Haryana Vet. **51** (December, 2012), pp 50-52

Research Article

EVALUATION OF GLYCOPYRROLATE-DIAZEPAM-THIOPENTONE ANAESTHESIA IN BUFFALO CALVES

SUNEET BINDLISH, SUKHBIR SINGH, ASHOK KUMAR*, P. K. PESHIN and KULDIP SINGH
Department of Veterinary Surgery & Radiology, College of Veterinary Sciences
Lala Lajpat Rai University of Veterinary & Animal Sciences, Hisar-125 004

ABSTRACT

The study was conducted on 12 clinically healthy male buffalo calves of six months to one year of age and weighing between 70 to 150 kg. Glycopyrrolate (0.02 mg/kg, IM), diazepam (0.2 mg/kg, IV) and thiopentone sodium (5%, 'to effect', IV) were administered. Calves became calm, ataxic and recumbent without analgesia within one minute of diazepam administration. The swallowing reflex was abolished after thiopentone administration. Regaining of head righting reflex was noticed at 50±6 minutes. The calves stood up with ataxia at 72±8 minutes but complete recovery took 198±8 minutes. A significant rise in respiration rate was observed after the administration of diazepam and thiopentone. There was a gradual increase in plasma bilirubin concentration after the induction of glycopyrrolate-diazepam-thiopentone anaesthesia. After glycopyrrolate administration, haemoglobin and packed cell volume decreased to 8.6±0.6 g% and 27±1%, respectively. There was a gradual increase in blood glucose concentration after glycopyrrolate administration. Heart rate increased gradually and remained higher throughout the experiment. There was a gradual decrease in mean arterial pressure (MAP) after glycopyrrolate administration which decreased further after thiopentone administration. There was a gradual decline in the arterial pH after diazepam administration. The arterial PCO2 values were considerably high after diazepam and thiopentone administration. The arterial hypoxaemia was also observed.

Key words: Buffalo, diazepam, glycopyrrolate, thiopentone

None of the available injectable general anesthetics provides all of the actions of an ideal anesthetic. Therefore, when used clinically, they are almost always combined with other drugs to ensure sedation, analgesia, muscle relaxation and control of visceral reflex responses. Glycopyrrolate is a synthetic and selective peripheral anticholinergic drug (Proakis and Harris, 1978). It greatly reduces cardiac inhibitory effects of the drugs acting through a vagal mechanism. The onset of its action is quicker and the effect lasts longer than atropine (Pablo *et al.*, 1995). Keeping in view the longer duration of its action, it was planned to study its efficacy in offsetting the adverse effects of diazepam-thiopentone anaesthesia in buffalo calves.

MATERIALS AND METHODS

The experiment was conducted on 12 clinically healthy male buffalo calves of six months to one year of age and weighing between 70 to 150 kg. The calves were randomly divided into two groups of six animals each. Glycopyrrolate (0.02 mg/kg, IM), diazepam at 10 minutes after glycopyrrolate (0.2 mg/kg, IV) and thiopentone sodium at 5 minutes after diazepam (5%, 'to effect', IV) were administered in all the 12 animals. In group I, behavioral changes (weak time, down time, relaxation of limb muscles, qualitative analgesic effects of drugs, recovery from analgesia, return to sternal recumbency, head righting reflex, standing time with ataxia, browsing/munching time and complete recovery without ataxia), rectal temperature, respiration rate, haemoglobin (Hb), packed cell volume (PCV), erythrocyte sedimentation rate (ESR), blood glucose, blood urea nitrogen (BUN), plasma bilirubin, creatinine and total proteins, were studied before and after 10 minutes of glycopyrrolate administration, after 5 and 10 minutes of diazepam and thiopentone administration, respectively; then at recovery and at 24 hours after recovery.

In group II, systolic (SP) and diastolic pressure (DP), central venous pressure (CVP),

*Corresponding author: kumarashok1961@yahoo.co.in

electrocardiogram (ECG), heart rate (HR), arterial blood pH (pHa), arterial blood oxygen tension (PaO2), arterial blood carbon dioxide tension (PaCO2), base excess-extra cellular fluid (BE-ECF) and bicarbonate ($HCO3^-$) were evaluated before the administration of glycopyrrolate, after 10 minutes of glycopyrrolate administration, after 5 minutes of diazepam administration and at 2, 15, 30 and 45 minutes after the administration of thiopentone. The statistical analysis of data was done by one way analysis of variance and Duncan's multiple range tests (Snedecor and Cochran, 1999).

RESULTS AND DISCUSSION

The administration of diazepam as premedicant made the calves calm and quiet. All the calves became ataxic and recumbent within one minute of diazepam administration, but no analgesia was observed on pin pricks in all the animals. The abolition of swallowing reflex was noticed within one minute after induction of anaesthesia with thiopentone. Head righting reflex was noticed at 50±6 minutes. The calves stood up with ataxia at 72±8 minutes but complete recovery took 198±8 minutes. Mean dose of thiopentone was 4.64 mg/kg, which is equal to average dose of thiopentone used by Singh *et al.* (2007) during diazepam-thiopentone anaesthesia in buffalo calves.

There was a significant decrease in rectal temperature after thiopentone administration as compared to base value (Table 1) that may be due to decreased metabolic rate and reduced muscular activity during anaesthesia (Amarpal and Kumar, 1995; Sarma and Kumar, 1998). A significant rise in respiration rate (27±3 and 27±4 per minute) was observed after the administration of diazepam and thiopentone as compared to the base value (18±1 per minute) which may be a compensatory mechanism of body in an attempt to offset the hypoxaemia and decrease in tidal volume caused by diazepam (Mirakhur *et al.*, 1988) and thiopentone sodium (Singh *et al.*, 1980).

There were statistically no significant changes in any of the haematological and blood biochemical parameters (Table 2). A gradual increase in plasma bilirubin concentration was recorded after the induction of glycopyrrolate-diazepam-thiopentone anaesthesia and the values remained elevated till recovery as compared to the base value but were not of clinical significance. During anaesthesia, the Hb and PCV decreased as compared to the base values which may be attributed to slight pooling of red blood cells into spleen. There was a gradual increase in the mean values of blood glucose concentration after glycopyrrolate administration. The blood glucose was 72.0±14.2 mg/dL as compared to base value of 54.9±5.1 mg/dL after thiopentone administration. However, in one calf, a gradual reduction (40.2 mg/dL) in blood glucose occurred after glycopyrrolate administration and further reduction (30.0 mg/dL) occurred with thiopentone administration.

The heart rate increased gradually and remained higher throughout entire period of observation. The pulse pressure almost remained near to base value. There was a gradual decrease in MAP after glycopyrrolate administration and the maximum decrease was immediately after thiopentone administration. The changes in CVP were non-significant throughout the experiment. There were no significant changes in the time and voltage functions of ECG. There was a gradual decline in the arterial pH

Table 1

Effects of glycopyrrolate-diazepam-thiopentone anaesthesia on rectal temperature and respiration rate in buffalo calves

Parameters (Units)	Base value	10 minutes after glycopyrrolate	5 minutes after diazepam	10 minutes after thiopentone	At recovery	24 hours after recovery
Ambient temperature (°C)	30.5^{b}±0.3	31.4^{b}±0.5	31.7^{b}±0.3	31.9^{b}±0.4	32.6^{ab}±0.7	34.2^{a}±0.1
Rectal temperature (°C)	37.3^{bc}±0.3	37.5^{abc}±0.1	37.0^{c}±0.2	35.9^{d}±0.2	37.2^{c}±0.4	38.4^{ab}±0.3
Respiration rate (per minute)	18^{b}±1	19^{b}±2	27^{a}±3	27^{a}±4	24^{ab}±3	21^{ab}±1

Values having different superscripts for a parameter in a row differ significantly ($p \leq 0.05$)

Table 2

Effects of glycopyrrolate-diazepam-thiopentone anaesthesia on certain haemato- biochemical parameters in buffalo calves

Parameters (Units)	Base value	10 minutes after glycopyrrolate	5 minutes after diazepam	10 minutes after thiopentone	At recovery	24 hours after recovery
Haemoglobin (g %)	$11.0^{a}\pm0.8$	$8.6^{b}\pm0.6$	$9.9^{ab}\pm0.6$	$8.8^{ab}\pm0.4$	$10.2^{ab}\pm0.7$	$9.7^{ab}\pm0.9$
Packed cell volume (%)	$32^{a}\pm2$	$27^{a}\pm1$	$30^{a}\pm1$	$28^{a}\pm1$	$30^{a}\pm2$	$28^{a}\pm2$
Erythrocyte sedimentation rate (mm first hour)	$58^{a}\pm4$	$57^{a}\pm5$	$55^{a}\pm5$	$58^{a}\pm4$	$58^{a}\pm4$	$57^{a}\pm4$
Blood glucose(mg/dl)	$54.9^{a}\pm5.1$	$55.3^{a}\pm5.9$	$64.4^{a}\pm8.7$	$72.0^{a}\pm14.2$	$71.2^{a}\pm16.4$	$78.9^{a}\pm11.3$
Plasma total proteins (g/dl)	$6.6^{a}\pm0.8$	$6.9^{a}\pm0.6$	$7.3^{a}\pm0.4$	$7.1^{a}\pm0.6$	$7.4^{a}\pm0.9$	$7.5^{a}\pm0.9$
Blood urea nitrogen (mg/dl)	$24.9^{a}\pm2.1$	$25.9^{a}\pm2.0$	$27.4^{a}\pm1.5$	$26.9^{a}\pm2.4$	$22.6^{a}\pm3.3$	$27.5^{a}\pm3.2$
Plasma creatinine (mg/dl)	$0.60^{a}\pm0.03$	$0.60^{a}\pm0.02$	$0.57^{a}\pm0.02$	$0.62^{a}\pm0.02$	$0.58^{a}\pm0.04$	$0.56^{a}\pm0.02$
Plasma bilirubin (mg/dl)	$0.34^{abcd}\pm0.06$	$0.42^{abc}\pm0.07$	$0.40^{abcd}\pm0.05$	$0.52^{ab}\pm0.09$	$0.53^{a}\pm0.13$	$0.28^{bcd}\pm0.04$

Values having different superscripts for a parameter in a row differ significantly ($p \leqslant 0.05$)

after diazepam administration. The PaCO2 values were considerably higher after diazepam and thiopentone administration. The arterial hypoxaemia was also observed. These changes may be due to alveolar hypoventilation (Singh *et al.*,1980; Mirakhur *et al.*, 1988; Amarpal and Kumar, 1995) and/or increased alveolar-arterial oxygen gradient as a result of venous admixture (Mirakhur, 1991).

Apnoea was observed in all the animals and one or more stimulus/stimuli like stretching of tongue, flexion or extension of legs etc. had to be used for the spontaneous breathing to restore. Moreover, analgesia was very poor in all the animals. Since the calves used were healthy, the administration of this combination in diseased animals may cause serious respiratory depression and might prove fatal in the absence of positive pressure ventilation facilities.

REFERENCES

Amarpal and Kumar, A. (1995). Physiological, haematological and biochemical effects of thiopentone with and without diazepam in hepatotoxic bovine. *Indian Vet. J.* **72**: 723-727.

Mirakhur, K.K. (1991). Effect of diazepam and thiopentone anaesthesia on pulmonary gas exchange in calves. *Indian J. Anim. Sci.* **61**: 516-518.

Mirakhur, K.K., Sharma S.N. and Kumar, V.R. (1988). Diazepam and thiopentone sodium anaesthesia in calves: Evaluation of cardio-respiratory dynamics, blood gases, and acid base status. *J. Vet. Med. A.* **35**: 775-784.

Pablo, L.S., Webb, A.I. and McNicholas, W.T. (1995). The effects of atropine and glycopyrrolate on heart rates in conscious mature goats. *Vet. Surg.* **24**: 531-534.

Proakis, A.G. and Harris, G.B. (1978). Comparative penetration of glycopyrrolate and atropine across the blood-brain and placental barriers in anesthetized dogs. *Anaesthesiol.* **48**: 339-344.

Sarma, B. and Kumar, A. (1998). Clinical and cardiopulmonary effects of thiopentone with and without diazepam in calves suffering from acute renal failure. *Indian J. Anim. Sci.* **68**: 1015-1016.

Singh, J., Singh, J. and Kumar, A. (2007). Evaluation of diazepam-thiopentone-anaesthesia in buffalo calves (*Bubalus bubalis*). *J. Vet. Pharmacol. Toxicol.* **6**: 86-88.

Singh, J., Mirakhur K.K., Sobti, V.K. and Kohli, R.N. (1980). Haemodynamics, blood gases and metabolic alteration during thiopental anaesthesia in buffaloes. *Zbl. Vet. Med. Assoc.* **27**: 730-739.

Snedecor, G.W. and Cochran,W.G. (1999). Statistical Methods. (9th edn.), Iowa State University Press, Ames, Iowa.