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RESEARCH PAPER

Hematological and splenic Doppler ultrasonographic changes in dogs sedated with acepromazine or xylazine

Dienifer V Sutil[a], Cláudio RS Mattoso[b], Julieta Volpato[a], Nádia C Weinert[c], Ádson Costa[a], Rozyanne R Antunes[a], Thiago R Muller[a], Suzane L Beier[b], Ronise Tochetto[a], Felipe Comassetto[a] & Mere E Saito[a]

[a]Department of Veterinary Medicine, Agroveterinary Sciences Center, Santa Catarina State University (UDESC), Lages, SC, Brazil

[b]Department of Clinical and Veterinary Surgery, Veterinary School, Federal University of Minas Gerais (UFMG), Belo Horizonte, MG, Brazil

[c]Department of Veterinary Medicine, Sector of Agricultural and Environmental Sciences, Paraná Midwestern University (UNICENTRO), Guarapuava, PR, Brazil

Correspondence: Julieta Volpato, Department of Veterinary Medicine, Agroveterinary Sciences Center, Santa Catarina State University (UDESC), Hospital de Clínica Veterinária, Av. Luiz de Camões, 2090, Conta Dinheiro, Lages, Santa Catarina, CEP 88520-000, Brazil. Email: jully_volps@hotmail.com

Abstract

Objective To evaluate the onset and duration of hematological changes and the use of Doppler ultrasound (spleen) in dogs sedated with acepromazine or xylazine.

Study design Clinical study.

Animals TA total of 24 mixed breed dogs aged 1–4 years and weighing 15–25 kg.

Methods Dogs were randomly distributed into two groups: acepromazine group (AG) which were administered acepromazine (0.05 mg kg^{-1}) intramuscularly and xylazine group administered xylazine (0.5 mg kg^{-1}) intramuscularly. Sonographic evaluations (morphologic and hemodynamic splenic vascularization) and hematologic tests were performed before drug administration (baseline) and 5, 15, 30, 60, 120, 240, 360, 480 and 720 minutes after drug administration.

Results A significant reduction occurred in erythrogram variables in AG at 15–720 minutes corresponding with a significant enlargement of the spleen. In the xylazine group, a significant reduction was observed in the erythrogram variables at 30–60 minutes without a significant enlargement of the spleen. Hilar diameter did not change over time in either group. Flow alterations were found only in the splenic artery in AG, with a decreased final diastolic velocity observed at 60–120 minutes.

Conclusions Administration of acepromazine resulted in decreased red blood cell count, hemoglobin, packed cell volume and an increased diameter of the spleen. Xylazine administration resulted in similar hematologic changes but of smaller magnitude and duration and without splenic changes. The absence of significant changes in the Doppler flow parameters of the splenic artery and vein and the hilar diameter suggests that the splenomegaly that was observed in AG was not due to splenic vasodilation. No splenic sequestration occurred after xylazine administration.

Clinical relevance The results indicate that acepromazine decreases the erythrocyte concentrations by splenic erythrocyte sequestration and concomitant splenomegaly. Xylazine can cause slight hematologic changes, but without splenic changes.

Keywords acepromazine, dogs, Doppler ultrasonography, erythrogram, xylazine.

Introduction

Drugs used as sedatives in veterinary medicine include the phenothiazines (acepromazine) and

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α_2-adrenergic agonists (xylazine) (Lemke 2007). Phenothiazines block pre- and postsynaptic dopaminergic receptors, inducing a state of indifference (tranquilization) in the animal (Baldessarini & Tarazi 2001). Phenothiazines also block α_1-adrenergic receptors resulting in peripheral vasodilatation, decreased systemic vascular resistance and even hypotension (Lemke 2007). Decreases in packed cell volume (PCV) and hemoglobin concentrations are also associated with acepromazine administration, probably caused by splenic enlargement (Dyson et al. 1998), but questions remain regarding the sequestration mechanism and also the beginning and end of the hematological changes.

Use of an α_2-adrenergic agonist results in sedation, analgesia and muscle relaxation. The sedative and anxiolytic effects are reported to be induced by activation of postsynaptic receptors in the *locus coeruleus* (Lemke 2007). Initially, xylazine causes transient vasoconstriction with consequent arterial hypertension, and this response is followed by reflex bradycardia from the postsynaptic peripheral action in the α_2-receptors (Alibhai et al. 1996). After this phase, the presynaptic effects of xylazine prevail, with a decrease in sympathetic tone leading to decreased systemic vascular resistance and arterial pressure. Bradycardia persists due to the decreased sympathetic tone and increased parasympathetic tone (Thurmon et al. 1996). Xylazine is followed by a decrease in erythrocyte parameters by splenic sequestration (splenomegaly) in several animal species (Wagner et al. 1991; Gweba et al. 2009; Udegbunam et al. 2012; Kullmann et al. 2014), but this drug may also increase erythrocyte variables (Hardy et al. 1994; Lindegaard et al. 2011). Muir et al. (1979) and Dyke (1993) suggested that hematologic abnormalities induced by acepromazine and xylazine in horses are a result of splenic vasodilation and blood sequestration.

Ultrasonography is useful in the evaluation of the spleen because it is noninvasive, is generally available and does not emit radiation. Ultrasonography provides reliable and accurate measurements of the spleen that correlate well with the actual size of surgically resected spleens in humans (Ishibashi et al. 1991). Doppler ultrasound can also be used to study the splenic circulation (Bolognesi et al. 1996), an important evaluation in diseases of splenomegaly and portal hypertension. The splenic vein has Doppler velocimetry characteristics similar to the portal vein flow and the splenic artery displays a parabolic flow characteristic in small animals (Tilde 2009).

The aims of this study were to evaluate the onset and duration of the hematological and splenic changes in dogs sedated with acepromazine or xylazine and to investigate the mechanisms involved in the recorded changes. Our hypothesis was that acepromazine and xylazine would generate splenomegaly by splenic vasodilation, with concomitant decrease in the red blood cell (RBC) count, hemoglobin concentration (Hb), PCV and platelets.

Material and methods

The study was conducted at the Veterinary Clinical Laboratory and the imaging diagnostic sector of the Clinical Veterinary Hospital of Agroveterinary Sciences Center, Santa Catarina State University (CAV-UDESC). The study was approved by the Ethics Committee on Animal Experimentation of CAV-UDESC (no. 1.7.13).

Animals

A total of 24 mixed breed dogs (10 females and 14 males) aged 1−4 years, with a mean ± standard deviation body weight of 16.2 ± 4.9 kg were used. The owners agreed to participation in the study by signing a consent form. All animals were received the day before the study and had been previously examined. Only the dogs showing no clinical or laboratory changes (American Society of Anesthesiologists class I) were included. The spleen of each animal was evaluated using ultrasonography before the start of the study, and only animals with measurements of the spleen within normal limits were included in the experiment. Prior to the experiment, the dogs were deprived of food for 8 hours and water for 2 hours. No food or water was provided during the experimental period.

After inclusion in the study, the animals were randomly allocated by manual draw to one of two experimental groups. An attempt was made to standardize the number of males ($n = 7$) and females ($n = 5$) included in each group; therefore, if a group already had the maximum number of animals of one sex, the new animal was automatically allocated to the other group. The two groups ($n = 12$ each group) were: group AG, administration of acepromazine (0.05 mg kg^{-1}; Acepran 0.2%; Vetnil Indústria Comércio Produtos Veterinários Ltda, Brazil) administered intramuscularly (IM); group XG, administration of xylazine (0.5 mg kg^{-1}; Rompun 2%; Bayer Saúde Animal, Brazil) IM.

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