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SHORT COMMUNICATION

Total intravenous anaesthesia in adult mules

Khadim H Dar* & Ajay K Gupta†

*Veterinary Surgery and Radiology, Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar, India
†Division of Veterinary Surgery and Radiology, Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu-180009, India

Correspondence: Khadim H Dar, Veterinary Clinical Services Complex, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shuhama, Alusteng, Srinagar 190006, India. E-mail: drkhadim23@gmail.com

Abstract

Objective To design an effective intravenous (IV) anaesthetic combination for field use in mules.

Study design Descriptive study.

Animals Six healthy adult mules.

Methods Xylazine 1.3 mg kg^{-1} was administered IV and the quality of sedation was recorded. Anaesthesia was induced with 0.03 mg kg^{-1} diazepam and 2.2 mg kg^{-1} ketamine IV. Times to sternal recumbency, lateral recumbency and standing were recorded. Heart rate (HR), respiratory rate (f_R), rectal temperature and haematological parameters were recorded at baseline and at 5, 15 and 45 minutes post-administration. Additionally, levels of antinociception according to responses to a pin prick test, and the quality of muscle relaxation and recovery were scored.

Results Times (mean ± standard deviation) to sternal and lateral recumbency were 1.3 ± 1.3 minutes and 1.8 ± 1.3 minutes, respectively, with hypertonicity of the pelvic limbs. Standing ataxia and normal gait were seen at 25.5 ± 19.0 minutes and 32.8 ± 7.9 minutes, respectively. Five minutes after induction of anaesthesia, the quality of antinociception was judged to be good to excellent (0 ± 1 on a scale of 0–3), muscle relaxation of the jaw incomplete (2 ± 1 on a scale of 1–4) and quality of recovery was very good to excellent (2 ± 1 on a scale of 1–5). The duration of anaesthesia was only 15.3 ± 1.6 minutes. Significant changes were observed only in HR at 15 minutes and f_R at 5 minutes. Changes in rectal temperature and haematological parameters following anaesthesia were non-significant.

Conclusions and clinical relevance The combination of xylazine–diazepam–ketamine provides effective short-term anaesthesia in mules under field conditions.

Keywords diazepam, ketamine, mules, xylazine.

Introduction

The mule is a hybrid born from the mating of a male donkey (jack) with a female horse (mare). The mule has been described as the animal without 'pride of ancestry, nor hope of posterity'and, by muleskinners, as '900 lbs of free enterprise' (Burnham 2002). The mule inherits the size, speed, strength and appearance of its dam, whereas its disposition, hardiness, patience, endurance, longevity, toughness and surefootedness derive from its sire. A great deal of research has been carried out in equine anaesthesia for horses and ponies, but the literature on mule anaesthesia is very limited (Matthews et al. 1992). The results of studies conducted in horses and ponies have been extrapolated to mules, invariably resulting in inadequate anaesthesia because there are several anatomical and physiological differences between horses and mules (Yousef 1979). Although induction with short-acting intravenous (IV) anaesthetic agents and maintenance with inhalant anaesthetics is the preferred method of general anaesthesia in most species, it is not practical under field conditions, especially in India, where the costly equipment required to administer

inhalant anaesthetics is not available. This paper describes the use of xylazine–diazepam–ketamine to provide total IV anaesthesia in adult mules.

Materials and methods

The study was conducted in the Department of Surgery, Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu and Kashmir-180009, India, and was approved by the Institutional Animal Ethics Committee.

Six healthy adult mules of both sexes (four females and two males) were used in this study. Trials were conducted at an altitude of 730–750 m a.s.l. Body weight was estimated according to the body length and chest girth of the mules (Carroll & Huntington 1988). Baseline data for temperature, heart rate (HR),respiratory rate (f_R) and physiological parameters were recorded, after which 1.3 mg kg^{-1} xylazine hydrochloride (Xylaxin; Indian Immunologicals Ltd, India) was administered IV using a 20 gauge needle. When peak sedation was achieved, anaesthesia was induced with an IV combination of 0.03 mg kg^{-1} diazepam (Lori; Neon Laboratories Ltd, India) and 2.2 mg kg^{-1} ketamine hydrochloride (Aneket; Neon Laboratories Ltd). After the induction of anaesthesia, the head and neck were extended to maintain a patent airway and the animal was left undisturbed.

Clinical observations

Sedation

The time periods between the IV administration of xylazine and the development of signs of sedation such as drooping of the lips, ears and head, and ataxia were recorded.

Time to sternal recumbency and time to induction

The interval between the IV administration of the diazepam–ketamine hydrochloride combination and attainment of sternal recumbency was recorded as time to sternal recumbency. The interval between the IV administration of the diazepam–ketamine hydrochloride combination and attainment of lateral recumbency was recorded as time to induction.

Quality and depth of anaesthesia

The quality and depth of anaesthesia were analysed by recording different reflexes, the extent of muscle relaxation and antinociception at 5, 15 and 45 minutes after the administration of the diazepam–ketamine hydrochloride combination.

Reflex status

The presence or absence of the palpebral reflex, corneal reflex, swallowing reflex and response to noise were recorded. These reflexes were graded on a scale of 0–3 depending on response, where 0 represented the absence of response, 1 and 2 represented mild and moderate responses, respectively, and 3 represented a maximum or normal response.

Muscle relaxation

Muscle relaxation of the neck, jaw, tail and anal sphincter were examined and scored on a scale ranging from 1 (poor) to 4 (excellent) (Table S1).

Quality of antinociception

The quality of antinociception was recorded without any surgical intervention by observing responses to noxious stimuli consisting of a pin prick at the flank region, a skin pinch with a haemostat at the coronary band and a slap over the rump. Purposeful skeletal muscle movement, observed at any of the test sites, was interpreted as a response and scored on a scale of 0–3 (Table S1).

Recovery

The time intervals between the IV administration of the diazepam–ketamine hydrochloride combination and the start of limb or head movements, standing ataxia and normal gait were recorded. These parameters were then scored on a scale of 1–5 (Table S1).

Physiological observations

Heart rate (beats minute^{-1}) was measured by auscultation using a stethoscope. Respiratory rate (breaths minute^{-1}) was measured by observing the thoracic excursion. Rectal temperature (°C) was recorded with a digital thermometer before the administration of any drug (time 0, baseline) and at 5, 15 and 45 minutes after the administration of the diazepam–ketamine hydrochloride combination.

Haematological observations

A series of 1 mL blood samples were collected from the jugular vein and transferred to vials containing EDTA for the estimation of various haematological