison. Group I received IV dexmedetomidine 0.5µg/kg 10 min. prior to induction (n=150) ,Group – II received IV dexmedetomidine 0.5µg/kg 5 min before the end of surgery (n=150).Template was generated in Excel Sheet and was analysed using SPSS version 20. Unpaired student t test was applied for comparing mean[quantitative data] and chi square test was applied for qualitative data.Paired t test was applied for intra-group comparison of the means of hemodynamic variables. The test was considered significant if $p<0.05$, at 95% confidence level.

Results: The incidence and severity of EA were measured upon admission to the PACU. Severity of EA was measured with PAEDS scale. In Group I 7 (4.67%) patients severely suffered EA whereas in Group II 5 (3.34%) patients sevierly suffered EA.Better reduction was observed in Group II compare to Group I.

Conclusion: Dexmedetomidine 0.5µg/kg IV administered 10 min prior to induction of GA and dexmedetomidine 0.5µg/kg IV administered 5 min before the end of surgery effectively reduce the incidence and severity of emergence agitation in children undergoing ophthalmic surgery.

KEYWORDS : Emergence Agitation, Dexmedetomidine,Pediatric Opthalmic Surgery

INTRODUCTION

The term "emergence agitation" has been used interchangeably with "emergence delirium" in the literature but there are differences in definitions and clinical presentations. Agitation, which is described as excessive motor activity, is a nonspecific symptom that incorporates discomfort, pain and anxiety[1]. Delirium on the other hand, is an acute state of confusion accompanied by cognitive impairment including perceptual disturbances and hallucinations.ED occurs within the first 30 minutes of recovery from anaesthesia, is usually self-limited but can last up to 2 days[2].Patients at particular risk of EA include children aged 3-5 years and those undergoing procedure including the head.[3] Emergence agitation has been identified as a significant problem in children recovering from anaesthesia. In the early 1960s, Eckenhoff et al were the first to report the signs of hyperexcitation in patients emerging from ether, cyclopropane, or ketamine anesthesia, particularly when administered for tonsillectomy, thyroidectomy, and circumcision. Children experienced postanesthesia agitation more often than adults (12%–13% vs 5.3%)[1].

The incidence of EA largely depends on definition, age, anesthetic technique, surgical procedure, and application of adjunct medication. Generally, it ranges from 10% to 50% but may be as high as 80%[1]. Possible etiological factors of pediatric emergence agitation[1,2] include rapid emergence, intrinsic characteristics of an anesthetic, postoperative pain, type of surgery, age, preoperative anxiety, child temperament and adjunct medication. Intrinsic characteristics of an anesthetic is another anesthesia related factor. EA often occurs in the following order- Desflurane ≥ sevoflurane > isoflurane >halothane.

Two unique intrinsic characteristics of sevoflurane might account for the development of EA. First, this anesthetic exerts an irritating side effect on the central nervous system (CNS). Second, although sevoflurane degradation products appear to cause no organ damage themselves, data are lacking on their possible interactions with other types of medication. Children who received sevoflurane/isoflurane for the induction/maintenance of anesthesia are twice as likely to develop EA when compared with children who had any other anesthetic regimen. EA may be related to the similar CNS effects of these anesthetics, which may affect brain activity by interfering with the balance between neuronal synaptic inhibition and excitation in the CNS[1]. Amongst surgery related factors postoperative pain has been the most confounding variable when assessing a child's behavior upon emergence because of the overlapping clinical picture with EA. Inadequate pain relief may be the cause of agitation, particularly after short surgical procedures for which peak effects of analgesics may be delayed until the child is completely awake. Surgical procedures that involve the tonsils, thyroid, middle ear, and eye have been reported to have higher incidences of postoperative agitation and restlessness[1].

EA is more in preschool boys aged 3–5 yrs.The authors speculated that the psychological immaturity of preschool children, coupled with the rapid awakening in a strange environment, may have been the main cause of EA.Children who are more emotional, impulsive, less social and less adaptable to environmental changes were identified to be at risk for developing postanesthesia agitation.[1] Numerous drugs, including anticholinergics, droperidol, barbiturates, opioids, benzodiazepines, and metoclopramide, may contribute to behavioral disturbances after anesthesia (not proven)[1]. There is no evidence that EA has any impact on long term outcome. Sevoflurane, the most frequently and widely used anesthestic in children has a frequent distressing complication, the EA. Compared to halothane and Propofol anesthesia, EA occurs more often after Sevoflurane anesthesia[5]. However the reasons for widespread use of Sevoflurane are several substance-specific properties such as "fast and well tolerated induction, low hepatotoxicity, hemodynamic stability and rapid emergence from anesthesia.[6] Because of these beneficial effects of sevoflurane, it is

important to improve the emergence status of children when sevoflurane is used. Many studies and clinical trials have been conducted with midazolam, ketamine, propofol, fentanyl, clonidine, dexmedetomidine etc. to prevent EA related to sevoflurane anesthesia. Dexmedetomidine an α2 adrenergic receptor agonist potentiates anesthetic effect of all the anesthetic agents irrespective of the mode of administration (intravenous, inhalational, regional blockade). It possesses anxiolytic, sedative, analgesic and sympatholytic properties, it might be used for premedication, in whom preoperative stress is undesirable[3]. Perioperative IV infusion of decreases the incidence and frequency of EA in children after sevoflurane based general anesthesia without prolonging the time to extubate or discharge[8]. It also provides intense analgesia during the postoperative period. It can be successfully used in pediatric patients for smooth removal of laryngeal mask airway (LMA) and decreasing postoperative respiratory complication and agitation. To the best of our knowledge, we have not found any study comparing different techniques & timing of administration of IV dexmedetomidine on sevoflurane EA in children using LMA. Thus we conducted a study on "Comparative Evaluation of Timing of Dexmedetomidine Administration for Prevention of Sevoflurane related Emergence Agitation in Pediatric Ophthalmic Surgery."

AIMS & OBJECTIVES

We compared between two different timing of dexmedetomidine administration for prevention of sevoflurane related emergence agitation in children in ophthalmic surgery in terms of-

- Incidence of emergence agitation
- Severity of emergence agitation
- Recovery time

MATERIALS AND METHODS

After approval from the institutional ethical committee, informed and written consent was obtained from the parents of all the children for randomized controlled trial. The present study entitled "Comparative Evaluation of Timing of Dexmedetomidine Administration for Prevention of Sevoflurane Related Emergence Agitation in Pediatric Ophthalmic Surgery" was conducted in the department of Anesthesiology and Critical Care, Pt. Jawaharlal Nehru Memorial Medical College and Dr. Bhimrao Ambedakar Memorial Hospital Raipur (C.G.).

Criteria for inclusion:

- ASA grade I & II
- Age group 01-12 years
- Patient undergoing elective ophthalmic surgeries

Criteria for exclusion:

- Restricted mouth opening
- Pharyngeal pathology
- History of GI reflux
- History of convulsions
- Patient on anti-epileptic medication
- History of cardiovascular, pulmonary and renal disease
- Allergy to the study drug
- History of genetic disorder
- Developmental delay or mental retardation as reported by parents
- Parental Separation Anxiety Scale (PSAS) >2
- Duration of surgery > 60 min

Preanesthetic Evaluation:

Preoperatively a detailed history of the patient was taken to assess the -

1. General condition of patient.
2. Airway assessment by Modified Mallampati grading.
3. Nutritional status and weight of the patient.
4. Detail examination of cardiovascular, respiratory and central nervous system.
5. Laboratory investigations:
   - Complete blood count.
   - Blood sugar.
   - Blood urea, serum creatinine.
   - Urine analysis.
   - Bleeding and coagulation profile and any other investigation (specific) as per requirement

Grouping:

Patients were randomly assigned into two groups by computer generated random numbers-

- Group - **Dp** received IV dexmedetomidine 0.5µg/kg 10 min. prior to induction (n=150)
- Group – **D** received IV dexmedetomidine 0.5µg/kg 5 min before the end of surgery (n=150)

Procedures: After approval from the institutional ethical committee, informed and written consent was obtained from parents of all the patients. All the patients were assessed pre-operatively that includes complete history, clinical examination and recording of vital parameters along with routine and special investigations, if required. Patients were kept nil orally 6 hrs for solid food, 4 hrs for clear fluid. Patients were premedicated with oral midazolam 0.5mg/kg half an hour prior to induction of anesthesia in preoperative room and intravenous cannulation was done[17]. IV Ondensetron 0.2mg/kg and IV Ranitidine 0.3mg/kgweregiven. Upon arrival in the operation theatre, the patients were lied supine on the operating table and IV fluid was started. The number of children who got agitated or combative (PSAS > 2) during induction of anesthesia despite premedication with midazolam were recorded in each group and excluded from study. An electrocardiogram (ECG), pulse oximeter (SPO_2) and noninvasive arterial blood pressure (NIBP) monitor were attached. IV Glycopyrrolate 0.04 mg/kg, IV Fentanyl 1-2 µg/kg (for intraoperative analgesia)[15] was given. Approximately 10 min. prior to induction of general anesthesia, patient of selected group will receive the study drug intravenously over 5 min . The observations will be recorded by an observer who was blinded to the drugs used. General anesthesia was induced with 8% sevoflurane increasing concentration via facemask and Jackson Ree's circuit[10]. Loss of eyelash reflex was considered as the end point of induction. LMA of proper size was inserted and anesthesia was maintained with 60% nitrous oxide in oxygen and 2-3% sevoflurane with spontaneous ventilation via Jackson Rees circuit or Bains circuit to maintain an end-tidal CO_2 of 35±4 mmHg. Incidence of apnea (cessation of respiration for > 20 sec) [12] or $EtCO_2$ >45 mm Hg was treated with manual ventilation**.** Hypotension was treated with bolus ringer lactate 4ml/kg. Bradycardia was treated with IV Atropine 0.02mg/kg. All patients received paracetamol suppository 20mg/kg for the control of postoperative pain. About 5 min before the end of surgery, patients of selected group received the study drug intravenously over 5 min. At the end of surgery nitrous oxide and sevoflurane were cut off (time will be considered as 'time zero' in the emergence process). Removal of LMA was performed when the patient's gag reflex was restored and they showed facial grimaces or purposeful motor movements. Children were transferred to the post anesthesia care unit (PACU) for further observation. Upon arrival to the PACU, all children were received by one of their parents[17]. Severity of Emergence Agitation was measured by the Pediatric Anesthesia Emergence Delirium scale (PAEDS) The severity of EA were evaluated using pediatric anesthesia emergence delirium (PAED)[27]; 20 scale devised by Sikich et al, a five-point rating scale with five grades for each item. The incidence and severity of EA were measured upon admission to the PACU (T0) and in the PACU at 5 min (T5), at 15 min (T15) and at 30 min (T30). Children with PAED scale15 or higher were considered severely agitated and were treated with IV Fentanyl 1-2 µg/kg.The following time duration(s) were noted-

- The duration of surgery(min).
- Duration of Sevoflurane anesthesia (min)- from mask induction to discontinuation of the inhaled anesthetic[10,22].
- Time to removal of LMA (min)- from the discontinuation of sevoflurane to the removal of LMA[8].

- Time of emergence (min)- from discontinuation of sevoflurane to the first response to a simple verbal command[19].
- Length of PACU stay (min)- from arrival to the PACU until discharge[22]. Children were discharged from the PACU to a ward when the recovery score- the modified aldrete score was more than nine .

RESULTS

Table-1:AGE WISE DISTRIBUTION OF PATIENTS

Age in years	Group Dp		Group D	
	No.of patients	%	No. of patient	%
1—3	40	26.7	34	22.7
4—6	50	33.3	43	28.7
7—9	44	29.3	54	36.0
10—12	16	10.7	19	12.7
Mean ± SD	5.81±2.86		6.19±2.81	

Table-1 shows the distribution of patients according to age . The age range in our study was 1-12 yrs. Mean age of the patients in Group Dp and Group D was 5.81 ± 2.86 yrs and 6.19 ± 2.81 yrs respectively. Maximum no. of patients were found in age group of 4-6yrs (33.3%) and 7-9yrs (36.0%) in group Dp and group D respectively.

Table – 2:SEX WISE DISTRIBUTION OF PATIENTS

Sex	Group Dp		Group D	
	No of patients	%	No. of patients	%
Female	51	34.0	51	34.0
Male	99	66.0	99	66.0

Table-2 shows the distribution of patients according to sex among two groups. The number of male patients to female patients in group Dp was 99 and 51, and in group D was 99 and 51 respectively.

Table-3:WEIGHT WISE DISTRIBUTION OF PATIENTS

Weight [kg]	Group Dp		Group D	
	No. of patients	%	No. of patients	%
5—9	7	4.7	3	2.0
10—14	38	25.3	37	24.7
15—19	68	45.3	73	48.7
20-24	25	16.7	26	17.3
25-29	12	8.0	11	7.3
Mean ± SD	17.01±4.51		17.41±4.23	

Table -3 shows the mean body weight in Group Dp was 17.01 ±4.51kg and in Group D it was 17.41±4.23kg.

Table -4:DURATION OF SURGERY

Groups	Mean Duration of surgery(min)	Std. Deviation
Dp	30.74	3.54
D	31.42	2.96

Table-4 shows the mean duration of surgery (min) in both the groups. The mean duration of surgery in Group Dp and Group D was 30.74±3.54 min and 31.42±2.96 min respectively.

Table-5:DURATION OF SEVOFLURANE ANESTHESIA

Groups	Mean Duration of sevoflurane anesthesia (min.)	Std. Deviation
Dp	38.10	5.72
D	38.03	6.69

Table-5 shows the mean duration of sevoflurane anesthesia in Group Dp and Group D was 38.10±5.72 min and 38.10±6.69 min respectively.

Table-6:MEAN TIME TO REMOVAL OF LMA

Groups	Mean Time to removal of LMA(min.)	Std. Deviation
Dp	5.86	1.45
D	8.10	1.68

Table-6 shows the mean time in to removal of LMA in Group Dp and Group D was 5.86±1.45 min and 8.10±1.68 min respectively.

Table-7:MEAN TIME TO EMERGENCE

Groups	Mean Time to Emergence(min.)	Std. Deviation
Dp	7.74	1.26
D	9.04	1.64

Table-7 shows the mean time in Group Dp and Group D was 7.74±1.26 min and 9.04±1.64 min respectively.

Table-8:MEAN HEART RATE (bpm)

HR (BPM)	Group Dp		Group D		p value
	Mean	± SD	Mean	± SD	
Baseline	101.37	7.96	100.56	9.06	0.25
Dexmed/ Placebo	100.50	8.45	100.20	9.6	0.45
T0	96.45	9.86	99.28	9.21	0.35
T10	94.45	10.21	97.91	9.55	0.16
T20	96.04	11.90	98.76	7.78	0.47
T30	96.88	9.04	98.70	6.70	0.95
T40	98.06	8.54	94.52	12.53	0.25
T50	98.89	8.11	94.69	6.97	0.18
T60	98.65	6.39	95.52	11.87	0.14
P0	97.68	5.95	95.88	9.60	0.62
P5	98.28	0.71	96.68	9.46	0.58
P15	99.02	7.82	96.89	8.59	0.48
P30	99.08	7.96	96.95	6.82	0.66
P45	99.35	9.86	97.72	6.97	0.24
P60	99.89	8.54	98.75	9.55	0.84

Table-8 shows mean heart rate decreased from a baseline value of 101.37±7.96 bpm to 94.45 ±11.90 bpm at T10 in Group Dp after IV administration of dexmedetomidine. In Group D mean heart rate decreased from a baseline value of 100.56±9.06 bpm to 94.52±12.53 bpm at T40 due to administration of IV dexmedetomidine approx. 5 min brfore the end of sugery . In both groups mean heart rate remained lower side of their baseline value but intergroup comparison was statistically not significant.

Table-9:MEAN BLOOD PRESSURE (mmHg)

MBP (mmHg)	Group Dp		Group D		Intra group p value [compared with pre-op]	Inter group p value [compared between Dp & D grp]
	Mean	± SD	Mean	± SD		
Baseline	77.82	8.82	78.72	8.91	0.45	0.26
Dexmed/ Placebo	77.99	8.67	78.6	8.58	0.33	0.33
T0	74.58	7.38	78.04	6.38	0.23	0.34
T10	74.85	6.08	77.56	6.77	0.41	0.15
T20	75.04	10.75	77.79	8.87	0.54	0.48
T30	75.85	9.91	77.35	8.81	0.26	0.25
T40	76.55	11.12	75.08	8.73	0.34	0.95
T50	77.18	8.11	75.78	9.69	0.22	0.86
T60	77.35	8.39	76.06	8.30	0.91	0.74
P0	77.05	8.62	76.23	11.11	0.84	0.65
P5	77.15	8.73	76.56	10.03	0.24	0.45
P15	77.45	9.37	77.06	10.00	0.35	0.65
P30	77.48	11.61	77.08	8.91	0.16	0.46
P45	77.65	10.97	77.15	7.94	0.45	0.95
P60	77.75	10.71	77.45	9.69	0.48	0.47

Table-9 shows the distribution of mean blood pressure which was decreased from 77.82±8.82 to 74.58±6.08 mmHg in Group Dp at T0 and 78.72±8.91 to 75.08±8.73 mmHg in Group D at T40. The MBP falls after IV administration of sevoflurane at T0 and T40 in Group Dp and Group D respectively. In both the groups MBP remained stable

intraoperatively and returned to their baseline value at discharge. Intergroup comparison was statistically not significant (p>0.05).

Table-10:MEAN SpO_2(%)

SpO2(%)	Group Dp		Group D		p value
	Mean	± SD	Mean	± SD	
Baseline	99.15	0.85	99.20	0.8	
Dexmed/Placebo	99.02	0.45	98.7	0.56	
T0	97.87	0.74	97.99	0.68	0.48
T10	97.85	0.29	97.89	0.43	0.71
T20	98.11	2.73	97.99	2.88	0.95
T30	99.23	2.02	98.06	1.52	0.56
T50	99.16	1.11	99.13	1.06	0.84
T60	99.08	0.54	99.21	0.63	0.18
Post opP0	98.66	0.00	97.78	0.00	0.29
P5	98.77	4.89	98.80	2.02	0.38
P15	98.09	4.10	98.07	1.11	0.47
P30	99.10	4.12	98.96	0.54	0.19
P60	99.78	7.65	99.96	0.29	0.33

Table-10 shows mean changes in the oxygen saturation 99% in Group Dp and 99.20% in Group D respectively. The mean SpO2 was statistically comparable in both the groups at the entire study period and was statistically not significant (p>0.05).

Table-11:INCIDENCE OF EMERGENCE AGITATION-(AONOS SCORE 3 & 4)

Time (min.)	Dp		D		p value
	No.	%	No.	%	
P0	12	8	13	8.67	0.81
P5	11	7.33	6	4	0.22
P15	3	2	1	0.67	0.32
P30	0	0	0	0	NA

Table-11 shows incidence of EA in PACU at P0, P5, P15 and P30 time intervals. In Group Dp total of 26(17.33%) and in Group D total of 20 (13.33%) EA have been recorded. Maximum EA was observed at PO in Group Dp and Group D was 12 (8%) and 13 (8.6%) respectively. At P5 EA in Group Dp and group D was 11 (7.33%) and 6 (4%) respectively. At P 15 EA in Group Dp and Group D 3 (2%) and 1 (0.67%) respectively. At P30 no incidence of EA was seen in both groups. Intergroup comparison shows no significant difference (p>0.05)

Table-12:SEVERITY OF EMERGENCE AGITATION-(PAEDS SCORE ≥15)

Time	Dp		D		p value
	No.	%	No.	%	
P0	04	2.67	03	2.00	0.22
P5	02	1.33	01	0.67	0.31
P15	01	0.67	01	0.67	0.69
P30	00	00.00	00	00.00	NA

Table 12 shows severity of EA .Maximum number of patients suffered severe EA at P0 {4 (2.67%) and 3 (2.00%) patients in group Dp and group D respectively}. At P5 2 (1.33%) and 1(0.67%) patients suffered severe EA in group Dp and group D respectively. At P 15, 1 (0.67%) and 1 (0.67%) patients suffered severe EA in Group Dp and Group D respectively. At P30 no incidence of EA seen. Intergroup comparison shows no statistically significant difference (p>0.05)

Table-13:TIME TO ACHIEVE MODIFIED ALDRETE RECOVERY SCORE ≥9

Time	Group Dp		Group D		p value
	No. of patients	%	No. of patients	%	
P0	0	0	0	0	NA
P5	2	1.33	3	2	0.65
P15	110	73.33	108	72	0.89
P30	30	20	36	24	0.88
P45	8	5.33	3	2	0.32
P60	0	0	0	0	NA

Table 13 shows the time taken to achieve modified Aldrete score of ≥9 . In Group Dp and Group D no patient achieved the required recovery score at PO. At P5, 2 (1.33%) and 3 (2%) patients in Group Dp and Group D respectively achieved the required score. At P15, 110 (72.33%) and 108 (72%) patients in Group Dp and Group D respectively achieved the required score. At P30, 30 (20%) and 36 (24%) patients in Group Dp and Group D respectively achieved the required score. At P45, 8 (5.33%) and 3 (2%) patients achieved the required score in Group Dp and in Group D . no patients achieved the required score in Group Dp and in Group D Intergroup comparison shows no statistically significant difference (p>0.05).

DISCUSSION :

The present study entitled "Comparative Evaluation of Timing of Dexmedetomidine Administration for Prevention of Sevoflurane Related Emergence Agitation in Pediatric Ophthalmic Surgery" was carried out in the Department of Anesthesiology and Critical care, Pt. J.N.M. Medical College and Dr. Bhim Rao Ambedkar Memorial Hospital, Raipur C.G. This randomized control trial was conducted in 300 patients aged 1-12 yrs of either sex of ASA physical status I or II scheduled for elective ophthalmic surgeries.

Mean age of the patients in Group Dp and Group D were 5.81 ± 2.86 years and 6.19 ± 2.81 respectively. Maximum no. of patients were found in age group of 4-6yrs (33.3%) and 7-9yrs (36.0%) in group Dp and group D respectively. Both groups were comparable with respect to age distribution and the difference was statistically insignificant (p=0.25; >0.05) **(Table-1)** .

The number of male patients to female patients in group Dp was 99 (66%) and 51 (34%), and in group D was 99(66%) and 51(34%) respectively. There was no statistically significant difference between the two groups regarding the gender (p=0.99;>0.05) **(Table-2).**

The mean body weight in Group Dp was 17.01 ±4.51kg and in Group D it was 17.41±4.23 kg. There was no significant difference in the body weight of patients between Group Dp and Group D (p=0.43) **(Table-3**).

The mean duration of surgery in our study was 30.74±3.54 min and 31.42±2.96 min in Group Dp and Group D respectively and was not found statistically significant (p=0.71).Our study correlates with Mukherjee Anindya et al (2014) where the mean duration of surgery in their study was 33.5±7.6 min in Dexmedetomidine group.Our study does not correlate with Amr Samy A. et al (2014) where the mean duration of surgery in their study was 56.7±14.8 min in Dexmedetomidine group. They enrolled several variety of pediatric surgery in their study. This might the cause of prolongation in duration of surgery.

Our study correlates with Guler Gulen et al (2005) the mean duration of surgery in their study was 35.73±8.3 min in Dexmedetomidine group and Ali Monaz Abdulrahman et al (2013) where the mean duration of surgery in their study was 36.7±10.8 min in Dexmedetomidine group.

In our study, the mean duration of sevoflurane anesthesia was 38.10±5.72 min and 38.03±6.69 min in Group Dp and Group D respectively. This was comparable between the two groups and statistically not significant (p=0.93) **(Table-5)** Our study correlates with Mukherjee Anindya et al (2014)The mean duration of sevoflurane anesthesia in their study was 40.17±12.63 min.

The mean time to removal of LMA in our study was 5.86±1.45 min and 8.10±1.68 min in Group Dp and Group D respectively. In Group D this time was longer than Group Dp but this difference was comparable between the two groups and statistically not significant (p=0.089). **(Table-6).**Our study does not correlate with Amr Samy A et al (2012) in which the mean time to extubate in their study was 15.4±1.6 min. They used tracheal tube whereas we used LMA in studies. These might be the cause of prolonged time to

extubation in their study. Our study correlates withGuler Gulen et al (2005) in which time to extubation in the dexmedetomidine group was 5.03 ± 2.3 min. They administered 0.5µg/kg dexmedetomidine 5 min before the end of surgery. We also administered the test drug in similar dose and at similar point of time.

The mean time to emergence in our study was 7.74±1.26 min and 9.04±1.64 min in Group Dp and Group D respectively. In Group D this time was longer than Group Dp but this difference was comparable between the two groups and statistically not significant (p=0.28). **(Table-7).**Our study correlates with the Mukherjee Anindya et al (2014) where the mean time to emergence (min) in their study was 4.6±2.1 min and it was 5.86±1.45 min in our study . Our study does not correlate with the study done by Amr Samy A. et al (2012) in which the mean time to extubate in their study was 15.4±1.6 min. They administered a bolus of 0.75 µg/kg dexmedetomidine in premedication followed by its continuous infusion of 0.5 µg/kg/h whereas in our study dose of dexmedetomidine is 0.5µg/kg bolus infusion 10 min prior to induction of GA. Higher doses of test drug might resulted in delayed emergence in their studies.Our study correlates with the previous study by Guler Gulen et al (2005)where the mean time to emergence was 9.30 ± 2.9 min in Dexmedetomidine group. . They administered 0.5µg/kg dexmedetomidine 5 min before the end of surgery. We also administered the test drug in similar dose and at similar point of time.

The mean heart rate decreased from a baseline value of 101.37±7.96 bpm to 94.45 ±10.21 bpm at T10 in Group Dp after IV administration of dexmedetomidine. In Group D mean heart rate decreased from a baseline value of 100.56±9.06 bpm to 94.52±12.53 bpm at T40 due to administration of IV dexmedetomidine approx. 5 min brfore the end of sugery . In both groups mean heart rate remained lower side of their baseline value but intergroup comparison was statistically not significant. In the PACU mean heart rate was below the baseline but remains stable. In group D mean heart rate is lower compared to group Dp. Intergroup comparison showed insignificant difference (p>0.05).Our study correlates with the study of Amr Samy A et al (2012) where Baseline HR decreases after induction and intubation but remains stable during intraoperativel and postoperative periods.Our study does not correlate with the study of Mukherjee Anindya et al (2014) in which HR decreases significantly from the baseline value of 100.2±16.3 bpm to 60.5±5.7 bpm intraoperatively. Our study protocol were different from them perhaps this might be cause of significant decrease in HR. Our study correlates with the studies done by Ali Monaz Abdulrahman et al (2013) and Aksu Recep et al (2009) who observed that there were no significant decreases in HR during intraoperative and postoperative period. Our study correlates with the study done by Amr Samy A et al (2012) and Shin Hye Won et al (2013)in which Baseline BP decreases after induction and intubation but remains stable during intraoperativel and postoperative periods. Our study does not correlate with the study of Mukherjee Anindya et al (2014) where BP decreased significantly from the baseline value of 80.6±13.0mmHg to 61.7±6.4 mmHg intraoperatively. Our study protocol were different from them perhaps this might be cause of significant decrease in MAP.

Incidence of EA was measured by Aonos scale. In Group Dp 26 (17.33%) patients and in Group D 20 (13.33%) patients suffered EA . Maximum EA was observed at P0 in both groups. In Group Dp it was 12(8%) and in Group D it was 8.6% at P0. At P5 EA in Group Dp and group D was 7.33% and 4% respectively. At P15, EA in Group Dp and Group D was 2% and 0.67% respectively. At P30 no incidence of EA was seen in both groups. Intergroup comparison shows no significant difference (p>0.05) **(Table 11).**Our study correlates with the study of Mukherjee Anindya et al (2014) where the incidence of EA was 22.5% (n=40) in Dexmedetomidine group in their study which is comparable with 17.33% (n=150) of our study. Our study does not correlate with the studies of Mountain Brian W. et al (2011)- The incidence of EA in their study was 7.3% (n=22) in Dexmedetomidine group which is significantly lower compared to 17.33% (n=150) of our study. The reason for this difference might be limited sample size (41 patients) in their study versus large sample size (300 patients) in our study.

The incidence and severity of EA were measured upon admission to the PACU (T0) and in the PACU at 5 min (T5), at 15 min (T15) and at 30 min (T30). In Group Dp 26 (17.33%) patients and in in Group D 20 (13.33%) patients suffered EA **(Table 12).** Out of 26 patients in Group Dp, 7 (4.67%) patients suffered severe EA. Out of 20(13.33%) patients in Group D 5 (3.33%) patients suffered severe EA. Maximum number of patients suffered severe EA at P0 2.67% and 2.00% patients in group Dp and group D respectively. At P5 1.33% and 0.67% patients suffered severe EA in group Dp and group D respectively. At P 15, 0.67% and 0.67% patients suffered severe EA in Group Dp and Group D respectively. At P30 no incidence of EA seen. Intergroup comparison shows higher severity of EA in Group Dp comparative to Group D insignificant difference (p>0.05)**.**Our study correlates with the study of Mukherjee Anindya et al (2014) where the incidence of EA was 22.5% in Dexmedetomidine group , out of which 2.5% patients suffered severe EA. Maximum PAED score was observed at P0 in their study. Thus our study results show similarity with their study in terms of incidence and severity of EA.

We managed the severely agitated patients with IV fentanyl 2µg/kg in both groups during which time patients were monitored for any signs of respiratory depression, and postoperative fentanyl consumption was recorded. In our study recovery was evaluated by using modified aldrete recovery score ranging from 0-10. Score of 9 or more is required for recovery and discharge from PACU to ward. In our study, at P0 no patients achieved the required recovery score in Group Dp and Group D. At P5, 2 (1.33%) and 3 (2%) patients in Group Dp and Group D respectively achieved the required score. At P15, 110 (72.67%) and 108 (72%) patients in Group Dp and Group D respectively achieved the required score. At P30, 30 (20%) and 36 (24%) patients in Group Dp and Group D respectively achieved the required score. At P45, 8 (5.33%) in Group Dp and 3 (2%) patients in Group D achieved the required score. Intergroup comparison shows no significant difference (p>0.05) (**Table 13).** Our study does not correlate with study of Amr Samy A. et al (2012)where mean time to achieve modified aldrete score ≥9 is significantly longer in their study compared to our study. The mean time to discharge from hospital was 298.7±26.4 min in their study while this value was 23.89±4.75 min in our study. The probable causes of delayed time to achieve recovery criteria in their study was administration of a bolus of 0.75 µg/kg dexmedetomidine in premedication followed by its continuous infusion of 0.5µg/kg/h whereas in our study bolus of 0.5µg/kg dexmedetomidine only has been administered 10 min prior to induction of GA. The other cause of delayed recovery might be enrolling the patients undergoing several types of surgeries whereas we enrolled the patients undergoing pediatric ophthalmic surgery only.

CONCLUSION

The findings suggest that Dexmedetomidine 0.5µg/kg IV administered 10 min prior to induction of GA and dexmedetomidine 0.5µg/kg IV administered 5 min before the end of surgery effectively reduce the incidence and severity of emergence agitation in children undergoing ophthalmic surgery. Better result was seen with later group but statistically not significant.Both the study groups contribute to hemodynamic stability in GA with LMA, maintaining the spontaneous respiration.Both the study groups facilitate smooth recovery from GA without significant prolongation of PACU stay.Both the study groups attenuate the perioperative complications including postoperative pain and PONV. Further studies are needed to demonstrate the effect of different timing of dexmedetomidine administration to prevent emergence agitation.

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