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Dexmedetomidine Infusion to Reduce Emergence Agitation Post Operatively

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Abstract

Background: Emergence Agitation is a very common phenomenon seen after nasal surgeries, can be due to the nasal packing done and feeling of shortness of breath. We did this study to investigate the efficacy of Inj. Dexmedetomidine infusion to reduce the incidence of emergence agitation in adults undergoing nasal surgeries. *Methods*: 60 adult patients undergoing nasal surgeries were randomized into two groups. The Group-D (n=30) receive dexmedetomidine infusion at rate of 0.5 mcg/kg/hour from starting of induction of anesthesia and stopped before extubation while Group-P (n=30) received normal saline infusion as placebo. Induction of anesthesia was done with Inj. Propofol (2-2.5 mg/kg) & fentanyl (1 mcg/kg) and sevofluarane used for maintainance of anesthesia. The incidence of Emergence Agitation (EA) evaluated by Ricker's Agitation sedation scale (RSAS) and intraoperative haemodynamic stability were evaluated in study. *Results*: Incidence of Emergence agitation was lower in Group-D than Group-P. Mean arterial blood pressure & heart rate were stable intra operatively and during emergence agitation in Group-D as compared to Group-P. There was no delay in extubation observed with no residual sedation in group D. *Conclusion*: Emergence agitation in the early post extubation phase following general anesthesia is a prevelantphenomenon seen during nasal surgery patients in adults. Intra operative dexmedetomidine infusion reduces postoperative Emergence Agitation (EA) and provides good intra operative haemodynamic stability in adults undergoing nasal surgeries without any respiratory depression and delayed extubation.

Keyword: Emergence Agitation; Dexmedetomidine; Ricker's Agitation Sedation Scale (RSAS).

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Introduction

Emergence agitation phenomenon that develops in the early phase of recovery from general anesthesia, and is characterized by agitation, confusion, disorientation, and possible violent behavior. EA is a mental state in which there is a lack of connection between consciousness and the patients' behavior, which is characterized by excitement, irritability, disorientation and inappropriate behavior. EA is transient but quite disturbing for patients and OR staff and can cause

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injury, hemorrhage, and self extubation. Various causes can be attributed for this agitated behavior like history of smoking, alcohol, obesity, duration of surgery, type of anesthetic agent used.

Dexmedetomidine is a highly selective alpha 2-adrenergic receptor agonist used widely in intensive care unit for its sedative, analgesic and anxiolytic effects without causing respiratory depression. When used per operatively, it shows better intraoperative haemodynamic stability and minimizes the response to surgical stimuli. Its use can be synergistic, reducing requirement of other anaesthetic agents.

The aim of the present study was to determine efficacy of dexmedetomidine in prevention of postoperative EA providing good haemodynamic stability per operatively in adults undergoing nasal surgeries.

Methodology

After approval from he hospital ethical committee, a prospective study was carried out in adult patients under going nasal surgeries for various indications at our hospital, from January 2018 to December 2018. Patients of age group 18-50 years of ASA I and II were included. Exclusion criteria were Grade III and IV, patients with co morbid conditions and systemic disease like diabetes, renal involvement, and liver abnormalities. A written, informed consent was obtained from all patients after full explanation of the study.

After proper premedication with inj. glycopyrolate 0.2 mg, inj.midazolam 1 mg, inj. ondansetron 8 mg/kg, inj. fentanyl 1 µg/kg., securing a large bore intravenous cannula, General anesthesia was administered to all the patients with inj.propofol (2-2.5 mg/kg) till loss of eyeless reflex and inj.succinylscoline (2 mg/kg) and inj.atracurium (0.5 mg/kg). The patients were divided into two groups. Group-D to receive Dexmedetomidine 0.5 mcg/kg/hour in an infusion immediately after the induction of anaesthesia while Group-P to receive normal saline as placebo. All other personnel and observers were blinded to the study grouping. The dexmedetomidine infusion was prepared by an attending anaesthesiologist and started immediately after intubating the patient. Anesthesia was maintained with oxygen and nitrous oxide in ratio of 50:50, inhalational agent sevoflurane at the concentration of 1.5–2% to maintain the desired MAC and Muscle relaxation was maintained by IV atracurium as per body weight at regular intervals. Per operatively the Patients were monitored all through out for Pulse, Blood Pressure, SpO_2, $EtCO_2$, and Temperature. Observations of Mean Arterial Blood Pressure, Heart rate was made preoperatively, and then 10, 30, 45 minutes for every fifteen minutes till the end of surgery. The dexmedetomidine infusion was stopped before extubation and any stimulation of patients was avoided except verbal command to open eyes. The Operating ENT surgeonon completion of surgery performed nasal packing anticipating postoperative hemorrhage. For nasal packing, gauze or saline-soaked Merocel was applied.

Patients were observed immediately after extubation for any emergence phenomenon. Post operative Emergenceis usually considered in between time interval from'time zero' to 2 min after extubation. Emergence agitation (EA) was evaluated by Riker sedation agitated scale [7,8] (RSAS, table1); this scale is usually used for agitated behavior in Intensive Care Units. It is a scale which scales the agitated behavior through various parameters and is scaled from score of 7 maximum (dangerous EA) to 1 as minimum. RSAS was measured at 2 min, 5 min & 10 min interval after extubation. The maximum RSAS scale noted was recorded, A score of ≥ 5 at any time was considered as emergence agitation (EA) A Scale of 7 was considered as dangerous EA. The presence of adverse side effects like sedation, delayed extubation & vomiting also evaluated.

Guidelines for RSAS Assessment

1. Agitated patients are scored by their most severe degree of agitation as described

2. If patient is awake or awakens easily to voice ("awaken" means responds with voice or head shaking to a question or follows commands), that's a RSAS 4 (same as calm and appropriate – might even be napping).

3. If more stimuli such as shaking is required but patient eventually does awaken, that's RSAS 3.

4. If patient arouses to stronger physical stimuli (may be noxious) but never awakens to the point of responding yes/no or following commands, that's a RSAS 2.

5. Little or no response to noxious physical stimuli represents a RSAS 1. This helps separate sedated patients into those you can eventually wake up (RSAS 3), those you can't awaken but can arouse (RSAS 2), and those you can't arouse (RSAS 1).

Results

A total of 60 patients were considered for the study. After randomization patients were divided in two groups. Group D to receive dexmedetomidine infusion (0.5 μg/kg/hour) and Group P to receive normal saline infusion during surgery. The infusion was stopped before surgery and the patients were observed for any emergence phenomenon after extubation. The time from extubation (time '0') to two minutes was considered for emergence agitation behavior if any.

Demographically there was no difference between the groups as far as age, sex and weight of the patient was concerned (Table 2).

Patients undergoing surgeries like Septoplasty for Deviated Nasal septum, FESS for nasal polyps, endoscopic DCRs were included for our study. Types of surgery and duration of surgery in both the groups were also comparable (Table 2).

Sevoflurane was maintained at 2% dial concentration initially at the start of surgery in both the groups and then adjusted as per the desired MAC of approximately 1. (the value reduces by around 50% when N_2O is used simultaneously). MAC value was 0.9 ± 0.2 in group D and was 1 ± 0.3 in group P and this was clinically not significant.

At the end of surgery patients were observed for the arousal state. The time from discontinuation of sevoflurane to time to verbal response was slightly longer in group D (8.2) as compared with group P (7.5) was noted. The mean time from discontinuation of inhalation anesthetic agent to extubation was 9 min in group D as compared to 8.8 min in group P. This difference was not of much clinical significance. There was no respiratory depression observed in either group (decrease in tidal volume or holding of breath) (Table 3).

The incidence of emergence agitation (EA) as observed by RSAS score was lower in Group D (20%) than in group P (50%),while no patients were dangerously agitated in either group in our study as shown in table 4 and graph 1. This agitated behavior subsided in 15 minutes of extubation in all patients. Airway reflexes, coughing and swallowing were well preserved in both the groups. The time at which rescue analgesic was given was noted. When compared the difference was not of much clinical significance. Trickling of blood, secretions from posterior nasopharynx can cause vomiting, but the use of anti emetics also was not much in either group (Table 4).

Hemodynamic monitoring of the patients in both the groups was done and pulse, Blood pressure

Table 1: Riker Sedation-Agitated Scale

7	Agitated dangerous agitation	Pulling of ET tube, trying to remove catheter, climbing over bed rail, striking at staff, thrashing side to side
6	Very agitated	Does not calm, despite frequent verbal reminding of limits, requires physical restraints, biting ET tube
5	Agitated	Anxious or mildly agitated, attempting to sit up, calm down to verbal instruction
4	Non agitated, calm & cooperative	Calm, awake and easily, follows commands
3	sedated	Difficult to arouse, awakens to verbal stimuli or gentle shaking but drifts off again, follows simple command
2	Very sedated	Arouses to physical stimuli but does not communicate or follow command, may move spontaneously
1	Unarousable	Minimal or no response to noxious stimuli

Table 2: Demographic Distributions

	Group D (N=30)	Group P (N=30)	p Value
Age (avg)	39.6	38.5	>0.05
Gender Male/Female	18/12	17/13	>0.05
Weight (avg)	55.3	53.7	>0.05
Duration of surgery (min)	94	98	>0.05

Table 3:

	Group D	Group P	p Value
Time to verbal response (min)	8.2	7.5	<0.05
Time to extubation (min)	9	8.8	>0.05

were noted before induction, after induction, 10, 30, 45 minutes after induction till the end of surgery. Post operatively also the patients were monitored for the vitals in the recovery room. Looking to the type of patients studied the mode of anesthesia and drugs used, not much gross changes were noted in the vital parameters of the patients. Comparing it within the group and with either group these changes were not of much clinical significance (Table 5 and 6). More so over it was found that patients receiving dexmedetomidine infusion were more stable as far as vitals were taken in consideration to that of pre operative values.

Other side effects related to anesthesia, surgery like vomiting, bradycardias, vomiting, bleeding, were not observed.

Table 4: Showing the Emergence Agitation (EA)

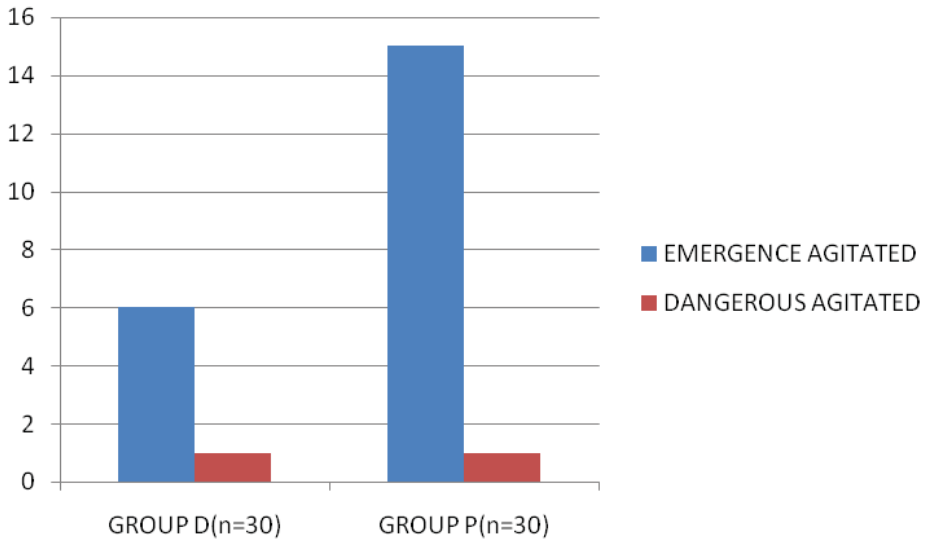
	Group D (N=30)	Group P (N=30)	p Value
Emergence Agitated	6	15	<0.001
Dangerous Agitated	1	1	>0.05

Table 5: Changes in Heart Rate

	Group D	Group P
Before induction	90.2 ± 7.94	89.4 ± 7.64
After 10 min	82.4 ± 7.38	82.2 ± 7.37
After 30 min	76.3 ± 6.58	84.3 ± 7.57
After 45 min	74.7 ± 6.23	86.5 ± 7.81
At extubation	92.6 ± 8.52	102 ± -9.37
2 min after extubation	84.9 ± 7.61	100 ± 9.12

Table 6: Changes in Mean Arterial Blood Pressure (MAP) (Avg ± SD)

	Group D	Group P
Before induction	88.9 ± 7.81	88.6 ± 7.72
After 10 min	79.6 ± 7.52	79.4 ± 7.38
After 30 min	77 ± 6.60	84.6 ± 7.54
After 45 min	78.3 ± 6.63	86.2 ± -7.85
At extubation	90.9 ± 8.07	98.5 ± 8.43
2 min after extubation	88.86 ± 7.56	94.3 ± 8.12



Graph 1: Showing the Emergence Agitation (EA)

Discussion

The results of this prospective randomized prospective study suggest that dexmedetomidine infusion at rate of 0.5 mcg/kg/hour intraoperatively from the starting of induction of anesthesia till extubation in adults patients undergoing nasal surgeries was effective in reducing postoperative emergence agitation and it provides more stable haemodynamics environment without any respiratory depression or delayed extubation and with bare minimum complication & side effect.

Intraoperative dexmedetomidine infusion helps in stable haemodynamic picture during surgery and during emergence. Emergence Agitation (EA) is common after nasal surgeries due to postoperative bilaterally nasal packing which causes a sense of suffocation. The mainstay for management of emergence agitation is elimination of preventable causes, especially in at-risk patients. Other factors being smoking, obesity, alcoholism, use of benzodiazepines, inhalational agents and the feeling of tracheal tube [9,10]. It is the nonuniform recovery of different parts of the central nervous system that has been postulated as the main mechanism of emergence agitation. We only included patients undergoing nasal surgeries expected to have higher risk of emergence agitation as they required nasal packing bilaterally [10], (though the patients undergoing nasal surgeries for various reasons are habituated with the nasal obstruction – habituated mouth breathers) Dexmedetomidine provides sedation and analgesia without any respiratory depression postoperatively [3], and this helps to reduce the emergence reaction which usually arises during the non uniform awakening of different parts of central nervous system. So the use of dexmedetomidine infusion for preventing emergence agitation in our study is advocated. As expected result of our study were similar to previous study (S.Y. Kim, J.M. Kim et al.) [1] in which incidence of emergence agitation was 52% in group P as compared to group D in which incidence of EA was 28%.

In another study done by Akanksha Garg, Manoj Kamal et al. [11], they studied the reduction in incidence of emergence phenomenon occurring postoperatively in nasal surgeries in which they used Inj. Dexmedetomidine 1 μg/kg bolus followed by infusion of 0.4 μg/kg/hr intravenously. They concluded that the incidence is highly reduced but there is delayed extubation with post operative sedation seen in many study cases.

Yingging Sun, Yuanhai li et al. [12] studied different infusion doses of Inj. Dexmedetomidine of 0.25, 0.5 and 1 μg/kg to study the incidence of post operative emergence phenomenon and concluded that 0.5 μg/kg/hr has better effect than 0.25 μg/kg/hr. Moreover, a dose of 1 μg/kg/hr did not have any added advantage over 0.5 μg/kg/hr infusion.

In a similar study it was seen that intraoperative infusion of dexmedetomidine reduces the incidence of emergence agitation in paediatric patients by 50-70% [2].

As observed by RSAS score, The time to verbal response after discontinuation of the infusion was slightly longer in group D as compared to group P. this can be attributed to more sedation caused by dexmedetomidine but when compared to group P this time duration was not of much clinical significance. Residual effects like sedation or agitation in the recovery room was not seen in any of our cases from both groups.

The use of Dexmedetomidine at the dose of 0.5 μg/kg/hr does not reduce the requirement of sevoflurane which was seen in other studies, [11] where they used more concentration of the dexmedetomidine (1 μg/kg bolus followed by the infusion of 0.4 μg/kg/hr). We tried to maintain the MAC around 1 in both our groups. In similar study [1] there was no reduction of inhalational agent where they used Inj. Dexmedetomidine in the concentration of 0.4 μg/kg/hr.

Dexmedetomidine can cause haemodynamic changes specially bradycardia and hypotension specially when given in loading doses. A loading dose of 1 mcg/kg followed by 0.5 mcg/kg/hour infusion intraoperatively, can cause delayed extubation and residual sedation in PACU. While use of dexmedetomidine only in infusion form with dose of 0.2–0.5 mcg/kg/hour infusion intraoperatively more haemodynamic stability [5]. We administered continuous infusion of dexmedetomidine 0.5 mcg/kg/hour during intraoperatively period to reduce postoperative emergence agitation and maintaining intraoperative haemodynamic stability [4]. With this dose the occurrence of hypotension and bradycardia were not seen to that extent requiring treatment. None of the patient had postoperative nausea vomiting in both groups. The mainstay for management of emergence agitation is elimination of preventable causes, especially in at-risk patients. The following are the main strategies to reduce the occurrence and consequences of emergence agitation episodes: encouraging patients to quit smoking at least 1 week before surgery, providing adequate postoperative

analgesia, removing tracheal tubes and urinary catheters as early as possible following surgery, and more vigilant monitoring for emergence agitation in younger patients. Some limitations can be pointed to the present study, like subjective or objective preoperative data on patients' nasal obstruction were absent, the impact of different nasal packing types on breathing difficulty could not be individually evaluated.

Conclusion

Inj. Dexmedetomidine infusion used intraoperatively at rate of 0.5 µg/kg/hour till extubation reduces the incidence of postoperative emergence agitation and maintain stable haemodynamics changes during intraoperative period and during emergence without delayed extubation & residual sedation in nasal surgeries.

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