Original Article

Prevention of Emergence Agitation with Dexmedetomidine in the Patients Undergoing Nasal Surgery Under Anesthesia with Desflurane

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ABSTRACT

Objective: To evaluate the effectiveness of Dexmedetomidine in the avoidance of emergence agitation occurring in the patients enduring nasal surgery under anesthesia with Desflurane.

Study Design: A randomized controlled trial study.

Place and Duration of Study: This study was conducted at the Department of Anesthesia and intensive care of DG khan/Sheikh Zaid Medical College & Hospital Rahimyar Khan, from May 2018 to August 2018.

Materials and Methods: Sixty patients were distributed into two equal groups, Dexmedetomidine was given to one while the other received normal saline as placebo. Primary outcomes included incidence of emergence agitation while hemodynamic stability, postoperative sedation, pain severity, analgesics and anti-emetics requirements, stay in PACU were included in secondary outcomes. The data was entered in SPSS v.23 and analyzed with independent t-test, Mann Whitney U-test and Chi-square test, as appropriate. P≤0.05 was considered statistically significant.

Results: Incidence of emergence agitation was 60% in group-N and 10% in group-D (p<0.001). Time to extubate, to attain BIS-90 and to get verbal reaction were prolonged in group-D (p<0.001). Stay time at PACU was considerablyextended in group-D (p=0.017). Ramsey sedation score was greater in Group-D than in group-N (p=0.016). The incidence of analgesics and anti-emetics use in PACU was 33.3% and 30% in group-N; and 10% and 6.7% in group-D, (p-value 0.028 and 0.020), respectively.

Conclusion: Dexmedetomidine is efficacious in reducing the occurrence of EA in the adult patients undergoing nasal surgery under general anesthesia with Desflurane but the degree of sedation is increased along with prolonged PACU stay.

Key Words: Emergence agitation, Dexmedetomidine, Desflurane, Nasal surgery

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INTRODUCTION

Anesthesia practice depends mainly on inhalational agents. The search for newer agents is still on the rise which aims at finding the agent which helps in rapid induction of anesthesia, is safe, pleasant smelling and free of adverse effects. Many newer agents including desflurane and sevoflurane have been discovered so far over the past one and half century but there are still some adverse effects associated with these agents which are holding them back from being the perfect anesthetic agents. Decreased awakening time and rapid eye opening, reaction to verbal command and time, place and person orientation are some of the important properties of desflurane[1]. Owing to these properties, emergence agitation occurs in the patients who are recovering from general anesthesia. Negative postoperative behavior and physical injury can also be associated with emergence agitation.

In spite of occurrence of emergence agitation for brief period of time, pharmacological intervention can be needed sometime to overcome this. Many agents including opioids, clonidine, ketamine and propofol have been used in the past for the prevention of emergence agitation. All of these agents are known to show increase in post anesthetic sedation, prolonged awakening time from anesthesia and some unwanted adverse effects including nausea and vomiting [2].

Dexmedetomidine is an agents which has selective action on alpha w adrenoceptors [3]. It is used commonly as adjuvant to ropivacaine in regional anesthesia a well as adjuvant in general anesthesia [4] to help reduce the

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consumption of opioids and inhalational anesthetics [5]. The block of nor adrenalin from alpha 2 adrenoceptors results in sedation and hypnosis [6]. Analgesia, sympatholysis and anxiolytics are very important functions of dexmedetomidine[7]. Stress responses of laryngoscopy are lessened when dexmedetomidine is injected intravenously[8]. Dexmedetomidine is used widely in children to reduce the occurrence of EA[9].

The studies to evaluate the efficacy of dexmedetomidine in reduction of EAin adult candidates are very few in number[10,11]. We directed our study to observe the effectiveness of dexmedetomidine in the reduction of EA and its effects on recovery in adult patients who underwent any type of nasal surgery under desflurane anesthesia.

MATERIALS AND METHODS

We conducted this randomized controlled trial in the Department of Anesthesia and intensive care of DG khan/Sheikh Zaid Medical College & Hospital Rahimyar Khan, from May 2018 to August 2018. Our study was accepted by the hospital review committee. The study conducted by Garg A. et al. [11] was taken as reference. The calculated sample size was 26 which was too small, therefore, we selected sixty (60) patients of American society of Anesthesiologist (ASA) physical status I or II and between 18-60 years of age, with non-probability consecutive sampling technique. All these patients were selected for the nasal procedures under anesthesia induced by desflurane on elective basis. All the patients who had systemic illness (such as cardiac, hepatic, endocrinal or neurological), substance induced disorder, psychiatric disorders or were taking medications such as alpha 2 agonists, beta blockers or tricyclic anti-depressants were excluded from our study. Thorough evaluation of all the patients was done one night before the surgery. Pulse oximeter non-invasive blood pressure monitor, ECG monitor and BIS electrodes were attached and baseline readings were taken. Two IV lines were secured. After pre oxygenation, midazolam 0.05mg/kg and fentanyl 2 µg/kg were given as slow intravenous infusion. Propofol 2-2.5 mg/kg was given intravenously for inducing anesthesia. Endotracheal intubation was facilitated by intravenous atracurium 0.5mg/kg body weight. We divided 60 patients into two equal groups: Group N was given desflurane in air and oxygen mixture (50:50) and normal saline placebo as bolus infusion for 10 minutes and as maintenance infusion after tracheal intubation; and group D was given desflurane in air and oxygen mixture (50:50) and a bolus of 1 µg/kg dexmedetomidine infusion for 10 minutes and 0.4 µg/kg maintenance dose as infusion following tracheal intubation. Drug was diluted keeping in view the body weight of the patients. Loading dose was given at 120 ml/h for 10 minutes and the maintenance dose 8 ml/h continued till the completion of surgery. The starting dial flow of desflurane was 6% in air and oxygen mixture (50:50) and it was titrated to sustain BIS 45-55 during the surgery. The tidal volume was maintained at 6-8L/kg and it was targeted at 35-40 mmHg end tidal CO_2 concentration. Analgesia and muscle relaxation was achieved by fentanyl and atracurium bromide. Blood pressure, BIS, O_2 saturation, end tidal desflurane concentration and CO_2 concentrations were noted every 10 minutes during the surgery. Desflurane and the drugs under study were stopped at the time of application of surgical dressing and the time (T_0) was recorded. Neostigmine and glycopyrrolate were given intravenously for antagonizing neuromuscular blockade. Tracheal extubation was performed when sufficient muscular power had returned. The time interval from T_0till the patient could tell his/her name was defined as emergence time. Level of agitation was evaluated by Ricker sedation-agitation scale (Table-I). The severity of pain was noted by Numeric rating scale (NRS) (0= no pain, 10= very severe pain). Verbal instructions and repeated verbal reminder of limit therapy was used in the patients with 5 or 6 emergence agitation score, respectively, whereas IV propofol at 1mg/kg dose was given to the patients with emergence agitation score of 7. NRS score was noted every 2 minutes for obtaining peak value. Time to extubate, to attain BIS-90, to get verbal response and stay time at PACU were documented. The degree of sedation was noted by Ramsey sedation scale [12]. Anti-emetics and analgesics requirement were also noted. Diclofenac sodium was given as rescue analgesic in PACU on the patient's demand.

Primary outcomes included the incidence of emergence agitation while hemodynamic stability, postoperative sedation, pain severity, analgesics and anti-emetics requirements, stay in PACU were included in secondary outcomes. The data was entered in SPSS v.23 and analyzed. The test applied were independent t test, Mann Whitney U test and Chi square test, as appropriate. $P \leq 0.05$ was considered statistically significant.

RESULTS

There was no noteworthy variance between the two groups in regard with age, weight, gander distribution and the types of the surgical procedures performed ($p>0.05$). The duration of surgery and anesthesia was 78.10±12.76 minutes and 108.01±10.93 minutes in group N; and 80.40±10.95 minutes and 112.37±12.30 minutes in group D, (p-value 0.457 and 0.152), respectively. Baseline heart rate was also not different in the groups ($p=0.757$). Mean arterial pressure was 88.90 ± 4.47 mmHg in group N and 86.03 ± 3.89 mmHg in group-D ($p=0.010$). Table-2

Time to extubation was 5.70 ± 0.94 min and 7.63 ± 1.10 min in group N and D, respectively ($p<0.001$).

Time for attaining BIS-90 and verbal response was 4.98 ± 0.65 min and 5.44 ± 0.81 min in group N; and 7.71 ± 0.93 min and 8.49 ± 0.94 min in group D, respectively (p<0.001). Occurrence of EA was 60% in group N and 10% in group D (p<0.001) and the difference was statistically noteworthy. Peak NRS score observed was 5.53 ± 1.43 and 5.27 ± 1.48 in groups N and D, respectively (p=0.482). Ramsey sedation score was higher in Group D than in group N (p=0.016). The incidence of analgesics and anti-emetics use in PACU was 33.3% and 30% in group N; and 10% and 6.7% in group D, (p-value 0.028 and 0.020), respectively. Stay in PACU was longer in group D i.e. 12.56 ± 4.94 min as compared to stay of group N i.e. 9.83 ± 3.55 min (p=0.017). Table-3.

Table No.1: Ricker sedation-agitation scale

Score	State	Behavior
7	Dangerous agitation	Climbing over bed railings, lashing side to side, demanding to remove lines, lashing at staff.
6	Very agitated	Restraints and recurrent verbal reminder of limits required.
5	Agitated	Physically agitated or anxious, calms to verbal directions.
4	Calm and cooperative	Follows commands, simply arousable and calm.
3	Sedated	Follows commands, difficult to awaken, awakes to verbal incentives.
2	Very sedated	Does not obey commands, awakes to physical stimuli.
1	Unarousable	Does not follow commands or communicate, slight or no response to harmful stimulus

Table No.2: Demographic and baseline data

Variable	Group N (n=30)	Group D (n=30)	P value
Age, years	29.83 ± 4.62	28.10 ± 5.58	0.195
Gender (male / female)	16 / 14	14 / 16	0.606
Weight, kg	58.73 ± 9.05	60.23 ± 7.57	0.489
Type of procedure, n (%)			0.793
FESS	5 (16.7)	8 (26.7)	
DCR	9 (30)	7 (23.3)	
Septoplasty	10 (33.3)	10 (33.3)	
Adenoidectomy	6 (20)	5 (16.7)	
Surgery duration, min	78.10 ± 12.76	80.40 ± 10.95	0.457
Anesthesia duration, min	108.01 ± 10.93	112.37 ± 12.30	0.152
Baseline heart rate, bpm	81.70 ± 4.53	81.30 ± 5.40	0.757
MAP, mmHg	88.90 ± 4.47	86.03 ± 3.89	0.010

Fess= functional endoscopic sinus surgery; DCR= dacrocystorhinostomy; MAP= mean arterial pressure; variables mentioned as mean ± S.D unless mentioned otherwise.

Table No.3: Outcome variables

Variable	Group N (n=30)	Group D (n=30)	P value
Time to extubation, min	5.70 ± 0.94	7.63 ± 1.10	<0.001
Time to achieve BIS-90, min	4.98 ± 0.65	7.71 ± 0.93	<0.001
Time to verbal response, min	5.44 ± 0.81	8.49 ± 0.94	<0.001
Emergence agitation, n (%)	18 (60)	3 (10)	<0.001
Peak NRS score	5.53 ± 1.43	5.27 ± 1.48	0.482
Ramsey sedation score, median (IQR)	3 (2 - 3.25)	3 (3 - 4)	0.016
Analgesics in PACU, n (%)	10 (33.3)	3 (10)	0.028
Anti-emetics in PACU, n (%)	9 (30)	2 (6.7)	0.020
Stay in PACU, min	9.83 ± 3.55	12.56 ± 4.94	0.017

DISCUSSION

It was observed in our study that the occurrence of EA was significantly reduced in the patients who were given intraoperative dexmedetomidine infusion. While keeping hemodynamic stability, dexmedetomidine is associated with delay in extubation and verbal response. Emergence agitation develops from quick recovery from anesthesia, especially with the short acting agents such as sevoflurane and desflurane. The state of purposeless restlessness, inconsolability and non-cooperation is defined as emergence agitation and it is associated with screaming, crying, thrashing and bafflement[13]. In spite of the occurrence of EA being more in pediatrics patients, 21.3% and 4.7% incidence has been observed in adult patients[14,15]. Variety of agitation scoring scales might be responsible for this much wide variation in the statedoccurrence of EA.

Increase in noradrenaline release from alpha-2 adrenoceptors in locus ceruleus of the preoptic rat brains had been demonstrated as causal for emergence agitation[16-17] but the association with inhalational anesthetics, pain, male gender, age and preoperative use of benzodiazepines had been proposed in other study[13]. Emergence agitation has been observed in 55.4% of the patients who underwent some sort of ENT surgery[14]. According to some studies, the occurrence of EA is higher in those who endured ENT surgery, especially nasal surgeries in which nasal packing was done, in both children as well as adults[14,15]. In our study,

occurrence of EA was 60% in the control group while 10% in the dexmedetomidine groups and these results were in agreement with some preceding studies[10,14]. Dexmedetomidine is also reported to significantly reduce the occurrence of EA in children and the researchers used a diverse dosing of dexmedetomidine and found it to be significantly superior to placebo in children[9]. In a study, 46% decrease in the occurrence of EA has been observed in grown-up patients with the intraoperative usage of dexmedetomidine at 0.4µg /kg dose without giving any bolus dose[10]. In the above mentioned study, time to extubate and verbal reaction was also prolonged with the use of dexmedetomidine, as observed in our study.

In this study, we witnessed no substantialalteration in heart rate but MAP was considerably lower in dexmedetomidine group, results similar those observed by Garg A et al[11]. But in contrast to our results, some studies observed significant decrease in intraoperative heart rate of the patients who were given dexmedetomidine[18-20]. In another study[11,21], MAP was witnessed to be considerably lower with the use of dexmedetomidine and their results were similar to those observed in our study. Significantly decreased heart rate and MAP were observed in another study with dexmedetomidine usage as compared to the use of placebo[22]. Dexmedetomidine has some anesthetic sparing effects which leads to decreased requirement of anesthetic agents which has been observed in some studies[23,24].

CONCLUSION

Dexmedetomidine is efficacious in reducing the frequency of EA in the adult patients enduring nasal surgery under GA with desflurane but the degree of sedation is increased along with prolonged PACU stay.

Author's Contribution:

Concept & Design of Study:	Syed Aushtar Abbas Naqvi
Drafting:	Mirza Shakeel Ahmad
Data Analysis:	Zeeshan Khan
Revisiting Critically:	Syed Aushtar Abbas Naqvi, Mirza Shakeel Ahmad
Final Approval of version:	Syed Aushtar Abbas Naqvi

Conflict of Interest: The study has no conflict of interest to declare by any author.

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