

Efficacy of dexmedetomidine as premedication in pediatric patients undergoing tonsillectomy

¹Richa Pande, Post Graduate Student, Department of Anesthesiology, Gandhi Medical College and Hamidia Hospital, Bhopal, Madhya Pradesh, India.

²Sonam Srivas, Post Graduate Student, Department of Anesthesiology, Gandhi Medical College and Hamidia Hospital, Bhopal, Madhya Pradesh, India.

³Akhilesh Yona, Senior Resident, Department of Anesthesiology, Gandhi Medical College and Hamidia Hospital, Bhopal, Madhya Pradesh, India.

⁴Urmila Keshari, Professor, Department of Anesthesiology, Gandhi Medical College & Hamidia Hospital, Bhopal, Madhya Pradesh, India.

Corresponding Author: Urmila Keshari, Professor, Department of Anesthesiology, Gandhi Medical College & Hamidia Hospital, Bhopal, Madhya Pradesh, India.

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Abstract

Introduction: The utility of dexmedetomidine in pediatric patients is increasing for providing good intraoperative hemodynamics, smooth & better postoperative recovery. This study evaluate the intraoperative, postoperative safety & efficacy of dexmedetomidine in pediatric patients undergoing tonsillectomy

Method: The present observational study was conducted on 60 pediatric patients Aged 5-12 Yrs, ASA Gr.1 or 2 Scheduled for elective tonsillectomy surgery & were assigned into two groups who received dexmedetomidine (Grp D) or saline (Grp C) as a premedication 10 mins before induction of anaesthesia.

Intraoperative HR, MAP, duration of surgery, level of sedation, and postoperative visual analog score for pain were recorded and compared.

Results: Dexmedetomidine group had lower HR & MAP compared to control group. The surgical field grading was found better in group D than group C. 83% of Grp D patients shows grade 1& 2 and only 46% in Grp C.

Postoperatively, patients in Group D has higher sedation score (sedation score >3). None of the patients were excessively sedated. No significant difference was found in VAS score at all times in group D only 2 & in group C, 6 patients had mild pain. The time for rescue analgesia was significantly higher in group D than Grp

C. Time to achieve ≥ 9 min, Aldrete score was higher in group D, ($p < 0.05$)

Conclusion: Premedication with dexmedetomidine at the dose of 1ug/kg in children undergoing tonsillectomy showed better hemodynamics & significant decrease in postoperative emergence agitation without any significant side effects.

Keywords: Dexmedetomidine, pediatric, tonsillectomy

Introduction

Tonsillectomy is one of the most common surgical procedures which is performed in pediatric age groups and to control the immediate postoperative pain is challenging in pediatric patients.^[1] Anesthesiologist should aim to provide a stable intraoperative hemodynamics, pain free surgery to the children without any airway complications avoid excessive sedation and smooth recovery in postoperative period.

Tonsillectomy associated with significant postoperative pain. Use of opioids can be associated with respiratory depression, otolaryngologists and anesthesiologists alike must reconcile adequacy of pain control with the risk of respiratory complications after tonsillectomy.^[2,3]

Its important because agents without respiratory depressant effects, such as non-steroidal anti-inflammatory drugs, acetaminophen, and local anesthetics, while used, are often inadequate to treat postoperative tonsillectomy pain.^[4,5]

Inhaled anesthetic agents with low blood-gas solubility such as sevoflurane and desflurane have clinical advantages in allowing rapid induction and emergence. Sevoflurane is widely used as an inhalation anesthetic in children for smooth rapid induction, emergence & to avoid the airway irritation, during the anesthetic induction. However, it is associated with a higher incidence of EA.^[6]

Emergence agitation presents as combative movements, excitability, thrashing, disorientation, and inconsolable crying during recovery and is encountered in up to 80% of children who have received inhalational anesthetics.^[7]

Dexmedetomidine is a highly selective adrenoceptor agonist which produce dose dependent sedation, anxiolysis and analgesia without any respiratory depression.^[8] Dexmedetomidine is being used off-label as an adjuvant agent in pediatric patients for sedation and analgesia. Sedative effects is by inhibition of locus ceruleus. It also decreases the use of opioids, prevent emergence sedation, provide hypotensive anesthesia and postoperative shivering^[9].

It also has a sympatholytic effect by decreasing the release of norepinephrine in the sympathetic nerve endings, which is used as a controlled hypotensive agent and decreases the heart rate and blood pressure and also minimizes bleeding during the procedure.^[10]

Aims & Objectives: This study was done –

- To evaluate the efficacy of Single Dose IV Dexmedetomidine in pediatric patients undergoing tonsillectomy.
- To evaluate Hemodynamic stability & Postoperative Recovery.

Material and method

The present study was a prospective double blind observational hospital-based study was conducted in 60 pediatric patients from 5-12 years admitted to the department of Ear, Nose and Throat, Gandhi Medical College & Hamidia Hospital, Bhopal (MP) for elective tonsillectomy surgery.

Inclusion criteria: Patients belonging to age group 5-12 years, ASA grade 1 or 2 and informed consent taken from parents.

Exclusion criteria: ASA grade 3 or more, patient with acute respiratory tract infection, bleeding diathesis or obstructive sleep apnea, children with a BMI >95th percentile for age.

Methodology: Based on computer generated randomization method, patients were enrolled in two groups:

Group D: n=30 received dexmedetomidine 1ug/kg diluted in 50 ml saline 0.9% and given by IV infusion before 10 mins of induction of anesthesia and

Group C: n=30 received saline of identical amount.

After institutional ethics committee approval and informed consent from the parents. Preoperative fasting advised to the patients.

Premedication with oral midazolam 0.5mg/kg was given to all patients 30 mins before shifting to operating room.

In the operating room, monitors for heart rate, ECG, blood pressure and SPO₂ were attached and baseline vitals were noted. Intravenous access was taken with 22G cannula IV glycopyrrolate 0.01mg/kg was given to decrease oral secretions and IV ondansetron 0.1mg/kg and IV fentanyl 2ug/kg was given to all patients.

Both the surgeon and anesthesiologist administering the drug were blinded to the study.

Group D received IV Dexmedetomidine 1ug/kg infusion over 10mins before induction of anesthesia & Group C received Same volume of IV saline infusion over 10mins before induction of anesthesia.

After preoxygenation for 3 min with 100% oxygen. Patients were induced with propofol 2mg/kg followed by atracurium 0.5mg/kg and layngoscopy and intubation was done. oropharyngeal pack was inserted and anesthesia maintained by O₂ with N₂O (2:1), sevoflurane and atracurium. At the end of the surgery, oropharyngeal pack was removed after gentle suctioning. N₂O was

discontinued and residual neuromuscular blockade was reversed by iv neostigmine 0.05mg/kg & glycopyrrolate 0.01mg/kg once the patients had good respiratory efforts.

. All patients were placed in recovery position and shifted to post anesthesia care unit (PACU).

Parameters that were recorded in both the groups: changes in heart rate and mean arterial pressure during intubation then at 10,20 and 30 mins intraoperatively; duration of surgery, bleeding from the site observed & noted after 15 mins of surgery by

Fromme-boezaart scale: ^[11,12]

Score

0- No bleeding,

1- Minimal bleeding, suctioning not required,

2-Minimal bleeding, suctioning occasionally required,

3- Minimal bleeding, repeated suctioning required,

4- Moderate bleeding, repeated suctioning required, bleeding obscures surgical field,

5 – severe bleeding, surgery not possible as bleeding, completely obscures the surgical field),

• **A. Excellent (Grade 0–1)** • **B. Good (Grades 2–3)**
C. Poor (Grades 4–5).

Level of sedation in PACU at 15mins and 30 mins by

Ramsay sedation score ^[13]

score 1- Patient is anxious, agitated or restless or both,

score 2- Patient is cooperative, oriented and tranquil,

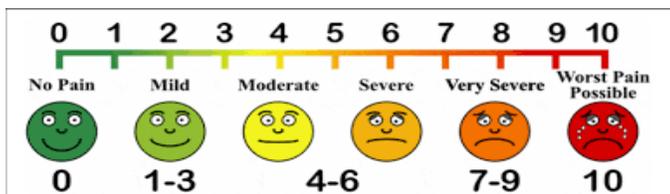
score 3- Patient responds to commands only,

score 4- Patient exhibits brisk response to light, glabellar tap or loud auditory stimulus,

score 5- Patient exhibits sluggish response to light, glabellar tap or loud auditory stimulus,

score 6- Patient exhibits no response),

Postoperative pain using visual analog score (VAS) ^[14]



and need for rescue analgesia and patients were considered ready for discharge from PACU when they achieve Aldrete score [15] of more than 9.

| | |
|--|---|
| Motric activity | |
| ▪ Spontaneous movement when addressed | 2 |
| ▪ Weak spontaneous movements when addressed | 1 |
| ▪ No movement | 0 |
| Breathing | |
| ▪ Coughs on comment or cries | 2 |
| ▪ Keeps the airway open | 1 |
| ▪ Obstructed airways | 0 |
| Blood pressure compared to reference measurement* | |
| ▪ $\Delta < 20$ mm Hg | 2 |
| ▪ $\Delta = 20 - 50$ mm Hg | 1 |
| ▪ $\Delta > 50$ mm Hg | 0 |
| Consciousness | |
| ▪ Awake | 2 |
| ▪ Response to stimulus, reflexes intact | 1 |
| ▪ No answer, reflexes absent | 0 |
| Oxygen saturation | |
| ▪ 100 - 98 % | 2 |
| ▪ 97 - 95 % | 1 |
| ▪ < 95 % | 0 |

*Reference measurement was performed 1½ minutes after administration of the spasmolytic agent.

Statistical analysis

All data were entered in MS excel and analyzed using Statistical Package for the Social Science software and were expressed as percentages, mean with standard deviation. Student T test was used to compare the mean values of age, weight, duration of surgery and Mann-Whitney U test was used for comparing different scores. P<0.05 was considered statistically significant.

Observations & results

This study was done with 60 pediatric patients who underwent elective tonsillectomy surgery.

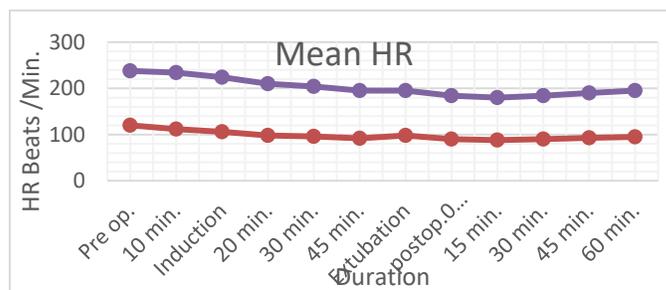
Table 1: demographic characteristics

| Parameters | Group d(n=30) | Group c (n=30) | P value |
|-------------|---------------|----------------|---------|
| Age(years) | 8.9±1.3 | 8.8±1.5 | 0.783 |
| Weight(kg) | 24.6±4.1 | 23.3±4.4 | 0.241 |
| Gender(m/f) | 22/8 | 20/10 | 0.467 |

| | | | |
|---------------------------|----------|---------|-------|
| Duration of surgery (min) | 38 ±2.91 | 47±3.47 | 0.005 |
|---------------------------|----------|---------|-------|

Demographic data (age, weight, sex) of both the groups were comparable & was statistically insignificant (Table1). Hypotensive effect of Dexem, leading to bloodless surgical field, Duration of surgery was significantly lower in Group D (38 ± 2.91 min in Group D vs. 47 ± 3.47 min in Group C, (P = 0.005)

Graph 1: mean heart rate



Heart rate and mean arterial pressure were compared between both the groups. In group D heart rate and MAP both are lower than group C and were statistically significant intraoperatively (p<0.05)

Graph 2: mean map

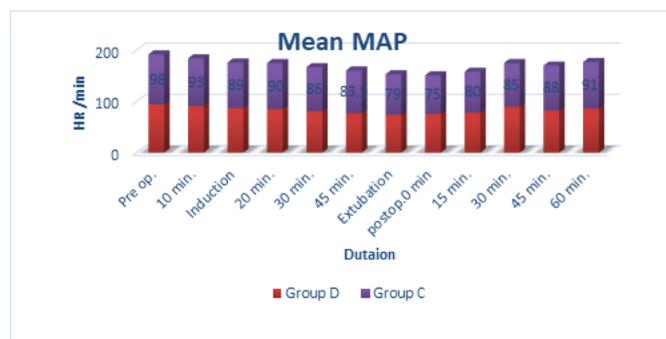


Table 2: bleeding score based on from me -boezart scale

| Grades of surgical field | Group d | Group c | P value |
|---|---------|---------|---------|
| Quality of field after 15 mins of surgery | N=30 | N=30 | |
| 0 | 0 | 0 | 1 |
| 1 | 3 | 0 | 0.007 |
| 2 | 22 | 14 | 0.074 |

| | | | |
|---------|---|----|--------|
| 3 | 5 | 16 | 0.0001 |
| 4 and 5 | 0 | 0 | 1 |

The surgical field grading was found better in group D than group C. 83% of Group D patients shows grade 1 and 2 and only 46% in group C. Only 5 patients in group D had grade 3 and none have grade 4 and 5.

Graph 3: sedation score-Ramsay sedation score



Comparison between two groups showed that there was statistically significant differences in sedation scores at 15 minutes & 30 minutes after surgery. Sedation scores were significantly higher in group D than group C. None of the patients were excessively sedated or had Ramsay sedation score >3.

Table 3: rescue analgesia, vas score and Aldrete score

| Parameter | Group d | Group c | P-value |
|---------------------------------|-----------|-----------|---------|
| Rescue Analgesia (Time in min.) | 74.1±8.78 | 41.20±6.1 | <0.0001 |
| VAS Score | 1 | 28 | |
| | 2-4 Mild | 2 | |
| | 4-7 | 0 | |
| Aldrete Score(min.) | 6.2±3.2 | 9.4±4.8 | 0.003 |
| Time to achieve => 9 | | | |

Comparison between two groups showed that there were statistically significant differences in the time for rescue analgesia (p value<0.0001). The time for rescue analgesia was significantly higher in group D than group.

No significant difference found in VAS score in both the groups at all the times. In group D only 2 and in group C only 6 patients had mild pain. No patient had severe pain in group D and in group C only two patients had severe pain and given fentanyl 0.5ug/kg.

Time to achieve >= 9min, Aldrete score was higher in group D, statistically significant p<0.05

None of the patients in either group encountered any episodes of desaturation (SpO₂ below 95%) during intraoperative period or in the PACU

No drug-related adverse events were observed. There were no episodes of bradycardia or hypotension in both the groups.

Discussion

Premedication is a must and important for pediatric patients. It reduces anxiety, fear, stress and ease of parent-child separation. There are various drugs that have been used and showed variable degrees of effectiveness, acceptance and safety.^[16]

In this study, we observed the efficacy of dexmedetomidine when used as premedication in pediatric patients undergoing tonsillectomy.

Dexmedetomidine infusion at the dose of 1ug/kg used in this study which results in predictable and stable hemodynamics with reduced heart rate and mean arterial pressure as compared with control group, results were similar to the study done by Sharma et al^[17] Predictable hemodynamics without causing hypotension and bradycardia in any patients who received dexmedetomidine.

The demographic profile between the two groups were comparable and did not show any significant statistical difference (p>0.05). Mean age was 8.9±1.3 years in D group and 8.8±1.5 yrs in C group. Mean weight was 24.6±4.1 kg in D group and 23.3±4.4 kg in C group and

mean duration of surgery was 38 ± 2.91 mins in D group and 47 ± 3.4 mins in C group.

Duration of surgery is reduced in Grp D as compared to control grp, because of blunted physiological response and controlled hypotension caused by dexmedetomidine, leading to decrease surgical bleed.

In this study, HR & MAP were compared between both the groups. In group D HR & MAP both are lower than group C & were statistically significant intraoperatively ($p < 0.05$) without causing significant bradycardia & hypotension as compared to the study Hala et al^[18] mean HR were lowered during & after infusion of dexmedetomidine $1 \mu\text{g}/\text{kg}$, 2 patients had significant bradycardia and were managed by atropine and volume infusions and to the study Sophie R et al^[19] also shows better hemodynamics in children with dexmedetomidine.

In this study, the surgical field grading was found better in group D than group C. 83% of Group D patients shows grade 1 and 2 and only 46% in group C. Only 5 patients in group D had grade 3 and none have grade 4 and 5. There was better visibility of structures for surgeon with dexmedetomidine than in control group, it is mainly due to hypotensive anesthesia which maintain better hemodynamics.

Dexmedetomidine was well tolerated, and no drug-related adverse events were observed. There were no episodes of bradycardia or hypotension in both the groups.

Sedation score between two groups was statistically significant differences at 15 min & 30 mins after surgery. Sedation scores were significantly higher in group D than group C. None of the patients were excessively sedated or had ram say sedation score > 3 as seen with other studies also, Sharma et al^[17] & in the study done by Olu Toyin et al^[20] different dose of

dexmedetomidine were compared & no significant difference found in sedation score between the groups, (Sedation score < 4).

In this study, no significant difference found in VAS score in both the groups at all the times. In Grp D only 2 & in group C only 6 patients had mild pain. No patient had severe pain in Grp D & in Grp C only two patient had severe pain & given fentanyl $0.5 \mu\text{g}/\text{kg}$, as in study Sharma et al^[17] postoperative VAS score for pain, though not statistically significant (except at 0h, $P = 0.002$), always lower in group D as compared to group C. In study Patel et al^[21] also found that patient with obstructive sleep apnea, there is decrease postoperative pain scores with dexmedetomidine in patients undergone tonsillectomy.

In this study, The time for rescue analgesia was significantly higher in Grp D than Grp C. Time to achieve ≥ 9 min, Aldrete score was higher in group D, ($p < 0.05$) & Rescue analgesia between two groups showed that there was statistically significant differences in the time (p value < 0.0001). The time for rescue analgesia was significantly higher in Grp D than Grp C Similar to study of Guler et al^[9] found that 23% who received dexmedetomidine and 53% in control group required rescue analgesia in PACU, same results observed by Zanaty & Elmetainy^[22] found that analgesia was better in patients who received dexmedetomidine with lower pain score as compared with ketamine alone. Sharma K et al et al^[17] 2022; conducted prospective, randomized, placebo-controlled study to evaluate the effect of preoperative use of single dose of intravenous dexmedetomidine on intraoperative hemodynamics and postoperative recovery in 60 pediatric patients posted for Elective tonsillectomy. They concluded that Dexem as premedication in Pediatric tonsillectomy ($1 \mu\text{g}/\text{kg}$) found

to be hemodynamically stable with significant decrease in postoperative EA without causing any excessive sedation, desaturation, or any other drug-related adverse events.

In present study None of the patients in both groups had any episodes of desaturation in the PACU or any signs of respiratory depression.

Conclusion

We found that dexmedetomidine, alpha 2 agonist as a premedication decreases anxiety, fear, improve hemodynamics and surgical field and decreases postoperative pain in tonsillectomy.

Limitations: Number of patients should be more for better observations n results.

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