PROPOFOL ANAESTHESIA IN DONKEYS IN COMBINATION WITH CHLORAL HYDRATE

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ABSTACT

The anesthesia characterized by bad quality induction with strong nervous manifestation after chloral hydrate injection. Nearly all body reflexes disappeared after propofol infusion. Complete analgesia and sedation was achieved at 4 minutes after injection where the animals showed no responses to any painful stimuli. The heart rate in this group showed gradual increase while the respiratory rate and body temperature were showed significant decrease. The recovery of the animals characterized by both of the pedal and anal reflexes appeared at 39 minutes after propofol injection .Complete recovery of the animals occurred at 95 minutes with tinny smooth recovery without any signs of nervous manifestation.

Keywords: propofol , chloral hydrate, donkeys

INTRODUCTION

Propofol is an alkyl phenol derivatives (2, 6 di-iso-propyl-phenol). Only slightly soluble in water and commercially present as an aqueous emulsion containing propofol (10mg / ml), glycerol (100mg/ml), soya bean oil (22.5 mg/ml), egg lecithin (12mg/ml) and sodium hydroxide to adjust PH. **(Branson and Gross, 1994).** Propofol is non barbiturate and relatively non cumulative intravenous anesthetic agent with rapid onset and recovery. It produce smooth induction with possibility of maintenance by intermittent injection **(Muir et al.,2007).** Its effects are similar to that of Sodium Pentothal. It provides no analgesia. Yet in some studies, when patients receive propofol compared to inhalation agents for anesthesia, post-operative pain is less after propofol. Propofol is a potent hypnotic currently formulated as oil in water emulsion. Propofol is a short acting, rapidly metabolized intravenous agent characterized in man by virtual lack of any cumulative effect and by rapid recovery after its administration in a bolus dose or by continuous infusion **(Branson and Gross, 1994).** Propofol is highly protein bound in vivo and is metabolized by conjugation in the liver. Its rate of clearance exceeds hepatic

blood flow, suggesting an extra-hepatic site of elimination as well as It has several mechanisms of action, **(Vanlersberghe and Camu ,2008)** both through potentiation of GABA-A receptor activity, thereby slowing the channel closing time, **(Krasowski, Hong , Hopfinger and Harrison ,2002**) and also acting as a sodium channel blocker **(Haeseler and Leuwer ,2003).**

(Haeseler , Karst , Foadi , Gudehus , Roeder , Hecker , Dengler and Leuwer, 2008). Recent research has also suggested the endocannabinoid system may contribute significantly to propofol's anesthetic action and to its unique properties **(Fowler, 2004).** Propofol is a short acting hypnotic unrelated to other general anesthetic agents. Propofol is provided in sterile glass ampoule contains no preservatives; there fore the formulation will support microbial growth and end toxin production (**Arduino, Bland and Allister, 1991).** Those authors added that, because of the microbial growth and the risk of infection and sepsis any unused propofol should be discarded at the end of the anesthetic procedure.

Propofol is oil at room temperature and insoluble aqueous solution. The concentration of propofol is 10% each 1ml containing l0 mg of the active principle. **Hui-Chn lin, Ram and Tom (1997).** Chloral hydrate presented as colorless translucent crystals and has penetrating odor. It metabolized by liver into (tri-chloro-ethyl alcohol), which in a less potent hypnotic. Chloral hydrate is a good hypnotic but a poor anesthetic and the amount needed to produce anesthesia approach the minimal lethal dose **(Reid , Nolan and Welsh (1993)** . **El-Sayad (2006),** stated that the injection of chloral hydrate in donkeys followed by propofol infusion lead to rapid induction of anesthesia. also added that chloral hydrate followed by propofol induce long time anesthesia and smooth recovery.

MATERIALS AND METHODS

The present study was carried out on 3 donkeys used as experimental model. The animals were apparently healthy and their ages and body weights were ranged from 3-4 years and 120-150 kg respectively. These animals were collected to investigate the pilot efficacies of propofol in combination with chloral hydrate, according to their physiological, hematological, and neuromuscular effects.

All animals were fasted for about 12 hours and freely given water before being investigated. These investigations were classified into two main parts. Before each injection, the jugular vein was cannulated on disinfected clipped skin, the weight of the animal was estimated and the dose of each anesthetic drug was calculated. The clinical signs of the anesthetic regimen including: assessments of its analgesic effect, duration of its action as well as the time of its recovery were recorded.

The effect of the regimen on the heart and respiratory rates as well as the body temperature were also measured and tabulated. They were recorded before each injection (0.0 time) and at 5, 10, 20, 30, 60, 120, 180 minutes after injection.

The anesthesia of each regimen was maintained for 30 minutes and the animals were put under observation recording the physiological and the clinical changes until the animals become in the sternal and then in the standing position. A catheter was inserted in the other jugular vein for blood sampling. The blood samples were obtained before injection of each regimen (0.0 time) and at 15, 30, 60 minutes and at 24 hours for the estimation of blood picture, as well as for liver and kidney function tests.

The animals were injected slowly with 10% chloral hydrate solution in a dose of 5 g/ 50 kg body weight then the anesthesia was maintained by intravenous infusion of 0.2mg / kg/minute propofol diluted in 5 % dextrose in a ratio of 1:4 respectively.

RESULTS

The anesthesia characterized by bad quality induction, all animals of this group showed strong nervous manifestation after chloral hydrate injection (5 g/ 50 kg body weight) with tremors in the muscles of the limbs, head, neck and the back of the animals. The animals let down on the ground 3 minutes after injection.

Nearly all body reflexes disappeared after propofol infusion. No anal or perennial reflexes by using strong stimuli. The eye reflexes disappear but the eye pupil reflex persist for 4 minutes then disappeared. Complete analgesia and sedation was achieved at 4 minutes after injection where the animals showed no responses to any painful stimuli. The heart rate in this group showed gradual increase from the preanesthetic value up to 20 minutes (Peak) then returned to normal 2 hour after injection as shown in table (1).

The respiratory rate showed significant decrease 20 minutes after injection (without apnea) then returned back 3 hour after injection as shown in table (1).

The body temperature showed significant decrease throughout the time of the anesthesia, this decrease of the body temperature was evidenced by shivering of the animals especially during the recumbancy period as shown in table (1).

The recovery of the animals of this group characterized by shivering of the animals, both of the pedal and anal reflexes appeared at 39 minutes after propofol injection, long recumbancy period, the animal raise its head but still recumbent and finally the animal became in the standing position after several trails to stand, then complete recovery of the animals occurred at 95 minutes with tinny smooth recovery without any signs of nervous manifestation.

Blood analysis:

Blood analysis of the animals given propofol/ chloral hydrate was shown in table 2 and 3.

Haemogram:

The red blood cells (RBCs) in this group showed non significant changes (7.70 ±1.82) when compared to the base line value (7.75 ±1.75) while the white blood cells (WBCs) showed gradual decrease (7.87 ±0.90) when compared to the base line value (8.30 ±0.92), as shown in table 8 and figure 36 and 37 respectively . The hemoglobin (Hb) showed non significant changes (12.34 ±0.85) when compared to the base line value (12.78 ±1.11) while the packed cell volume (PCV) showed gradual decrease (44.67 ±2.08)when compared to the base line value (46.33±2.52), as shown in table (2) .

GPT showed gradual decrease (64.33 ±11.15) when compared to the base line value (69.00 ±11.14) while GOT showed non significant changes (64.00 ±38.97) when compared to the base line value (64.00 ±43.59), as shown in table (3). The cholesterol showed sudden increase 15 minutes after injection then gradual decrease (143.00 ±15.87) when compared to the base line value (148.67 ±15.53) and the total protein showed gradual decrease (5.87 ±0.78) when compared to the base line value (6.03 ±0.80) while the glucose level showed abrupt increase 15 minutes after injection then returned back to gradual increase (99.67 ±2.89) when compared to the base line value (73.33 ±10.97), as shown in table (3).

The creatinine showed gradual decrease (1.44 ±0.25) when compared to the base line value (1.52 ±0.36) while the urea concentration showed increase (24.67 ±5.13) when compared to the base line value (22.67 ±5.03), as shown in table (3).

The albumin showed no significant changes (2.64 ±0.36) when compared to the base line (2.76 ±0.30) while the A/G showed gradual increase (0.91 ±0.10) when compared to the base line (0.85 ±0.04), as shown in table (3).

Time / Parameters	0	5	10	20	30	60	120	180 h
Heart rate	63 ±5.29	64.67 ± 18.15	67 ±18.36	68 ±16.82	64.67 ±13.80	66.67 ±13.32	58.33 ±6.81	58.67 ±7.64
Respiratory	18.67 ± 2.08	14 ±2.65	13 ±2.65	12.67 ±2.52	14.67 ±1.15	15.67 ±1.53	15.67 ±2.08	16.33 ±0.58
Temperature	37.47 ± 0.64	36.07 ±0.12	36.2 ±0.52	36.17 ±0.38	36.23 ±0.25	36.57 ±0.31	36.6 ±0.69	36.77 ±0.49

Table (1): Showing the changes in the heart, respiratory rate and body temperature.

Time / Parameters	0	15	30	60	24 h
RBCs (million/cmm)	7.75±1.75	7.64±1.58	7.70±1.82	7.47±1.39	7.64±1.68
WBCs (cell/cmm)	8.30±0.92	7.93±1.01	7.87±0.90	8.20±0.66	8.40±0.70
HB (gm/dl)	12.78 ±1.11	12.51±0.71	12.34±0.85	12.11±0.88	12.00±0.66
PCV %	46.33±2.52	46.00±1.00	44.67±2.08	43.67±3.21	47.00±3.61

Table (2): Effect on blood picture samples (RBCs, WBCs, Hb and PCV).

Time / Parameters	0	15	30	60	24h
GPT (u/L)	69.00 ±11.14	66.00 ±12.49	64.33 ±11.15	61.67 ±9.50	66.00 ±13.89
GOT (u/L)	148.67 ±15.53	154.33 ±14.36	143.00 ±15.87	147.67 ±16.04	128.33 ±11.85
Cholesterol (mg/ dl)	64.00 ±43.59	62.33 ±35.28	64.00 ±38.97	63.00 ±40.71	59.00 ±36.39
Creatinin (mg/ dl)	1.52 ±0.36	1.48 ±0.33	1.44 ±0.25	1.25 ±0.16	1.39 ±0.02
Total protein (mg/dl)	6.03 ±0.80	5.85 ±0.75	5.78 ±0.78	5.81 ±0.86	5.90 ±0.79
Glucose (mg/dl)	73.33 ±10.97	101.67 ±11.02	99.67 ±2.89	86.33 ±12.70	94.33 ±10.26
Urea (mg/dl)	22.67 ±5.03	24.67 ±3.79	24.67 ±5.13	25.67 ±5.13	23.67 ±4.16
Albumin (gm/dl)	2.76 ±0.30	2.66 ±0.40	2.64 ±0.36	2.76 ±0.33	2.59 ±0.38
A/G %	0.85 ±0.04	0.83 ±0.07	0.84 ±0.06	0.91 ±0.10	0.79 ±0.11

Table (3): effect on liver and kidney functions of animals given propofol / chloralhydrate

DISSCUSION

In this study, we avoid the adverse effect of high induction dose of propofol by injection of chloral hydrate for induction of anesthesia, and then the maintenance of anesthesia was done by propofol infusion at rate of 0.2 mg/kg/minute. Chloral hydrate was relatively good hypnotic but poor analgesic as stated by **Reid , et al. (1993)** and this showed agreement with our results .

The induction of anesthesia in this group after injection of chloral hydrate was rapid with severe nervous manifestation as vigorous struggling, tremors and stiffness in head, neck and limbs. These finding were agreed with that recorded by **Silverman and Muir (1993) , Field (1993) and El-Sayad (2006).**

In this group, the induction of anesthesia with chloral hydrate produced a bad quality induction, so the use of sedative tranquilizer to improve the bad condition of the induction of anesthesia as reported by **(Silverman and Muir (1993)**.

The anesthesia was deep in all animals of that group and the duration of anesthesia was longer than that of propofol alone. This result supported by **Silverman and Muir (1993), Field (1993) and El-Sayad (2006).**

The adverse effect of high induction dose of propofol was avoided by injection of chloral hydrate, so the marked changes in cardio respiratory parameters were not observed, as the heart rate showed no significant increase in this group. This finding was similar to that stated by **El-Sayad (2006)** in donkeys.

The respiratory rate in this group showed significant decrease at the first 20 minutes then returned back by time to the base line level. This result showed agreement with **Field (1993)** who added that the respiratory depression occurred in horses anesthetized with chloral hydrate.

The body temperature in this group showed significant decrease and this decrease was evidenced by shivering of all animals of this group, this similar to the finding of **El-Sayad (2006)** in donkeys.

In this group the recovery from combination of chloral hydrate and propofol was prolonged than that of propofol alone and this showed agreement with the results of **Silverman and Muir (1993), Field (1993) and El-Sayad (2006)** in horses and donkeys respectively. Those authors added that the main disadvantage of chloral hydrate is that the dose required for inducing general anesthesia causes prolonged recovery.

The duration of recovery in this group was 95 minutes. The animal take long recumbancy time then begin to response to external stimuli, then raise the head but still recumbent, then attend to stand and complete recovery at 95 minutes. No nervous signs recorded. This was augmented by **Silverman and Muir (1993), Field (1993) and El-Sayad (2006)** in horses and donkeys respectively.

The use of chloral hydrate as induction drug with propofol infusion in donkeys produce bad quality induction anesthesia, but the anesthesia was deep with prolonged recovery. However the uses of chloral hydrate reduce the high induction dose of propofol, so reduce the adverse effect and the high cost of using propofol.

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