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Study of physico- clinical parameters in guaifenesin-ketamine-xylazine and diazepam-ketamine-xylazine triple drip anaesthesia for gelding in equines

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Abstract

The study was conducted to compare combinations using guaifenesin and diazepam in xylazine-ketamine induced total intravenous anaesthesia for gelding in equine. Non-significant decrease in rectal temperature was observed between the groups and within the groups. non-significant changes was observed in heart rate between groups. While, heart rate decreased significantly in Group II at 30 min after induction and remained decreased till immediately after complete recovery. The SpO₂ level in both the groups was near to baseline immediately after recovery and thereafter.

Keywords: Guaifenesin, Xylazine, ketamine, cattle, physiological, clinical parameter

Introduction

Horses and humans interact in a wide variety of sport competitions and non-competitive recreational pursuits, in working activities such as police work, entertainment, and therapy. Anaesthesia in horses is usually induced by intravenous (IV) injections. Minimising patient mortality and morbidity remains a priority for equine anaesthesia and it is important to identify the causes to reduce the risk associated with general anaesthesia. Horses are large and potentially dangerous creatures, during induction and recovery, when they become excited and ataxic, they can all too easily injure a person. Even when a horse appears well sedated it may still respond aggressively to a stimulus, and hence, normal precautions about where to stand and how to hold the horse should be taken care. The fundamental goals of any anesthetic plan are to place the animal in an unconscious state with immobility, analgesia, neuro-vegetative protection and obviously safety and predictability, with rapid return to physiological parameters and motor activities to baseline values without excitation and sequelae. Prolonged recumbency is unnatural in the horse. The incidence of recovery associated complication is higher in equines than other domestic species. The present study was carried out to compare triple drip by using guaifenesin and diazepam in combination with xylazine-ketamine for gelding in equine under field conditions.

Materials and Methods

The present study was conducted in horses referred to Teaching Veterinary Clinical Complex, Nagpur Veterinary College, Nagpur and in various field hospitals of the Maharashtra State. A total of twenty apparently healthy horses of age group 3 to 9 years and weighing between 280 to 370 kg were randomly divided into two equal groups. The horses were fasted for 12 hours and water was withheld for 8-10 hours prior to induction of anaesthesia. The anaesthesia was induced with Xylazine @ 1.1 mg/kg body weight and Ketamine @ 2.2 mg/kg body weight in both the groups. Maintenance of anaesthesia during surgical procedure was carried out with triple drip GKC of Guaifensin (25 gm), Ketamine (500 mg) and Xylazine (250 mg), in 500 mL normal saline solution and (DKX) Diazepam (25 mg), Ketamine (500 mg) and Xylazine (250 mg), in 500 mL normal saline solution in group I & II, respectively and was administered @ 2.2 mg/kg/hr in both the groups. The Clinical parameters such as rectal temperature (°F), respiratory rate (breaths/min) and heart rate (beats/min) were recorded pre induction (0 min), after induction at 30 minutes,

immediately after the complete recovery and 24 hrs after recovery of anaesthesia. Hemoglobin oxygen saturation (Spo₂) was recorded with Pulse-Oximeter and the clip was placed on sublingual artery and values were expressed in percentage (%). The collected data were statistically analysed as per Snedecor and Cochran (1994) [12].

Results and Discussion

The mean rectal temperature (°F) pre induction was 100.12 ± 0.15 (°F) and 99.96 ± 0.17 (°F) in Group I and Group II, respectively. After induction at 30 min, immediately after complete recovery and 24 Hrs after recovery from Group I and Group II are 99.80 ± 0.16 , 99.90 ± 0.21 , 100.08 ± 0.10 and 99.79 ± 0.16 , 99.56 ± 0.14 , 99.75 ± 0.12 (°F), respectively. Non-significant decrease was observed in rectal temperature between the groups and within the groups. Similar findings were reported by Nanda *et al.* (2014) [8] and Molinaro *et al.* (2014) [7] in horses. However, Malik and Singh (2007) [6] reported the significant decrease in rectal temperature. Generally, rectal temperature decreases following general anaesthesia in animals as a result of the reduction in metabolic rate and muscular activity. The result indicated that GKX and DKX TIVA infusions did not produce any severe alteration in rectal temperature, suggesting maintenance of normal body metabolism even during anaesthesia (Nanda *et al.*, 2014) [8].

The mean respiratory rate before pre-induction of anaesthesia was 21.40 ± 0.26 and 21.20 ± 0.32 (breaths/min) and immediately after complete recovery was 20.80 ± 0.24 and 20.40 ± 0.40 (breaths/min) for Group I and II, respectively. However, respiration rate was not significantly differed between and within the groups, The similar findings were recorded by Hubbell *et al.* (2012) [14], Nobrega *et al.* (2013) [9] and Nanda *et al.* (2014) [8]. Further, Purohit *et al.* (1981) [11] found decreased respiratory rate with irregular and apneutic after ketamine injection in xylazine pre-anaesthetized horses. However, Young and Taylor (1993) [15] observed the higher respiratory rate during anaesthesia.

The mean heart rate pre-induction was 33.00 ± 1.64 beats/min and 36.00 ± 0.76 beats/min in Group I and II, respectively. No significant decrease was noted in the heart rate of Group I horses. Heart rate when compared between group found non-significant. The heart rate decreased significantly (32.80 ± 0.72 beats/min) in Group II at 30 min after induction and remained decreased till immediately after complete recovery (31.80 ± 0.53 beats/min), although (36.60 ± 0.76 beats/min) 24 hrs after recovery heart rates in horse from Group II returned to pre-induction. These findings are in conjugation with the findings of non-significant depressant effect of guaifenesin on the heart rate by Ajadi *et al.* (2008) [1] and Nanda *et al.* (2014) [8]. However Pandey *et al.* (1991) observed significant decreased heart rate. Whereas, increased heart rate observed by Ferreira *et al.* (2013) [4]. Further, in Group II the significant decrease in heart rate might be attributable to decreased sympathetic outflow from the CNS, to vagal activation caused by the central activation of α -2 adrenoreceptors by xylazine and to the involvement of the baroreceptors reflex induced by xylazine (Dar and Gupta, 2015) [3].



Plate 1: Monitoring heart rate during maintenance of anaesthesia



Plate 2: Monitoring of hemoglobin oxygen saturation

The Mean SpO₂ was 95.30 ± 0.65 % and 95.90 ± 0.45 % in Group I and Group II, respectively. After the onset of anaesthesia at 30 minutes compared with pre-induction (0 min) significant decrease (87.20 ± 1.07 and 92.90 ± 1.02 ; 86.60 ± 0.87 and 93.40 ± 0.65) was observed within the groups of I and II, however, between the groups there were no significant difference (87.20 ± 1.07 and 86.60 ± 0.87) was noted. The SpO₂ level in both the groups near to baseline immediately after recovery and thereon.

The guaifenesin itself has been shown to cause a drop in partial pressure of oxygen in arterial blood when given IV in horses (Baetge *et al.*, 2007) [2], however, they also stated that maintaining a MAP greater than 70 mmHg at all the times is sufficient to maintain organ and tissue perfusion. Guaifenesin is known to cause hypoventilation; however, the resultant hypoxia is often effectively counteracted by oxygen administration (Jackson and Lundavall, 1972) [5]. However, Thakur *et al.* (2011) [13] observed mean SpO₂ value in equines of was 76.50 ± 4.14 and 83.33 ± 4.18 % in guaifenesin administered in Spiti ponies. However, in both the groups ventilation perfusion mismatch is a more probable cause of decreased SpO₂ level, during anaesthesia, ventilation is directed preferentially to the uppermost region of the lung while perfusion is concentrated caudodorsally (Baetge *et al.*, 2007) [2]. However, in both the groups cyanosis or any anaesthetic fatalities were not observed.

Conclusion

The study suggested that both the drug combinations of GKX and DKX produced no any adverse effect on the vital organs of the body and were accept fig for maintenance of anaesthesia in horses for gelding up to 30 minutes duration under field conditions.

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