The Effect of Different Doses of Intramuscular Xylazine HCl Administration on Intraocular Pressure in Rabbits

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INTRODUCTION

Xylazine HCl is an alpha-2 adrenoceptor drug that has muscle relaxant, sedative and analgesic properties and commonly combined with ketamine for routine procedures [1]. It is used as a premedicant to prevent side effects (e.g., respiratory depression) associated with ketamine administration [2,3]. Alpha-2 adrenoceptor drugs decrease intracellular cyclic adenosine monophosphate levels and results with less production of aqueous humor and increased uveoscleral outflow [4].

Maintaining intraocular pressure (IOP) at certain level is an important aspect for experimental studies especially in oculary surgery [5]. Because sudden increase in IOP may provoke complications such as vitreal hemorrhage or retinal decollement, IOP alterations should be minimized during the anesthesia [6]. Previous study has reported that topical and intraarterial administration of Xylazine HCl decreases IOP in rabbits, cats and monkeys [7]. Moreover, intravenous Xylazine HCl administration causes a decrease in IOP in horses [8]. It has shown that intramuscular (im) administration of 10mg/kg Xylazine HCl and 50 mg/kg Ketamine HCl combination results with lower IOP values in rabbits [6]. However, no significant alterations were observed in IOP after anesthesia achieved with the im combination of 5 mg/kg Xylazine HCl and 35 mg/kg Ketamine in rabbits [9].

Even though Xylazine HCl may be used alone for minor procedures in animals, to date no study has evaluated the im administration of Xylazine HCl alone on IOP in rabbits. For this reason, this study was aimed to detect the effects of 5 mg/kg and 10 mg/kg doses of Xylazine HCl administration on IOP in rabbits.
MATERIAL and METHOD

Atatürk University Local Board of Ethics Committee for Animal Experiments has approved the study protocol of this research (HADYEK decision no: 2015/188).

Eight, adult male, New Zealand White rabbits weighing 2.2-3.5 kg were used in this study. They were housed in individual cages with food and water ad libitum. The humidity ranged between 40 and 60%. A uniform temperature of 22±2°C was maintained throughout with a 12:12 h light:dark cycle. The rabbits were screened for pre-existing ocular disorders and clinical assessment was performed to ensure adequate health status. All animals were determined to be free of corneal and conjunctival diseases and they underwent a 14 days acclimatization period. Food and water were not withdrawn before administration, and animals were weighed prior to experiment.

Animals received each drug treatment in random order in a crossover study, with a minimum interval of one week between treatments. All rabbits in group of XYL-5 received im 5 mg/kg Xylazine HCl (2% Rompun, Bayer, Istanbul, Turkey), and those in group of XYL-10 received im 10 mg/kg Xylazine HCl. The doses used in this study were selected based on previous studies [6,9]. All injections were performed to quadriceps femoris muscle by the same person who was unaware of the experimental design.

Handling of rabbit and calibration of tonometer were accomplished as previous report [10]. Anesthetic eye drops were not used during the measurements. IOP was measured with a rebound tonometer (Tonovet, Icare, Vantaa, Finland). The left eye measurement was always performed prior to the right eye measurement. The mean of the left and right IOP was assumed as the animal’s IOP.

Each measurement of IOPs were taken by the same examiner who was unaware of performed medications. Statistical Analysis

All data were analyzed using the SPSS 19 (IBM Company, Version 19.0, SPSS Inc, USA, 2010) statistical package. Data are reported as means±SD. Prior to statistical analysis data were subjected to Kolmogorow-Smirnow test to assess normality. An independent samples t-test was used to determine pre-treatment differences between groups. Post-treatment differences within each treatment group were evaluated using a paired samples t-test. A P-value of <0.05 was considered statistically significant.

RESULTS

The mean values of IOP at all time intervals are shown in Table 1. All data were expressed as mm Hg. The mean T-1 values of IOP in group XYL-5 and XYL-10 were 10.25±2.54 and 10.62±2.04 mm Hg, respectively. There were significant differences (P<0.05) observed between groups at T45 and T60 values. However, the differences in IOPs at the other predefined time (T5, T10, T15, T20, T30) points were not statistically significant.

IOP values were significantly decreased at T15 in group XYL-5 (8.37±1.45 mm Hg) and at T5 in group XYL-10 (8.00±1.13 mm Hg). The lowest IOP values were obtained at T60 in both groups. These were 8.12±1.40 mm Hg in group XYL-5 and 5.93±0.77 mm Hg in group XYL-10.

DISCUSSION

This study is the first report on the IOP alterations following different doses of im Xylazine HCl administration. The im Xylazine HCl significantly reduced IOP in rabbits at the latest after 15 min of administration, regardless of the doses used in this study.

Rabbits are commonly prefered in ocular experiments because of their large size of the eye, easy handling and meekness [11]. Normal IOP measurements using rebound tonometer in rabbits are ranged between 9.51±2.62 mm Hg [10]. In the current study, the mean IOP of baseline values for all rabbits were within the reference values. The IOP can vary throughout the day and environmental factors may

<table>
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<th>Groups</th>
<th>Predefined Time Points</th>
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<tr>
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<td>T1</td>
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<tr>
<td>XYL-5</td>
<td>10.25±2.54</td>
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<tr>
<td>XYL-10</td>
<td>10.62±2.04</td>
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*a* Indicates significant differences within the groups (P<0.05); *ab* indicates significant differences between the groups; T: Baseline value
alter the measurements [12,13]. Based on these premises, IOP measurements of rabbits were recorded at the same time of the day and after two weeks of acclimatization period.

Previous study has reported that Xylazine HCl at the dose of 1 or 2 mg/kg do not cause any significant changes in IOP, whereas 4 or 8 mg/kg doses of Xylazine HCl administration results in lower IOP values in dogs [14]. In the present study significant decrease in IOP was observed 15 min after im administration of 5 mg/kg Xylazine HCl (T15). Moreover, 10 mg/kg doses of xylazine used in this study reduced IOP 5 min after administration (T5) in comparison with the baseline value (T -1). In the current study, no significant decrease on IOP was observed between groups at all time intervals with the exception of T45 and T60. Xylazine HCl at 10 mg/kg dose used in the present study more reduced IOP at 45 and 60 min, compared with at the dose of 5 mg/kg. A limitation to the present study is the rabbits that enrolled having healthy eyes. Effects of Xylazine HCl administration on IOP involving rabbits with ocular diseases is a worthy topic for future study.

It has been stated that reduced blood pressure results with lower IOP values [15]. Similarly in this study, Xylazine HCl administration causes reduced IOP in rabbits possibly due to xylazine-induced bradycardia [1].

In conclusion, im Xylazine HCl at 5 mg/kg or 10 mg/kg doses reduced IOP in rabbits. Comparison of two pre-anesthetic regimen suggests Xylazine HCl at 10 mg/kg is preferred over 5 mg/kg in rabbits that require lower intraocular pressure for procedures that longs more than 45 min. Because present study was carried out in only eight rabbits, additional studies involving larger numbers of rabbits are needed to confirm our results.

REFERENCES