Introduction - Emergence agitation (EA) is defined as a state of disorientation associated with confusion, restlessness, involuntary movements, and inconsolability. EA causes an increased risk of postoperative complications. This study compares the effectiveness of dexmedetomidine and propofol in preventing EA in children undergoing surgeries using sevoflurane anesthesia.

Methods - This prospective randomized double-blind study was conducted from March 2022 to Oct 2023. A total of one hundred were included in the study and randomized to two groups. One group received dexmedetomidine and the other propofol to prevent EA. Pain scores, agitation scores, and sedation levels were compared as per study protocol between the two groups. Results - In our study incidence of EA was higher in the dexmedetomidine (n = 13) group in comparison to the propofol group (n = 5) (p<0.05). A significantly lower mean Observational Pain Score (OPS) was observed among the dexmedetomidine group as compared to the propofol group after extubation (p < 0.05). Also, post extubation mean heart rate was significantly lower in Dexmedetomidine group as compared to Propofol Group.

Conclusion - Dexmedetomidine may provide significant benefits in providing post-op pain relief in comparison to propofol however incidence of emergence agitation appears to be higher with dexmedetomodine when compared to propofol as found in this study. Larger, randomized multicentre trials with appropriate sample sizes will be required to further evaluate the efficiency of these drugs in the prevention of EA.
Methods

This prospective randomized double-blind study was conducted from March 2022 to Oct 23. The study was carried out as per Helsinki protocol. After institutional research and Ethical Committee approval and written parental consent, a total of one hundred and thirty children with age less than 12 years and in ASA Grade 1 or 2 were included in the study. Patients with a history of developmental delay, congenital airway problems, cardiac disorders, psychological disorders, epilepsy and allergy to study medications were excluded from the study. Patients were randomized into the following two groups using simple random sampling (sealed envelope method). Group D received Dexametomidine and Group P received Propofol. All patients meeting the inclusion criteria were studied. After obtaining informed consent and ensuring that they do not fall in the exclusion criteria, they were randomly allocated into either study group. Pre-op NPO of children advised as per established guidelines. Premedication of all children was done with injection midazolam 50 microgram/kg, Injection Glycopyrrolate 10 µg/kg & Injection ketamine 0.5 mg/kg approximately 5 min before separation from the parents. Intraoperative standard monitoring was done with an electrocardiogram, pulse oximeter, noninvasive arterial blood pressure monitoring and End Tidal Carbon-dioxide (EtCo2).

General anesthesia induction was done with injection ketamine 1-2 mg/kg i.v. followed by analgesia with Injection Fentanyl 1 microgram/kg, i.v. Muscle relaxation was given using injection Atracurium 0.5 mg/kg, i.v. Post orotracheal intubation, maintenance of anaesthesia was done with 60% nitrous oxide in oxygen supplemented by an end-tidal concentration of 2%-3% sevoflurane with controlled ventilation, to maintain an EtCo2 of 35 ± 4 mmHg. Patients were assigned to one of two groups according to simple random sampling (sealed envelope method). Fifteen minutes before the end of the surgery, patients in the dexmedetomidine group received 0.4 microgram/kg intravenous dexametomidine diluted to a total volume of 10 ml using saline 0.9% and administered over 5 min, while patients in the propofol group received 10 ml saline 0.9%. Five minutes before the end of surgery, patients in the dexmedetomidine group received saline 0.9%, and patients in the propofol group received a single intravenous bolus of 1 mg/kg propofol. HR, mean arterial pressure (MAP), and peripheral oxygen saturation (SpO2) recordings before induction (baseline), at induction, and every 5 min after induction during the procedure. Neuromuscular blockade reversal with Inj Neostigmine 0.05 mg/kg and Glycopyrrolate 0.01 mg/kg IV. In PACU, the intensity of pain assessment is calculated using the Modified Hannallah pain score11 – an Observational Pain Score (OPS). Score ≥ 4 was an indicator of pain which was treated with injection Paracetamol 15 mg/kg. EA was quantified using the Pediatric anesthesia emergence agitation (PAEA) scale12 in which a Score ≥ 10 is an indicator of agitation. The sedation level of children was quantified using the Ramsay sedation score (RSS). RSS ≥ 3 was considered significant sedation.

Discharge from PACU of children was done after obtaining an Aldrete discharge scoring system ≥ 9.13 Data so obtained was analyzed using Statistical Package for Social Sciences (SPSS). Results are presented as the mean or their confidence interval. Intergroup statistical analysis was performed using appropriate standard statistical datasets.

Table 1: Comparison of mean value of Heart Rate between Study Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>HR (Mean±SD) (n=65)</th>
<th>Group</th>
<th>HR (Mean±SD) (n=65)</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group D</td>
<td>78.1±14.6</td>
<td>Group P</td>
<td>78.2±14.6</td>
<td>0.2 ± 0.2</td>
<td>0.95</td>
</tr>
<tr>
<td>Group D</td>
<td>78.1±14.6</td>
<td>Group P</td>
<td>78.2±14.6</td>
<td>0.2 ± 0.2</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Table 2: Comparison of mean value of OPS Score between Study Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>OPS (Mean±SD) (n=65)</th>
<th>Group</th>
<th>OPS (Mean±SD) (n=65)</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group D</td>
<td>8.7±0.8</td>
<td>Group P</td>
<td>8.6±0.8</td>
<td>0.1 ± 0.1</td>
<td>0.36</td>
</tr>
<tr>
<td>Group D</td>
<td>8.7±0.8</td>
<td>Group P</td>
<td>8.6±0.8</td>
<td>0.1 ± 0.1</td>
<td>0.36</td>
</tr>
</tbody>
</table>

*Significant p-value < 0.05, statistically significant
The demographic profiles of age, sex, and weight were comparable with a p-value > 0.05. Also, both the groups were comparable with respect to ASA Grading (p=0.380). Mean Spo2 values were comparable between the study groups from pre-intubation to till prior to discharge from PACU (P-value >0.05). The comparable values of the study drugs in maintaining Spo2 signify the safety profiles of these drugs in maintaining respiration and oxygenation in the postoperative period. Mean EtCO2 values were comparable between the study groups from pre-intubation to till prior to discharge from PACU (p > 0.05).

In our study incidence of EA was higher in the dexmedetomidine (n = 13) group in comparison to the propofol group (n = 5) (p<0.05) Bong, CL et al14 had shown both propofol and dexmedetomidine being comparable in the reduction of EA. Monaz Abdulrahman Ali et al15 had contradictory findings with dexmedetomidine being better than propofol for the management of EA. Guler et al16 concluded that dexmedetomidine decreased the incidence of EA, however, this study did not compare dexmedetomidine with any other drug. Also, this study showed a significant delay in emergence and extubation times. Propofol appears superior to dexmedetomidine in decreasing EA in our study which can be attributed to smooth and delayed recovery from propofol. Also, studies have shown increased residual side effects and euphoric effects in the early recovery period.17,18 We opine that larger randomized trials are required to study the aspect of EA post anaesthesia.

In our study mean heart rate of the study patients was comparable at pre & post-intubation among both study groups. Post extubation mean heart rate was significantly lower among Group D as compared to Group P till prior to discharge from PACU (p < 0.05). However, a decrease in heart rate was not significant in any patient so as to require pharmacological intervention. Also, this decrease in heart rate in the dexmedetomidine group can be attributed to better analgesic properties in comparison to propofol. Dexmedetomidine produces dose-dependent HR and BP decrease.19 However study by Monaz Abdurahman Ali et al15 showed no significant hemodynamic effect. In our study mean MAP were comparable between the study groups for all mean values starting from pre-intubation till discharge from PACU (p > 0.05).

In the present study, a significantly lower mean OPS Score was observed among the dexmedetomidine group as compared to the propofol group at 15 minutes post-extubation. (p < 0.05). Monaz Abdurahman Ali et al19 found that the modified OPS was...
significantly lower with dexmedetomidine in comparison to propofol. Aiji Boku et al20 also concluded that dexmedetomidine administration has the advantage of a reduced pain score. The presence of pain is thought to be one of the major causes of EA, but painless treatment does not guarantee calm emergence from sevoflurane anesthesia.21 Isik et al22 reported that EA was seen in 48% of pediatric patients after sevoflurane anesthesia for MRI, where the pain is not a factor. Nevertheless, the properties to induce emergence sedation could explain the preventive effect. The findings in our study do not conclude the superiority of propofol and dexmedetomidine over each other in the prevention of EA. As statistically significant values were not derived, larger randomized multicentre trials with appropriate sample sizes will be required to further evaluate the efficiency of these drugs in the prevention of EA.

The findings of our study also conclude a decrease in pain score post-extubation with dexmedetomidine in comparison to propofol. However, this property of dexmedetomidine did not decrease the incidence of EA confirming findings of studies stating analgesia is not the only criteria to decrease EA and multi-factorial cause needs evaluation. Both dexmedetomidine and propofol increase emergence and extubation time due to their sedative and hypnotic properties.19,23 However our study could not corroborate this finding as a placebo group would be required for analysis. Emergence agitation is a proven treatable entity with adverse effects affecting post-operative care of paediatric patients due to multiple factors. Further studies are a necessity to evaluate the efficacy of various drugs in decreasing the incidence while at the same time maintaining the safety profile of not prolonging emergence and extubation times due to residual sedative and hypnotic effects.

Conclusion

Dexmedetomidine may provide significant benefits in providing post-op pain relief in comparison to propofol however incidence of emergence agitation appears to be higher with dexmedetomidine when compared to propofol as found in this study.

Larger, randomized multicentre trials with appropriate sample sizes will be required to further evaluate the efficiency of these drugs in the prevention of EA.

References