DISTAL PARAVERTEBRAL NERVE BLOCK EFFECTS ON WEST AFRICAN DWARF GOAT HEMATOLOGY AND PHYSIOLOGY

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ABSTRACT

Distal paravertebral nerve block is commonly used in the goat as a method of choice for surgical restraint. This study highlights the response to distal paravertebral nerve block using lignocaine HCl in combination with adrenaline in WAD goat Its effects on haematology and physiology were investigated in twelve adult male and female WAD goats that were injected with 6ml of 2% lignocaine HCl, and 2ml deposited at each intervertebral space to block the spinal nerves of the thirteenth thoracic and first and second lumbar vertebrae. The onset and duration of analgesia was assessed. Haematological parameters were measurred at baseline (T0), thirty minutes into analgesia (T30), immediately the analgesia waned (Ti), and 24 hours post-analgesia. The onset of analgesia was 2 ± 1minutes and it lasted for 70± 3minutes. The results of physiological values showed a statistically significant ($p<0.05$) increase in the heart rate. All other measured physiological parameters were elevated although not significantly. Haematological parameters were not significantly elevated.. A significant cardiac response may be of clinical concern in patients with diagnosed cardiac, renal or hepatic insufficiencies. This study also shows that 6ml of lignocaine HCl was adequate to achieve the desired loss of sensitivity within the time-frame.

INTRODUCTION

Paravertebral anaesthesia is the perineural injection of local analgesic solution around the spinal nerves as they emerge from the vertebral canal through the intervertebral foramina (1). Paravertebral analgesia was introduced in cattle by Farquharson (1940) in order to induce anaesthesia of the lateral abdominal wall (2). This region is innervated by the dorsal and ventral branches of the thirteenth thoracic and first and second lumbar nerves. It has the advantages of facilitating operations on the thoracic and abdominal wall of large animals in a standing position with a minor effect on the sympathetic supply to the circulatory system. It is technically easier to perform and standard -size needles may be used reducing the risk of penetrating major blood vessels. There is also a lack of scoliosis and minimal weakness in the pelvic limb and ataxia (1). Ruminants are generally considered unsuitable for general anaesthesia (1). Nowadays, surgical procedures are performed safely and humanely in ruminants using a combination of physical restraint, mild sedation or tranquilizers and local or regional anaesthesia (3, 4, and 5).

Distal paravertebral nerve block is a preferred method of regional anaesthesia in small ruminants for surgical procedures such as Caesarean section, rumenotomy, and correction of gastro-intestinal displacement in a standing animal. For some years the method has been employed in human surgery both for operative interferences and as an aid to diagnosis (5). The technique for injection has been described in the cow, sheep and goat, the injection site is approximately 3cm from the midline (6) and although the ideal drug and dosage for regional anaesthesia in the goat has not been fully researched, lignocaine HCl is commonly used. Studies have shown that in cattle, distal paravertebral block using about 20ml/kg of 2% lignocaine is achieved in about 10 minutes following injection and analgesia lasts for approximately 90minutes (1, 7). Reports of studies in goat are not known. The aim of this study was to determine the effects of administration of lignocaine hydrochloride combined with adrenaline on haematology and physiology in WAD goats.

METHODS

Goats

Twelve healthy WAD goats comprising six intact, apparently healthy bucks and six apparently healthy non-pregnant and non-lactating does of age 1-2 years and weighing between 7-12kg were used for the study. The animals were housed in the Veterinary Teaching Hospital large animal ward II (Ruminant Pen Unit) prior to and during the study. They were fed corn shaft, cassava peels, and pasture; water was provided ad lib. The animals were brought to condition and baseline physiological parameters (rectal temperature, pulse, heart and respiratory rates) and blood samples were taken, (T0).

Procedure

Goats were tagged F1-6 for the females and M1-6 for the males. The dorsolateral aspect of the caudal half of the left side of each

goat was aseptically prepared by shaving the coat ,cleaning with disinfectant and finally with methylated spirit. 2ml (40mg) each of lignocaine HCl in combination with adrenaline {2% lidocaine with adrenaline USP (1:100000) (Labcalin ®, Laborate Pharmceutical India) was injected into the intervertebral spaces between T13-L3 using a10ml syringe and 21gauge needle. The drug was deposited around the spinal nerves as they emerged from the vertebral canal through the intervertebral foramina to achieve a distal paravertebral nerve block. A total of 6ml (120mg) of lignocaine HCl was used in each goat. The caudolateral aspect of the abdominal wall was pricked using a sterile 21 gauge hypodermic needle immediately the anaesthetic agent was injected to ascertain and note the time of onset and duration (i.e. immediately the anaesthetic agent waned).

Sample collection

Blood samples were collected in EDTA bottles from the jugular vein prior to administration of the drug (T0), at the onset of analgesia and at intervals of 30 minutes into analgesia (T30), immediately the anaesthesia waned (Ti), and 24hours after anaesthesia (T24). Physiological parameters were taken manually (heart rate taken by auscultation with a stethoscope, pulse rate taken by digital counting, respiration by counting abdominal movement, rectal temperature with a clinical thermometer) at intervals of 0, 30, 60, 90,120 minutes and 24 hours after lignocaine administration.

Analysis

Red blood cell count (RBC) and white blood cell counts (WBC) were determined as described by Jain (8). Packed cell volume (PCV) was determined by the microhematocrit method (9, 10). Haemoglobin (Hb) was determined by Sahl's method (11). MCV, MCH and MCHC were calculated from the values of PCV, RBC and Hb. The data were analysed by calculating the mean values and standard errors and the results were treated statistically using student's t-test assessing the mutual statistical difference (12) and analysis of variance (ANOVA).

RESULTS

The effect of distal paravertebral nerve block on the physiological parameters is shown in figure 1; it was observed that a statistically significant increase occurred in the heart and pulse rates at 30mins after onset of analgesia. The respiration increased immediately after onset but fell to within normal rate through the end of the experiment. The rectal temperature remained within normal range throughout the experiment. Haematological values remained within normal limits throughout the study even though elevated but not significantly as recorded in table 1.

DISCUSSION

The administration of 6ml (120mg) of 2% lignocaine hydrochloride to achieve distal paravertebral nerve block produced appreciable analgesia of the lateral abdominal wall. It is noteworthy that 2ml (40mg) of the drug was deposited at each site rather than 3ml (60mg) as specified by some authors (7). This deliberate reduction in the volume of lignocaine has a significant implication on both the economy of cost and reduced toxicity to the animal.

The heart and pulse rate rose significantly ($p< 0.05$) at 30minutes post-administration (see figure 1) and returned to non-significant level of increase thereafter till the end of the experiment which is in agreement with other observations (13, 14). This may be due to secondary effects of lignocaine which is independent of its direct action; there is also the compensatory vasoconstriction which occurs in rostral regions of the body due to caudal nerve activity as reported (1).The respiratory rate rose but not significantly in the immediate post-administration period and returned to within normal limits in contrast to some reports (13, 14). The rectal temperature remained normal in contrast to observations in Black Bengal goats (13).

The haematological values observed in this study were within normal range for the WAD (15, 16). According to (1), lignocaine has been known to control cardiac arrhythmia and suppressing automaticity, and this may have helped to keep the haematological parameters within normal range.

The onset of action and duration of analgesia for WAD goats was determined as 2 minutes and 70minutes whereas Runa et al (2003) observed onset to be 5mins after administration and duration to be 88mins respectively. The difference may be due to the differences in weight between the breeds of goats in the study..

The concentration of local anaesthestic such as lignocaine is determined by the rate of absorption from the site of injection, rate of tissue distribution and rate of metabolism and excretion of the drug (1). The protein binding characteristics of local analgesic agents influence the duration of action (17) with lignocaine, there is a reduction in renal and hepatic flow secondary to the central nervous system effect. This effect may be further increased by the combination with adrenaline. It is therefore important to be cautious in the use of lignocaine in combination with adrenaline under conditions where hepatic, renal or cardiac insufficiency exist or adrenaline is administered prophylactically. This may then lead to synergism, and toxicity and fatality may then result.

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Figure 1: Physiological Parameters Of Wad Goats Under Distal Paravertebral Nerve Block Anesthesia

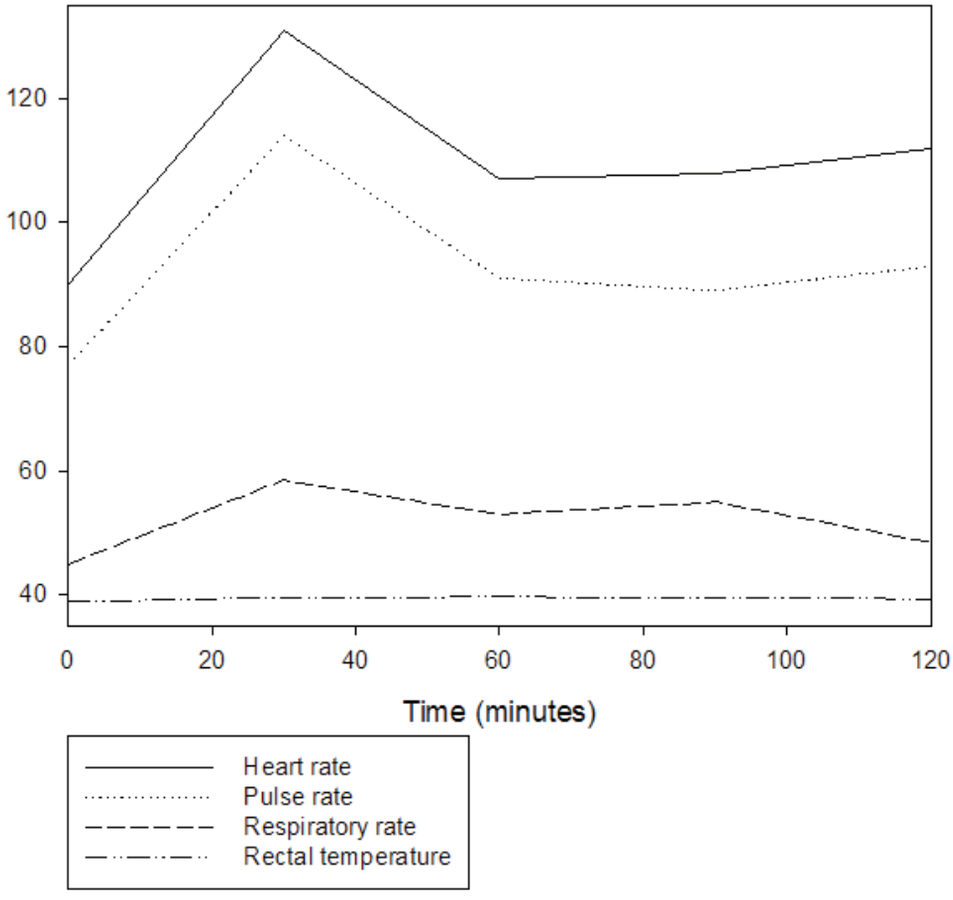

Table 1: Haematological Parameters Of Wad Goats Under Paravertebral Nerve Block

	T0	**T30**	**Ti**	**T24**
%PCV	24.55	24.00	25.45	27.5
%Hb gm	8.15	8.00	8.40	9.20
RBC 10^{12}/L	15.65	15.30	14.35	14.90
WBC 109/L	14.35	21.25	18.35	18.9
Platelets 109/L	15.45	16.90	15.70	13.00
MCV Fl	20.25	16.75	22.00	21.40
MCH Pg	6.45	5.10	6.90	6.75
% MCHC	33.00	33.00	33.00	33.00
% LYM	67.20	69.60	66.85	63.5
% NEU	32.95	30.40	33.15	36.50
ESR	2.15	2.60	2.30	2.25