Anaesthetic evaluation of lignocaine alone and in-combination with butorphanol in goats

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ABSTRACT
The objective of study was to assess the quality of analgesia and record the alteration in anaesthetic indices following lumbosacral administration of lignocaine alone @ 4 mg/kg body weight in group I and its combination with butorphanol@ 0.04 mgkg body weight in group II. Onset of analgesia in both groups was evident at 5 min and reached to peak level at 15 minutes of observation. The incoordination and sedation was more marked in butorphanol groups as compared to lignocaine groups. The onset of analgesia was delayed in group II as compared to group I, whereas, duration of analgesia and standing time was significantly higher (P<0.05) in group II as compared to group I. Time to recumbency did not reveal significant variation between groups. It is concluded that lignocaine alone and in-combination produced satisfactory onset of analgesia but it remained longer time in lignocaine – butorphanol group (group II) with respect to duration of analgesia and time to standing. However, this combination also showed the marked sedation and incoordination. Hence, butorphanol in combination with lignocaine was considered better for producing analgesia for longer duration operative procedure.

Key words: Anaesthetic evaluation, Butorphanol, Epidural, Goats, Lignocaine.

INTRODUCTION
Epidural anaesthesia is accomplished by introduction of a local anaesthetic drug into the epidural space. The drug so injected temporarily paralyse the spinal nerves by coming into contact with them and give rise to loss of sensation in those parts of the body from which the sensory portion of the nerves carries impulse (Booth, 1988). The technique of administration of epidural anaesthetics is easy and within the reach of clinician for its use in veterinary medicine. Epidural and intrathecal administration of agents with greater duration of action may be more appropriate for procedures requiring long duration anaesthesia. These agents include opioids, alpha-2 adrenoreceptor agonist and ketamine. Opioids can provide good analgesia without causing ataxia by highly selective actions on spinal receptors, thereby providing significant anaesthesia with decreased likelihood of rear limb dysfunction (Natalini and Robinson, 2000).

Most frequently used epidural anaesthetic in all species is lignocaine, although bupivacaine is sometimes also used. The lignocaine is known to have excellent diffusion and penetrability, as well as produce rapid onset and establishment of surgical anaesthesia of short duration along with motor blockade (Adetunji et al., 2002; Jones, 2001).

Butorphanol is a lipid soluble narcotic with weak μ-receptor agonist and antagonist activity and strong K-receptor agonism. K-receptors appear to be involved in visceral pain modulation and, therefore, should be useful in reducing labor pain, which has a strong visceral component. Butorphanol has little analgesic properties when administered epidurally alone, but appears to extend the duration of analgesia associated with a lidocaine epidural in horse and cattle (Robinson and Natalini, 2002; Scott, 2004). Butorphanol is occasionally administered to cattle, sheep, goats and pigs to provide analgesia (Lamont and Mathews, 2007) but there is limited information in the literature on its analgesic efficacy in these species. Therefore, the present papers deals the anaesthetic evaluation of lignocaine incombination with butorphanol in goats.

MATERIALS AND METHODS
The study was conducted on 12 clinically healthy goats of either sex of 1-2 years of age and weighing between 12-15 kg. They were divided into two groups with 6 goats in each group. The goats were maintained in iso-managemental conditions in the indoor ward of Ranchi Veterinary College Clinics. All the goats were dewormed with broad spectrum anthelmintic (fenbendazole) two weeks prior to the experiment. Frequent clinical examination of animals was done to rule out the possibility of any illness.
The animal experimentation for this study was carried out as per the guidelines and approval of Institutional Animal Ethical Committee (IAEC) and Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA).

Lignocaine hydrochloride 2% inj. (Xylocaine 2%-Manufactured by AstraZeneca Pharma. India Limited) @ 4 mg/kg body weight was administered at lumbosacral space in group I, whereas, Butorphanol tartrate inj. (Butrum®- Manufactured by ARISTO Pharmaceutical Pvt. Ltd.)@0.04 mg/kg body weight was administered in combination with lignocaine hydrochloride @4 mg/kg bwt in group II.

To accomplish epidural block, an 18-gauge 3.5 cm hypodermic needle was inserted percutaneously at the prepared site into the epidural space to inject analgesic solution. The goat so treated was supported in sternal recumbency for at least 2 min following drug injection to ensure that a bilateral rather than unilateral blockade is achieved.

Following lumbosacral epidural administration of analgesic agents different anaesthetic parameters and anaesthetic indices were recorded at the time intervals of 0, 5, 15, 30, 45, 60, 90 and 120 minutes of epidural administration of analgesic agents.

ANAESTHETIC OBSERVATION

Various reflexes like corneal, palpebral, pedal, anal and cutaneous were noticed.

Analgesia was scored using a 0-3 numerical rating scale to pin prick response as: 0 - No analgesia (strong reaction to pin prick), 1 - Mild (weak response to pin prick), 2 - Moderate (occasional response to pin prick), 3 - Excellent (no response to pin prick)

Motor incoordination / ataxia was graded as 0-3 scale: 0 – Walking without staggering, 1 – Able to stand and walk with little incoordination, 2 – Frequent swaying of the body but animal able to stand and could walk with extreme incoordination, 3 – Unable to stand and assumed recumbency

Sedation was judged by observing drowsiness and lowering of head and scored using a 0-3 numerical rating scale: 0 - Fully alert, 1 - Alert but unable to walk, 2 - Drowsy and unable to stand, 3 - Heavily sedated/asleep

ANAESTHETIC INDICES

The anaesthetic indices like onset of analgesia, duration of analgesia, time to recumbency and time to standing was noted in each treated goat on the basis of physical symptoms and reflexes.

Onset of analgesia was recorded as time interval (min) between epidural injections of anaesthetic solution to loss of pin prick reflex.

Duration of analgesia was recorded as time interval (min) between loss of pin prick reflex to return of pin prick reflex.

Time to recumbency was recorded as time interval (min) between epidural injections of anaesthetic solution to paralysis of the goat’s hind limbs.

Time to standing (min) was recorded as time between paralyses of the goat’s hind limbs to return of ambulation on the limbs.

Statistical analysis: All the statistical analysis was performed using the computer programme WINstat version 9.01 for windows. ANOVA and DMRT were used to compare the means at different intervals with base values as per method described by Snedecor and Cochran (2004). The level of significance was set to 0.05.

RESULTS AND DISCUSSION

Analgesia (pedal reflex in hind limb, anal reflex, analgesia in tail, perineal analgesia, and flank) was maximum up to 45 minutes of observations, thereafter it follow the decreasing trends and tended to reach to a point of no analgesia. Development of analgesia in upper hind limb was evident at 5 minutes in group I and II which reached to peak level at 15 minutes of observation. However, the peak level persisted up to 30 minutes and 45 minutes in group I and II, respectively. Analgesia was more marked in the animal of group II. The perineal analgesia was prolonged up to 90 minutes in both the groups, but greater degree of analgesia was evident in group II. Complete return of sensation in perineal region was conspicuous after 90 minutes of observation in both the groups.

The analgesic score at anus, tail, perineum, upper part of the limbs and flank was noticed at different intervals might be due to the inherent spreading power of lidocaine which responsible for its wider spread blockade and intense action (Hall and Clarke, 1991). The more depth and longer duration of analgesia in butorphanol group might be due to synergistic antinociceptive interaction between the drugs in the spinal cord (Wilcox et al., 1987). Similar to the results of the present study, lignocaine in combination with butorphanol produced greater depth and longer duration of analgesia as compared to lignocaine alone in mare (Csik et al., 1996). The uptake of the anaesthetics by the nervous tissue, which determines the depth of analgesia, is dependent upon the concentration of the solution. Maximum depth of analgesia at tail, perineum and thigh region in both the groups in the present study could be attributed to the highest concentration of the drug in the posterior to lumbosacral area as compared to anterior area.

The extreme motor incoordination in animals of both the groups could be attributed to local anaesthetic action of lignocaine causing blockade of motor fibres along with sensory fibres (LeBlanc et al., 1988). The longer duration of incoordination in lignocaine - butorphanol may be ascribed to synergistic effect on blocking of dorsal spinal nerves. A transient sedation was observed in lignocaine-butorphanol
group which might be due to anaesthetic action of butorphanol on kappa receptors (Hammad Usmani, 2004). Similar finding has also been reported after epidural administration of opioids along with lignocaine in cattle (Naaine et al., 2004).

Onset of analgesia was delayed in group II (4.17±0.40 min) as compared to group I (3.33±0.61 min.). However, group II exhibited significantly longer (P<0.05) duration of analgesia and standing time as compared to group I (Table - I). The recumbency time was observed to be almost similar in both the groups.

The greater degree of analgesia in lignocaine-butorphanol may be due to butorphanol mediated CNS depression and lack of excitement (Csik Salmon et al., 1996). Prolong analgesia in lignocaine-butorphanol groups may also be attributed to the fact that butorphanol has its action on ë-receptor (Hammad Usmani, 2004). Opioids are effective analgesics in sheep, especially for visceral pain (Habibian et al., 2011; De Rossi et al., 2012). Delayed onset in butorphanol group as compared to lignocaine may be due to interaction of opioids with opioid receptor in spinal cord. Further, increasing the volume of the anaesthetic solution has been reported to produce more cranial / cephalad migration of analgesics (Johnson et al., 1996). In the present study the drugs were administered at lumbosacral space and the variable was kept uniform in all the animals and therefore, any variation in the extent and depth of analgesia may be attributed to the drug itself. In this study, the extent of analgesia was achieved up to 1st lumbar dermatome in both the groups.

Adverse side effects viz. respiratory depression, pruritis, nausea, vomiting and urinary retention have been reported by some workers following epidural opioids (Cousins and Mather, 1984; Chaney, 1995). In present study respiratory depression was more in lignocaine-butorphanol group and less in lignocaine group. Butorphanol does not produce any significant nausea, vomiting or shivering (William, 2002; Mishra and Sinha, 2005) but in the present study one goat of lignocaine- butorphanol group exhibited shivering after epidural administration. None of the animals manifested vomiting tendency after administration of butorphanol. The lignocaine group did not reveal any unwanted reaction. Epidurally administered analgesics provide longer and more effective analgesia with fewer side effects as compared to systemic administration (Novello, 2010).

It is concluded that lignocaine alone and in combination producing satisfactory onset of analgesia but it remained longer time in lignocaine – butorphanol group (group II) with respect to duration of analgesia and time to standing. However, this combination also showed the marked sedation and incoordination. Hence, butorphanol in combination with lignocaine was considered better for producing analgesia for longer duration operative procedure.

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<thead>
<tr>
<th>Parameters of anaesthetic indices</th>
<th>Groups</th>
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<tr>
<td>Onset of analgesia (min)</td>
<td>I 3.33±0.61 a</td>
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<tr>
<td>Duration of analgesia (min)</td>
<td>I 81.83±5.91 a</td>
</tr>
<tr>
<td>Time of standing (min)</td>
<td>I 85.83±5.71 a</td>
</tr>
<tr>
<td>Time of recumbency (min)</td>
<td>I 5.17±0.54 a</td>
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</tbody>
</table>

Group I: Lignocaine, Group II: Lignocaine + Butorphanol

Value bearing different superscripts in small letter among groups differed significantly (P<0.05)

REFERENCES


