INCIDENCE OF BRADYCARDIA IN INFANTS UNDERGOING INTUBATION WITH OR WITHOUT ATROPINE

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Abstract: Bradycardia is a life-threatening arrhythmia that endangers life by compromising blood flow to the brain. During intubation, its prevention is life-saving—the benefit of atropine in preventing bradycardia before intubation is controversial in the literature. Objective: The objective of the study was to find and compare the incidence of bradycardia with and without atropine.

Methods: This single-centre randomised controlled trial was conducted at a tertiary care pediatric emergency department for six months. After applying inclusion and exclusion criteria, children were divided into two groups. Group 1 was given atropine before intubation, and group 2 was not. The overall incidence of bradycardia in subgroups was noted, along with the number of attempts and intubation time. Data was analysed using SPSS 26.0. Results: 86 patents were included in the study, with 43 in both groups. The mean age of the participants was 69.02±109.10 days. 48 (55.8%) were males and 38 (44.2%) were females. The incidence of bradycardia was 7% (6 Patients), with no statistically significant difference in both the groups (p-value was greater than 0.05). The number of attempts for intubation and intubation duration was also neither associated with bradycardia nor with atropine use. (p-value> 0.05). Conclusion: There is a higher incidence of bradycardia during intubation in children, with no significant difference in its occurrence with the use of atropine.

Keywords: Atropine, Bradycardia, Intubation, Infants.

Introduction

Children require endotracheal intubation to secure the airway and to provide assisted ventilation.(1) Hypoxemia, bradycardia, and hypotension may occur during intubation, which are potential physiologic responses to intubation that have been reported in pediatric studies.(2, 3) Recommendation of Rapid sequence intubation (RSI) is a systematic strategy to prevent complications during intubation and advocates using pre-oxygenation and pre-medications to achieve the goal without complication.(4) Bradycardia during intubation is reported due to vagal stimulation from the intubation equipment, i.e. laryngoscopy blade or endotracheal tube, secondary to hypoxia resulting from the removal of the patient’s drive to breathe with soothing agents, or as a result of adverse effects from other commonly used premedication agents (mainly succinylcholine).(1, 5) Atropine sulfate, an anticholinergic agent, (6) blocks the vagus nerve by reducing the parasympathetic nervous system's effect. Thus, it stimulates the sinoatrial node and conduction through the cardiac electrical system, resulting in cardiac muscle contraction.(7) Because bradycardia is associated with vagal stimulation, atropine is a natural choice for counteracting these effects. In addition to increasing heart rate, atropine reduces respiratory secretions, effectively 'drying out' the airway and facilitating visualisation of the glottis.(7, 8) The use of atropine during routine RSI procedures is controversial. Some studies recommend the use of atropine as pre-medication to prevent bradycardia.(9, 10) Other studies have shown no benefit from the use of atropine before intubation.(11-13) Thus, careful analysis and evidence-based studies' recommendations are still needed. We hypothesise that pre-medication for intubation with atropine will maintain heart rate stability compared to the non-atropine group without prolonging the time to completion of intubation and will prevent bradycardia. Here, we aimed to analyse the incidence of bradycardia with and without the use of atropine as pre-medication before intubation. Thus, this study seeks to identify the incidence of bradycardia, both with and without the administration of atropine.

Methodology

This was a randomised, blinded control study conducted at G Pediatric Emergency Department Ghurki Trust Teaching Hospital, Lahore, for 6 months. The ethical review board approved the institution's study, and informed consent was taken from the parents. A sample size of 86 patients (43 patients in each group) was estimated using 95% confidence levels and 10% absolute precision with an expected %age of Bradycardia with atropine at 35.7% and no atropine at 10.7%.(11) The non-probability consecutive sampling technique was used to select the sample.

Any child under 1 year of age, including preterm, requiring intubation having intravenous access was included in the study.

Any child requiring cardiac compressions, having Congenital cyanotic heart disease, Obvious airway abnormalities, hypothermia and Child receiving succinylcholine during intubation were excluded from the study.

Any child under 1 year of age requiring intubation obeying inclusion and exclusion criteria after parental informed consent in the emergency department was divided into two groups-

- Group 1 received atropine at 0.02 mg/kg intravenous/intraosseous and repeats once if needed; the minimum dose is 0.1 mg, and the maximum single dose is 0.5 mg. (12)
- Group 2 didn’t receive atropine, and we compared the heart rate 2 minutes before intubation, during intubation and 2 minutes after intubation and the duration of intubation between 2 groups. We defined bradycardia as heart beats more slowly than expected, under 100 beats per minute. The primary outcome measure focuses on a heart rate falling below 100 beats per minute within 5 to 6 minutes.

Secondary outcome measures encompass the duration and number of intubation attempts made during the procedure. A proforma also recorded additional data about the child's age, number of intubation attempts, and time. The data was analysed using SPSS 26.

### Results

There were 86 (43 in each group) patients in our study, with a mean age of 69.02±109.10 days (0–332 days) and a mean weight of 3.28 ± 1.85 kg. 48 (55.8%) were males and 38 (44.2%) were females. There were 55 (64%) children who had ages less than 1 month and 17 (19.8%) and 14 (16.3%) who had ages less than 6 months and less than 1-year, respectively. 85 (98.8%) intubation was made in 1st attempt and less than 1 minute, whereas 1 (1.2%) child was intubated in more than 1 attempt and took more than a minute. Hypoglycemia (BSR 35) was observed only in 1 (1.2%) patient with a mean glucose level of 118.34±51.69mg/dl. 6 patients developed bradycardia. In patients who were not given atropine, and 80 (93%) patients did not have bradycardia. So, the incidence of bradycardia was 7%. (Table 1)

### Table 1: Descriptive Statistics of Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contracts</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intubation Time</td>
<td>Less than 1 min</td>
<td>85</td>
<td>98.8%</td>
</tr>
<tr>
<td></td>
<td>More than 1 min</td>
<td>1</td>
<td>1.2%</td>
</tr>
<tr>
<td>Attempts for intubation</td>
<td>1st Attempt</td>
<td>85</td>
<td>98.8%</td>
</tr>
<tr>
<td></td>
<td>&gt; 1 Attempt</td>
<td>1</td>
<td>1.2%</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>Yes</td>
<td>6</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>80</td>
<td>93%</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>Yes</td>
<td>1</td>
<td>1.2%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>85</td>
<td>98.8%</td>
</tr>
</tbody>
</table>

After stratification of the variable, we found that out of 6 patients with bradycardia, 2 were males and 4 were females. Both the groups were not significantly associated with each other, i.e, p value < 0.05. All the patients who had bradycardia were intubated on 1st attempt with a time of less than a minute. In a sub-group analysis, 3 (6.97%) patients developed bradycardia in patients who were given atropine and 40 (93.02%) children did not develop bradycardia. The exact percentages were observed in children who were not given atropine. There was no significant association between bradycardia and the use of atropine since the value was 1.00. The association of striated variables and their p values are given in table 2:

### Table 2: Association of variables and bradycardia

<table>
<thead>
<tr>
<th>Variables</th>
<th>Contracts</th>
<th>Bradycardia</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male (48)</td>
<td>2</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Female (38)</td>
<td>4</td>
<td>34</td>
</tr>
<tr>
<td>Intubation Time</td>
<td>Less than 1 (85)</td>
<td>6</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>More Than 1 min (1)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Attempts for intubation</td>
<td>1st Attempt (85)</td>
<td>6</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>&gt; 1 Attempt (1)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Atropine Given</td>
<td>Yes (43)</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>No (43)</td>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>Yes (1)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No (85)</td>
<td>6</td>
<td>79</td>
</tr>
<tr>
<td>Age Strata</td>
<td>Less than 1 month (55)</td>
<td>4</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>Less than 6 months (17)</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Less than 1 year (14)</td>
<td>0</td>
<td>14</td>
</tr>
</tbody>
</table>

Among the groups, 24 (55.8%) males and 19 (44.2%) females were in both groups with and without atropine. In the Atropine group, one (1.2%) patient had more than one incubation attempt and an intubation time of more than 1 minute. Whereas, in patients who were not given atropine, all were intubated in 1st attempt and less than a minute. In

the Atropine group, there were 23 (53.5%) patients with age
less than 1 month, 11 (25.6%) with less than 6 months of age
and 9 (20.9%) patients with age less than a year. In the no-
atropine group, 32 (74.4%), 6 (14.0) and 5 (11.6%) children
were in all three strata, respectively. All these variables and
primary endpoint, i.e., bradycardia, were not associated
with both groups. A statistically insignificant p-value was
found in all these cases, as given in Table 3.

Table 3: Comparison of variables between atropine and no-atropine groups:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Contracts</th>
<th>Atropine</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male (43)</td>
<td>24</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Female (43)</td>
<td>24</td>
<td>19</td>
</tr>
<tr>
<td>Intubation Time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less than 1 (85)</td>
<td>42</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>More Than 1 min (1)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Attempts for intubation</td>
<td>1st Attempt (85)</td>
<td>42</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>&gt; 1 Attempt (1)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bradycardia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes (6)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>No (80)</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes (1)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>No (85)</td>
<td>6</td>
<td>79</td>
</tr>
<tr>
<td>Age Strata</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less than 1 month (55)</td>
<td>23</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Less than 6 months (17)</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Less than 1 year (14)</td>
<td>19</td>
<td>5</td>
</tr>
</tbody>
</table>

Discussion

The literature has been controversial regarding the use of
atropine as a premedication. Guidelines regarding its use
before intubation have also been variable at different times.
We aimed to analyse the effectiveness of atropine in
preventing bradycardia, and we studied two groups with and
without atropine to look for bradycardia during and after
intubation.

In our study, 7% of patients had bradycardia, and equal
incidence was observed in both groups. No significant
relationship was found between preventing bradycardia and
atropine. This incidence was also in a considerable
disproportion to another study by Saeed et al., where
bradycardia was reported to be 46.7 %, in contrast to our
research. Other studies have reported a comparable
incidence of bradycardia to our research. In our study,
the distribution of incidence was also equal, with no
statistically significant difference between the groups.

Three patients in both groups had bradycardia.
A recent study in Baghdad reported a significant reduction
in the use of atropine. This study was an observational
study conducted in a specific population of acute illness in
intensive care settings and has higher validity to provide the
evidence. However, the study provided a lower level of
scientific evidence than experimental study designs in the
literature. The benefit of atropine use was endorsed by
a recent randomised trial by Jones et al. As well. This trial
was conducted on 327 critically ill patients, and a significant
difference in arrhythmia was noted in the atropine group as
compared to the control (9.45% vs 26.5%). However,
many studies have contradicted this—that reported to have
insignificant differences in the incidence of bradycardia
with the use of Atropine. Desalu et al. have observed this.
They conducted a study on children of age less
than 1 year undergoing elective intubation; the study
reported a low incidence of bradycardia since they defined
it to be less than 60 per minute, which is usually not the case
in the pediatric population. He reported no bradycardia with
the use of atropine and no significant difference between the
groups. This can be explained by the elective nature of
the procedure and the absence of obvious ongoing life-
threatening pathology, contradictory to our study, which
was performed in intensive care unit (ICU) settings,
predisposing many risks for developing bradycardia.
Another study conducted on critically ill patients advocated
that there is no benefit in the prevention of bradycardia with
the use of atropine as premedication. (19)

The number of attempts and intubation time was not
affected by the use of atropine in our study. These results
are in accordance with the literature reported. (14, 16, 20)
The occurrence of hypoglycemia was also studied but was
not found to be significant.

There are a few limitations to our study. It was conducted in
a single centre on a limited population with a small sample
size. Many confounders that contribute to the development
and prevention of bradycardia were not considered. (20, 21)
A multicenter large trial with multivariate analysis is
recommended.

Conclusion

There is a higher incidence of bradycardia during intubation
in children, with no statistically significant difference with
the use of atropine. Routine use of atropine before
intubation for the prevention of bradycardia is not
recommended. Furthermore, a multicenter large trial
involving multivariate analysis is also recommended.

Declarations

Data Availability statement
All data generated or analyzed during the study are included
in the manuscript.

Ethics approval and consent to participate.
Approved by the department Concerned.

Consent for publication
Approved

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Conflict of interest

The authors declared an absence of conflict of interest.

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(Associate Professor)
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MUHAMMAD ARSHAD (Senior Registrar)
Drafting
HIRA ADIL (Consultant Plastic Surgeon)
Concept & Design of Study.

References