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Combined Sedation and Regional Analgesia in Black Bengal Goats of Bangladesh

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Abstract: To find out the effect of diazepam and promethazine hydrochloride on respiratory rate, pulse rate, temperature and production of clinical signs in goats and also to compare the effect of 2% lignocaine hydrochloride and 0.5% bupivacaine hydrochloride during paravertebral and epidural analgesia were investigated. A total of 16 apparently healthy Black Bengal goats with body weight of 8-12 (median 9.5 kg) kg were used and allocated in 8 groups. Both diazepam and promethazine, were used as sedatives. Diazepam and promethazine produced significant reduction ($P<0.01$) of respiratory rate and significantly ($P<0.01$) increase of the pulse rate, respectively. But both drugs produced reduction of temperature insignificantly. The important clinical signs recorded using diazepam was movement of legs, neck, salivation and sleepiness whereas with promethazine only a tranquilizing effect was recorded. With 2% lignocaine hydrochloride the onset of analgesia was rapid compared to 0.5 bupivacaine hydrochloride. But the duration was significantly longer in 0.5% bupivacaine than that of 2% lignocaine hydrochloride. Muscle relaxation was better with 2% lignocaine hydrochloride compared to 0.5% bupivacaine hydrochloride. This experiment suggested that both diazepam and promethazine are suitable as pre-medicants in goats and bupivacaine seemed to be better for longer duration of analgesia compared to lignocaine which may be used for shorter and minor surgery in goats.

Key words: Sedatives, analgesics, paravertebral and epidural analgesia, goats

Introduction

Sedation and anesthesia are prerequisite for surgery in goats. Sedatives have been using routinely as a painkiller which also controlled the animals, is an essential part of a balanced anaesthetic regimen. Combination of sedatives is necessary for both general and local anesthesia (Hall and clarke, 1989), the later is very important for ruminants because of regurgitation during general anesthesia (Hossain, 1984; Hashim and Hossain, 1989). Most of the operations in ruminants should therefore, are performed under local or regional analgesia. Efficacy of operative procedure largely depends on efficient anesthesia. A sedative may be used to keep quiet an animal that is excited by a change in its surroundings or by some unfamiliar procedure such as per rectal and of the regional examination. The course of the anaesthetic also tends to be smoothed and the amount of anaesthetic required is also reduced. In ruminants various regional anaesthesia is performed. The sedatives have been used in goats either alone or in combination

with local, regional or general anesthesia. thus the action of some sedatives and regional analgesia in Black Bengal goats and their evaluation in respect to doses, duration are of great significance. The approximation of dose rate of available sedatives in goat may be helpful to the practitioners. It will ultimately improve the treatment measures in Black Bengal goats, particularly, those suffering from surgical affection. The present work was therefore, designed to find out the action of some available sedatives along with local analgesic in black Bengal goats, determination of dose rate of different sedative and to compare the effects of 2% lignocaine Hydrochloride and 0.5% bupivacaine Hydrochloride.

Materials and Methods

The research work was carried out in the Department of Surgery and Obstetrics, Bangladesh Agricultural University, Mymensingh during the period from November, 1997 to February, 1999. A total of 64 local and regional analgesic were performed in 16 apparently healthy Black Bengal goats to investigate the effect of certain sedatives and local analgesics. Four replications of the animals were used at seven (7) days interval.

The animals were maintained in a well ventilated room and kept under good hygienic condition. The animals were allowed to graze in the open field for six hours every day and also supplied pulse bran and water ***ad libitum***. Before starting the experiment the body weight of the animal was taken. The body weight of the animal ranging from 8-12 kg (medium 9.5 kg) and the age were 12-18 months.

The animals were kept fasting over night prior to sedation and analgesia, the animals were then placed on the operating table and was restrained physically by an assistant. The anesthesia was always performed in the morning throughout the course of investigation. Pulse rate (recorded by auscultation with a stethoscope), respiration rate (recorded by counting the abdominal movement) and rectal temperature (taking by using clinical thermometer, °F) were taken before sedation and different time during sedation. After giving sedation various clinical sings and physical scouring method were applied.

Diazepam (Seduxen^{R}, Jayson Pharmaceuticals Bangladesh Ltd.) is used at the dose rate of 0.5 mg kg^{-1} body weight and Promethazine Hydrochloride (Phenergan^{R}, Rhone poulenc Agrovet Bangladesh Ltd.) was also used for tranquillizer/ sedatives as a dose rate of 5 mg kg^{-1} body weight.

For analgesia either 2% lignocaine hydrochloride (Jasocaine^{R}, Jayson Pharmaceuticals Bangladesh Ltd.) or 0.5% Bupivacaine hydrochloride (Ultracaine^{R}, Jayson Pharmaceuticals Bangladesh Ltd.) were used.

Paravertebral analgesia by blocking thirteenth thoracic and the first three lumber nerves were performed. For epidural analgesia injection of local analgesic solution into the epidural canal was performed through the sacrococcygeal space.

The experimental animals were divided into eight different groups and allocated the following local anaesthetic agents, sedatives and regional anaesthesia in Table 1.

In group-A diazepam was injected @ 0.5 mg kg^{-1} body weight (1 ml) intramuscularly then fifteen min later 2% lignocaine hydrochloride was injected @ 3 ml, 2 ml and 2 ml to block the 13th thoracic spinal nerve, 1st and 2nd lumber spinal nerve, respectively. In Group B fifteen min

Table 1: Experimental design

Groups	Type of analgesia	Name and dose of sedatives	Analgesic % and dose
A	Paravertabral (PV)	Diazepam (Seduxen^R) (0.5 mg kg^{-1} bwt.)	2% Lignocaine HCl (Jasocaine^R) 7 ml
B	PV	Diazepam (Seduxen^R) (0.5 mg kg^{-1} bwt.)	0.5% Bupivacaine HCl (Ultracaine^R) 7 ml
C	PV	Promethazine HCl (Phenergan^R) (5 mg kg^{-1} bwt.)	2% Lignocaine HCl (Jasocaine^R) 7 ml
D	PV	Promethazine HCl (Phenergan^R) (5 mg kg^{-1} bwt.)	0.5% Bupivacaine HCl (Ultracaine^R) 7 ml
E	Epidural (Ed)	Diazepam (Seduxen^R) (0.5 mg kg^{-1} bwt.)	2% Lignocaine HCl (Jasocaine^R) 2 ml
F	Ed	Diazepam (Seduxen^R) (0.5 mg kg^{-1} bwt.)	0.5% Bupivacaine HCl (Ultracaine^R) 2 ml
G	Ed	Promethazine HCl (Phenergan^R) (5 mg kg^{-1} bwt.)	2% Lignocaine HCl (Jasocaine^R) 2 ml
H	Ed	Promethazine HCl (Phenergan^R) (5 mg kg^{-1} bwt.)	0.5% Bupivacaine HCl (Ultracaine^R) 2 ml

prior to analgesia diazepam was injected @ 0.5 mg kg^{-1} body weight intramuscularly, 0.5% bupivacaine hydrochloride was injected @ 3 ml, 2 ml and 2 ml to perform the paravertebral analgesia as described above. In Group C Promethazine hydrochloride was injected @ 5 mg kg^{-1} intramuscularly, 2% lignocaine hydrochloride was injected to performed paravertebral analgesia @ 3 ml, 2 ml and 2 ml respectively after 15 min of Promethazine hydrochloride injection. In group D at first Promethazine hydrochloride was injected @ 5 mg kg^{-1} intramuscularly, 0.5% bupivacaine hydrochloride was injected at the above mentioned dose rate after 15 min of Promethazine hydrochloride injection. In group E diazepam was injected @ 0.5 mg kg^{-1} body weight intramuscularly, fifteen min later 2 ml of 2% lignocaine hydrochloride was injected at sacrococcygeal space to perform the epidural anaesthesia. In group F at first diazepam was injected intramuscularly @ 0.5 mg kg^{-1} bd wt, to perform the epidural anaesthesia 2 ml of 0.5% bupivacaine hydrochloride was injected at sacrococcygeal space after 15 min of promethazine hydrochloride injection. In group G Promethazine hydrochloride was injected @ 5 mg kg^{-1} intramuscularly, to perform the epidural anaesthesia 2 ml of 2% lignocaine hydrochloride was injected at sacrococcygeal space after 15 min of promethazine hydrochloride injection., In group H Promethazine hydrochloride was injected @ 5 mg kg^{-1} intramuscularly, fifteen min later 2 ml of 0.5% bupivacaine hydrochloride was injected at sacrococcygeal space to perform epidural anaesthesia.

Statistical analysis

Statistical analysis of the experimental data was carried out according to Steel and Torrie (1980) to analysis of variance in Completely Randomized Design (CRD). The results were assayed by the Least Significant Difference Test in "MSTAT" computer programme.

Results and Discussion

In all groups (A to H) the respiratory rate in goats were significantly ($P<0.01$) decreased after 15 and 30 min of sedation (Table 2). The decreased in respiratory rate here have the relevance

Table 2: Effects of diazepam and promethazine on respiratory rate in Black Bengal goats (n=8)

Group	Drugs used	Observation of respiratory rate 5 min prior sedation (Mean±SD)	Observation of respiratory rate after sedation 5 min (Mean±SD)	15 min (Mean±SD)	30 min (Mean±SD)
A	Diazepam-lignocaine (Paravertebral)	29.25±2.05$_a$	28.75±3.73$_a$	22.75±2.65^b	19.87±1.72^c
B	Diazepam-bupivacaine (Paravertebral)	30.25±3.61$_a$	30.12±6.72$_a$	26.5±5.83^b	21.5±3.66^c
C	Promethazine-lignocaine (Paravertebral)	28.87±3.79$_a$	28.62±3.20$_a$	24.25±3.10^b	20.25±1.98^c
D	Promethazine-bupivacaine (Paravertebral)	29.12±3.97$_a$	27.75±5.15$_a$	24.12±3.56^b	20.75±1.90^c
E	Diazepam-lignocaine (Epidural)	28.75±1.90$_a$	25.87±2.23^b	23.75±2.43^c	20.25±2.05^d
F	Diazepam-bupivacaine (Epidural)	30.37±3.02$_a$	26.25±1.38^b	22.75±1.03^c	19.5±1.06^d
G	Promethazine-lignocaine (Epidural)	28.25±3.05$_a$	24.37±2.32^b	21.5±1.41^c	19.25±1.03^d
H	Promethazine-bupivacaine (Epidural)	25.37±3.24$_a$	25.25±3.32$_a$	23.25±3.32^b	17.87±1.97c

^{abcd}, Mean values of different superscripts in a row differ significantly (P<0.01)

Significant at 1% level of probability (P<0.01)

Table 3: Effects of diazepam and promethazine on pulse rate in Black Bengal goats (n=8)

Group	Drugs used	Observation of pulse rate 5 min prior sedation (Mean±SD)	Observation of respiratory rate after sedation 5 min (Mean±SD)	15 min (Mean±SD)	30 min (Mean±SD)
A	Diazepam-lignocaine (Paravertebral)	78.12±6.37^a	109.0±8.21^b	104.12±14.98^c	93.575±8.87^d
B	Diazepam-bupivacaine (Paravertebral)	76.5±5.12^a	107.75±8.56^b	99.62±7.96^c	90.62±7.90^d
C	Promethazine-lignocaine (Paravertebral)	76.37±4.47^a	103.0±10.02^b	100.75±18.04^c	96.0±10.29^d
D	Promethazine-bupivacaine (Paravertebral)	74.25±4.43^a	109..03±7.78^b	101.12±4.18^c	89.37±8.24^d
E	Diazepam-lignocaine (Epidural)	76.62±4.53^a	109.5±9.60^b	98.62±5.44^c	89.75±5.67^d
F	Diazepam-bupivacaine (Epidural)	73.25±5.80^a	107.75±8.64^b	97.75±7.14^c	86.5±1.19^d
G	Promethazine-lignocaine (Epidural)	70.87±4.18^a	103.37±8.19^b	92.5±6.32^c	81.25±4.80^d
H	Promethazine-bupivacaine (Epidural)	73.87±3.87$_a$	104.62±8.01^b	96.5±8.53^c	83.0±7.38^d

^{abcd}, Mean values of different superscripts in a row differ significantly (P<0.01)

Significant at 1% level of probability (P<0.01)

Table 4: Effects of diazepam and promethazine on rectal temperature (°F) in Black Bengal goats (n=8)

Group	Drugs used	Observation of temperature 5 min prior sedation (Mean±SD)	Observation of respiratory rate after sedation 5 min (Mean±SD)	15 min (Mean±SD)	30 min (Mean±SD)
A	Diazepam-lignocaine (Paravertebral)	102.37±0.35^a	102.02±0.38^a	101.43±0.32^a	101.0±0.37^a
B	Diazepam-bupivacaine (Paravertebral)	102.37±0.44^a	101.92±0.55^a	101.12±0.51^a	100.75±0.46^a
C	Promethazine-lignocaine (Paravertebral)	102.5±0.46^a	102.25±0.49^a	101.56±0.56^a	100.96±0.50^a
D	Promethazine-bupivacaine (Paravertebral)	102.62±0.58^a	102.3±0.66^a	101.43±0.41^a	100.98±0.45^a
E	Diazepam-lignocaine (Epidural)	102.33±0.44^a	101.92±0.34^a	101.52±0.27^a	101.12±0.23^a
F	Diazepam-bupivacaine (Epidural)	102.58±0.45^a	102.21±0.45^a	101.56±0.49^a	101.21±0.58^a
G	Promethazine-lignocaine (Epidural)	102.52±0.49^a	102.15±0.54^a	101.43±0.49^a	101.07±0.54^a
H	Promethazine-bupivacaine (Epidural)	102.7±0.59^a	102.45±0.68^a	101.75±0.65^a	101.15±0.62^a

Mean values of same superscript (a) in a row differ non significantly (P>0.01)

Non Significant at 1% level of probability

Table 5: Effects of lignocaine and bupivacaine on paravertebral analgesia in Black Bengal goats sedated with diazepam (0.5 mg kg^{-1}) or promethazine hydrochloride (5 mg kg^{-1})

Groups	Sedative used	Analgesic %	Onset of analgesia	Duration of analgesia	Area of analgesia after 5 min	10 min	15 min	Observations
A	Diazepam	2% Lignocaine hydrochloride	2-5 min	50-55 min	Upper flank region	Paralumbar fossa, some part of ventral abdomen and hind quarter.	Whole flank, paralumbar fossa, some part of abdomen and hind quarter	Muscle relaxation - abdominal muscle relaxation is good within 10 min. and it persist for about 40 min. Needle pricking - After 5-10 min animal can not response to needle pricking. No urination and defecation occur.
B	Diazepam	0.5% Bupivacaine hydrochloride	10-15 min	120-180 min	No analgesia occur	Upper flank region	Whole flank, paralumbar fossa.	Muscle relaxation - relaxation of abdominal muscle is adequate after 20 min. Needle pricking - Response to needle prick abolishes within 25-30 min. No urination and defecation occur.
C	Promethazine hydrochloride	2% Lignocaine hydrochloride	2-5 min	40-45 min	Upper flank region	Paralumbar fossa, some part of ventral abdomen and hind quarter.	Whole flank, paralumbar fossa, some part of abdomen and hind quarter.	Muscle relaxation - abdominal muscle relaxation is good within 10 min. and it persist for about 40 min. Needle pricking - After 5-10 min animal can not response to needle pricking. No urination and defecation occur.
D	Promethazine hydrochloride	0.5% Bupivacaine hydrochloride	10-15 min	120-160 min	No analgesia occur	Upper flank region	Whole flank, paralumbar fossa.	Muscle relaxation - relaxation of abdominal muscle is adequate after 25 min. Needle pricking - Response to needle prick abolishes within 25-30 min. No urination and defecation occur.

Table 6 : Effects of lignocaine and bupivacaine on epidural analgesia in Black Bengal goats sedated with diazepam (0.5 mg kg^{-1}) or promethazine hydrochloride (5 mg kg^{-1})

Groups	Sedative used	Analgesic %	Onset of analgesia	Duration of analgesia	Area of analgesia after			Observations
					5 min	10 min	15 min	
E	Diazepam	2% Lignocaine hydrochloride	2-5 min	50-55 min	Base of the tail, some part of perenial region	Base of the tail, perenial region, the udder, some part of hind quarter	Base of the tail, perenial region, some part of the abdomen, udder, hind quarter	Muscle relaxation - Good muscle relaxation occur within 10 min. Needle pricking -After 5-10 min animal can not response to needle pricking. No urination and defecation occur.
F	Diazepam	0.5% Bupivacaine hydrochloride	10-15 min	120-180 min	Base of the tail	Base of the tail, some part of perenial region	Base of the tail, perenial region, udder	Muscle relaxation - Adequate muscle relaxation occur within 20 min. Needle pricking - After 15-20 min animal can not response to needle pricking. No urination and defecation occur.
G	Promethazine hydrochloride	2% Lignocaine hydrochloride	2-5 min	40-45 min	Base of the tail, some part of perenial region	Base of the tail, perenial region, the udder, some part of hind quarter	Base of the tail, perenial region, some part of the abdomen, udder, hind quarter	Muscle relaxation - Good muscle relaxation occur within 15 min. Needle pricking -After 5-10 min animal can not response to needle pricking. No urination and defecation occur.
H	Promethazine hydrochloride	0.5% Bupivacaine hydrochloride	10-15 min	120-160 min	Base of the tail	Base of the tail, some part of perenial region	Base of the tail, perenial region, udder	Muscle relaxation - Adequate muscle relaxation occur within 25 min. Needle pricking - After 20-25 min animal can not response to needle pricking. No urination and defecation occur.

with the earlier reports (Sanhouri ***et al.***, 1991; Kumar and Thurman, 1977; Amin, 1998) This reduction in respiratory rate resulted from direct depressing effect of diazepam on central nervous system (Marjore and Nicholas, 1995).

The pulse rate in goats of all groups (A to H) were significantly increased ($P<0.01$) after 5 min of sedation. The pulse rate also significantly increased after 15 and 30 min of sedation, but not as like as the mean value after 5 min of sedation (Table 3). These results are in agreement with the earlier findings (Kinge ***et al.***, 1985; Amin, 1998).

The rectal temperature in goats of all groups were decreased after 5, 15 and 30 min of sedation which was non significant ($P>0.01$). This result is in close conformity with the earlier reports (Kumar and Thurmon, 1977; Amin, 1998). Reduction of rectal temperature with diazepam and promethazine might result from depression of thermoregulatory centre in the hypothalamas (Kumar and Singh, 1990). However, there were no significant differences in respiratory rate, pulse rate and rectal temperature between any of the two groups (Table 4).

Most important clinical signs after using diazepam were drowsiness, salivation, movement of the legs and ears, raising of head and lowering down after a short while and finally sleep. But with promethazine only a tranquilizing effect was recorded. Jerking movement of the head (twitching of the head), movements of the leg were recorded. There was no salivation and sleep.

The effects of 2% lignocaine hydrochloride and 0.5% bupivacaine hydrochloride in paravertebral analgesia in goats is presented in the Table 5 and 6. The onset of analgesia occur within 5 min in most of the cases with 2% lignocaine hydrochloride where as the onset is within 5-10 min with 0.5% bupivacaine hydrochloride (Table 5). This observation are in agreement with Howel ***et al.*** (1990). In the contrary the duration of analgesia is shorter (40-55 min) with 2% lignocaine hydrochloride and longer(120-160 min) with 0.5% bupivacaine hydrochloride. According to these findings, rapid onset occur with 2% lignocaine hydrochloride and slow onset occur with 0.5% bupivacaine hydrochloride. This observations support the previous findings of Kumar and Chouhan(1996) who stated that bupivacaine is a long acting anaesthetic agent and its effect lasts for 120- 360 min. Here we got better muscle relaxation during paravertebral analgesia with 2% lignocaine hydrochloride compared to 0.5% bupivacaine hydrochloride (Table 6). Although there is earlier report supporting this but a poor muscle relaxation with bupivacaine has been reported (Covino, 1986; Howel ***et al.***, 1990).

In conclusion, both diazepam and promethazine (at the dose rate of 0.5 mg kg^{-1} bwt and 5 mg kg^{-1} bwt, respectively) can be used as premedicants in goats, both the drugs produce similar effect on respiration, pulse and temperature but sedation were more profound with diazepam compared to promethazine. It was found that during paravertebral and epidural analgesia 2% lignocaine hydrochloride produce rapid onset and better muscle relaxation compared to 0.5% bupivacaine hydrochloride., however, on the contratry, the 0.5% bupivacaine hydrochloride. produce prolonged duration of analgesia with a lesser degree of muscle relaxation. It is suggested that if a longer time is required for surgery, 0.5% bupivacaine hydrochloride should be used but for minor surgery 2% lignocaine hydrochloride is suitable as bupivacaine is an expensive drug.

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