Effects of Xylazine or Xylazine Followed by Yohimbine on Some Biochemical Parameters in the Camel (Camelus dromedarius)

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Abstract: Biochemical parameters were determined in the serum of three adult she-camels. The effects of following four treatments were studied: (i) 5 ml of isotonic saline solution, (ii) xylazine (0.25 mg/kg), (iii) xylazine (0.5 mg/kg), (iv) xylazine (0.5 mg/kg) followed by yohimbine (0.5 mg/kg). The biochemical parameters investigated were: total proteins, albumin, globulin, A/G ratio, glucose, urea, creatinine, AST, ALT, AP, Na, K, Cl, Ca, P, Mg and Fe. Xylazine administration resulted in significant changes in glucose, urea, AST, ALT and AP values. Yohimbine administration failed to prevent or decrease the hyperglycemic effect of xylazine. Minor changes were observed in the remaining parameters.

Key words: Camel, xylazine, serum, biochemistry

Introduction
Xylazine [Rompun, Bayer 1470, 21,2,6-dimethylphenylamino-4H-5, 6-dihydro-1, 3-thiazine] is an ζ2-aminergic non-narcotic sedative-analgesic with muscle relaxant properties (Booth, 1993). It causes sedation mainly by stimulating the central nervous system (CNS) presynaptic ζ2-adrenergic receptors. Xylazine is widely used in different animal species such as dogs, cats, horses, ruminants, laboratory animals as well as zoo and wild animals (Mohammed, 1997). The use of xylazine in camels was described prior to performance of various procedures such as splenectomy (Demling, 1972), tuberculin testing, rectal palpation, electroacupuncture and hoof trimming (Custer et al., 1977), clinical examination and surgical procedures (Ranadam, 1994). The present study was undertaken to evaluate: (1) the biochemical changes associated with xylazine anesthesia in camels, and (2) the ability of yohimbine, a specific ζ2-antagonist, to reverse these changes.

Materials and Methods
The present experiments were conducted during March and April, 2000. The camels belonged to the Camel Research Centre, King Faisal University. Three mature, non-pregnant she-camels weighing 356, 357 and 459 kg body weight were used. Body weight was estimated using the following equation of Ramadan (1994):

\[ \text{Weight (kg)} = 2.297 \times 10^{-3} \times \text{Girth (cm)}^2 + 104.2 \]

The girth (cm) was determined at its maximum circumference just from behind the sternal pad to the peak of the hump. The camels were housed in open-air enclosures and were offered hay and water ad libitum. On experimental days food was not offered in the morning. Each she-camel was studied on 4 occasions. Each treatment was separated by 3 days and all studies were performed in the morning.

Treatment: On experimental days, she-camels were restrained in the sitting position. With a handler restraining the head, one of the following treatments was administered intravenously: (i) 5 ml of isotonic saline solution (ii) xylazine (0.25 mg/kg), (iii) xylazine (0.5 mg/kg), and (iv) xylazine (0.5 mg/kg) followed 10 minutes later by yohimbine (0.5 mg/kg). A pre-treatment blood sample was collected 15 minutes before treatment administration. Further samples were collected at 15, 30, 60, 120, 180 and 240 minutes posttreatment administration. Blood was collected in clot tubes without anticoagulants. Serum was removed from clotted blood after centrifugation and was frozen at -20°C until analyzed. Serum concentrations of total proteins (TP), albumin, glucose, urea, creatinine, aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (AP), Na, K, Cl, Ca, P, Mg and Fe were determined spectrophotometrically (RA-60 chemistry analyzer, Ames, Bayer Diagnostics) using commercial reagent kits (United Diagnostic Industry, Damman, Kingdom of Saudi Arabia).

Statistical analysis: The statistical analysis of data was facilitated by the statistical package SPSS. One-way analysis of variance (ANOVA) with covariance analysis were carried out for all the parameters. The time factor was included in the model as a covariate. Therefore the adjusted means for all the treatments are presented in Tables 1 and 2. All the means were compared by Duncan’s test.

Results
The adjusted mean (± SD) of the various biochemical parameters studied are shown in Tables 1 and 2. The intravenous administration of xylazine (0.25 or 0.5 mg/kg) or xylazine (0.5 mg/kg) followed by yohimbine (0.5 mg/kg) had no significant effects on total serum protein, albumin, globulin, A/G ratio and creatinine concentrations (Table 1). A significant increase in serum glucose concentration was observed following the intravenous administration of xylazine (0.5 mg/kg) or xylazine (0.5 mg/kg) followed by yohimbine (0.5 mg/kg). A significant decrease in the value of serum urea was observed after the i.v. administration of xylazine (0.5 mg/kg) or xylazine followed by yohimbine. Serum AST activity increased significantly (P < 0.05) following the i.v. administration of xylazine (0.5 mg/kg) or xylazine followed by yohimbine. Serum ALT activity was significantly lower (P < 0.05) following the administration of the three treatments as compared with saline control. A significant (P < 0.05) reduction in serum AP activity was observed following the i.v. administration of the lower dose of xylazine (0.25 mg/kg) (Table 2).

Xylazine injected alone or followed by yohimbine had no significant effects on serum sodium, potassium, chloride, calcium, inorganic phosphorus, magnesium or iron values.

Discussion
The results on total serum proteins, albumin and globulin obtained in control animals of the present study were comparable with those reported by previous workers (Soliman and Shaker, 1967; Barkat and Abdel-Fattah, 1971; Ghodsian et al., 1978; Hussein et al., 1982; Abdel et al., 1982; Melhota and Gupta, 1988; Saywar et al., 1991; Rezakhani et al., 1997). Non-significant changes in total serum proteins following xylazine administration were substantiated with similar results obtained by Sharma et al. (1994) following epidural administration of xylazine in camels. The present findings confirm earlier reports that xylazine markedly elevates the serum glucose in camels (Custer et al., 1977; Posbin et al., 1980; Sharma et al., 1994; Ahmed et al., 1996). Xylazine induced hyperglycaemia that appears to involve, in part, an inhibition of insulin secretion (Brockman, 1981; Greene et al., 1967). Xylazine also may have caused stimulation of
Table 1: Adjusted mean (± SD) serum, TP, albumin, globulin, A/G ratio, glucose, urea and creatinine values of mature she-camels (n= 3) given various treatments intravenously.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Saline (5ml)</th>
<th>Xylazine (0.25 mg/kg)</th>
<th>Xylazine (0.5 mg/kg)</th>
<th>Xylazine (0.5 mg/kg) + yohimbine (0.5 mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP (mg/dl)</td>
<td>6.7±0.3</td>
<td>8.7±0.5</td>
<td>8.2±0.6</td>
<td>6.2±0.6</td>
</tr>
<tr>
<td>Albumin (g/dl)</td>
<td>4.0±0.2</td>
<td>3.9±0.3</td>
<td>3.8±0.4</td>
<td>3.9±0.3</td>
</tr>
<tr>
<td>Globulin (g/dl)</td>
<td>2.6±0.3</td>
<td>2.3±0.3</td>
<td>2.4±0.5</td>
<td>2.1±0.4</td>
</tr>
<tr>
<td>A/G ratio</td>
<td>1.6±0.2</td>
<td>1.7±0.2</td>
<td>1.6±0.4</td>
<td>1.9±0.5</td>
</tr>
<tr>
<td>Glucose (mg/dl)</td>
<td>114.0±8</td>
<td>134.0±37</td>
<td>153.0±33</td>
<td>152.0±57</td>
</tr>
<tr>
<td>Urea (mg/dl)</td>
<td>30.9±7.2</td>
<td>32.0±10.1</td>
<td>24.7±9.1</td>
<td>22.4±6.0</td>
</tr>
<tr>
<td>Creatinine (mg/dl)</td>
<td>1.6±0.31</td>
<td>1.7±0.4</td>
<td>1.6±0.4</td>
<td>1.7±0.4</td>
</tr>
</tbody>
</table>

Means in a row followed by the same letter do not differ significantly at P<0.05. *Adjusted for the time covariate effect.

Table 2: Adjusted mean (± SD) serum, ALT, ALP, Na, K, Cl, Ca, P, Mg and Fe values of mature she-camels (n= 3) given various treatments intravenously.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Saline (5ml)</th>
<th>Xylazine (0.25 mg/kg)</th>
<th>Xylazine (0.5 mg/kg)</th>
<th>Xylazine (0.5 mg/kg) + yohimbine (0.5 mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AST (IU/L)</td>
<td>91.50±12.7</td>
<td>86.7±14.7</td>
<td>112.6±26.8</td>
<td>121.9±42.5</td>
</tr>
<tr>
<td>ALT (IU/L)</td>
<td>17.2±1.8</td>
<td>14.3±3.5</td>
<td>15.4±2.2</td>
<td>14.6±2.6</td>
</tr>
<tr>
<td>AP (IU/L)</td>
<td>28.5±6.3</td>
<td>23.6±6.1</td>
<td>26.1±8.9</td>
<td>27.9±9.7</td>
</tr>
<tr>
<td>N/L (mg/kg/L)</td>
<td>139.0±4.3</td>
<td>136.2±0.2</td>
<td>127.0±7.5</td>
<td>127.4±8.0</td>
</tr>
<tr>
<td>K (mEq/L)</td>
<td>4.2±0.3</td>
<td>4.1±0.4</td>
<td>4.1±0.4</td>
<td>4.5±0.3</td>
</tr>
<tr>
<td>Cl (mEq/L)</td>
<td>118.3±2.8</td>
<td>124.8±5.8</td>
<td>121.5±4.4</td>
<td>122.0±4.1</td>
</tr>
<tr>
<td>Ca (mg/dl)</td>
<td>10.2±0.2</td>
<td>9.8±0.4</td>
<td>9.8±0.4</td>
<td>9.7±0.5</td>
</tr>
<tr>
<td>P (mg/dl)</td>
<td>4.6±0.6</td>
<td>4.3±0.6</td>
<td>5.3±0.4</td>
<td>4.2±0.9</td>
</tr>
<tr>
<td>Mg (mg/dl)</td>
<td>1.9±0.2</td>
<td>1.9±0.2</td>
<td>1.9±0.2</td>
<td>2.4±0.2</td>
</tr>
<tr>
<td>Fe (mg/dl)</td>
<td>27.2±12.1</td>
<td>65.0±15.0</td>
<td>73.1±8.0</td>
<td>74.6±11.9</td>
</tr>
</tbody>
</table>

Means in a row followed by the same letter do not differ significantly at P<0.05. *Adjusted for the time covariate effect.

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References
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