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Effectiveness of dexmedetomidine in reducing postoperative agitation in pediatric adenotonsillectomy patients

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Abstract

Background and Objectives: Autoinjury, slowed healing, and heightened worry in caregivers are symptoms of postoperative agitation, a prevalent consequence after pediatric tonsillectomy. One effective drug to reduce emergence agitation in children is dexmedetomidine, and α_2 -adrenergic agonist that has sedative and analgesic qualities. The purpose of this research was to find out whether dexmedetomidine helped paediatric children who had adenotonsillectomy recover more quickly and with less discomfort after the procedure.

Materials and Methods: A prospective, randomized, double-blind clinical trial was performed on 50 pediatric children aged 4 to 12 years, categorized as ASA I-II, who were scheduled for elective adenotonsillectomy under general anesthesia. Patients were randomly divided into two groups: Group D (n=25) got dexmedetomidine 0.5 μ g/kg intravenously over 10 minutes before to induction, whereas Group C (n=25) received an equal volume of normal saline. The evaluated parameters encompassed emergence agitation score (utilizing the Pediatric Anesthesia Emergence Delirium Scale), sedation score, hemodynamic stability, recovery duration, and the occurrence of side effects. Statistical analysis included Student's t-test and the Chi-square test, with a significance threshold set at $p < 0.05$.

Results: There was a statistically significant difference in the incidence of postoperative agitation between Group C (48%) and Group D (12%). The dexmedetomidine group had significantly lower mean emergence agitation scores (4.1 ± 1.2) compared to the control group (8.3 ± 1.8). Although two patients using dexmedetomidine experienced moderate bradycardia, all other hemodynamic measures stayed within clinically acceptable ranges. There was no clinically significant difference between Group C (14.2 ± 2.6 min) and Group D (16.4 ± 2.3 min) in terms of the mean recovery time. There were no reports of major side effects.

Conclusion: Patients undergoing pediatric adenotonsillectomy can benefit from dexmedetomidine's ability to alleviate postoperative agitation and enhance the quality of their recovery without experiencing major side effects. Whether administered before or during surgery, it can improve children's perioperative safety and comfort.

Keywords: Dexmedetomidine, postoperative agitation, pediatric anesthesia, adenotonsillectomy, emergence delirium, sedation

Introduction

Postoperative agitation, known as emerging delirium, is a prevalent and troubling occurrence in children recovering from general anesthesia, especially after ear, nose, and throat (ENT) surgeries such as adenotonsillectomy [1, 2]. Clinically, it presents as perplexity, inconsolable weeping, disorientation, agitation, and in severe instances, self-harm or disturbance of surgical sites, thereby complicating recovery and exacerbating caregiver stress. The reported prevalence of emerging agitation in pediatric patients varies significantly, from 10% to 80%, influenced by factors including the anesthetic technique utilized, the child's age, preoperative anxiety, and the type and duration of surgery [3-5].

Children under seven years of age are at an elevated risk, likely due to the underdeveloped central nervous system and challenges in articulating discomfort or fear.

The fundamental pathophysiology of postoperative agitation is multifaceted. The fast recovery following volatile anesthetics like sevoflurane or desflurane, insufficient pain management, preoperative anxiety, and environmental influences in the post-anesthesia care unit (PACU) all contribute to its incidence [6-8]. Children may feel sensory overload, disorientation, or fear in the unfamiliar postoperative setting, which can intensify agitation.

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Effectively managing emergence agitation is clinically significant, as it influences the child's immediate safety and comfort, affects overall recovery quality, extends PACU duration, increases nursing workload, and elevates parental anxiety [9, 10].

Dexmedetomidine, a highly selective α_2 -adrenergic receptor agonist, has garnered significant interest in pediatric anesthesia due to its sedative, anxiolytic, and analgesic effects. In contrast to conventional sedatives, dexmedetomidine induces these effects without substantial respiratory depression, rendering it especially appropriate for pediatric patients having ENT operations where airway safety is paramount. Its pharmacological characteristics facilitate a seamless recovery from anesthesia, maintain stable hemodynamics, and diminish postoperative agitation, as evidenced in multiple pediatric surgical contexts [11-13].

This study was conducted to assess the efficacy of dexmedetomidine in mitigating emerging delirium in pediatric patients having adenotonsillectomy, considering the therapeutic importance of postoperative agitation and the possible advantages of the drug. The study aims to evaluate its effect on hemodynamic stability, recovery attributes, and the occurrence of adverse events, thereby offering evidence to inform safer and more comfortable perioperative care in pediatric patients.

Material and Methods

A prospective, randomized, double-blind, controlled clinical trial was performed on 50 pediatric children aged 4 to 12 years, categorized as American Society of Anesthesiologists (ASA) physical status I-II, who were scheduled for elective adenotonsillectomy under general anesthesia. This study was conducted at Department of ENT, Tagore Medical College, Rathinamangalam, Melakottaiyur, Chennai, Tamil Nadu, between May 2014 to April 2015. The Institutional

Ethics Committee approved the study, and the parents or guardians of all participants signed a paper giving their full consent. Patients were randomly divided into two equal groups (n = 25 each). All patients received premedication with midazolam (0.05 mg/kg) and glycopyrrolate (0.004 mg/kg).

Inclusion Criteria

- Pediatric patients aged 4-12 years.
- ASA physical status I or II.
- Scheduled for elective adenotonsillectomy under general anesthesia.
- Obtained written informed consent from parents or guardians.

Exclusion Criteria

- History of cardiac conduction abnormalities or bradyarrhythmias.
- Known hypersensitivity or contraindication to dexmedetomidine.
- Neurological, psychiatric, or developmental disorders.
- Chronic medication affecting the central nervous or cardiovascular systems.
- Severe hepatic or renal impairment.
- Patients who required intraoperative blood transfusion or had major surgical complications.

Results

The study included 50 pediatric patients who finished it. The two groups were similar in terms of age, sex, weight, and length of surgery, which shows that the randomization worked. Dexmedetomidine considerably decreased postoperative agitation, ensured stable hemodynamics, and was linked to few adverse effects.

Table 1: Demographic and Baseline Characteristics of Patients

Parameter	Group D (n=25)	Group C (n=25)	p-value
Age (years)	7.4±2.3	7.6±2.1	0.72
Weight (kg)	24.6±4.5	25.2±4.8	0.64
Sex (M/F)	14/11	13/12	0.77
Duration of surgery (min)	45.2±6.8	46.0±7.1	0.64

The dexmedetomidine group (Group D) and the control group (Group C) were well-matched according to demographic data such as age, weight, sex distribution, and

length of surgery. This confirmed that the groups were similar at baseline.

Table 2: Incidence of Postoperative Agitation (PAED Score >12)

Parameter	Group D (n=25)	Group C (n=25)	p-value
Number of patients with agitation	3 (12%)	12 (48%)	0.008
Mean PAED score	4.1±1.2	8.3±1.8	<0.001

The incidence of postoperative agitation was dramatically reduced with dexmedetomidine compared to the control group. Agitation was observed in 48% of patients in Group

C, but only 12% in Group D. The dexmedetomidine group also had a considerably lower mean PAED score (p < 0.001), suggesting a less traumatic emergence.

Table 3. Sedation Scores (5-Point Sedation Scale) at Different Time Intervals

Time (min)	Group D	Group C	p-value
5	3.8±0.7	2.5±0.9	<0.001
10	3.2±0.6	2.8±0.8	0.02
20	2.6±0.5	2.4±0.7	0.21

Sedation scores were greater in Group D at 5 and 10 minutes after extubation, suggesting that patients in this

group were more sedated and showed less restlessness. It appears that normal alertness can be restored without long-

term sedation, as the difference was no longer statistically significant after 20 minutes.

Table 4: Hemodynamic Parameters (Mean \pm SD)

Parameter	Group D	Group C	p-value
Heart rate (bpm)	92.4 \pm 8.3	95.6 \pm 9.1	0.18
Systolic BP (mmHg)	102.5 \pm 6.4	104.2 \pm 7.0	0.28
Diastolic BP (mmHg)	63.2 \pm 5.1	64.5 \pm 5.7	0.36
SpO ₂ (%)	98.5 \pm 1.2	98.8 \pm 1.3	0.42

In both groups, hemodynamic parameters were found to be steady. Two patients in Group D showed moderate bradycardia, although the values were still within what is considered clinically acceptable. There was no statistically significant difference in oxygen saturation or blood pressure among the groups.

Table 5: Recovery Profile and Adverse Events

Parameter	Group D	Group C	p-value
Recovery time (min)	16.4 \pm 2.3	14.2 \pm 2.6	0.01
Nausea and vomiting	1 (4%)	2 (8%)	0.55
Bradycardia	2 (8%)	0 (0%)	0.15
Hypotension	0 (0%)	0 (0%)	-

In a clinically acceptable manner, the dexmedetomidine group had a somewhat longer recovery period. Two patients on dexmedetomidine experienced mild bradycardia, but no episodes of hypotension or other problems occurred, and the number of adverse events was minor. Both groups had similar rates of nausea and vomiting, which occurred rarely.

Discussion

Particularly after adenotonsillectomy, postoperative agitation or emergent delirium is a major worry for pediatric anesthesiologists. It poses risks to the child's and caregivers' mental health, including the possibility of self-injury, disturbance of the surgical site, increased analgesic requirements, and stress. In this study, researchers looked at how well dexmedetomidine worked to calm down young kids after adenotonsillectomy [14-16].

The results showed that dexmedetomidine greatly decreased the occurrence of agitation after surgery. The mean PAED scores were substantially lower in the dexmedetomidine group (12%) versus the control group (48%). These results corroborate earlier research showing that dexmedetomidine reduces emerging delirium in children and adolescents as a result of its sedative, anxiolytic, and analgesic effects. It is ideal for otolaryngological (ENT) procedures that need a secure airway because it allows for a peaceful emergence without respiratory depression [17, 18].

The dexmedetomidine group showed less agitation and more drowsiness in the first ten minutes after extubation, according to the sedation scores. It appears that dexmedetomidine does not significantly prolong sedation or slow recovery because within 20 minutes, sedation levels were similar to the control group. The advantage of reduced agitation more than compensated for the small increase in recovery time shown in the dexmedetomidine group [19, 20].

During the time leading up to surgery, all hemodynamic parameters stayed the same. Two patients on dexmedetomidine experienced mild bradycardia; this condition did not necessitate any treatment. Dexmedetomidine is hemodynamically safe for use in pediatric patients at low dosages, since there was no

significant difference in blood pressure or oxygen saturation levels across the groups. The findings are consistent with earlier research showing that children can safely and effectively receive intravenous dexmedetomidine at doses ranging from 0.5-1 μ g/kg [21-23].

Nausea and vomiting were rare adverse events that occurred similarly across groups. The safety profile of dexmedetomidine in pediatric adenotonsillectomy was highlighted by the absence of significant consequences such as hypotension, respiratory depression, or extended drowsiness. This research shows that dexmedetomidine can be useful for pediatric anesthesia as a premedicant or intraoperative adjunct. By utilizing it, perioperative comfort, agitation, and recovery quality can all be improved. On the other hand, kids who already have bradyarrhythmias or cardiovascular instability should be more careful [24, 25].

Conclusion

Dexmedetomidine is a safe and efficient way to settle down young patients after an adenotonsillectomy. Intravenous dexmedetomidine is safe and effective. It lowers the number and severity of emergence delirium and provides enough sedative for recovery and stable hemodynamic parameters. It helps make patients more comfortable during and after surgery. It's also an excellent supplement to pediatric anesthesia for procedures on the ears, nose, and throat.

Funding

None.

Conflict of Interest

None.

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