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COMPARATIVE EVALUATION OF LIGNOCAINE, ARTICAINE AND ROPIVACAINE FOR PROXIMAL PARAVERTEBRAL ANAESTHESIA IN CATTLE

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Abstract: Present study was conducted on 18 clinical case of cattle presented with various gastro-intestinal affections to TVCC, PGIVAS, Akola subjected for laparotomy surgical procedure. All clinical cases were randomly divided into three equal group (n=6) and proximal paravertebral nerve block was performed by using Lignocaine, Articaine and Ropivacaine. Comparative anaesthetic assessment of onset of action and duration of anaesthesia along with clinicophysiological parameters were evaluated.

Keywords: Lignocaine, Articaine, Ropivacaine, Cattle, Paravertebral.

INTRODUCTION

Thoracolumbar paravertebral block is performed to anesthetize the surgical site for a flank laparotomy. This technique is preferable to infiltration anesthetic techniques because of the smaller volume of anesthetic agent required, production of a more extensive anesthesia of the abdominal wall and reduced postoperative swelling and hematoma (Rostami & Vesal 2011). In ruminants, flank region is the most common site for laparotomy; caesarian section, rumenotomy, intestinal obstruction, volvulus, ruminal fistula, foreign body syndrome and hernia etc. (Lee, 2006; Kumar, 2003). Paravertebral nerve block results effective analgesia in all layers of the abdominal wall while the tissue infiltration, inverted L block may not produce analgesia of all muscle layers as well as peritoneum specially in fat animals (Sloss and Dufty, 1977). Local anesthetic techniques are simple to perform and inexpensive and provide a reversible loss of sensation to a distinct area of the body. There are many local anesthetics available that vary in their potency, toxicity, and cost.

However no information is available about efficacy and safety of Articiane and Ropivacaine used for paravertebral analgesia in cattle. The primary aim of this study was to evaluate the onset of action and duration of anesthesia of the flank region by undertaking the

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Proximal Paravertebral regional nerve block in cattle by using Lignocaine, Articiane and Ropivaciane.

MATERIALS AND METHODS

Present study was conducted on 18 clinical cases of cattle presented with various gastro-intestinal affections to Teaching Veterinary Clinical Complex, Post Graduate Institute of Veterinary and Animal Sciences, Akola subjected for laparotomy surgical procedure. These cases were randomly assigned into a block study design of three equal groups. The proximal paravertebral anesthesia was accomplished using one of three anesthetic agents: Group L (n=6) receives 2% Lignocaine Hcl @ 4mg/kg body weight, Group A (n=6) receives 4% Articaine Hcl @ 4mg/kg body weight and Group R (n=6) receives Ropivacaine Hcl 0.75% @ 1mg/kg Group

The animal was restrained in standing position, the area between spinus process and flank was prepared aseptically. The proximal paravertebral nerve block desensitizes the dorsal and ventral nerve roots of the last thoracic (T13) and first and second lumbar (L1 and L2) spinal nerves as they emerge from the intervertebral foramina. To desensitize T13, the cannula needle was placed through the skin at the anterior edge of the transverse process of L1 at approximately 4–5 cm lateral to the dorsal midline. The 18-gauge, 10- to 15-cm spinal needle was passed ventrally until it contacts the transverse process of L1. The needle was then walked off of the cranial edge of the transverse process of L1 and advanced approximately 1 cm to pass slightly ventral to the process and into the intertransverse ligament. Local anesthetic was injected with little resistance to desensitize the ventral branch of T13. The needle was then withdrawn 1–2.5 cm above the fascia or just dorsal to the transverse process, and anesthetic was infused to desensitize the dorsal branch of the nerve. To desensitize L1 and L2, the needle was inserted just caudal to the transverse processes of L1 and L2. The needle was walked off of the caudal edges of the transverse processes of L1 and L2, at a depth similar to the injection site for T13, and advanced approximately 1 cm to pass slightly ventral to the process and into the intertransverse ligament. Local anesthetic was injected with little resistance to desensitize the ventral branches of the nerves. The needle was then withdrawn 1–2.5 cm above the fascia or just dorsal to the transverse processes and local anesthetic is infused to desensitize the dorsal branch of the nerves.

STATASTICAL ANALYSIS

Data analysis was done by one way analysis of variance using univariate by SPSS software Version 21. Significant means of different groups were compare using Duncun multiple range test

PARAMETERS RECORDED:

Onset of action

The cattle response to pinpricks with a 22 G, 2·5 cm long hypodermic needle was recorded at the flank region approximately 3 to 5 cm below the transverse process at one-minute intervals; each time two or three pricks were made. A strong avoidance response, manifested in kicking, rapid shifting of weight on the hindlimbs, rapid movement of the tail and turning of the head towards the site of the pinpricks was considered the normal response of the animal to the stimulus. The time from the injection to the observation of a diminished avoidance response was recorded as the time of onset of action.

Duration of action

The interval from the onset of analgesia to the full return of sensation at the site was considered as the duration of analgesia. The cases were observed continuously for two hours, and then every 10 minutes, until they had normal response to the stimulus.

Clinico-physiological parameters

Clinico-physiological variables like Heart rate, Respiratory rate and Rectal temperature were evaluated on 0, 1, 24 and 48 hours after surgery.

RESULT AND DISCUSSION

The mean time required for onset of action was 9.95±0.24 and 7.78±0.14 min in group L and A respectively, whereas in group R the time for onset of action was 11.66±0.28 min. (Table 1). In group A time of onset of action was significantly less as compared to group L and R. The variation recorded within the group was statistically significant. The onset of action was much rapid in group A as compared to group L; similar finding was recorded by Kamblinath *et al* 2013 and Darwade *et al* 2014. Whereas in group R the onset of action was much slower relation to group A and L respectively. In group L the onset of action was much rapid as compared to group R, this was in agreement with findings observed by John *et al* 2012 and Khajuria *et al* 2014. The rapid onset of action is observed in group A may be attributed due to the presence thiophene ring with additional ester ring (Bansal *et al* 2018). Presence of thiophene ring favours greater lipid solubility, which facilitates diffusion across the lipid rich nerve membrane (snoeck 2012, Thaminee 2015). On other hand the rapid induction is

directly influenced by the pKa value. Smaller pKa value is associated with the rapid induction (Kamblinath et al 2013). The Articaine has small pKa value as compared to Lignocaine and Ropivacaine which is 7.8, 7.9 and 8.1 respectively.

Duration of analgesia was 191.15±1.68 and 175.70±5.69 min in group R and A, whereas in group L duration of analgesia was 147.51±3.15 min (Table 1). The variation in the duration of anaesthesia was highly significant in group R as compared to group A and L, similar finding was also noted by Krzemiński *et al* 2011 and Kamal 2012. The longer duration of group R may be due to the higher protein binding affinity of group R (92%) as compared to other two groups. Local anesthetics vary in their duration of action primarily due to differences in their affinity for protein, greater the tendency for protein binding, the longer the anesthetic will sustain neural blockade (Becker and Reed 2012).

The mean values of heart rate (Beats per min)(Table 2) in group L and group A varied from 55.83±1.88 beats/min to 62.50±2.09 and 59.66±2.90 to 60.66±0.95 beats/min with pooled mean of 59.58±1.09 and 59.37±0.91 beats/min respectively, whereas in group R it ranged from 58.66±1.28 to 60.66±1.87 beats/min with pooled mean of 59.83±0.72 beats/min. All the values remained within the normal physiological limits throughout the study period and did not show any significant difference.

In the present study, average respiration rate (Respiration per minute) (Table 2) in group L varied from 19.83±1.40 to 19.50±0.563 with pooled mean of 20.00±0.50, and in group A it ranged from 24.83±1.76 to 20.67±1.11 with pooled mean of 23.29±0.80, where as in group R respiration rate varied from 25.17±1.44 to 20.83±0.87 with pooled mean of 23.79±0.67. The baseline values itself were different for three groups and thus show no clinical consequences as they were within normal physiological range at all times during the study.

The average values of rectal temperature were within the normal physiological range and did not have any clinical significance (Table. 2).

CONCLUSION

It can be concluded that 0.75 % Ropivacaine and 4% Articiane provide prolong and good quality of analgesia as compared to 2% Linocaine Hcl. Whereas Articaine produce rapid induction than that of 2% Lignocaine and 0.75% Ropivacine. 4% Articaine and 0.75 % Ropivacaine can be used safely for Proximal Paravertebral Nerve Block in cattle.

Table 1. Mean ± SE for assessment of anaesthesia in different groups

Parameter (Minutes)	Anaesthetic protocol used		
	Lignocaine (L) (n=6)	Articaine (A) (n=6)	Ropivacaine (R) (n=6)
Onset of Action (Induction)	9.95 ± 0.24^{b}	7.78 ± 0.14^{a}	11.66 ± 0.28^{c}
Duration	147.51 ± 3.15^{a}	175.70 ± 5.69^{b}	191.15 ± 1.68^{c}

Mean bearing different superscript differ significantly

Table 2. Mean ± SE values of Clinico-Physiological parameters in different groups

Group	Interval in Hrs	HR (Bpm)	RR (Rpm)	RT (^{0}F)
Group L	0	55.83±1.88	19.83±1.40	102.01±0.25
	1	59.50±1.52	21.33±1.22	101.85±0.21
	24	60.50±2.62	19.33±0.55	101.88±0.17
	48	62.50±2.09	19.50±0.563	101.79±0.15
	Pooled Mean	**59.58±1.09**	**20.00±0.50**	**101.79±0.10**
Group A	0	59.66±2.90	24.83±1.76	101.63±0.22
	1	59.16±1.55	24.83±1.76	102.11±0.15
	24	58.00±1.65	23.17±1.37	102.06±0.17
	48	60.66±0.95	20.67±1.11	102.10±0.27
	Pooled Mean	**59.37±0.91**	**23.29±0.80**	**101.97±0.10**
Group R	0	58.66±1.28	25.17±1.44	101.85±0.18
	1	59.33±1.54	26.00±1.15	101.86±0.32
	24	60.66±1.20	23.17±0.98	101.7±0.11
	48	60.66±1.87	20.83±0.87	102.03±0.21
	Pooled Mean	**59.83±0.72**	**23.79±0.67**	**101.86±0.10**

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