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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, 2(2,6-dimethylphenylamino)-4-H-5, 6-dihydro-1, 3 – thiazine] is an α2-adrenergic non-narcotic sedative analgesic with muscle relaxant properties (Booth, 1982). It causes sedation mainly by stimulating the central nervous system (CNS) presynaptic α2-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, 1987). The use of xylazine in camels was described prior to performance of various procedures such as splenectomy (Dennig, 1972), tuberculin testing, rectal palpation, electroejaculation and hoof trimming (Custer *et al*., 1977), clinical examination and surgical procedures (Ramadan, 1994). The present study was undertaken to evaluate: (1) the biochemical changes associated with xylazine anaesthesia in camels, and (2) the ability of yohimbine, a specific α2-antagonist, to reverse those 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, 387 and 499 Kg body weight were used. Body weight was estimated using the following equation of Ramadan (1994):

$$\text{Weight (kg)} = 2.297 \times 10^{-5} \times (\text{Girth (cm)})^3 + 104.2$$

The girth (cm) was determined at its maximum circumference from just 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 preinjection 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-50 chemistry analyzer, Ames, Bayer Diagnostics) using commercial reagent kits (United Diagnostic Industry, Dammam, 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; Barakat and Abdel-Fattah, 1971; Ghodsian *et al*., 1978; Hussein *et al*., 1982; Abdo *et al*., 1987; Mehrotra and Gupta, 1989; Sarwar *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; Peshin *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*., 1987). 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

Parameters	Saline (5ml)	Xylazine (0.25 mg/kg)	Xylazine (0.5 mg/kg)	Xylazine (0.5 mg/kg) + yohimbine (0.5 mg/kg)
TP/g/dl)	6.7^{a}± 0.3	6.2^{a}± 0.6	6.2^{a}± 0.6	6.0^{a}± 0.5
Albumin(g/dl)	4.0^{a}± 0.2	3.8^{a}± 0.3	3.8^{a}± 0.4	3.9^{a}± 0.3
Gobulin(g/dl)	2.6^{a}± 0.3	2.3^{a}± 0.3	2.4^{a}± 0.5	2.1^{a}± 0.4
A/G ratio	1.5^{a}± 0.2	1.7^{a}± 0.2	1.6^{a}± 0.4	1.9^{a}± 0.5
Glucose(mg/dl)	114.0^{b}± 8	134.0^{ab}± 37	153.0^{a}± 33	153.0^{a}± 57
Urea (mg/dl)	30.3^{a}± 7.2	32.0^{a}± 10.1	24.7^{b}± 9.1	22.4^{b}± 6.9
Creatinine (mg/dl)	1.6^{a}± 0.31	1.7^{a}± 0.4	1.6^{a}± 0.4	1.7^{a}± -0.4

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, AST, ALT, AP, Na, K, Cl, Ca, P, Mg and Fe values of mature she-camels (n= 3) given various treatments intravenously

Parameters	Saline (5ml)	Xylazine (0.25 mg/kg)	Xylazine (0.5 mg/kg)	Xylazine (0.5 mg/kg) + yohimbine(0.5 mg/kg)
AST(U/L)	91.56^{b}± 12.7	86.7^{b}± 14.7	112.6^{a}± 26.8	121.9^{a}± 42.5
ALT(U/L)	17.2^{a}± 1.8	14.3^{b}± 3.5	15.4^{b}± 2.2	14.6^{b}± 2.6
AP(U/L)	29.5^{a}± 6.8	23.6^{b}± 6.1	$26.1^{a,b}$± 8.9	$27.9^{a,b}$± 9.7
Na(mEq./L)	139.0^{a}± 4.3	136.2^{a}± 6.2	127.6^{a}± 7.6	127.4^{a}± 7.8
K(mEq./L)	5.0^{a}± 0.3	4.2^{a}± 0.5	4.1^{a}± 0.4	4.5^{a}± 0.3
Cl(mEq./L)	118.3^{a}± 2.8	124.8^{a}± 5.8	121.8^{a}± 4.4	122.0^{a}± 4.1
Ca(mg/dl)	10.2^{a}± 0.2	9.9^{a}± 0.5	9.8^{a}± 0.4	9.7^{a}± 0.5
P(mg/dl)	4.6^{b}± 0.5	4.3^{a}± 0.5	5.3^{a}± 0.4	4.2^{b}± 0.9
Mg(mg/dl)	2.1^{a}± 0.2	2.1^{a}± 0.2	2.4^{a}± 0.1	2.4^{a}± 0.2
Fe(µg/dl)	77.2^{a}± 12.1	65.0^{a}± 15.0	73.1^{a}± 8.0	74.6^{a}± 11.9

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

glucooneogenesis because of increased glucagon secretion (Brockman, 1981). In the animals of present study, yohimbine failed to prevent or decrease xylazine-induced hyperglycaemia. This is not in agreement with reports in cattle (Hsu and Hummel, 1981) and mares (Greene *et al.*, 1987). In those studies, the α2-antagonist yohimbine prevented or decreased the hyperglycaemic effects of xylazine.

The significant decline in serum urea values following the administration of xylazine (0.5 mg/kg) or xylazine followed by yohimbine, could be due to the dilution of the circulating blood as a result of the blood dilating effect of xylazine (Bolbol and Misk, 1979). In the present study a nonsignificant change in serum creatinine value was found. Similar results were obtained by Gasthuys *et al.* (1986).

Serum AST, ALT and AP activities found during saline treatment were comaprable to figures reported by Beaunoyer (1992), Eldirdiri *et al.* (1987) and Bengoumi *et al.* (1997), and Custer *et al.* (1977), respectively. Xylazine (0.5 mg/kg) or xylazine followed by yohimbine administration resulted in a significant increase in serum AST activity and a significant decrease in serum ALT activity. The increase in serum AST activity and the decrease in serum ALT activity could be attributed to various factors such as changes in body temperature, haemodilution or more leakage of cellular enzyme (AST) into the plasma during xylazine anaesthesia. Serum AP levels decreased significantly following the intravenous administration of the lower dose of xylazine (0.25 mg/kg). A decline in serum AP activity was observed by Peshin and Kumar (1983) following xylazine administration (0.22 mg/kg) in buffaloes. These authors attributed the reduction in AP activity to decrease the circulation.

Serum values of sodium, potassium and calcium slightly decreased after xylazine administration. However, these reductions and the variations in concentrations of serum chloride, phosphorus, magnesium and iron are within the normal physiological limits. The majority of serum electrolytes are similar to results obtained in camels (Custer *et al.*, 1977; Sharma *et al.*, 1994), cattle (Eichner *et al.*, 1979), dog (Kumar *et al.*, 1979) and mares (Gasthuys *et al.*, 1986) following xylazine administration. As concluded by Peshin and Kumar (1983), it appears that the blood dilution has not been caused by water or electrolyte retention , but most probably by the increased temporary migration of interstitial fluid into the vascular system.

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References

Abdo, M.S., M.M. Hussanein, M.E. Manna and M. Hamed, 1987. Electrophoretic pattern of serum protein in Arabian camel. Indian Vet. J., 64: 841-844.

Ahmed, I.H., S.R. Nouh, A.A. Kenawy and O.A. Abd-Alla, 1996. Antagonization of xylazine induced sedation with tolazoline in camels (*Camelus dromedarius*). J. Camel Prac. Res., 3: 33-36.

Barakat, M.S. and M.A. Abdel-Fattah, 1971. Seasonal and sexual variations of certain constituents of normal camel blood. Zbl. Vet. Med. A, 18: 174-178.

Beaunoyer, D.E., 1992. Changes in serum enzyme activities after after maximal exercise in camels. In: Proceedings of First International Camel Conference, 2nd-6th Feb. , Dubai Eds. Allen, W.K., Higgins, A.J., Mayhew,L.G., Snow, D.H. and Wade J.E.; R.W. Publications, Newmarket Ltd, pp: 331-333.

Bengoumi, M., B. Faye, K.El-Kasmi and F. De La Farge, 1997. Clinical enzymology in the dromedary camel (*Camelus dromedarius)* Part 2. Effect of season, age, sex, castration, lactation and pregnancy on serum AST, ALT, , GGT, AP and LDH activities. J. Camel Prac. Res., 4: 25-29.

Bolbol, A.I. and N.A. Misk, 1979. The role of the spleen for the blood circulation of sheep after sedation with Rompun. Vet. Med. Rev. No., 1: 46-48.

Booth, N.H., 1982. In: Booth, N.H. and McDonald, I.F. (ed.): Veterinary Pharmacology and Therapeutics. Nonnarcotic analgesics. pp: 297-322. Iowa State Univ. Press, Ames, Iowa.

Brockman, R.P., 1981. Effect of xylazine and plasma glucose, glucogon on insulin concentrations in sheep. Res. Vet. Sci., 30: 383-384.

Custer, R., L. Kramer and S. Kennedy, 1977. Haematologic effects of xylazine when used for restraint of Bactrian camels. J. Amer. Vet. Med. Assoc., 1171: 899-901.

Dennig, H.K., 1972. The use of Rompun in the dromedary in diagnostic splenectomoy (Infection with Trypanosoma evansi/surra). Vet. Med. Rev., 72: 239-242.

Eichner, R.D., R.L. Prior and W.G. Kvashika, 1979. Xylazine induced hyperglycemia in beef cattle. Amer. J. Vet. Res., 40: 127-129.

Eldirdiri, N.I., H.B. Suliman and A.M. Shommein, 1987. Normal serum activities of some diagnostic enzymes in dromedary camel in Sudan. Vet. Res. Commun., 11: 201-203.

Gasthuys, F., C. V. Hende and A.De. Moor, 1986. Study on some ionary parameter in horse serum and urine during halothane anaesthesia with xylazine premedicxation. J. Vet. Med., 33: 791-800.

Ghodsian, I., I. Nowrouzian and H.F. Schels, 1978. A study of some haematological parameters in the Iranian Camel. Trop. Anim. Hlth. Prod., 10: 109-110.

Greene, S.A., J.C. Thurmon, W.J. Tranquilli and G.J. Benson, 1987. Effect of yohimbine on xylazine-induced hypoinsulinemia and hyperglycemia in mares. Am. J. Vet. Res., 48: 678-678.

Hsu, W.H. and S.K. Hummel, 1981. Xylazine-induced hyperglycemia in cattle: a possible involvement of alpha-2 adrenergic receptors regulating insulin release. Endocrinology, 109: 825-829.

Hussein, M.F., A.A. Al-Sabayei and H.A. Hassan, 1982. A study of some aspects of blood chemistry in Saudi Arabian camels (*Camelus dromedarius*). Sudan J. Vet. Sci. Anim. Husb., 23: 69-72.

Kumar, A., S.C. Pandiya and H.P. Singh, 1979. Canine anaesthesia with a combination of ketamine and xylazine in experimental and clinical cases. Indian J. Anim. Hlth., 18: 39-43.

Mehrotra, V. and M.L. Gupta, 1989. Seasonal variations in certain blood constituents in camels. Indian J. Anim. Sci., 9: 1559-1561.

Mohammed, F.K., 1987. Xylazine antagonists in animals. A review of pharmacological aspects. Vet. Med. Rev. No., 1: 3-8.

Peshin, P.K. and A. Kumar, 1983. Haematological and biochemichemical effects of xylazine in buffaloes. Indian Vet. J., 60: 981-986.

Peshin, P.K., J.M. Nigam, S.C. Singh and B.A. Robinson, 1980. Evaluation of xylazine in camels. J. Amer. Vet. Med. Assoc., 177: 875-878.

Ramadan, O.R., 1994. Surgery and Radiology of the Dromedary Camel. First Edition, Al-Jawad, Printing Press, Kingdom of Saudi Arabia.

Rezakhani, A., S. Nazifi Habibabadi and M. Magrebi Ghojogh, 1997. Studies on normal haematological and biochemical parameters of Turkmen camel in Iran. J. Cam. Prac. Res., 4: 41-44.

Sarwar, S., M. N. Chaudhry, L. R. Khan, S. Abbas and M.A. Majeed, 1991. Eight serum biochemical values of one-humped camel (*Camelus dromedarius*) in summer; Effects of sex, age in males and lactation and/or pregnancy in females. Pakistan Vet. J., 11: 62-68.

Sharma, S.D., T.K. Gajhlot, N.R. Purohit, C.K. Sharma, D.S. Chouhan and R.J. Chaudhary, 1994. Haematological and biochemical alterations following Epidural administration of xylazine in camels (*Camelus dromedarius*) J. Cam. Prac. Res., 1: 26-29.

Soliman, M.K. and M. Shaker, 1967. Cytological and biochemical studies on the blood of adult she-camel. Indian Vet. J., 44: 989-995.