ATTENUATION OF HEMODYNAMIC RESPONSES FOLLOWING LARYNGOSCOPY AND TRACHEAL INTUBATION

- Comparative assessment of Clonidine and Gabapentin Premedication

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Abstract

Objective: The present study was conducted to compare the effect of clonidine and gabapentin premedication in modifying the hyperdynamic response following laryngoscopy and tracheal intubation.

Methods and Materials: Seventy-five ASA I-II patients of both sexes (37 males (49.3%), 38 females (50.7%)) 18 to 45 years (mean 32.8 ± 8.65yr.) were randomly allocated into three equal groups (25 each). Group-1 received 0.2 mg clonidine, Group-2 received placebo and Group-3 received 900 mg gabapentin, 120 minute before operation. Heart rate, systolic, diastolic and mean arterial blood pressure were measured before induction of anesthesia, before laryngoscopy, and 1, 3, 5, 10 min after intubation.

Results: Analysis revealed that the heart rate, systolic, diastolic and mean arterial blood pressure significantly differed between groups (p<0.001, p = 0.003, p<0.001, p<0.001, respectively). The highest rates of heart rate, systolic, diastolic and mean arterial blood pressure were in the placebo group and in one minute after laryngoscopy, and the lowest rate were in the gabapentin group at the time of 1, 3, 5 and 10 after laryngoscopy, except that the lowest rate of heart rate in 10 min after laryngoscopy was in clonidine group.

Conclusion: The data propose that both clonidine and gabapentin have effective role in blunting hyperdynamic responses after laryngoscopy, more so with gabapentin.
Introduction

Manipulation of the respiratory tract such as in laryngoscopy and tracheal intubation are associated with hemodynamic and cardiovascular responses consisting of increased circulating catecholamines, heart rate, blood pressure, myocardial oxygen demand, tachycardia and dysrhythmias. In the recent decade, several studies have focused on clonidine and newly on gabapentin premedication to attenuate the hemodynamic responses following laryngoscopy and intubation. However, there was no comparative study.

Clonidine is a α2- adrenoceptor agonist with sedative and analgesic effects, also has the beneficial effect of blunting hyperdynamic responses due to laryngoscopy and tracheal intubation. In addition gabapentin, a structural analogue of the γ-aminobutyric acid (GABA) is known as an anticonvulsant drug that has various analgesic effects. Recently, its role in attenuating of hemodynamic responses following laryngoscopy and intubation has been noticed.

The present study was performed to compare the effect of clonidine and gabapentin on modifying the hemodynamic responses following laryngoscopy and tracheal intubation.

Methods and Materials

Data source

Written informed consent from all patients was obtained and the study was approved by the Hospital’s Ethics Committee.

This is a double-blind, placebo-controlled randomized study. Seventy-five ASA I-II patients aged 18-45 years (mean 32.8 ± 8.65 years) of both sexes comprised of 37 male (49.3%) and 38 female (50.7%) were enrolled into the study. Patients were scheduled for elective orthopedic and general surgical procedures under general anesthesia. Exclusion criteria consisted of urgent surgical procedures, body mass index (BMI) more than 30, hiatal hernia, gastroesophageal reflux, history of allergy to clonidine or gabapentin, history of cerebrovascular, neurologic, cardiovascular, respiratory, hepatic and renal disease, hypertension and pheochromocytoma, patients with history of drug or alcohol abused, patients who were administered daily β-blocker, antidepressant, anti-anxiety, anticonvulsant or antipsychotic drugs, any history of immunity response to muscle relaxant drugs or history of neuromuscular disease that would made muscle relaxants contraindicated, difficult intubation (Mallampati class III-IV or laryngoscopic grade III-IV), prolonged laryngoscopic time (more than 30 second).

Randomization and drugs

Patients were randomly divided to three equal groups (25 each) according to a computerized random table. All patients received premedication drugs 120 minute before admission to the operating room.

Group-1, patients received 0.2 mg clonidine (0.2 mg × 1 capsule + 2 placebo capsules).

Group-2, patients received placebo (3 capsules).

Group-3, patients received 900 mg gabapentin (300 mg × 3 capsules).

Technique of anesthesia

Following insertion of intravenous catheter, all patients were infused with 5 ml/kg normal saline. Routine monitoring comprised, ECG, pulse oximetry, and non-invasive blood pressure.

2.5 µg/kg Fentanyl and 0.03 mg/kg midazolam intravenous as premedication was administered before induction of anesthesia. Patients were preoxygenated for 3 minutes with oxygen 100% and anesthesia was induced with 5 mg/kg thiopental sodium and 0.5 mg/kg atracurium. Three minutes later, laryngoscopy using Macintosh blade size 3 and intubation using intratracheal tube (size 7.5-8) were performed by an anesthetist or by a two-year trained resident in anesthesiology. Heart rate, systolic, diastolic and mean arterial blood pressure were recorded before induction of anesthesia, before laryngoscopy, and 1, 3, 5, 10 min after intubation.

Statistical analysis

Data was represented as mean ± standard deviation for interval and count (relative frequency) for categorical variables. Baseline data were compared among study groups by one-way analysis of variance (ANOVA) for interval and Chi-square (and Fisher’s
exact) test for categorical data. Repeated measure ANOVA model was used to compare variations in different time intervals and among study groups. A p-value of less than 0.05 was considered significant. Statistical analysis was performed using SPSS 11.5 for Windows (SPSS Inc., Chicago, Illinois).

Results

Table-1 shows distribution of sex, mean of age and weight in each group with no significant differences between the three groups (respectively; p = 0.5, p = 0.2, p = 0.4).

HR: The placebo group recorded highest mean HR 101.16 ± 16.48 (beat/min) in one minute after laryngoscopy. The clonidine group recorded the lowest HR 69.12 (beat/min) in 10 minutes after laryngoscopy. Heart rate differed with regard to groups (p<0.0001) also with regard to time between groups (p<0.0001). HR profile is shown in (Fig.1).

SAP: The highest mean SAP 148.88 ± 14.12 (mmHg) belonged to placebo group in one minute after laryngoscopy and the lowest one was 99.76 ± 14.69 (mmHg) belonged to gabapentin group in 10 minutes after laryngoscopy. SAP differed with regard to group (p = 0.003) also with regard to time between groups (p<0.0001). SAP profile is shown in (Fig. 2).

DAP: The highest mean DAP was 98.60 ± 11.49 (mmHg) belonged to placebo group in one minute after laryngoscopy and the lowest one was 65.72 ± 9.70 (mmHg) belonged to gabapentin group in 10 minutes after laryngoscopy. DAP differed with regard to group (p<0.0001) also with regard to time between groups (p<0.0001). DAP profile is shown in (Fig. 3).

MAP: The highest mean MAP was 115.36 ± 11.40 (mmHg) belonged to placebo group in one minute after laryngoscopy and the lowest one was 77.07 ± 10.43 (mmHg) belonged to gabapentin group in 10 minutes after laryngoscopy. MAP differed with regard to group (p<0.0001) also with regard to time between groups (p<0.0001). MAP profile is shown in (Fig. 4).

Discussion

Gabapentin is a known anticonvulsant drug with wide spread effects on pain. Its efficacy on attenuating hemodynamic responses following laryngoscopy was revealed by Fassoulaki and colleagues in 2006. They showed SAP and DAP significantly were lower in the gabapentin group than in the control group (p<0.05) immediately also in 1, 3, 5 and 10 minute after laryngoscopy but HR did not differ between two groups at any of the times. Kayan and colleagues in 2008 demonstrated attenuation of gabapentin on MAP in the first 10 minutes following endotracheal intubation.

The attenuating effect of clonidine has previously been documented by many studies. Our data also confirmed HR, SAP, DAP and MAP significantly differ with regard to groups and to times (all the p-values were less than 0.05). Between the groups, the highest rate of HR, SAP, DAP and MAP were in the placebo group especially in one minute after laryngoscopy. It follows that both clonidine and gabapentin have effective roles in blunting hemodynamic responses following laryngoscopy.

The type of surgery and the quantity of surgical stimulation in the first 10 min of anesthesia induction was not exactly adjusted in all patients. These can be

<table>
<thead>
<tr>
<th>characteristics</th>
<th>Clonidine group (Group-1)</th>
<th>Placebo group (Group-2)</th>
<th>Gabapentin group (Group-3)</th>
<th>P-value</th>
</tr>
</thead>
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<tr>
<td>Gender</td>
<td></td>
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<td></td>
<td>0.5</td>
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<tr>
<td>Male</td>
<td>13(52%)</td>
<td>14(56%)</td>
<td>10(40%)</td>
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<tr>
<td>Female</td>
<td>12(48%)</td>
<td>11(44%)</td>
<td>15(60%)</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>32.88 ± 8.57</td>
<td>30.72 ± 7.59</td>
<td>34.96 ± 9.51</td>
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</tr>
<tr>
<td>Weight (kg)</td>
<td>67.88 ± 11.25</td>
<td>67.12 ± 14.65</td>
<td>71.32 ± 10.68</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Values are presented as n (%) or mean ± SD.
considered as our study limitation; however, an effort was made to start surgery 10 min after anesthesia induction.

Conclusions

Results of our study suggest that both clonidine and gabapentine have effective roles in blunting the hyperdynamic responses following laryngoscopy, more so with gabapentine. It also suggests that there are significant differences between gabapentin, clonidine and placebo in modifying the hemodynamic responses in the first 10 min. after laryngoscopy. It is recommended that further studies be done to compare the effects of gabapentine and its dosage, with the newer α₂ adrenoceptor, like dexmedetomidine, on modifying the hemodynamic variables following laryngoscopy.

Fig. 1
Plot of estimated means of HR according to groups and time

Fig. 2
Plot of estimated means of SAP according to groups and times

Fig. 3
Plot of estimated means of DAP according to groups and times

Fig. 4
Plot of estimated means of MAP according to groups and times
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References


