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Physiological and hematobiochemical effects of proximal paravertebral administrated bupivacaine and lignocaine in bovine

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Abstract
The present investigation was conducted on 18 bovines (14 buffalo and 4 cattle) to study comparative evaluation of 0.25% Bupivacaine HCL, 0.5% Bupivacaine HCL and 2% Lignocaine HCL for proximal paravertebral nerve block in bovines. Bupivacaine was found to haveno clinically relevant effects on heart rate, respiration rate and rectal temperature. 0.5% Bupivacaine did not show any adverse clinical effect on the haematological and physiological parameters. Non-significant decreased in serum cortisol was observed 30 minutes after administration of local anesthetics compare to before administration of local anesthetics in all groups and quantified that the local anaesthetic reduced surgical stress during surgical procedures. From the present study, it was concluded that 0.5% Bupivacaine effectively administrated in paravertebral space in physiologically impaired animals.

Keywords: Lignocaine, haematological, biochemical, bupivacaine, serumcortisol

Introduction

In ruminants, regional anaesthesia is preferred over general anaesthesia because of regurgitation and other anatomical and physiological features that limit general anaesthesia (Shokry, 1982) [28]. Jennings (1961) [10] stated paravertebral anaesthetic technique developed by Farquaharson was determined to be the most effective type of regional anaesthesia for the flank. In order to block the nerves that innervate the flank region during regional anaesthesia, either proximal paravertebral nerve block or distal paravertebral nerve block local anaesthetic is injected into the intervertebral foraminae at the free ends of the lumbar transverse process and the posterior border of the head of the last rib (Kumar, 2003) [16]. In the proximal paravertebral approach, local anaesthetic is injected perineurally close to the spinal nerves as they leave the vertebral canal. The 13th thoracic spinal nerveas well as the first and second lumbar spinal nerves must be anaesthetized in order to sufficiently desensitise the flank region (Valverde and Sinclair, 2015) [32]. Farquharson (1940) [8] reported paravertebral nerve block benefits in cattle. It was stated that paravertebral anaesthesia produced consistent analgesia and muscular relaxation of the abdominal region, so there were no difficulties encountered during surgical wound repair. Nils Lofgren, a Swedish chemist, invented the amide-type local anaesthetic lidocaine hydrochloride. Due to the intermediate anaesthetic duration, financial constraints, and restricted space in mobile practise vehicles, it has emerged as the only agent of choice. Since entering the market, it has enjoyed Gold-Standard status. Bupivacaine hydrochloride is amide type local anaesthetic, was created in 1957. Bupivacaine hydrochloride is 4 time more potent than lignocaine hydrochloride (Khursheed *et al*. 2001) [14]. Therefore, the present study is designed to study clinicophysiological of 0.25% Bupivacaine HCL, 0.5% Bupivacaine HCL and 2% Lignocaine HCL using proximal paravertebral nerve block in bovine.

Materials and Methods

Design of study

The study on clinical evaluation of three local anaesthetics *viz.,* 0.25% bupivacaine hydrochloride, 0.5% bupivacaine hydrochloride and 2% lignocaine hydrochloride using proximal paravertebral nerve block in eighteen clinical cases of bovine (14 buffalo and 4 cattle) presented at Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Sardarkrushinagar, Gujarat, India for various surgical procedure. The animals were randomly divided into three groups and each groups consisting six animals. All the local anaesthetics used in present study does not contain epinephrine or any other preservative.

Groups	No. of animals	Drugs	Dose rate	Surgical approach
I	6	0.25% bupivacaine HCL	0.75 mg/kg	Left flank laparotomy
II	6	0.5% bupivacaine HCL	1.5 mg/kg	Left flank laparotomy
III	6	2% lignocaine HCL	4 mg/kg	Left flank laparotomy

Physiological Parameters

The physiological parameters *viz.* rectal temperature, respiration rate and heart rate were recorded before analgesia, 15, 30, 45, 60 and 120 minutes of anaesthesia.

Haematobiochemical Parameter

Haematological parameters viz. haemoglobin (gm/dl), packed cell volume (%), total erythrocyte count (×106/µl), total leukocyte count (×103/µl) and differential leukocyte count (DLC) *viz.* neutrophil (%) eosinophil(%), lymphocyte (%) and monocyte (%) were measured by automated animal haematology analyzer. The biochemical parameters *viz.* Serum creatinine (mg/dl), Alanine amino- transaminase (IU/L) and Aspartate amino-transaminase (IU/L) were estimated using fully automated biochemical analyzer.

Serum Cortisol (nmol/L)

Serum cortisol concentrations in animals were tested as indications of physiological stress. Serum cortisol level was determined before onset of analgesia, 15, 30, 45, 60 and 120 minutes of analgesia. Serum cortisol concentration was measured by standard Enzyme Linked Immuno Sorbent Assay (ELISA) technique.

Statistical Analysis

The results gathered in the current study of various parameters were statistically evaluated using ANOVA (A one way analysis of variance) comparison within and between groups prior to anaesthesia, 15, 30, 45, 60, and 120 minutes following the onset of analgesia. Duncan's Multiple Range Test (DMRT) was utilised after a one-way analysis of variance.

Results and Discussion

Physiological Parameters

Heart rate (beats/min)

In group-I, the mean heart rate was 69.66±1.54 before anaesthesia, whereas it was 67.12±1.89, 64.33±1.83, 61.83±2.02, 64.11±2.12 and 67.23±1.86 on 15, 30, 45,60 and 120 minutes after onset of analgesia, respectively. In group II, the mean heart rate was 70.66±1.74 before anaesthesia, whereas it was 65.33±1.89, 62.00±2.06, 57.33±1.76, 59.66±2.44 and 65.83±1.16 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean heart rate was 71.16±1.07 before anaesthesia, whereas it was 68.16±1.24, 65.83±1.31, 65.17±1.09, 66.33±0.84 and 67.66 ± 1.92 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In all the three groups decreasing trend in heart rate was observed up to 45 minutes beyond which increasing trend was seen up to 120 minutes after administration of local anaesthetics. In group-II and group-III, this decrease in mean value of heart rate was significantly ($p<0.05$). Singh *et al.* (2005, B) [30] observed administering epidural 0.5% bupivacaine hydrochloride and xylazine in buffaloes heart rates were significant ($p<0.05$) decreased heart at 120 minutes. Khajuria *et al*. (2014) [12] reported significantly increased heart rate at 150 minutes in goat administering 2% lignocaine hydrochloride. No significant changes ($p>0.05$) were observed in heart rate reported by the Rostami and Vesal (2011) [25] in paravertebral anaesthesia with 0.5% bupivacaine and 2% lignocaine hydrochloride administration in fat tail sheep. When 0.25% bupivacaine hydrochloride was used in dog epidural space, Khodwe *et al.* (2014) [13] noticed non-significant ($p>0.05$) fluctuation in heart. A significant decreased in heart rate with bupivacaine may be attributed to these inhibitory effect of bupivacaine on the cardiovascular and autonomic nervous system (Singh *et al*., 2005, B) [30].

Respiration rate (breaths/minutes)

In group I, the mean respiration rate was 23.16±1.27 before anaesthesia, whereas it was 21.18±1.35, 20.66±1.05, 19.66±1.06, 19.52±1.14 and 18.66±1.40 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean respiration rate was

20.50±0.84 before anaesthesia, whereas it was 19.66±0.88, 20.16±1.01, 19.83±0.90, 18.36±0.81and 18.16±0.73 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean respiration rate was 21.13±1.32 before anaesthesia, whereas it was 22.33±1.52, 20.51±1.84, 20.00±1.58, 19.66±0.98 and 20.33±1.56 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In all the three groups the respiratory rate fluctuated within physiological limits at different sampling intervals. In all the three groups the respiratory rate fluctuated within physiological limits at different sampling intervals. In accordance with report of Chepte *et al.* (2019) [4] who observed non-significant fluctuations in respiratory rate within normal physiological limits in proximal paravertebral anaesthesia using 2% lignocaine hydrochloride in cattle. In caudal epidural blocks with 0.25% bupivacaine hydrochloride in horses. According to Lucky *et al.* (2007) [19], sheep underwent caudal epidural anaesthesia with 0.5% bupivacaine hydrochloride had non- significantly ($p<0.05$) decreased respiratory rate during analgesia.

Rectal temperature (ºF)

In group I, the mean rectal temperature was 100.66±0.45 before anaesthesia, whereas it was 101.23±0.44, 100.06±0.56, 101.10±0.37, 100.33±0.56 and 100.30±0.63 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean rectal temperature was 100.46±0.73 before anaesthesia, whereas it was 100.88±0.53, 100.30±0.55, 100.61±0.46, 101.00±0.43 and 100.76±0.63 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean rectal temperature was 100.70±0.59 before anaesthesia, whereas it was 100.66±0.44, 101.28±0.53, 100.25±0.50, 100.20±0.54 and 99.98±0.41 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. Throughout the whole study the rectal temperature fluctuated non-significantly and within physiological limits at different sampling intervals in all three groups. Rectal temperature was not substantially different from baseline value in horses receiving 0.25% bupivacaine caudal epidural analgesia, according to DeRossi *et al*. (2012) [7], similar result was found by Bansal *et al*. (2012) [1] in paravertebral block with 0.25% bupivacaine in human. Rectal temperature was not significantly different (p>0.05) before and during analgesia in a sheep epidural block with 0.5% bupivacaine and 2% lignocaine hydrochloride, according to Lucky *et al*. (2007) [19].

Haematological Parameters

Haemoglobin (g/dl)

In group I, the mean haemoglobin was 11.01±0.82 before anaesthesia, whereas it was 10.86±0.96, 10.38±0.59, 10.15±0.71, 10.06±0.48 and 9.93±0.52 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean haemoglobin was 11.12±0.71 before anaesthesia, whereas it was 10.87±0.57, 10.76±0.58, 10.27±0.68, 10.43±0.67 and 10.01±0.67 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean haemoglobin was 11.15±0.67 before anaesthesia, whereas it was 11.05±0.65, 10.93±0.78, 10.53±0.62, 10.21±0.59 and 9.95±0.47 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. The mean values of haemoglobin concentration in group I, group II and group III there showed non-significant (p>0.05) decrease up to 120 minute after onset of analgesia. There was no significant difference in haemoglobin concentrations at within and between groups at the various time points of the present study. Pathak *et al*. (2012) [23] reported non- significantly (p>0.05) reduced haemoglobin in buffalo administered 0.25 mg/kg bupivacaine for spinal analgesia in buffalo calves. Kumar *et al.* (2020) [17] in ruminants using 2% lignocaine and 0.5% bupivacaine hydrochloride, respectively. In present study the non-significantly decreased haemoglobin value may be due to pooling of the circulating blood cell in the spleen or other reservoir secondary to decreased sympathetic activity (Singh *et al*., 2005, A) [29].

Packed Cell Volume (per cent).

In group I, the mean packed cell volume was 32.61±2.10 before anaesthesia, whereas it was 31.26±2.2, 30.11±1.46, 29.20±1.72, 29.03±0.97 and 28.73±1.22 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean packed cell volume was 33.03±1.99 before anaesthesia, whereas it was, 32.05±1.54, 31.05±1.46, 29.93±1.74, 30.05±0.65 and 29.26±1.71 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean packed cell volume was 11.15±0.67 before anaesthesia, whereas it was 11.05±0.65, 10.93±0.78, 10.53±0.62, 10.21±0.59 and 9.95 ± 0.47 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. Throughout the whole study the packed cell volume fluctuated non-significantly and within physiological limit at different sampling intervals in all three groups. Throughout the whole study the packed cell volume fluctuated non-significantly and within physiological limit at different sampling intervals in all three groups (Constable *et al*., 2017) [6]. Similar observation was found by Sukirtharaj (2015) [31] in paravertebral block in human using 0.25% bupivacaine. Kalim *et al*. (2011) [11] in lumbar epidural block using 0.5% bupivacaine hydrochloride in buffalo calves and Prasant (2016) [22] in buffalo for epidural space using 2% lignocaine hydrochloride. In present study the packed cell volume was non- significantly decreased may be due pooling of the circulating blood cell in the spleen or other reservoir secondary to decreased sympathetic activity could be the reason for decreased the haemoglobin level (Singh *et al*., 2005, A) [29].

Total Erythrocyte Count ($\times 10^6/\mu L$)

In group I, the mean total erythrocyte count was 6.64±0.54 before anaesthesia, whereas it was 6.40±0.56, 6.13±0.52, 6.34±0.55, 6.14±0.58 and 6.12±0.49 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean total erythrocyte count was 6.61±0.68 before anaesthesia, whereas it was, 6.47±0.57, 6.19±0.51, 5.83±0.45, 5.69±0.40 and 5.42±0.39 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean total erythrocyte count was 6.55±0.49 before anaesthesia, whereas it was 6.24±0.45, 6.03±0.51, 5.89±0.44, 6.23±0.57 and 6.10±0.64 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group I and group II, the mean values of the total erythrocyte count was nonsignificantly (p>0.05) decreased within the normal physiological limits. In group III, there was non-significantly (p>0.05) fluctuated within normal range. There was no significant difference (p>0.05) between all groups of total erythrocyte count at the various time points in the present study. Similar findings were reported by the Kumar *et al.* (2020) [17] after paravertebral anaesthesia in bovines with 0.5% bupivacaine and 2% lignocaine hydrochloride. In present study, the total erythrocyte count was non-significantly decreased may be due pooling of the circulating blood cell in the spleen or other reservoir secondary to decreased sympathetic activity could be the reason for decreased the haemoglobin level (Singh *et al*., 2005, A) [29].

Total Leukocyte Count ($\times 10^3/\mu L$)

In group I, the mean±SE of total leukocyte count was 8.45±1.04 before anaesthesia, whereas it was 8.23±1.08, 8.21±1.21, 9.51±1.05, 8.76±1.07 and 8.90±1.09 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean±SE of total leukocyte count was 10.68±0.52 before anaesthesia, whereas it was 9.26±1.42, 11.23±0.36, 9.47±0.77, 9.80±0.38 and 9.01±1.02 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean±SE of total leukocyte count was 9.08±0.92 before anaesthesia, whereas it was 8.33±1.10, 9.68±1.06, 8.43±0.52, 9.83±0.87 and 9.03±0.74 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group I, group II and group III the total leukocyte count was non- significantly (p>0.05) fluctuated within normal physiological limits up to 120 minutes after onset of analgesia. The total leukocyte count was found to be non-significant (p>0.05) in between group at various time points. Similar result was found by the Khodwe *et al*. (2013) [13] in dog received an epidural injection of 0.25% bupivacaine, Kumar *et al.* (2020) [17] observed the total leukocyte count was non-significantly (p>0.05) fluctuated within normal physiological bounds in proximal paravertebral block with 0.5% bupivacaine and 2% lignocaine hydrochloride in ruminants. Lokhande and Aher (2018) [18] found that leukocyte count significantly dropped (p<0.05) during anaesthesia and reverted to baseline 24 hours later in cattle receiving a 2% lignocaine hydrochloride dorsolumbar epidural block.

Neutrophil (per cent)

In group I, the mean ± SE of neutrophil was 47.66±2.97 before anaesthesia, whereas itwas 46.83±2. 79, 47.51±3.25, 50.12±2.82, 47.21±3.30 and 45.33±3.39 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean ± SE of neutrophil was 53.33±1.70 before anaesthesia, whereas it was 51.39±3.91, 50.47±2.88, 51.53±2.52, 52.83±3.09 and 49.32±2.87 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean ± SE of neutrophil was52.16±2.54 before anaesthesia, whereas it was 49.21±3.95, 51.59±2.68, 48.24±3.01, 46.61±3.35 and 47.66±1.05 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group I, group II and group III, the mean value of neutrophil was observed non-significant (*p*>0.05) fluctuated within and between group at different time interval. When the groups were compared at 24 hours, Kumar *et al*. (2020) [17] found that 2% lignocaine administrated animals had the highest neutrophilia, followed by 0.5% bupivacaine hydrochloride administrated animals, similar result was observed by the Lokhande and Aher (2018) [18] in epidural block with 2% lignocaine.

Lymphocyte (per cent)
In group I, the mean ± SE of lymphocyte was 37.16±2.82 before anaesthesia, whereas it was 36.66±2.43, 37.58±3.45, 34.53±2.56, 37.24±2.88 and 40.14±3.74 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean ± SE of lymphocyte was 34.50±1.68 before anaesthesia,whereas it was, 35.83±3.74, 35.52±2.90, 37.56±2.12, 38.23±3.17 and 38.41±3.36 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean ± SE of lymphocyte was 33.33±2.85 before anaesthesia, whereas it was 34.16±2.28, 34.00±2.73, 33.66±3.48, 35.39±2.88 and 33.54±2.64 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. The mean values of lymphocyte was observed non-significantly (*p*>0.05) changes within and between groups at different time interval. % lignocaine hydrochloride was used by Kumar *et al*. (2020) [17] and Shendage (2015) [27] for paravertebral anaesthesia and they observed a non-significant difference in lymphocyte value, similar fining was reported by the Moulvi *et al*. (2011) [21] in epidural anaesthesia using 2% lignocaine in cow calves, Shah (2017) [26] observed the lymphocytopenia in epidural anaesthesia using 0.25% bupivacaine hydrochloride in dogs. Anaesthesia stress, viral or bacterial infection, immunological suppression, chronic renal insufficiency and the use of corticosteroids are causes of lymphocytopenia (Roland, 2014) [24].

Monocyte (per cent)
In group I, the mean ± SE of monocyte was 4.16±0.47 before anaesthesia, whereas it was 5.00±0.63, 3.64±0.49, 4.33±0.42 , 4.00±0.85 and 3.41±0.49 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean ± SE of monocytes was 1.16±0.30 before anaesthesia, whereas it was 2.16±0.47, 2.66± 0.47, 2.83±0.61, 2.20±1.03 and 1.66±0.33 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean±SE of monocytes was 2.5±0.42 before anaesthesia, whereas it was 3.00±0.63, 3.54±0.71, 3.25±0.91, 4.19±0.51and 4.83±1.24 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group I, group II and group III there was non-significant (*p*>0.05) fluctuated within and between the group at different time intervals. Monocyte count was non-significantly fluctuated within group observed by the Lokhande and Aher (2018) [18] in epidural block using 2% lignocaine in cattle, similar result was observed by the Kalim *et al.* (2011) [11] in epidural block with 0.5% bupivacaine hydrochloride in buffalo calves.

Eosinophil (per cent)
In group I, the mean±SE of eosinophil was 0.86±0.37 before anaesthesia, whereas it was 1.50±0.42, 1.44±0.35, 1.16±0.47, 1.53±0.39 and 1.57±0.41 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean±SE of eosinophil was 1.33±0.33 before anaesthesia, whereas it was 0.83±0.29, 1.00±0.36, 0.83±0.31, 0.73±0.54 and 1.16±0.47 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean±SE of eosinophil was 0.96±0.21 before anaesthesia, whereas it was 1.00±0.36, 1.16±0.30, 1.24±21, 0.83±0.30 and 1.16±0.34 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group I, group II and group III the mean value of eosinophil was non- significant (*p*>0.05) fluctuated within normal haematological bounds at different time intervals. The mean value of different groups showed a non-significant (*p*>0.05) changes between the group at different time intervals in present study. The eosinophil was non-significant (*p*>0.05) fluctuated within normal range reported by Kumar *et al.* (2020) [17] in paravertebral nerve block using 0.5% bupivacaine and 2% lignocaine hydrochloride local anaesthetics in bovine.

Biochemical Parameters
Serum Creatinine (mg/dl)
In group I, the mean±SE of serum creatinine was 1.51±0.18 before anaesthesia, whereas it was 1.58±0.31, 1.72±0.15, 1.60±0.18, 1.44±0.25 and 1.83±0.27 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean±SE of serum cretinine was

1.48±0.21 before anaesthesia, whereas it was 1.80±0.27, 1.63±0.26, 1.45±0.17, 1.95±0.15 and 1.62±0.18 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean±SE of serum creatinine was 1.49±0.16 before anaesthesia, whereas it was 1.37±0.12, 1.76±0.27, 1.29±0.20, 1.69±0.17 and 1.68±0.21 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group I, group II and group III the mean value of serum creatinine was non- significantly (*p*>0.05) fluctuated within and between the group at different time interval in normal biochemical limit. Similar finding was conducted by the Kumar *et al*. (2020) [17] in proximal paravertebral nerve block using 0.5% bupivacaine hydrochloride and 2% lignocaine in bovines. Mishra *et al.* (1993) [20] in epidural block using 0.5% bupivacaine hydrochloride in bovine. Kalim *et al*. (2011) [11] reported significant increase in serum creatinine levels at 60 to 120 minutes in epidural block in buffalo calves with 0.5% bupivacaine hydrochloride. According to Lokhande and Aher (2018) [18], serum creatinine levels considerably elevated during anaesthesia and then reverted to baseline 24 hours following lignocaine administration in cattle.

Alanine Amino Transaminase (IU/L)
In group I, the mean±SE of alanine amino transaminase was 39.36±2.88 on before anaesthesia, whereas it was 41.46±3.24, 41.30±2.87, 41.78±2.42, 40.93±2.42 and 42.66±2.68 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean±SE of alanine amino transaminase was 37.33±2.38 on before anaesthesia, whereas it was 38.78±1.75, 40.10±1.88, 41.25±2.58, 41.76±2.18 and 43.03±2.03 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean±SE of alanine amino transaminase was 38.21±1.65 on before anaesthesia, whereas it was 38.81±2.67, 40.36±2.22, 41.96±2.36, 42.05±2.27 and 39.66±2.07 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group I group II and group III, the mean value of alanine amino transaminase was non-significantly (*p*>0.05) fluctuated within the normal physiological limit. Non-significant effect of 2% lignocaine

hydrochloride on goat lumbosacral was noted by Zayed *et al*. (2020) [33], similar finding was observed by the Kumar *et al*. (2020) [17] in proximal paravertebral block with 0.5% bupivacaine and 2% lignocaine hydrochloride in ruminants.

Aspartate Amino Transferase (IU/L)

In group I, the mean±SE of aspartate amino transferase was 105.56±5.21before anaesthesia, whereas it was 107.31±6.17, 106.66±6.51, 104.78±6.26, 104.25±6.16 and 108.53±6.42 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean±SE of aspartate amino transferase was 103.63±4.13 before anaesthesia, whereas it was 105.20±5.79, 101.66±5.26, 106.95±6.13, 104.85±5.28 and 109.01±4.60 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean±SE of aspartate amino transferase was 101.53±4.21 before anaesthesia, whereas it was105.36±3.56, 106.20±5.53, 105.46±5.05, 108.28±5.66 and 109.20±6.18 on 15, 30, 45, 60 and 120 minutes after onset ofanalgesia, respectively. In group I and group II, the mean value of aspartate amino transferase was non-significantly (p>0.05) fluctuated within the normal biochemical bounds at different time intervals. In group III, there was non-significant (p>0.05) increased up to 120 minutes but non-significant (p>0.05) decreased at 45 minutes after onset of analgesia. There was no statistically significant (p>0.05) difference in the AST values, according to the comparisons made between the groups and within each group at various points in proximal paravertebral block with 0.5% bupivacaine hydrochloride and 2% lignocaine hydrochloride in ruminants reported by the Kumar *et al.* (2020) [17]. Aspartate amino transaminase levels were significantlyelevated (p<0.05) during anaesthesia and to return to baseline 24 hours later in cattle receiving a dorsolumbar epidural block with 2% lignocaine observed by Lokhande and Aher (2018) [18].

Serum Cortisol (nmol/L)

In group I, the mean±SE of serum cortisol was 40.60±3.18 before anaesthesia, whereas it was 69.66±8.34, 66.20±4.07, 60.33±4.39, 67.15±5.46 and 71.34±6.42 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group II, the mean±SE of serum cortisol was
43.60±2.82 before anaesthesia, whereas it was 63.34±5.96, 55.81±3.63, 45.19±3.24, 41.94±3.89 and 49.44±3.85 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. In group III, the mean±SE of serum cortisol was 37.99±2.84 before anaesthesia, whereas it was 42.53±4.69, 50.32±5.43, 35.55±3.67, 41.27±3.70 and 43.44±2.73 on 15, 30, 45, 60 and 120 minutes after onset of analgesia, respectively. Barot *et al*. (2022) [2] found that the serum cortisol value was significantly (p<0.05) higher in 2% lignocaine hydrochloride group of animals. They observed that 10 minutes after the onset of analgesia the serum cortisol levels were non- significantly (p>0.05) increased, but at 30 minutes after the onset of analgesia, they were non-significantly (p>0.05) decreased. Bristow and Holmes. (2006) [3] reported significant (p<0.05) finding in cortisol levels and anxiety related baheviors in cattle, similar results were seen in Kim *et al.* (2011) [15] using sprayed intraperitoneal bupivacaine 0.25% (SIB) to treat post-operative pain behaviour and biochemical stress response following laparoscopic ovariohysterectomy in dogs. Serum cortisol concentrations tended to be higher in the CAST (castrated placebo treated control) and CONT (control) groups compared with the sedative- analgesic treated group, but this difference was not statistically significant (p = 0.396) according to Coetzee *et al.* (2010) [5] observation of the sub anaesthetics effect of xylazine and ketamine administered to calves prior to castration. Transportation-induced stress in animals caused by the adrenocortical response reported by Greenwood and Shutt (1992) [9].

Conclusions

Onset of analgesia was significantly (p<0.05) faster in 2% lignocaine hydrochloride (6.10±0.36 min.) followed by 0.5% bupivacaine hydrochloride (13.20±0.50 min.) and 0.25% bupivacaine hydrochloride (16.50±0.14 min.). Duration of anaesthesia was longest in 0.5% bupivacaine hydrochloride (177.40±03.28 min.) followed by 0.25% bupivacaine hydrochloride (131.20±2.38 min.) and 2% lignocaine hydrochloride (95.50±2.09 min.). 0.5% bupivacaine hydrochloride produced complete analgesia in all layer of abdomen except peritoneum when compared with 0.25% bupivacaine hydrochloride and 2% lignocaine hydrochloride given through proximal paravertebral nerve block. None of the three local anaesthetics showed any effect on haematological and biochemical parameters. However, significant fluctuation in serum cortisol levels were observed in animal undergoing proximal paravertebral nerve block with 0.25% and 0.5% bupivacaine hydrochloride.

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