ANAESTHETIC EVALUATION OF KETAMINE/PROPFOLO IN ACEPROMAZINE-XYLAZINE PREMEDICATED HORSES*

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ABSTRACT

The study was conducted in twelve clinical cases of horses for diagnostic and surgical procedures warranting general anaesthesia were randomly divided into two groups, group I and group II, each consisting of six cases. Xylazine @ 0.50mg/kg and acepromazine @ 0.03mg/kg body weight was used as pre-anaesthetic in both the groups. Ketamine @ 2.20 mg/kg body weight and 0.50mg/kg/min was used as induction and maintenance agent in group I and Propofol 2.0 mg/kg body weight and 0.15mg/kg/min was used as induction and maintenance agent in group II. The mean time for sedation in group I and group II were 5.16±0.30 minutes and 5.10±0.21 minutes respectively. The mean quality of sedation in group I and group II were 2.27 ±0.21 minutes and 2.67 ± 0.21 minutes respectively and the mean time for induction was 1.83± 0.17 minutes and 1.17 ±0.17 minutes respectively. The induction was smooth in all horses (100%) in group II. In group I smooth induction was observed in 83.33% and rough induction in 16.67% of the cases. The total dose of xylazine administered including the incremental doses in group I was 1.00 ± 0.00 mg/kg/hr where as in group II xylazine incremental dose was not administered. The calculated dose was 6.52 ± 0.13mg/kg/hr in group I and 11.86 ± 0.533 mg/kg/hr in group II. The score for the quality of muscle relaxation was 2.50± 0.22 and 2.33 ±0.21 in group I and group II respectively. The score for reflex status in group I and group II were 1.00± 0.36 and 0.67±0.31 respectively. The mean time for recovery in group I and group II were 32.00±2.87 minutes and 14.00±1.05 minutes respectively. The quality of recovery was smooth in 66.66% of group I and 83.33% of group II. The quality of recovery was rough in 33.34% of group I and 16.67% of group II. The number of attempts for unassisted standing was 4.67± 0.21 times in group I and 1.50± 0.22 times in group II. None of the animals in any groups showed any intra and post operative complication.

Key words : Horse, Anaesthetic evaluation, Ketamine/Propofol, Acepromazine, Xylazine

INTRODUCTION

Induction and maintenance of general anaesthesia in horses are critical when performing surgical or diagnostic procedures in the field. Horses are physiologically bradycardic and bradypenic and recumbency presents some unique concerns such as ventilation - perfusion mismatch and reduction in cardiac output. Oxygen supplementation and ventilatory support are ideal which are often unavailable in the field ambulatory practice but appropriate intravenous anaesthetic technique could be employed safely up to 60.00 minutes without these supportive measures in the field. The selected anaesthetic regimen should provide smooth anaesthetic induction and recovery, adequate plane of anaesthesia and analgesia to facilitate the surgical and diagnostic procedures. No single anaesthetic agent had proved to be ideal but a combination of agents that either work synergistically or balance undesirable effects is used. Providing adequate sedation before administering anaesthesia is critical to achieve smooth induction and may reduce the required dose of the induction agent. The present study was undertaken to evolve an ideal anaesthetic

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regimen to provide smooth induction, recovery and adequate surgical plane of anaesthesia for field ambulatory practice or minor diagnostic or surgical procedure.

MATERIAL AND METHODS

The study was conducted on 12 horses reported to large animal surgery operation theatre Madras Veterinary College teaching hospital for castration (nine Kathiawari horses), external circular skeletal fixator for metacarpal fracture (one Katiawari colt), semi-tubular plating for metacarpal fracture (one Marwari-Filly), sinusotomy (one Indian Thoroughbred). Selected horses were randomly allotted to either group I or group II, each consist of 6 horses. Feed and water were with held for 18 hours and 6 hours respectively prior to anaesthesia on the day of procedure. The mouth was rinsed with plain water to remove any food material and the horses were given bath and the feet were cleaned thoroughly. Protective bandages were applied on the limbs and tail. All the trials were started around 10 am to avoid diurnal variation (Taylor, 1989). Jugular vein was cannulated in all the horses. All the horses were premedicated with xylazine hydrochloride @ 0.50mg/kg and acepromazine maleate @ 0.03mg/kg body weight. The anaesthetic parameter studied were mean time for sedation (minutes), mean quality of sedation (score 0 to 3), mean time for induction (Minutes), quality of induction (%), mean total dose of xylazine, ketamine and propofol, quality of muscle relaxation (score 0 to 3), reflex status (score 0 to 2), mean time for recovery, quality of recovery, mean number of attempts for unassisted standing and intra and post operative complications (Figueiredo, J.P. et al. 2005). The obtained data were statistically analysed using completely randomized block design as statistical tool (Ott and Longneker 2001).

RESULTS AND DISCUSSION

The mean time for sedation in group I and group II were 5.16 ± 0.30 and 5.10 ± 0.21 without any statistical variation (P > 0.05) when xylazine and acepromazine were administered at the dose rate of 0.50 mg per kg and 0.03 mg per kg intravenously respectively. Brock (1994) reported maximum tranquilization effect in horses after 15 minutes and 13.12 minutes after administration of 0.02 and 0.04 mg per kg intravenously respectively. In the present study combination of xylazine and acepromazine reduced the time taken for ataxia to 5.16 minutes which could be due to the synergistic effect of xylazine and acepromazine. Xylazine induced sedation was attributed to the stimulation of peripheral and central alpha2-adrenergic receptor via opiate pathway which modulated epinephrine directly (Aubin and Mama, 2002). The tranquilizing effect of acepromazine was due to the blocking of the central dopaminergic receptors in the basal ganglia, fore brain, chemoreceptor trigger zone and hypothalamus (Brock, 1994).

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The mean time for induction was 1.83 ± 0.17 and 1.17 ± 0.17 respectively. Statistical analysis revealed significant increase in the time for sedation in group I (P< 0.01). In the present study ketamine induced anaesthesia and recumbency in 1.83 ±
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0.17 minutes when the horses were premedicated with xylazine at the dose rate of 0.50 mg and acepromazine at the dose rate of 0.03 mg respectively.

The findings of the present study concurred with Gaikwad et al. (2006) who suggested the administration of acepromazine as preanaesthetic before administration of ketamine for better and faster induction (Gaikwad et al., 2006). The induction was rough in only one horse and in the remaining horses (83.33%) the induction was smooth. The increased muscle tone and tonic clonic seizures (Haskins et al., 1985) were abolished by the premedicants. The rapid onset of induction following the administration of ketamine could be attributed to the ability of ketamine to cross the blood-brain-barrier in one-arm-brain circulation (Bovil et al., 1971), stereo specific binding ability of ketamine with opiate receptor, high lipid solubility of ketamine (Wright, 1982), disorganization of cortical area (Short, 1987) and the antagonistic action of N-methyl D-aspartate receptor. The calculated dose of ketamine required for one hour of anaesthesia including induction dose, continuous infusion and incremental bolus to maintain the depth of anaesthesia was 6.52 ± 0.13 mg and the incremental dose of xylazine administered apart from the premedication dose was 0.5 mg per kg per hour. The systemic half life of xylazine (Villar et al., 1981) was reported to be 22 to 50 minutes; hence xylazine was repeated when the surgical or diagnostic procedures were prolonged. Supplementation of xylazine enhanced the quality of induction, duration of anaesthesia and analgesia due to the enhanced distribution and half life of ketamine as xylazine premedication increased the mean distribution and half life of the ketamine from 6.90 minute to 60.50 minutes (Muir et al., 1978). Propofol when administered at the dose of 2.00 mg per kg for induction and intravenous infusion at the dose rate of 0.15 mg per kg per minute for maintenance required additional bolus administration of 0.86 ± 0.06 mg per kg of propofol for one hour. The rapid and smooth onset of induction following propofol administration could be attributed to its ability to cross the blood-brain-barrier in one-arm-brain-circulation, high plasma free fraction and its lipid solubility (Mama et al., 1995). Mathews et al. (1999) reported slow administration of propofol for induction over a period of 2 minutes then bolus over 60 minutes to prevent central nervous system stimulation. The findings of the present study concurred with Vende et al. (2006). Gaikwad et al. (2006) reported administration of higher dose of propofol to improve the quality of anaesthesia.

The induction was smooth in all horses (100%) in group II when compared with group I in which smooth induction was observed in 83.33 per cent and rough induction in 16.67 per cent in group I. The duration of surgery ranged from 15 minutes to 1 hour in group I and 15 minutes to 2.30 hours in group II. The total dose of xylazine administered including the incremental doses in group I was 1.00 ± 0.00 mg per kg per hour where as in group II xylazine was not administered. The calculated total dose in mg per kg per hour including induction dose, continuous infusion and incremental bolus to maintain the depth of anaesthesia was 6.52 ± 0.13 mg of ketamine in group I and 11.86 ± 0.53 mg of propofol in group II. Statistical analysis revealed significant increase in the total dose of xylazine in group I when compared to group II.

The mean score for the quality of muscle relaxation and reflex status were 2.50 ± 0.22 and 1.00 ± 0.36 and 2.33 ± 0.31 and 0.67 ± 0.31 in group I and group II respectively. Ketamine due to its extrapyrimidal activation increased electrical activity of basal ganglia (Folts et al., 1975) and striking increase of multiple unit activity both in the brain stem and limbic system induced muscle tremors, limb stretching and tonic clonic convulsion (Pathak et al., 1982). The muscle relaxation observed during xylazine-acepromazine premedication could be attributed to decrease intraneuronal transmission of impulses from muscles to the central nervous system (Haskins et al., 1975) and decreased motor activity (Gleed, 1987). The vital reflexes were also sluggish during xylazine-acepromazine-ketamine anaesthesia due to the depressed motor activity (Hopkins, 1972). Propofol induced good muscle relaxation in xylazine-acepromazine premedicated horses by enhancing the effect of the inhibitory transmitter GABA and decreasing the brain metabolic activity (Gaikwad et al., 2006). The sluggish reflex status was attributed to the depression of central nervous system.
Mean time for recovery in group I and group II were 32.00 ± 2.87 minutes and 14.00 ± 1.15 minutes respectively and the mean duration of recovery was significantly higher in group I when compared with group II. The quality of recovery was smooth in 66.66 per cent of the horse in group I and 83.33 per cent of the horses in group II. The quality of recovery was rough in 33.34 per cent in group I and 16.67 per cent in group II. The mean number of attempts for unassisted standing was 4.67 ± 0.21 times in group I and 1.50 ± 0.22 times in group II with statistically significant variation (P<0.05).

No intra and post operative complication was observed in group I and group II horses.

The higher percentage of rough recovery, more number of attempts for unassisted standing and longer duration of recovery in group I animals induced and maintained with ketamine could be attributed to the enhanced plasma half life of ketamine by xylazine premedication. (Singh et al., 1985). In group II animals when propofol was used as an induction and maintenance agent, higher percentage of smooth recovery, limited number of attempts for unassisted standing and shorter duration of recovery was noticed, which could be attributed to its rapid elimination from the body. Propofol was eliminated from the body by hepatic metabolism but the clearance rate far exceeded the hepatic blood flow hence; it was apparent that other tissues also involved in its elimination. Multiple dosing of the drug and constant infusion to maintained anaesthesia could induce very little cumulative effect or prolongation of recovery (Raut et al., 2006) making its potentially useful for short diagnostic procedures and surgical procedures at a constant rare of infusion and the findings concurred with Raut et al. (2006 ).

REFERENCES