The effect of oral clonidine pretreatment on intraocular pressure and hemodynamic stability after succinylcholine injection and intubation in cataract surgery

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Abstract

Background: Providing better surgical conditions with meticulous control of Intraocular Pressure (IOP) is one of the most important factors that affect the success rate in ophthalmic surgery. Clonidine is a selective central $\alpha_2$ agonist with analgesic, antianxiety and sedative effects which makes it a good choice in premedication recently. In this study, we compared the effects of oral clonidine with oral diazepam as premedicants on IOP and hemodynamic stability after injection of succinylcholine and intubation in cataract surgery.

Methods: 109 patients with physical status 1-2 were randomly assigned in 2 groups. The C Group (54 cases) was treated with oral clonidine (3 mg/kg) and the D group (55 cases) was treated with oral diazepam (0.15 mg/kg), 2 hours before induction of anesthesia. Induction of general anesthesia in all patients was performed with sodium thiopental (5 mg/kg), fentanyl (2 mcg/kg) & succinylcholine (1.5 mg/kg). Heart rate and mean arterial blood pressure were measured before and immediately after induction and 5 & 10 minutes after intravenous injection of succinylcholine. Measurements of IOP were performed before and 5 and 10 minutes after injection of succinylcholine.

Results: IOPs' were always lower in C group as compared with D group but the IOP difference between groups was only significant at 5 minutes after succinylcholine injection. Mean arterial blood pressure and pulse rate were lower in C group compared with D group and the most significant difference observed was at the time 5 minutes after succinylcholine injection.

Conclusion: Small doses of oral clonidine as premedicant can effectively reduce the IOP and provide better hemodynamic stability after intravenous injection of succinylcholine and intubation in cataract surgery.

Keywords: clonidine, diazepam, succinylcholine, IOP, cataract.

Introduction

Although many anesthetic drugs can reduce intraocular pressure (IOP), succinylcholine transiently elevates IOP 2-4 minutes after IV injection [1]. Sudden significant rise of IOP can produce permanent loss of vision perioperatively, so success in ophthalmic surgery mainly depends on meticulous control of IOP [2,3]. Therefore, many drugs and methods have been proposed to prevent IOP rise in ophthalmic surgery [1,4,5]. Clonidine is an imidazoline derivative, selective central $\alpha_2$ agonist with analgesic, antianxi-
The effects of oral clonidine...
The mean arterial blood pressure (MAP) in clonidine group was significantly lower than diazepam group immediately after intubation (MAP1) (P<0.01, Table-3). Heart rate (HR) increased in response to intubation in the two study groups but the difference between mean HR before and after intubation was only significant in D group (P<0.001). In addition mean HR after intubation was significantly lower in C group as compared with D group (P<0.008) (Table 3).

**Conclusion**

Many drugs including carbonic anhydrase inhibitors, myotics, beta blockers, calcium channel blockers, etc. have been used to reduce IOP in ocular surgery [5,10]. Most anesthetic drugs except for succinylcholine and ketamine have a lowering effect on IOP, too [1]. Transient IOP elevation after IV succinylcholine injection may lead to adverse outcome in ocular surgery and several studies have been performed to assess the effectiveness of some drugs or premedicants on reducing IOP and providing better surgical conditions [3]. Low dose oral clonidine (0.15mg) was effective in terms of anxiolysis, sedation, stable hemodynamics, and lowering effect on IOP and perioperative endocrine stress responses [11]. The effectiveness of oral clonidine(300μg) [12] or smaller doses like 2-2.5μg/kg as premedication on prevention of IOP rise following IV succinylcholine was confirmed by other studies [2,6,8,11,12].

In the study, 5 and 10 minutes after induction of anesthesia there was a decline in IOP compared with the time before anesthesia in the two study groups, which could be related to anesthetic drugs, but the difference of mean IOP between the clonidine and diazepam groups was only significant at 5 minutes after IV succinylcholine injection (immediately after intubation). Considering the transient rise of IOP, 2-4 min after IV succinylcholine and significantly lower IOP in the clonidine group at the same time, we conclude that clonidine and not diazepam had successfully prevented the IOP rise after intubation.

<table>
<thead>
<tr>
<th>Time</th>
<th>MAP (mmHg)</th>
<th>PR (beat/min)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Before induction</td>
<td>After intubation</td>
</tr>
<tr>
<td></td>
<td>Clonidine</td>
<td>Diazepam</td>
</tr>
<tr>
<td>88.6±11</td>
<td>87.3±13</td>
<td>78.6±12</td>
</tr>
<tr>
<td>95.1±16</td>
<td>94.3±17</td>
<td>82.2±13</td>
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<tr>
<td>77.5±15</td>
<td>79.5±14</td>
<td>75.9±14</td>
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<tr>
<td>82.1±15</td>
<td>91.1±17</td>
<td>83±15</td>
</tr>
</tbody>
</table>

1,2,3. Difference between two study groups are significant. (1: P <0.01, 2: P ≤ 0.008, 3: P ≤0.05).

SBP=Systolic Blood Pressure, MAP=Mean Arterial Pressure, PR=Pulse Rate.

**Table 3. Mean of hemodynamic indices at different times in clonidine and diazepam groups.**
In general, IOP was measured indirectly by Indentation tonometry (Schiotz) and Applanation tonometry. There might be errors in two methods and after repeated measurements IOP could be underestimated [6,13], so in a study a placebo group was used to limit the biases caused by repeated IOP measurements.

All hemodynamic indices (HR, MAP) in clonidine group were lower than the diazepam group but the difference between the two groups was only significant at the time immediately after intubation. In other words, the stress response to intubation was significantly lower in the clonidine group as compared with the diazepam group and clonidine was able to provide more hemodynamic stability, although in one study there was no significant discrepancy between clonidine and diazepam in terms of hemodynamic stability after laryngoscopy and tracheal intubation [14].

Complications such as tachyphylaxis, contraction of posterior segment vasculature, depression, syncope, hypotension, and allergy-like syndromes were seen after long-term treatment with α₂-agonists for IOP control in Robin et al’s study [15]. Larger doses of clonidine (5 μg/kg) are thought to produce severe hypotension and bradycardia [6,16], but there is no evidence that single clonidine doses of 2-3μg/kg could result in major hemodynamic complications [2,6,17]. We had no significant adverse effects like hypotension, syncope, and bradycardia in our patients.

A dose of 3μg/kg oral clonidine is a safe and effective premedicant compared with oral diazepam for IOP reduction and provides hemodynamic stability in cataract surgery in elderly patients.

References
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