Animal Welfare Related to Evaluate Intraocular Pressure in Anatolian Buffaloes: Preliminary Report

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Abstract: One of the main cause of stress in livestock is the vision problems. The goal of this study was to determine Intraocular Pressure (IOP) in Anatolian Buffaloes (AB) by means of application tonometry using Tono-Pen XL for the investigation of a stress factor in welfare of the anatolian buffaloes. A total of 2118 eyes were examined from 1059 apparently healthy AB aged between 1 and 8 years old from both sexes. IOP of AB were measured with Tono-Pen XL three times for each eyes in the morning at noon and in the evening during afternoon examination. IOPs of the left eyes were found to be 22.05±2.68 mmHg (range 16.5-27.3 mmHg) whereas the right eyes were 22.07±2.68 mmHg (range 16.1-27.0 mmHg). Comparison of the tonometry between the right and left eyes of AB showed no significant difference. IOP was decreased in accordance with the age of the animal. To the knowledge, this is the 1st report of tonometrical investigation performed in AB. It was determined that IOP for AB could be 22.05±2.68 mmHg (range 16.1-27.3 mmHg).

Key words: Anatolian buffaloes, intraocular pressure, application tonometry, Tono-Pen XL, age, Turkey

INTRODUCTION

Water buffaloes belong to Bovidae family in terms of zoological point of view are divided into two groups as African and Asian buffaloes. Asian ones are further subdivided into 2 groups as wild and domesticated buffaloes. Domestic buffaloes are classified as river and swamp buffaloes (Van den Berg, 1990). Anatolian Buffaloes (AB) cluster within the river type belonging to the Mediterranean group (Cockrill, 1974). Since, animal welfare aims a life away from undesired feelings like pain, suffering and stress, absence of stress response is accepted as an indicator for welfare mood in animals. Welfare status of an animal depends primaril on how the animal feels and claims that an animal’s welfare is compromised only to the extent that the animal suffers (Duncan and Petherick, 1991). Stress has usually been conceived as a reflex reaction that occurs ineluctably when animals are exposed to adverse environmental conditions and which is the cause of many unfavourable consequences, ranging from discomfort to death (Dantzer and Mormede, 1983). Intraocular Pressure (IOP) of AB is the area that has not been exclusively studied so far however reports on cattle related to IOP and tonometry are available but scarce (Gerometta et al., 2004; Gum et al., 1998; Passaglia et al., 2004). Tonometry is a method that using indentation, application or rebound techniques and is employed to measure IOP indirectly. Schiotz (Friedenwald, 1937) and Tono-Pen XL (Mindexler et al., 1987) developed many years ago are commonly used technologies even today. Last three decades, electronic devices have been frequently used however Schiotz indentation tonometry almost 100 years old is still the choice for clinicians (Kontiola, 1997). Application tonometers in dogs such as MacKay-Marg, Mentor pneumotonomography and Tono-Pen XL devices are reliable options but only the latter two is commercially available (Dziezyc et al., 1992; Gelatt et al., 1981; Priehs et al., 1990).

Tono-Pen XL is an electro-mechanical device that measures the IOP without penetration to the eyes. Although, the Tono-Pen XL was developed for human subjects, the principles of its operation may well apply to eyes of many species. A growing number of researchers and veterinary clinicians are using Tono-Pen instrument to measure IOP in non-human animals (Passaglia et al., 2004). The objective of this study was to evaluate and determine IOP for AB using Tono-Pen tonometry (application tonometry) since, the data search on this field in the available literature was unrewarding.

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MATERIALS AND METHODS

In this study, a total of 2118 eyes from 1059 apparently healthy AB between 1 and 8 years of age from both sexes were used from different farms located in Afyonkarahisar region, Turkey. Since, water buffaloes show aggressive behaviour towards unfamiliar persons apart from their owners for a period of 3 months prior to the study farms were visited everyday at the same time by researchers to be accepted by the animals to produce reliable measurements. According to the owners, none of the buffaloes had medications at least 2 months before the study. All animals were examined for the health status whether they had diseases or not (Table 1). In addition, gynaecological evaluation was carried out to make sure that animals were not pregnant. Animals that were cachectic, excessively fat or having suspected infectious diseases were not included in the study.

Animals were physically restrained in a chute. Nasal clips were used for some aggressive animals. Eyes were closely examined and defined that there were no diseases associated with the eyes. To exclude any corneal diseases that could interfere with sound opthalmological examination, eyes were stained with fluoorescense and Schirmer tear test I was performed. Any cornea absorbed minute amount of fluoearsence and tear production <15 mm were not included in the study. Study was carried out for 3 months between March and May 2009. For the measurement of IOP both eyes were locally anaesthetized with 5% proparacain HCl (Alcaine, Alcon Istanbul, Turkey). Eyelids were manually retained applying lowest pressure then the Tono-Pen instrument (TonoPen-XL, Medtronic Solan, USA) was calibrated everyday, it was used. Latex head of the Tono-Pen XL was changed after every 100 applications. The same person (KP) performed the tonometry throughout the study. Three measurements were done for each eyes during morning, noon and evening evaluations. Student t test was used for the differences between the right and left eyes and Pearson correlation analysis was used for the differences between the age and IOP of the animals. Significant level was set at p<0.05.

RESULTS AND DISCUSSION

The minimum and maximum IOP values were shown in Table 2. According to the data minimum IOPs were 16.50 mmHg for the left eye and 16.10 mm Hg for the right eye whereas maximum IOPs were 27.30 mmHg for the left eye and 27 mmHg for the right eye. The average IOP for the left eye was 22.05±2.68 mmHg and it was 22.07±2.68 mmHg for the right eye. There was no statistically significant differences in IOP between the left and right eyes (p>0.05). The age of the animals were varied from 1-8 years. The relationship between age and IOP was shown in Fig. 1 and Table 3. There was a negative correlation between the age and IOP. This difference was significant (p<0.05).

This is the 1st report on IOP determination of AB in the literature according to the knowledge. Reports on ocular tonometry in cattle are also infrequent since the incidence of spontaneous glaucomas are rare (Mertel et al., 1996; Miller and Gelatt, 1991).

Gum (1991) compared IOP in normal dairy cows by applanation tonometry using Mackay-Marg tonometer. In their part I study of Holstein Friesian (n = 15) and Jersey (n = 17) cattle the mean IOP was 27.5±4.8 mmHg (range 16-39 mmHg) for both breed indicating no statistically significant difference (Gum et al., 1998). According to their part 2 study of Holstein Friesian (n = 15) and Jersey (n = 12) cattle the mean IOPs by Mackay-Marg and TonoPen-XL tonometry were 28.2±4.6 mmHg (range 19-39 mmHg) and 26.9±6.70 mmHg (range 16-42 mmHg), respectively. Comparison of these two tonometers produced no significant differences. Similarly in an equine study, no significant difference was also observed between IOP measurements by Mackay-Mark and Tono-Pen tonometers (Kitazawa and Horie, 1975).
Table 2: The highest and lowest IOP for Anatolian water buffaloes

<table>
<thead>
<tr>
<th>Factors</th>
<th>Left eye</th>
<th>Right eye</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of animals</td>
<td>1059.00</td>
<td>1059.00</td>
<td>-</td>
</tr>
<tr>
<td>Minimum IOP</td>
<td>16.50</td>
<td>16.10</td>
<td>16.30</td>
</tr>
<tr>
<td>Maximum IOP</td>
<td>27.30</td>
<td>27.09</td>
<td>27.15</td>
</tr>
<tr>
<td>Mean IOP</td>
<td>22.05</td>
<td>22.07</td>
<td>22.06</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>2.68</td>
<td>2.68</td>
<td>2.68</td>
</tr>
</tbody>
</table>

Table 3: IOP of Anatolian water buffaloes according to the age

<table>
<thead>
<tr>
<th>Age</th>
<th>No. of animals</th>
<th>IOP±SD Left eye</th>
<th>IOP±SD Right eye</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>216</td>
<td>22.55±0.18</td>
<td>22.54±0.18</td>
</tr>
<tr>
<td>1.5</td>
<td>20</td>
<td>22.66±0.59</td>
<td>22.75±0.58</td>
</tr>
<tr>
<td>2.0</td>
<td>208</td>
<td>22.37±0.16</td>
<td>22.24±0.16</td>
</tr>
<tr>
<td>2.5</td>
<td>1</td>
<td>23.40±2.65</td>
<td>23.60±2.65</td>
</tr>
<tr>
<td>3.0</td>
<td>108</td>
<td>22.70±0.20</td>
<td>22.16±0.20</td>
</tr>
<tr>
<td>3.5</td>
<td>1</td>
<td>21.30±2.65</td>
<td>21.16±2.65</td>
</tr>
<tr>
<td>4.0</td>
<td>129</td>
<td>21.80±0.23</td>
<td>21.74±0.23</td>
</tr>
<tr>
<td>5.0</td>
<td>63</td>
<td>21.60±0.33</td>
<td>21.60±0.25</td>
</tr>
<tr>
<td>5.5</td>
<td>7</td>
<td>21.50±1.00</td>
<td>21.60±1.00</td>
</tr>
<tr>
<td>6.0</td>
<td>87</td>
<td>20.94±0.28</td>
<td>20.93±0.28</td>
</tr>
<tr>
<td>6.5</td>
<td>14</td>
<td>22.18±0.71</td>
<td>22.14±0.71</td>
</tr>
<tr>
<td>7.0</td>
<td>61</td>
<td>21.54±0.34</td>
<td>21.57±0.34</td>
</tr>
<tr>
<td>7.5</td>
<td>7</td>
<td>20.66±1.00</td>
<td>20.24±1.00</td>
</tr>
<tr>
<td>8.0</td>
<td>17</td>
<td>21.93±0.64</td>
<td>21.37±0.64</td>
</tr>
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</table>
mmHg (range 16.1-37.3 mmHg) could be beneficial
criterion for clinicians and researchers who are interested
in the field.

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