ANALGESIC EFFECT AND HAEMATOLOGICAL CHANGES AFTER EPIDURAL ADMINISTRATION OF BUPIVACAINE, BUPIVACAINE-KETAMINE AND BUPIVACAINE-TRAMADOL IN BUFFALO CALVES[#]

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ABSTRACT

The present study was performed on six healthy buffalo calves of either sex weighing 40-60 kg. Onset, duration and complete recovery time of analgesia were studied and haematological changes were recorded at different time intervals after epidural administration of bupivacaine and its combination with ketamine and tramadol. Long duration of analgesia and complete recovery was prolonged in combination with tramadol as compare to bupivacaine alone and its combination with ketamine, onset of analgesia was minimum in bupivacaine and its combination with tramadol as compare to bupivacaine alone and its combination with ketamine. Non significant (P>0.05) changes were observed in packed cell volume (PCV%), haemaglobin (g%), total erythrocyte count (million/ cumm) and total leucocytes count (thousand/cumm) in all three groups.

Key words: Bupivacaine, ketamine, tramadol, analgesic effect and haematological changes

Introduction

Epidural anaesthesia is accomplished by introduction of a local anaesthetic or analgesic combination into the epidural space. An epidural local analgesia with or without opioids, decrease the risk of post operative pulmonary complications such as atelectasis and pneumonia by 50-70**%** compared with systemic opioids (Igg *et al*., 2002). Bupivacaine hydrochloride is most widely used local analgesic for epidural use because of its tendency to block sensory fibres preferentially to relative sparing of motor fibres (Alvarez *et al*., 1983). Ketamine as epidural analgesia suppress myelinated nerve conduction, interacts with monoaminergic and opioid receptors. Epidural administration of tramadol seems to produce satisfactory antinociception as an analgesics technique for surgery in the hind limb of the dog (Alonso *et al.,* 2005).

Materials and Methods

The present study was conducted on 6 healthy buffalo calves of either sex weighing 40-60 kg. All the calves were dewormed by bolus panacure (fenbendazole) at the dose rate of 7 mg/kg b.wt. one week prior to experiment. All animals were maintained under similar standard managemental condition and standard feed ration. Each animal was subjected to the following three treatments at an interval of 8 days. The epidural catheter was placed at the sacrococcygeal space. In treatment I-bupivacaine hydrochloride @ 0.15 mg/kg body weight in the sacrococcygeal space. In treatment II- bupivacaine hydrochloride @ 0.15 mg/kg body weight and ketamine @ 2 mg/kg body weight in the sacrococcygeal space. In treatment III- bupivacaine hydrochloride @ 0.15 mg/kg body weight and tramadol hydrochloride @ 2.5 mg/kg body weight in the sacrococcygeal space. The epidural Injection was well tolerated by all experimental animals and there was no sedimentation observed between mixing of bupivacaine with the ketamine and tramadol. Packed cell volume (PCV%), haemoglobin (g%), total leucocytes count (thousand/cumm) and erythrocyte count (million/ cumm) were recorded at 0 min, 10 min, 20 min, 40 min, 60 min, 80 min, 2 hrs, 3 hrs, 4 hrs, 12 hrs, 24 hrs, and 48 hrs. The '0' hr values from each animal were recorded immediately before the start of the treatment, as the control value. The onset and duration of analgesia was determined by the pin prick method. The onset of analgesia was ascertained by noting the time of loss of tail reflex, pedal reflex and pin prick reflex. Complete recovery from the analgesia was the interval between the onset of complete effect of analgesia and total regression of analgesia. The duration of analgesia was the interval between complete effect and the first sign of regression of analgesia. All these haematological parameters were studied as per the procedure described by Jain (1986).

Results and Discussion

Time of onset of analgesia was prolonged in bupivacaine 7.20±0.10 minutes in comparison with bupivacaine-ketamine 5.87±0.53 minutes and bupivacaine-tramadol 4.98±0.68 minutes. The duration of analgesia was 93.34±2.71 minutes, 113.48 minutes and 184±4.84 minutes in treatments I, II and III, respectively. There was a significant difference (P<0.05) between three treatments. The total duration of complete recovery was 160.23 ± 3.5, 185.05 ± 2.4 and 210 ± 3.28 minutes in treatment I, II and III, respectively. There was a significant difference (P<0.05) between three treatments.

Dhage and Pawshe (2010) compared bupivacaine and ketamine groups in goats after epidural administration and found the prolonged period of onset of analgesia in bupivacaine (10.51±0.72 min) compared to ketamine group (6.80±0.25 min).

The packed cell volume (PCV%) did not vary significantly in all three treatment groups and there was no significant

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change in values of PCV between groups. The minimum and maximum values of PCV ranged from 28.79±0.69 at 3 hrs to 32.68±0.89 at 48 hrs, 28.16±0.32 at 3 hrs to 30.37±0.77 at 0 minute and 29.75±0.62 at 2 hrs to 33.27± 0.83 at 0 minute in treatment I, II and III, respectively.

The haemoglobin concentration (g%) also did not vary significantly in all three treatment groups and there was no significant change in the values of Hb between groups. The minimum and maximum values of Hb ranged from 10.37±0.23 g% at 80 minutes to 12.43±0.29 g% at 48 hrs, 9.84±0.53 at 60 minutes to 11.67±0.19 g% at 48 hrs and 9.39±0.17 at 80 minutes to 10.78±0.45 g% at 0 minute in treatment I, II and III, respectively.

There was no significant change in erythrocyte count (million/cumm) in all three treatment groups and value obtained ranged from 6.08±0.28 at 40 minutes to 6.70±0.36 at 0 minute in treatment I. The maximum and minimum values of erythrocyte count ranged from 6.23±0.21 at 24 hrs to 6.02±0.24 at 80 minutes and 5.78±0.29 at 0 minute 5.36±0.15 at 10 minutes millions/cumm of blood in treatment II and III, respectively.

The leucocytes count (thousand/cumm) also did not vary significantly in all three treatment groups. The minimum and maximum values of leucocytes count ranged from 6.83±0.36 to 6.88±1.12, 6.69±0.10 to 6.77±0.14 and 6.24±0.07 to 6.40±0.08 thousands/cumm per ml of blood in treatment I,II and III, respectively.

These findings for the haematological parameters (Hb, TEC, TLC, PCV and DLC) are in accordance with Ahmad and Shukla (2011).

Onset of analgesia was reduced in the bupivacaine-ketamine group when compared with the bupivacaine group because of competitive antagonism of ketamine to NMDA receptors and cause hyperalgesia (Yanli and Eren, 1996). Prolonged duration of analgesia (4hrs) following the administration of tramadol has been reported in dogs and horses (Guides *et al.,* 2005). These results support the prolonged duration of analgesia observed in our study after epidural injection of bupivacaine-tramadol group in comparison with bupivacaine and bupivacaine-ketamine group.

Epidural administration of bupivacaine/ketamine combination resulted in fast onset and moderate duration of analgesia of caudal areas and this combination could be used to perform operations without any marked side effects (Dadafarid and Najafpour, 2008).

Ketamine-lidocaine combination provides very effective and long duration of analgesia (Gunduz *et al.*, 2005). Long duration anaesthesia could commence soon after epidural administration of lidocaine-tramadol combination and might be used without re-administration of anaesthetic agent in long duration obstetrical and surgical procedures in cattle. Lidocaine-tramadol combination produced a significantly ($P<0.05$) longer duration of analgesia than lidocaine alone (Bigham *et al*., 2010). It also has been reported that ketamine releases the endogenous opioids to cause analgesic effects (Pekoe, 1982). Caudal epidural ketamine administration induces analgesia without sedation in cows and duration of analgesia was dose dependent with ataxia (Lee *et al*., 2003).

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