COMPARATIVE EFFICACY OF XYLAZINE AND XYLAZINE-KETAMINE PREMEDICATION ON PROPOFOL ANAESTHESIA FOR CAESAREAN SECTION IN DOGS

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Thesis submitted in partial fulfilment of the requirement for the degree of

Master of Veterinary Science

Faculty of Veterinary and Animal Sciences
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2006

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DECLARATION

I hereby declare that this thesis, entitled **"COMPARATIVE EFFICACY OF XYLAZINE AND XYLAZINE-KETAMINE PREMEDICATION ON PROPOFOL ANAESTHESIA FOR CAESAREAN SECTION IN DOGS"** is a bonafied record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

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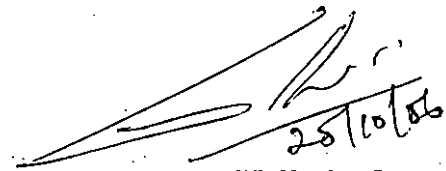
CERTIFICATE

Certified that the thesis entitled "**COMPARATIVE EFFICACY OF XYLAZINE AND XYLAZINE-KETAMINE PREMEDICATION ON PROPOFOL ANAESTHESIA FOR CAESAREAN SECTION IN DOGS**" is a record of research work done independently by **Sri. M. Ranjith Mohan,** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to him.



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We, the undersigned members of the Advisory Committee of **Sri. M. Ranjith Mohan**, a candidate for the degree of Master of Veterinary Sciences in Surgery, agree that the thesis entitled **"COMPARATIVE EFFICACY OF XYLAZINE AND XYLAZINE-KETAMINE PREMEDICATION ON PROPOFOL ANAESTHESIA FOR CAESAREAN SECTION IN DOGS"** may be submitted by Sri. M. Ranjith Mohan, in partial fulfillment of the requirement for the degree.

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M. RANJITH MOHAN

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

Introduction

1. INTRODUCTION

Anaesthesia is an inevitable part of surgery. This is true, especially in veterinary practice where patients require proper control and restrain. The practice of veterinary anaesthesia in the earlier times was primarily of the use of barbiturates intravenously or diethyl ether by facemask for induction and maintenance in small animals. Although good results in terms of anaesthesia were provided, undesirable side effects accompanied these agents. These side effects of existing anaesthetics led to a continuing need for improving the quality of anaesthesia by the use of more effective and less toxic agents and thereby improving the method of administration of such agents. Total intravenous anaesthesia was one such technique, but has a few side effects. The induction and maintenance of anaesthesia by this method is advantageous for practitioner, especially when acting as surgeon-anaesthetist, as it is easy to administer and require minimum apparatus.

Now-a-days Veterinarians often use xylazine-ketamine combination to produce general anaesthesia for caesarean section in dogs. But as reported by Navarro and Friedman (1975) ketamine often produces depressant effect on puppies. It has been reported that the likelihood of all puppies born alive is increased if propofol is part of anaesthetic protocol (Robertson and Moon, 2003).

Propofol (2, 6-diisopropyl phenol), an alkylphenol derivative was reported as an ultra short acting anaesthetic to have desirable anaesthetic profile in animals without much side effects. It is available as one per cent preparation in an emulsion of soyabean oil, glycerol, purified egg

phosphatide and sodium hydroxide and is marketed under the trade name "Profol" (Claris Lifescience Ltd., Gujarat).

Propofol is often referred to as the "milk of amnesia" due to its milky white colour. Propofol is a sedative-hypnotic anaesthetic. Propofol produces a rapid onset of anaesthesia with ultra short duration of action and quick and smooth recovery. Propofol lacks cumulative effects on continuous administration (Morgan and Legge, 1989). These qualities of propofol make it attractive for its use in small animal veterinary practice, especially in caesarean sections, where the primary objective is to bring the patient to full consciousness at the earliest so that it can take care of the puppies thereby reducing the chance of puppy mortality.

The study is intended to evaluate the beneficial effects of xylazine and xylazine-ketamine premedication on propofol anaesthesia for caesarean section in dogs.

2. REVIEW OF LITERATURE

2.1 PROPOFOL

Hall and Chambers (1987) used propofol for the induction and maintenance of general anaesthesia in dogs. Propofol was administered at a dose rate of 3 mg/kg body weight as an intravenous bolus injection over a period of 20 seconds for induction and the calculated mean induction dose was found to be 4.89 mg/kg body weight. Anaesthesia was maintained by intravenous injection at an infusion rate of 0.4 mg /kg/ minute. A fall in respiration rate was observed during induction. There was no evidence of phlebitis or thrombosis of vein in any of the dogs within 24 hours of infusion. In a few dogs persistent coughing until the removal of endotracheal tube, jerky respiratory movements throughout anaesthesia, shivering during inspiration and vomiting during recovery were observed.

Watkins *et al.* (1987) during their initial trials of anaesthesia, propofol was administered intravenously at the dose of 7.5 mg/kg bodyweight for the induction of anaesthesia. But during later trials propofol was administered in smaller initial doses followed by small incremental doses for the induction of anaesthesia. The respiration rate was variable and pulse rate was not consistent. The most useful feature of propofol anaesthesia noticed was the rapid excitement free recovery of unpremedicated dogs, irrespective of the duration of anaesthesia. The recovery time was 22.00 ± 11.00 minutes in unpremedicated dog while it was 25.00 ± 13.00 minutes in dogs premedicated with acepromazine.

Bearley *et al.* (1988) administered propofol for the induction of anaesthesia in cats and reported smooth induction but rapid administration

resulted in a period of apnoea up to 30 seconds which resolved spontaneously. The bronchomotor tone and gastrointestinal motility was seen unaffected. There was no significant variation in heart rate. The recovery was remarkably smooth though clinical signs like retching, sneezing and pawing of the face were observed.

Morgan and Legge (1989) evaluated the efficacy of propofol as inducing agent in halothane anaesthesia in dogs subjected to caesarean section and categorized the suitability of propofol as an inducing agent for caesarean section as good or excellent. It was reported that propofol had no cumulative effects when given repeatedly to maintain anaesthesia. Rapid and usually excitement free recovery of the animals were observed.

Weaver and Raptopoulos (1990) used propofol for the induction of anaesthesia in both unpremedicated and medicated dogs. The induction and recovery were free of excitement, apnoea, vomiting and retching.

Robertson *et al.* (1992) reported that the volume of packed red cells and total plasma proteins were unaffected by propofol administration. Tremors in the limbs during induction and opisthotonus during recovery accompanied by forelimb paddling were noticed in a few dogs.

Watney and Pablo (1992) administered propofol with and without acepromazine premedication for the induction of anaesthesia in dogs and the median effective dosage (ED_{50}) of propofol was found to be 2.2 mg/kg bodyweight in premedicated dogs and 3.8 mg/kg bodyweight in unpremedicated dogs. The signs of excitement were observed only in a few dogs.

Smith *et al.* (1993) observed rapid induction of anaesthesia with propofol on dogs and reported apnoea as the frequent adverse effect. It was reported that the frequency and duration of apnoea were not influenced by the preanaesthetic regimen, but it was observed that slow injection could avoid apnoea.

Thurmon and Tranquilli (1995) carried out studies in healthy female beagle dogs. It was observed that the dogs given 2 mg/kg bodyweight propofol intravenously did not become recumbent but were ataxic. Propofol (2 mg/kg bodyweight intravenously) induced only a minimal clinical anaesthetic response in unpremedicated healthy beagle dogs. When the propofol dose was increased to 4 mg/kg bodyweight, all dogs immediately became recumbent; however, endotracheal intubation could not be achieved. Endotracheal intubations in unpremedicated dogs require a dose of propofol ranging from 5.95 mg/kg bodyweight to 6.55 mg/kg bodyweight. Apnoea did not occur in any of the dogs though there was mild to moderate respiratory depression.

Funkquist *et al.* (1997) recommended general anaesthesia induced with propofol and maintained with isoflurane for performing caesarean section in dogs. It was also stated that survival rate for puppies delivered by caesarean section performed on dam under general anaesthesia was higher for dams induced with propofol than for dams induced with thiopental sodium.

Bufalari *et al.* (1998a) stated that propofol should be administered to effect, after selecting an appropriate dose based premedication, temperament of patient and speed of injection.

Bufalari *et al.* (1998b) suggested that anticholinergic premedication is unnecessary in healthy dogs receiving propofol anaesthesia. Bradycardia and excessive salivation were not typically observed. It was stated that the use of tranquilizers and sedatives reduced the propofol dosage needed for the induction of anaesthesia.

Muir and Gadawski (1998) stated that propofol is metabolized by the liver and possibly by extra hepatic pathways to inactive conjugates that are excreted mainly in the urine. Respiratory depression and apnoea were noticed in beagle dogs as the potential adverse effects after intravenous administration, particularly when administered at rapid rates of infusion. The apnoea in dogs following propofol was found dose dependent. The haematological and biochemical value did not change and were within the normal limits at all times throughout the period of anaesthesia. There was decrease in rectal temperature throughout the anaesthesia period. The decrease in body temperature during propofol anaesthesia was attributed to decreases in skeletal muscle tone and the shivering threshold, vasodilatation, and impairment of thermoregulatory control. Propofol induced dose related depression of the central nervous and cardio-respiratory systems.

Quandt *et al.* (1998) compared the cardio respiratory and anaesthetic effects of propofol and thiopental in dogs. Apnoea and respiratory depression were the major adverse effects associated with both the drugs, but recovery was more rapid with propofol.

Short and Bufalari (1999) reported the dose of propofol for induction of anaesthesia in unpremedicated dogs as 6 to 8 mg/kg bodyweight intravenously. Muscle relaxation and the degree of analgesia produced were only suitable for minor diagnostic procedures and hence the

uses of potent sedatives/analgesics were recommended for performing surgical procedures.

Sooryadas (2001) studied the clinical evaluation of propofol anaesthesia with xylazine premedication in dogs and found the anaesthetic regimen effective and safe for induction and maintenance of anaesthesia for surgery, in both healthy and compromised dogs with fewer side effects.

Moon-Masset and Erb (2002) reported that the use of propofol for caesarean section was associated with better puppy vigor than with thiopentone or thiamylal.

Venugopal *et al.* (2002) reported a significant decrease in rectal temperature, respiration rate, total leukocyte count, haemoglobin concentration and volume of packed red cells following the propofol administration with and without premedication.

Bayan *et al.* (2002) studied biochemical and haematological changes during propofol anaesthesia in canines and found non-insignificant decrease in haemoglobin level, total erythrocyte count and total leukocyte count. No significant change in differential leukocyte count was observed throughout the period of study. The total serum protein levels were within the normal physiological limits indicating that the effect of propofol on liver was minimal or absent. It was concluded that propofol could be considered as a safe intravenous anaesthetic for dogs.

Robertson and Moon (2003) reviewed the anaesthetic management for caesarean section in bitches and opined that the likelihood of puppies born alive is increased if propofol or isoflurane is a part of anaesthetic

protocol. It was also reported that propofol was associated with better puppy vigor than thiopentone or thiamylal.

Luna *et al.* (2004) reported that puppies delivered from the bitches anaesthetised with propofol showed less neurological depression than puppies delivered from bitches anaesthetised with midazolam or ketamine and more respiratory depression than with thiopentone.

2.2 XYLAZINE AND KETAMINE

Moye et *al.* (1973) conducted studies in dogs and cats and reported that when used alone, xylazine produced a state of relaxation which was adequate for performing minor surgical procedures. The strongest analgesic effects lasted for 15 to 30 minutes post injection, and the sedative effects lasted for up to three hours post injection.

Klide *et al.* (1975) reported subjective sedative effects like lying down, lack of response to environment, medial rotation of eye ball and prolapse of nictitans in dogs following the administration of xylazine. The drug did not produce any effect on respiratory functions but it did produce changes in the blood pressure, heart rate, cardiac output and cardiac rhythmicity.

According to Navarro and Friedman (1975), xylazine (0.5-1 mg/lb bodyweight) was found not to depress the puppies delivered by caesarean section, but administration of ketamine hydrochloride in xylazine sedated pregnant dogs resulted in the depression of puppies. Hence they preferred xylazine in conjunction with local infiltration with 2% lidocaine to allow surgical delivery of pups and administration of ketamine hydrochloride

(10 mg/lb bodyweight), after the uterus was emptied, for the uterine and abdominal closure.

Manziano and Manziano (1978) reported that augmentation of muscle relaxation and prolongation of anaesthesia was possible with the administration of ketamine in combination of thiamylal sodium, morphine, xylazine, or acepromazine. It was also reported that ketamine had no cumulative effect when it is administered intravenously in small doses. No convulsions were seen in dogs younger than six months of age.

Peshin *et al.* (1980) observed transient Bradycardia and decrease in respiratory rate in dogs following intramuscular injection of xylazine at the dose rate of 3 mg/kg bodyweight. There was slight decrease in total erythrocyte and leukocyte counts, packed cell volume and haemoglobin concentration. There was decrease in lymphocyte count with subsequent increase in neutrophil count following xylazine administration. Significant increase in blood glucose, mild increase in serum sodium and decrease in potassium and chloride concentrations were also observed.

Wright (1982) reported ketamine alone had not proven useful in dog, primarily because of increased muscle rigidity and occasional convulsions, but found effective in combination with drugs like xylazine, acetylpromazine, promazine etc.

Sharma *et al.* (1983) studied the effect of xylazine on thiopental sodium anaesthesia in atropine premedicated dogs and observed decrease in heart and respiration rates, mean arterial pressure and body temperature. Decreases in total erythrocyte and leukocyte counts, packed cell volume and haemoglobin concentration were also observed.

Hall (1985) opined that premedication is the term used to describe the medication given immediately before anaesthesia to make the anaesthetic period safer and more comfortable for the animal and to simplify the tasks of the anaesthetist. Atropine may be given i.m., i.v.or s.c. at the dose rate of 0.02-0.1 mg/kg bodyweight. Xylazine can produce deep sedation with centrally induced muscle relaxation, but side effects include Bradycardia, cardiac dysarryhthmias, retching and vomiting. The prolonged sedation may give rise to hypothermia, if measures are not taken to maintain body temperature. Xylazine reduced the rigidity produced by the dissociative agent ketamine, used to induce anaesthesia. For this purpose, it is administered intramuscularly in the doses of 1.0-3.0 mg/kg bodyweight.

Haskins *et al.* (1985) with the administration of ketamine alone, observed an unsatisfactory anaesthesia for surgical procedures in dogs. One of the dogs exhibited brief tonoclonic seizures after ketamine administration. Muscle tone was extreme and exuberant spontaneous movements were virtually continuous after about 15 minutes. Hence it was recommended to use adjunctive sedative or tranquilizer for premedication when ketamine is used since ketamine is a cardiovascular and metabolic stimulant. There was an increase in the rectal temperature after ketamine administration in dogs and attributed it to the increased metabolic and muscular activity during ketamine anaesthesia.

Haskins *et al.* (1986) observed better muscle relaxation and less salivation with xylazine-ketamine combination compared with ketamine alone. The time to ultimate recovery was similar between xylazine-ketamine and ketamine alone.

Hikasa *et al.* (1989) observed that intramuscular injection of xylazine induced dose dependent vomiting as there was an increase in the number of bouts of vomiting in cats as the dose increased.

Moens and Fargetton (1990) observed that respiratory rate decreased immediately after injection of xylazine-ketamine but reached premedication values after two hours,

Thiruthalinathan *et al.* (1995) opined that dissociative anaesthesia was characterized by analgesia, dissociation from consciousness awareness, intact laryngeal and pharyngeal reflexes, normal or increased muscle tone, cardiac stimulation and respiratory depression. A major advantage of these agents was their tendency to cause excitement, muscle rigidity, convulsions and unpredictable recoveries. Xylazine is a sedative, analgesic and muscle relaxant effective in a wide range of species. The use of xylazine-ketamine combination reduced the side effects of ketamine while retaining its anaesthetic properties. It was also reported that convulsions, muscle rigidity and salivation were observed in wild canines under captivity when treated with ketamine at the rate of 8.25-18 mg/kg, i.m. But the wild canines (wild dogs, wolf, jackals) treated with xylazine-ketamine combination did not show any such effects and showed better sedation, good muscle relaxation and faster recovery.

Thurman *et al.* (1996) observed muscle rigidity, salivation and convulsion in dogs during ketamine anaesthesia.

Sharma *et al.* (1997) reported a nonsignificant fall in rectal temperature and respiratory rate in dogs following xylazine-ketamine anaesthesia.

Singh *et al.* (1997) observed a nonsignificant alteration in plasma biochemistry in dogs during and after the administration of atropine-xylazine-ketamine anaesthetic combination.

2.3 GLYCOPYRROLATE

Watney *et al.* (1987) reported that with premedication of the anticholinergic drugs like atropine sulphate, hyoscine and glycopyrrolate, the salivary secretions were reduced but comparing the premedication effect of atropine sulphate, hyoscine and glycopyrrolate, the cardiovascular stability and effective reduction in salivation produced by glycopyrrolate proved to be significant advantages when administration of antimuscarinic agent is considered necessary and reported that atropine sulphate and hyoscine produced a tachycardia followed by a fall in pulse rate, but glycopyrrolate maintained pulse rate at the same level throughout.

Smith *et al.* (1993) observed that preanaesthetic treatment with glycopyrrolate attenuates the hypotensive effect of propofol in human beings through peripheral effects on systemic vascular resistance and glycopyrrolate therefore may be beneficial as a preanaesthetic agent.

Robertson and Moon (2003) reported that though glycopyrrolate is indicated for alleviating bradycardia temporarily in bitches, it will not result in unnecessary foetal tachycardia since it could not cross the placental barrier.

Materials and Methods

3. MATERIALS AND METHODS

The anaesthetic study was conducted in twelve female dogs of different breeds subjected to caesarean section at the Veterinary College Hospitals at Mannuthy and Kokkalai. All the dogs were clinically examined and were randomly divided into two group's *viz.* Group I and Group II, each consisting of six dogs. They were serially numbered from 1 to 6.

To all the dogs glycopyrrolate[1] (Plate 1) at the dose rate of 0.01 mg/kg bodyweight was administered intramuscularly, 15 minutes prior to the administration of preanaesthetic drug(s).

The trials were carried out as given under:

Group I

Xylazine[2] (Plate 2) at the rate of 0.5mg/kg bodyweight was administered intramuscularly for premedication. Fifteen minutes later, propofol[3] (Plate 3) 1% emulsion was administered by intravenous bolus injection for the induction of general anaesthesia. Thereafter, 20 ml 1% propofol emulsion was mixed with 180 ml of normal saline solution (i.e. 1 ml contains 1 mg propofol) and was administered intravenously at the dose rate of 6 drops/kg/min (0.4mg propofol/kg/min.) for maintenance of anaesthesia till the surgical manipulations were completed (Plate 4).

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1. Pyrolate - Neon Laboratories Ltd., Thane, Maharashtra.
2. Xylaxin - Indian Immunologicals Ltd., Hyderabad.
3. Profol - Claris Lifesciences Ltd., Ahmedabad.

Group II

Xylazine at the rate of 0.5mg/kg and ketamine[4] (Plate 2) at the rate of 2.5mg/kg bodyweight was administered intramuscularly as a combined injection for premedication. Fifteen minutes later, propofol 1% emulsion was administered by intravenous bolus injection for the induction of general anaesthesia. Thereafter, 20 ml 1% propofol emulsion was mixed with 180 ml of normal saline solution (i.e. 1 ml contains 1 mg propofol) and was administered intravenously at the dose rate of 6 drops/kg/min (0.4mg propofol / kg /min.) for maintenance of anaesthesia till the surgical manipulations were completed.

Endotracheal intubation was carried out in all the dogs for maintaining the airway patency. The dogs were subjected to caesarean section (Plate 5).

The right lower flank region was prepared aseptically in the routine manner. A 10-15 cm laparotomy incision was made above and parallel to the mammary glands (pararectal site) (Plate 6). The foetuses were delivered through a single incision made on either of the uterine horns, close to its uterine body (Plates 7, 8 and 9). The uterus was sutured in Cushing's pattern followed by Lemberts and abdominal muscles in simple continuous pattern using chromic catgut. The skin incision was apposed with monofilament nylon in vertical mattress interposed with simple interrupted suture patterns. Normal saline solution was administered intravenously during and after surgery. Injection of Amoxicillin-Cloxacillin[5], 500 mg

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4. Ketmin-50 - Themis Medicare Ltd., Maharashtra.

5. Intamox – Intas Pharmaceuticals, Gujarat

was given intramuscularly followed by Amoxicillin-Cloxacillin tablet, 500 mg thrice daily for five consecutive days post operatively. The sutures were removed on the 8th postoperative day.

The physiological observations and collection of blood samples were carried out before and after premedication with xylazine/xylazine-ketamine, 15 minutes after induction of general anaesthesia, after the complete recovery and at 24 hours postoperatively.

Main items of observation

I. CLINICAL OBSERVATIONS

1. Clinical signs

The salient clinical signs exhibited by the dogs following the premedication with xylazine/xylazine-ketamine combination and after the administration of propofol during induction, maintenance, and recovery were recorded.

2. Time for induction of anaesthesia

Induction time was calculated as the time from the initiation of injection of propofol to the disappearance of jaw muscle tone and relaxation of laryngeal muscles which allowed endotracheal intubation.

3. Duration of anaesthesia

It was calculated as the time interval between the time of induction of anaesthesia and the time of return of pedal reflex.

4. Degree of muscle relaxation

It was rated as excellent, good, moderate, or poor depending upon resistance in opening jaws manually and by the assessment of relaxation of muscles of abdomen during surgery.

5. Recovery time

It was calculated as the time interval between the return of pedal reflex and the time when the animal could stand up and walk unaided.

6. Quantity of propofol administered for induction and maintenance

The quantity of propofol administered for the induction and the maintenance of general anaesthesia were recorded.

7. Time required for surgical operation

It was calculated as the time interval between the start of skin incision to the complete closure of the surgical incision.

II. Physiological observations

Rectal temperature (^{0}C), pulse rate (per min), respiration rate (per min) and the colour of conjunctival mucous membrane were recorded.

III. Haematological observations

Haemoglobin concentration (Sahli method), volume of packed red cell (Wintrobe, 1961), total and differential leukocytic counts were recorded (Benjamin, 2005).

IV. Serum constituents

Serum total protein, albumin and globulin contents were estimated using total protein and albumin kit[6] by Biuret method and albumin/globulin ratio was also calculated.

Serum sodium and potassium concentrations were estimated by flame photometric method.

V. Observations on puppies delivered

Number of puppies delivered, number of live/dead puppies, puppy vigour (sluggish/active) and neonatal resuscitation (required or not) were recorded.

VI. Post anaesthetic and post operative complication(s), if any

All the dogs were observed for any post anaesthetic and post operative complications up to the time of recovery, 24th hour after surgery and on 8th day postoperative day. The sutures were removed on the 8th day.

Statistical Analysis

The data were analysed by students t – test (Snedecor and Cochran, 1985).

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6. Total protein/Albumin kit – Agappe Diagnostics, Maharashtra.

Plate 1.

Glycopyrrolate ampoules (PYROLATE, NEON LABS)

Plate 2.

Ketamine hydrochloride (KETMIN-50, THEMIS) ampoules and Xylazine hydrochloride (XYLAXIN, Indian Immunologicals, Hyderabad) Vials

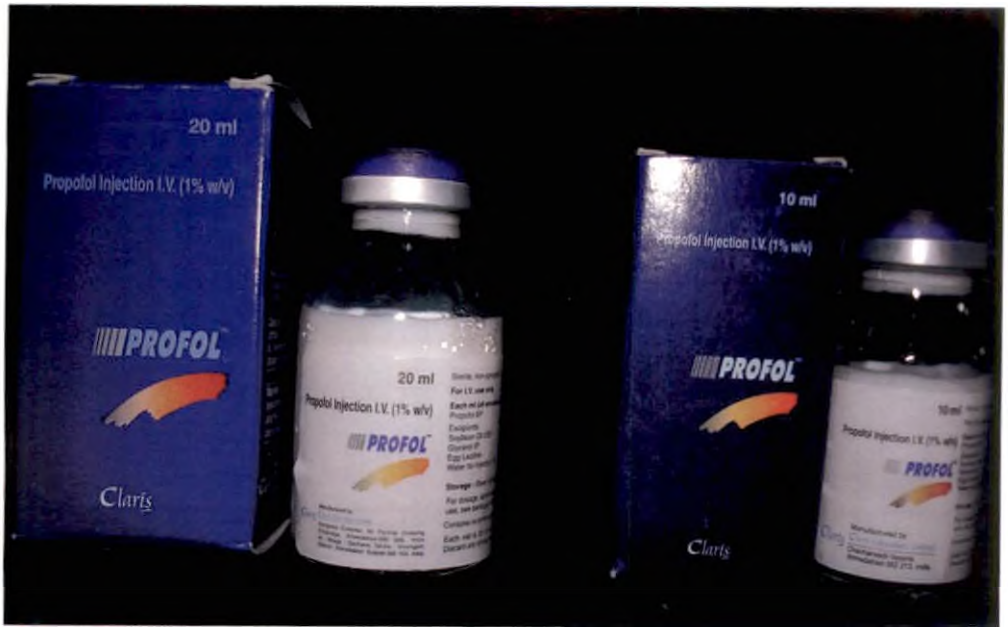

Plate 3.

Propofol (PROFOL, CLARIS LIFESCIENCES Ltd.) 1% emulsion, 10ml and 20ml Vials

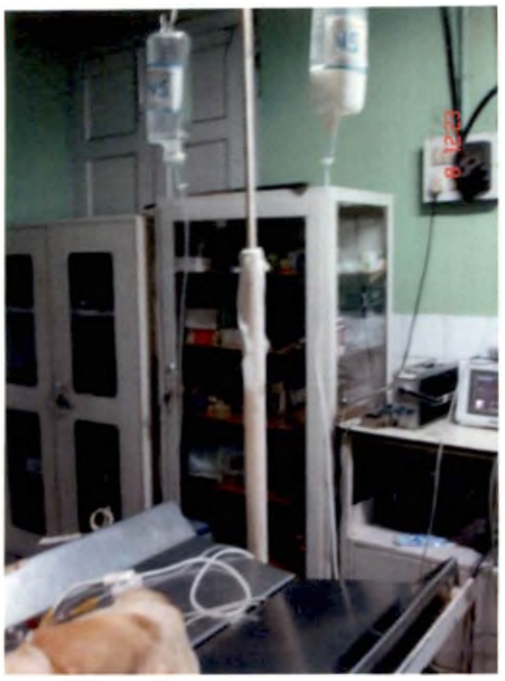

Plate 4.

Dog - Propofol intravenous infusion in progress

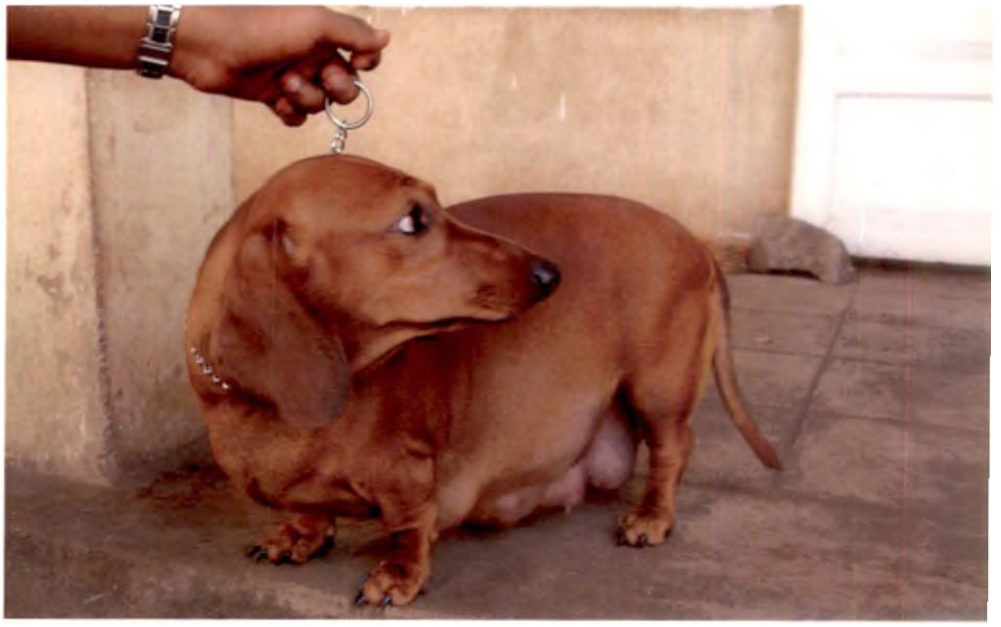

Plate 5.

Pregnant female Dachshund dog before caesarean section

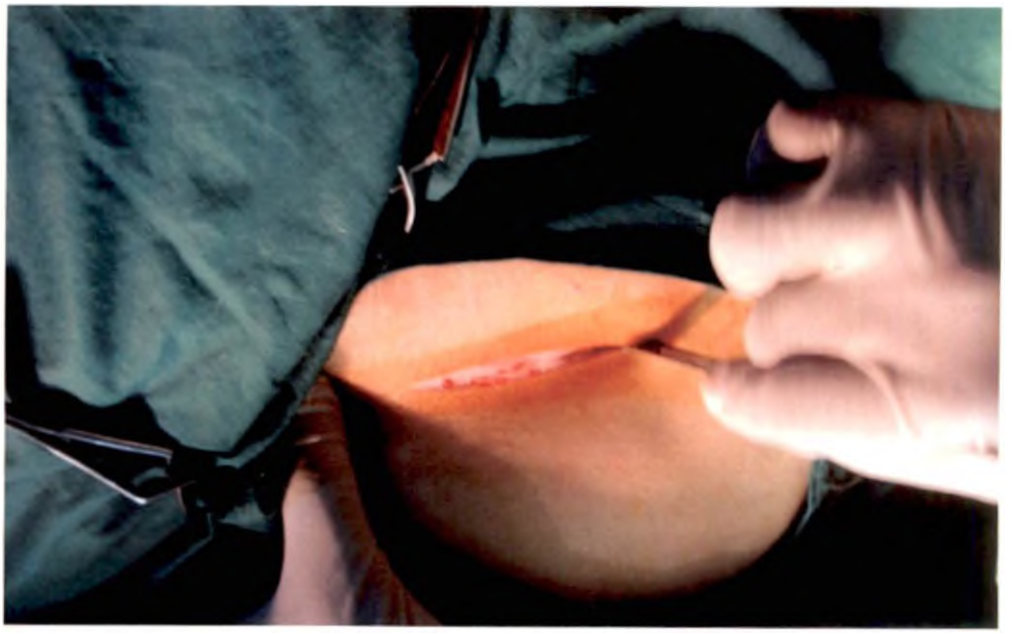

Plate 6.

Dog - Right lower flank incision (Para rectal site)

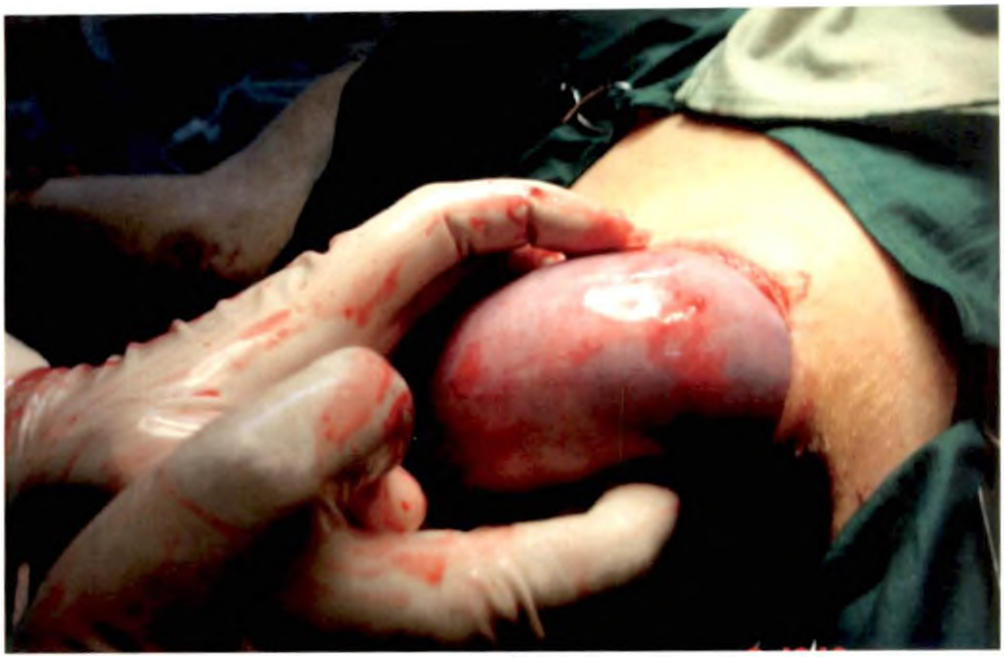

Plate 7.

Caesarean section - exteriorisation of uterus

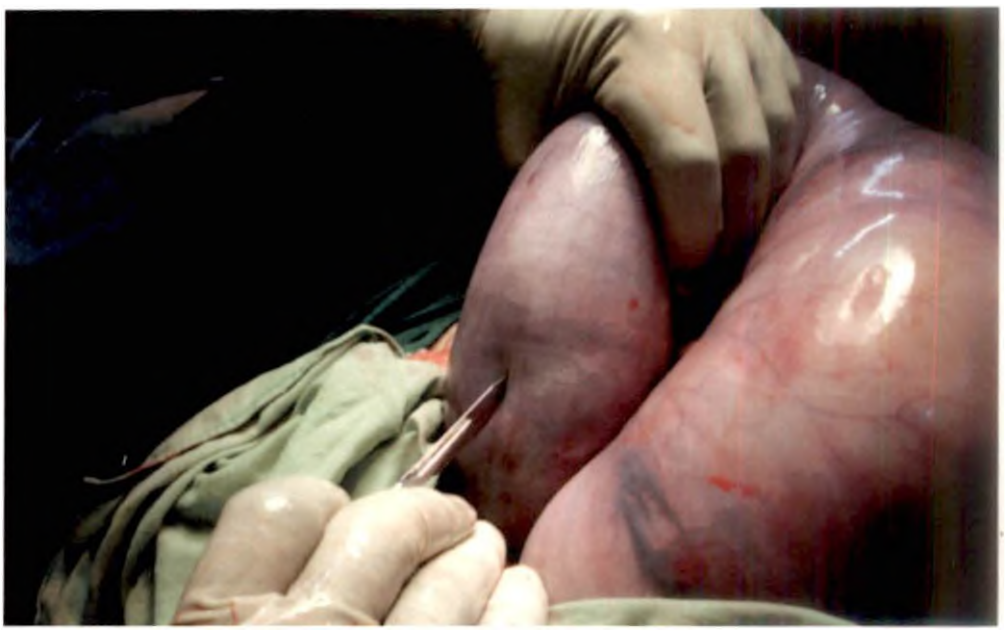

Plate 8.

Caesarean section - uterine incision in progress

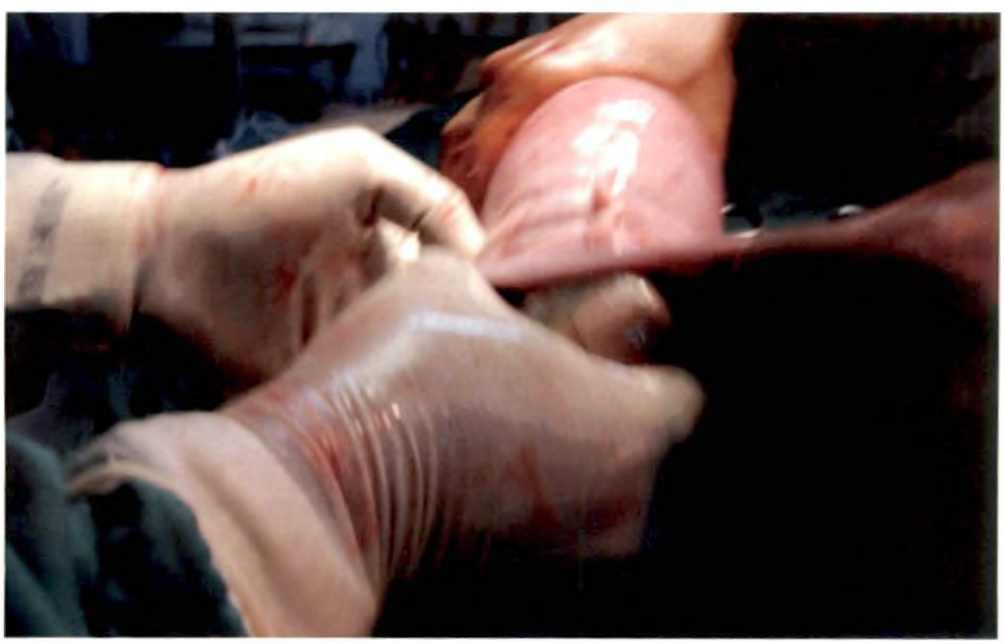

Plate 9.

Caesarean section - foetus being delivered

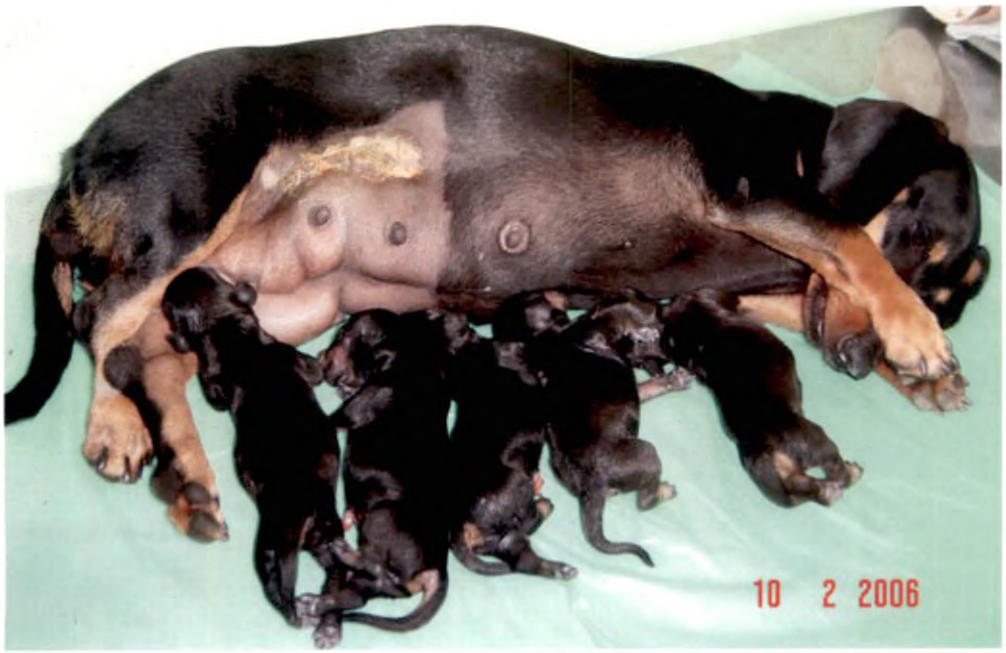

Plate 10.

A Dachshund dog - with active puppies

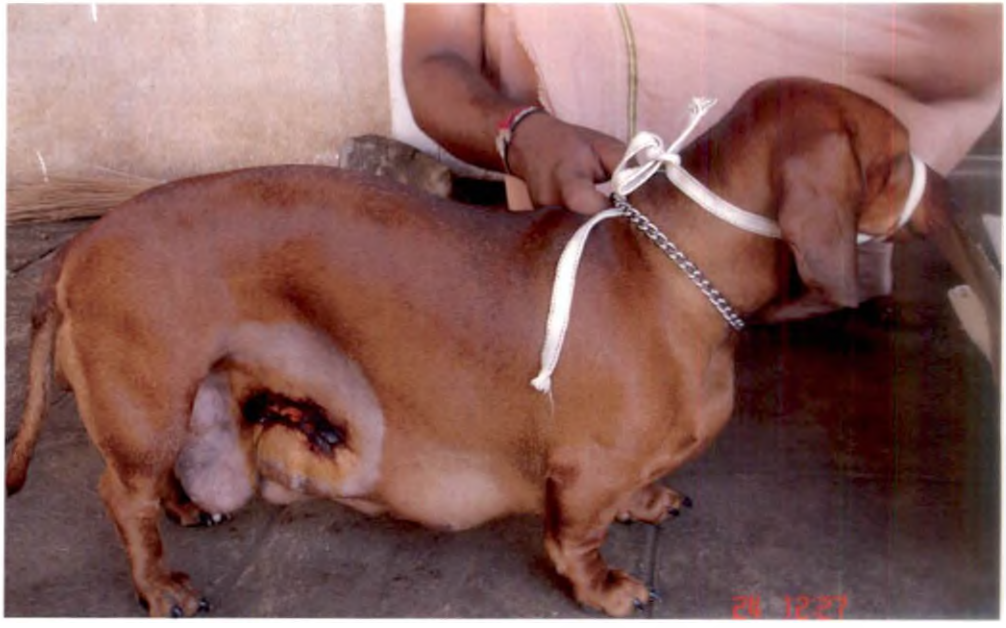

Plate 11.

A Dachshund dog - after recovery from anaesthesia

Results

4. RESULTS

GROUP I

The observations are presented in tables 1 to 5.

Glycopyrrolate at the dose rate of 0.01 mg/kg bodyweight was administered intramuscularly, 15 minutes prior to the administration of xylazine to all the animals of this Group.

Xylazine at the rate of 0.5mg/kg bodyweight was administered intramuscularly for premedication. Fifteen minutes later, propofol 1% emulsion was administered by intravenous bolus injection for the induction of general anaesthesia. Thereafter, 20 ml 1% propofol emulsion was mixed with 180 ml of normal saline solution and was administered intravenously at the dose rate of 6 drops / kg / min (0.4mg propofol / kg /min.)for maintenance of anaesthesia till the surgical manipulations were completed.

I. Clinical Observations

1. Clinical signs

Administration of xylazine resulted in sedation in dogs as manifested by the clinical signs such as winking of eyes, yawning and in coordination of movements with lowering of head .The other symptoms noticed were vomiting (Animal No.I/2) and licking (Animal Nos.I/2,I/3 & I/6) during induction and urination (Animal Nos.I/2,I/3 &I/5) during

recovery. All the dogs assumed sternal recumbency with head down posture.

The induction of anaesthesia was smooth after the administration of propofol. Palpebral reflex was sluggish (Animal Nos.I/1, I/2, I/3, I/5 & I/6). Palpebral reflex abolished (Animal No.I/4). Eyeball rolled down during induction and remained in that position throughout the period of anaesthesia.

The surgical anaesthesia was satisfactory. Degree of muscle relaxation was adequate. Relaxation of abdominal muscles was moderate to good in all the dogs.

The recovery from anaesthesia was quick, smooth and uneventful except in two animals (I/2, I/5) which showed slight shivering during recovery.

2. Induction time (Table 2)

The induction time was 2.23 ± 1.04 minutes following the intravenous bolus injection of propofol.

3. Duration of surgical anaesthesia following slow intravenous drip of propofol (Table 2)

With slow intravenous drip of propofol, on an average 49.77 ± 1.01 minutes of surgical anaesthesia was maintained to complete the surgery.

4. Quantity of propofol administered for induction (Table 2)

The quantity of propofol administered for induction was 76.66 ± 2.11 milligrams.

5. Quantity of propofol administered for maintenance (Table 2)

Average quantity of propofol administered for maintenance was 188.31 ± 5.06 milligrams depending upon the duration of surgery.

6. Recovery time (Table 2)

The average recovery time was 17.66 ± 1.81 minutes. All the dogs were active by the next day of surgery.

7. Degree of muscle relaxation (Table 2)

The degree of muscle relaxation was moderate to good.

8. Time required for surgical operation (Table 2)

The average time required for surgical operation was 52.00 ± 1.02 minutes.

II. Physiological Observations (Table 3)

The rectal temperature (^{0}C) was 38.50 ± 0.25 and 38.15 ± 0.32 before and after premedication respectively. It was 37.30 ±

0.28, 36.85 ± 0.35 and 38.60 ± 0.15 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the rectal temperature at 15 min after induction compared to that after premedication and it continued until recovery, thereafter returned to normal range by 24 hours.

The pulse rate (per minute) was 117.50 ± 0.20 and 114.67 ± 5.03 before and after premedication respectively. It was 130.33 ± 4.19, 111.50 ± 6.60 and 109 .67 ± 4.34 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the pulse rate after premedication and increase in pulse rate at 15 min after induction. The increase in pulse rate was significant at 15 min after induction. ($p<0.05$)

The respiration rate (per minute) was 71.67 ± 3.12 and 60.33 ± 4.94 before and after premedication respectively. It was 31.00 ± 4.41 ,52.27 ± 4.38 and 72.83 ± 3.87 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively There was a decrease in the respiration rate after premedication and at 15 min after induction with propofol and an increase at complete recovery. The decrease after premedication and at 15 min after induction with propofol and an increase at complete recovery was significant. ($p<0.05$)

The heart rate (per minute) was 142.67 ± 3.81 and 132.67 ± 3.26 before and after premedication respectively. It was 149.83 ± 3.29, 129.17 ± 5.54 and 138.00 ± 0.15 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the heart rate after premedication and an increase

at 15 min after induction with propofol. There is no significant variation in heart rate during the period of anaesthesia.

The colour of conjunctival mucous membrane was congested before and, after premedication. It was congested at 15 minutes, after complete recovery and pale roseate at 24 hours after administration of propofol respectively.

III. Haemogram (Table 4)

The volume of packed red cell (per cent) was 25.50 ± 0.43 and 21.83 ± 0.48 before and after premedication respectively. It was 23.87 ± 0.42, 23.83 ± 0.60 and 24.33 ± 0.41 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the volume of packed red cell after premedication and an increase at 15 min after induction with propofol. The decrease in the volume of packed red cell after premedication and an increase at 15 min after induction with propofol was significant ($p<0.05$).

The haemoglobin concentration (g/dl) was 8.65 ± 0.17 premedication and 8.35 ± 0.15 before and after premedication respectively. It was 7.75 ± 0.12, 7.55 ± 0.16 and 8.35 ± 0.13 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the haemoglobin concentration after premedication and at 15 min after induction with propofol, which continued until complete recovery. This decrease in the haemoglobin concentration after premedication, at 15 min after induction with propofol and at complete recovery was found to be insignificant.

The total leukocyte count ($10^6/mm^3$) was16.73 ± 0.33 and 13.13 ± 1.51 before and after premedication respectively. It was 18.53 ± 0.67, 17.78 ± 0.46 and 17.22 ± 0.37 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively There was an decrease in the total leukocyte count after premedication and a decrease at 15 min after induction with propofol. This decrease in the total leukocyte count after premedication and a decrease at 15 min after induction with propofol was found to be significant.

The neutrophil count (per cent) was 72.33 ± 3.20 and 80.33 ± 2.02 before and after premedication respectively. It was 82.67 ± 1.54, 76.27 ± 1.53 and 72.50 ± 3.08 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was an increase in the neutrophil count after premedication and at 15 min after induction with propofol. This increase in the neutrophil count after premedication and at 15 min after induction with propofol was found to be significant ($p<0.05$).

The lymphocyte count (per cent) was 29.17 ± 4.20 and 16.83 ± 1.63 before and after premedication respectively. It was 16.83 ± 1.64, 23.17 ± 1.54 and 26.50 ± 2.87 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the lymphocyte count after premedication and at 15 min after induction with propofol. This decrease in the neutrophil count after premedication and at 15 min after induction with propofol was found to be significant. ($p<0.05$).

The eosinophil count (per cent) was 1.17 ± 0.31 and 0.50 ± 0.22 before and after premedication respectively. It was

0.33 ± 0.21, 0.50 ± 0.22 and 0.83 ± 0.31 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. The decrease in the eosinophil count after premedication and at 15 min after induction with propofol was found to be significant. ($p<0.05$).

The monocyte count (per cent) was 0.50 ± 0.22 and 0.33 ± 0.21 before and after premedication respectively. It was 0.15 ± 0.17, 0.17 ± 0.17 and 0.17 ± 0.17 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a gradual decrease in monocyte count after premedication. This decrease in monocyte count was within the normal limits and was found to be insignificant.

The basophil count (per cent) was 0.00 ± 0.00 before and after premedication respectively. It was 0.00 ± 0.00 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. The basophil count was zero throughout the period of study.

IV. Serum constituents (Table 5)

The serum sodium concentration (mEq/l) was 145.5 ± 0.89 and 140.17 ± 1.54 before and after premedication respectively. It was 142.67 ± 0.99, 143.33 ± 1.23 and 143.00 ± 0.06 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. The changes observed were very marginal and was within the normal limits.

The serum potassium concentration (mEq/l) was 4.78 ± 0.07 and 4.42 ± 0.08 before and after premedication respectively .It was 4.17 ± 0.09, 4.3 ± 0.06 and 4.72 ± 0.06 at 15 minutes, after complete recovery and at 24

hours after administration of propofol respectively. The gradual decrease in serum potassium concentration after premedication and at 15 min after induction with propofol was within the normal ranges and hence found to be insignificant.

The serum albumin content (g/dl) was 2.85 ± 0.06 and 2.18 ± 0.05 before and after premedication respectively. It was 2.57 ± 0.04, 2.82 ± 0.06 and 3.02 ± 0.07 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the serum albumin content after premedication and an increase at 15 min after induction with propofol. This decrease in the serum albumin content after premedication and an increase at 15 min after induction with propofol was found to be significant. ($p<0.05$).

The serum globulin content (g/dl) was 2.3 ± 0.06 and 3.02 ± 0.06 before and after premedication respectively. It was 2.28 ± 0.03, 2.23 ± 0.03 and 2.13 ± 0.06 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was an increase in the serum globulin content after premedication and a decrease at 15 min after induction with propofol. This increase in the serum globulin content after premedication was found to be significant. ($p<0.05$).

The serum total protein content (g/dl) was 5.15 ± 0.06 and 5.2 ± 0.07 before and after premedication respectively. It was 4.85 ± 0.04, 5.00 ± 0.04 and 5.15 ± 0.03 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was an increase in the serum total protein content after premedication and a decrease at 15 min after induction with propofol which continued till

complete recovery. The decrease in the serum total protein content at 15 min after induction with propofol and at complete recovery was found to be significant.

The serum albumin/globulin ratio was 1.24 ± 0.03 and 0.72 ± 0.02 before and after premedication respectively. It was 1.12 ± 0.03, 1.29 ± 0.05 and 1.41 ± 0.08 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in A/G ratio after premedication and a gradual increase in A/G ratio at 15 min after induction with propofol till complete recovery and at 24 hours postoperatively. The decrease in albumin/globulin ratio after premedication and a gradual increase in albumin/globulin ratio at 15 min after induction with propofol till complete recovery were found to be significant.

V. Observation on puppies delivered (Table 1)

1. Number of puppies delivered

Total number of puppies delivered was 38 from six dogs subjected to caesarean section.

2. Number of live/dead puppies

Out of 38 puppies delivered by caesarean 29 puppies were live and 9 puppies were dead.

3. Puppy vigor

All the live puppies delivered were active and cried within two minutes (Plate 10).

4. Neonatal resuscitation required/not

Neonatal resuscitation was not required in any case.

VI. Post anaesthetic and post operative complications, if any

All the dogs had uneventful recovery from anaesthesia (Plate 11). Post operative complications were not encountered in any of the dogs.

Table 1. Observations on age, breed, parity, bodyweight, gestation length, total number of puppies delivered, number of live puppies and number of dead puppies (Group I)

Animal no.	Age (months)	Breed	Parity	Bodyweight (kg)	Gestation length (days)	No. of puppies delivered	No. of live puppies		No.of dead puppies
							Active	Sluggish	
1	24	Labrador	---	21	70	3	3	---	---
2	36	Bull Mastiff	---	38	66	5	3	---	2
3	18	Dachshund	---	18	73	7	7	---	---
4	24	Basset Hound	1	22	60	10	10	---	---
5	36	Dachshund	2	12	68	5	5	---	---
6	36	Dachshund	---	14	65	8	1	---	7

Table 2. Induction time, duration of surgical anaesthesia, quantity of propofol administered, recovery time, degree of muscle relaxation, time required for surgical operation. (Group I) (Mean ± S.E) (n=6)

Clinical Observations	Mean ±S E
Induction time (min)	2.23 ± 1.04
Duration of surgical anaesthesia (min)	49.77 ± 1.01
Quantity of propofol administered for induction in milligrams	76.66 ± 2.11
Quantity of propofol administered for maintenance in milligrams	188.31 ±5.06
Recovery time (min)	17.66 ± 1.81
Degree of muscle relaxation	Moderate to good
Time required for surgical operation (min)	52.00 ± 1.02

Table 3. Effects of administration of propofol with xylazine premedication on respiration rate, pulse rate, heart rate, temperature and colour of conjunctival mucous membrane (Group I) (Mean ± S.E) (n = 6)

Parameter	Before xylazine premedication	After xylazine premedication	15 minutes after induction with propofol	After complete recovery	24 hours post-operatively
Respiration (per min)	71.67 ± 3.12	60.33 ± 4.94*	31.00 ± 4.41*	52.27 ± 4.38*	72.83 ± 3.97
Pulse (per min)	117.50 ± 0.20	114.67 ± 5.03	130.33 ± 4.19*	111.50 ± 6.60	109.67 ± 4.34
Heart rate (per min)	142.67 ± 3.81	132.67 ± 3.26	149.83 ± 3.29	129.17 ± 5.54	138.00 ± 4.12
Temperature (^{0}C)	38.50 ± 0.25	38.15 ± 0.32	37.30 ± 0.28	36.85 ± 0.35	38.60 ± 0.15
Colour of conjunctival mucous membrane	congested	congested	congested	congested	Pale roseate

* Significant at 5percent ($p<0.05$) level as compared to value before xylazine premedication.

Table 4. Effects of administration of propofol with xylazine premedication on haematological parameters. (Group I) (Mean ± S.E) (n = 6)

Parameter	Before xylazine premedication	After xylazine premedication	15 minutes after induction with propofol	After complete recovery	24 hours postoperatively
Volume of packed red cells (%)	25.50 ± 0.43	21.83 ± 0.48*	23.87 ± 0.42*	23.83 ± 0.60*	24.33 ± 0.41
Haemoglobin (g/dl)	8.65 ± 0.17	8.35 ± 0.15	7.75 ± 0.12	7.55 ± 0.16	8.35 ± 0.13
Total leukocyte count ($10^6/mm^3$)	16.73 ± 0.33	13.13 ± 1.51*	18.53 ± 0.67*	17.78 ± 0.46	17.22 ± 0.37
Neutrophil count (%)	72.33 ± 3.20	80.33 ± 2.02*	82.67 ± 1.54*	76.17 ± 1.53	72.50 ± 3.08
Lymphocyte count (%)	29.17 ± 4.20	16.83 ± 1.63*	16.83 ±1.64*	23.12 ± 1.54	26.50 ± 2.87
Eosinophil count (%)	1.17 ± 0.31	0.50 ± 0.22*	0.33 ± 0.21*	0.50 ± 0.22*	0.83 ± 0.31
Monocyte count (%)	0.50 ± 0.22	0.33 ± 0.21	0.15 ± 0.17	0.17 ± 0.17	0.17 ± 0.17
Basophil count (%)	0	0	0	0	0

* Significant at 5 percent ($p<0.05$) level as compared to value before xylazine premedication

Table 5. Effects of administration of propofol with xylazine premedication on serum biochemical parameters. (Group I) (Mean ± S.E) (n = 6)

Parameter	Before xylazine premedication	After xylazine premedication	15 minutes after induction with propofol	After complete recovery	24 hours postoperatively
Serum sodium concentration (mEq/l)	145.5 ± 0.89	140.17 ± 1.54	142.67 ± 0.99	143.33 ± 1.23	143.00 ± 1.34
Serum potassium concentration (mEq/l)	4.78 ± 0.07	4.42 ± 0.08	4.17 ± 0.09	4.30 ± 0.06	4.72 ± 0.06
Serum total Protein content (g/dl)	5.15 ± 0.06	5.20 ± 0.07	4.85 ± 0.04*	5.00 ± 0.04*	5.15 ± 0.03
Serum albumin content (g/dl)	2.85 ± 0.06	2.18 ± 0.05*	2.57 ± 0.04*	2.82 ± 0.06	3.02 ± 0.07
Serum globulin content (g/dl)	2.30 ± 0.04	3.02 ± 0.06*	2.28 ± 0.03	2.23 ± 0.03	2.13 ± 0.06
Serum albumin/globulin ratio	1.24 ± 0.03	0.72 ± 0.02*	1.12 ± 0.03*	1.29 ± 0.05*	1.41 ± 0.08

* Significant at 5 percent ($p<0.05$) level as compared to value before xylazine premedication.

GROUP II

The observations are presented in tables 6 to 10.

Glycopyrrolate at the dose rate of 0.01 mg/kg bodyweight was administered intramuscularly, 15 minutes prior to the administration of xylazine-ketamine combination to all the animals of this Group.

Xylazine at the rate of 0.5mg/kg and ketamine at the rate of 2.5mg/kg bodyweight was administered intramuscularly as a combined injection for premedication. Fifteen minutes later, propofol 1% emulsion was administered by intravenous bolus injection for the induction of general anaesthesia. Thereafter, 20 ml 1% propofol emulsion was mixed with 180 ml of normal saline solution and was administered intravenously at the dose rate of 6 drops / kg / min (0.4mg propofol / kg /min.) for maintenance of anaesthesia till the surgical manipulations were completed.

I. Clinical Observations

1. Clinical signs

Administration of xylazine-ketamine combination resulted in sedation in dogs as manifested by the clinical signs such as winking of eyes, yawning and in coordination of movements with lowering of head .The other symptoms noticed were vomiting (Animal Nos.II/1, II/4) and licking (Animal Nos.II/2,II/3,II/5 & I/6) during induction and urination (Animal Nos.II/1,II/2,I/3 & I/6) during recovery. All the dogs assumed sternal recumbency with head down posture.

The induction of anaesthesia was smooth after the administration of propofol. Palpebral reflex was sluggish (Animal Nos. II/2, II/4, II/5 & II/6). Palpebral reflex abolished (Animal Nos.II/1,II/3 & II/5). Eyeball rolled down during induction and remained in that position throughout the period of anaesthesia.

The surgical anaesthesia was satisfactory. Degree of muscle relaxation was adequate. Relaxation of abdominal muscles was good to excellent in all the dogs.

The recovery from anaesthesia was quick, smooth and uneventful except for five animals (II/1, II/2, II/4, II/5 & II/6) which showed slight seizures during recovery.

2. Induction time (Table 7)

The induction time was 2.11 ± 1.08 minutes following the intravenous bolus injection of propofol.

3. Duration of surgical anaesthesia following slow intravenous drip of propofol (Table 7)

With slow intravenous drip of propofol, on an average 50.35 ± 1.07 minutes of surgical anaesthesia was achieved.

4. Quantity of propofol administered for induction (Table 7)

Average quantity of propofol administered for induction was 92.76 ± 3.21 milligrams.

5. Quantity of propofol administered for maintenance (Table 7)

Average quantity of propofol administered for maintenance was 193.58 ± 5.13 milligrams depending upon the duration of surgery.

6. Recovery time (Table 7)

The average recovery time was 22.68 ± 2.01 minutes. All the dogs were active by the next day of surgery.

7. Degree of muscle relaxation (Table 7)

The degree of muscle relaxation was good to excellent.

8. Time required for surgical operation (Table 7)

The average time required for surgical operation was 53.01 ± 1.11 minutes.

II. Physiological Observations (Table 8)

The rectal temperature (^{0}C) was 38.52 ± 0.22 and 38.3 ± 0.19 before and after premedication respectively. It was 37.40 ± 0.12, 36.90 ± 0.11 and

38.57 ± 0.09 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the temperature at 15 min after induction compared to that after premedication and it continued until recovery, thereafter returned to normal range by 24 hours.

The pulse rate (per minute) was 121.50 ± 5.23 and 111.17 ± 5.33 before and after premedication respectively. It was 135.00 ± 5.71, 123.00 ± 5.16 and 119 .00 ± 4.00 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the pulse rate after premedication and increase in pulse rate at 15 min after induction. The increase in pulse rate was non-significant at 15 min after induction.

The respiration rate (per minute) was 71.83 ± 2.82 and 68.00 ± 2.03 before and after premedication respectively. It was 31.83 ± 1.19 ,60.17 ± 1.04 and 68.67 ± 2.12 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively There was a decrease in the respiration rate after premedication and at 15 min after induction with propofol and an increase at complete recovery. The decrease after premedication and at 15 min after induction with propofol and an increase at complete recovery was significant. ($p<0.05$)

The heart rate (per minute) was 148.83 ± 8.17 and 138.33 ± 6.40 before and after premedication respectively. It was 154.50 ± 6.69, 139.17 ± 5.42 and 142.67 ± 6.32 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the heart rate after premedication and an increase

at 15 min after induction with propofol. There is no significant variation in heart rate during the period of anaesthesia.

The conjunctival mucous membrane was congested before and, after premedication. It was congested at 15 minutes, after complete recovery and pale roseate at 24 hours after administration of propofol respectively.

III. Haemogram (Table 9)

The volume of packed red cells (per cent) was 32.00 ± 1.31 and 28.83 ± 1.01 before and after premedication respectively. It was 27.33 ± 1.02, 25.00 ± 1.03 and 31.50 ± 0.76 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the volume of packed red cells after premedication, at 15 min and at complete recovery after induction with propofol. The decrease in the volume of packed red cells after premedication, at 15 min and at complete recovery after induction with propofol was non-significant.

The haemoglobin concentration (g/dl) was 11.55 ± 0.53 premedication and 9.88 ± 0.52 before and after premedication respectively. It was 9.78 ± 0.63, 10.37 ± 0.47 and 12.15 ± 0.45 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the haemoglobin concentration after premedication and at 15 min after induction with propofol, which continued until complete recovery. The decrease in the haemoglobin concentration after premedication, at 15 min after induction with propofol and at complete recovery was found to be insignificant.

The total leukocyte count ($10^6/mm^3$) was17.93 ± 0.38 and 17.05 ± 0.40 before and after premedication respectively. It was 16.32 ± 0.29, 17.38 ± 0.27 and 19.57 ± 0.86 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively There was an decrease in the total leukocyte count after premedication and a decrease at 15 min after induction with propofol. The decrease in the total leukocyte count after premedication and a decrease at 15 min after induction with propofol was found to be significant.

The neutrophil count (per cent) was 77.67 ± 3.04 and 84.83 ± 2.49 before and after premedication respectively. It was 80.83 ± 2.16, 80.83 ± 2.13 and 81.33 ± 1.80 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was an increase in the neutrophil count after premedication and a decrease at 15 min after induction with propofol. The increase in the neutrophil count after premedication was found to be significant ($p<0.05$).

The lymphocyte count (per cent) was 20.83 ± 2.86 and 14.17 ± 2.44 before and after premedication respectively. It was 18.33 ± 2.16, 18.67 ± 2.34 and 17.83 ± 1.72 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the lymphocyte count after premedication and an increase at 15 min after induction with propofol. The decrease in the neutrophil count after premedication and an increase at 15 min after induction with propofol was found to be non-significant.

The eosinophil count (per cent) was 1.00 ± 0.36 and 0.67 ± 0.21 before and after premedication respectively. It was 0.5 ± 0.22,

0.30 ± 0.21 and 0.68 ± 0.33 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. The decrease in the eosinophil count after premedication and at 15 min after induction with propofol was found to be significant ($p<0.05$).

The *monocyte count* (percent) was 0.50 ± 0.34 and 0.33 ± 0.21 before and after premedication respectively. It was 0.33 ± 0.21, 0.17 ± 0.16 and 0.17 ± 0.16 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a gradual decrease in monocyte count after premedication. The decrease in monocyte count was within the normal limits and was found to be insignificant.

The basophil count (per cent) was 0.00 ± 0.00 before and, before and after premedication respectively. It was 0.00 ± 0.00 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. The basophil count was zero throughout the period of study.

IV. Serum constituents (Table 10)

The serum sodium concentration (mEq/l) was 146.83 ± 0.60 and 136.50 ± 0.56 before and after premedication respectively. It was 141.33 ± 0.0.86, 145.83 ± 0.87 and 146.50 ± 0.76 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. The changes observed were marginal and were within the normal limits.

The serum potassium concentration (mEq/l) was 4.67 ± 0.06 and 4.33 ± 0.09 before and after premedication respectively .It was 4.27 ± 0.12, 4.57 ± 0.16 and 4.70 ± 0.15 at 15 minutes, after complete recovery and at

24 hours after administration of propofol respectively. The gradual decrease in serum potassium concentration after premedication and at 15 min after induction with propofol was within the normal ranges and found to be non-significant

The serum albumin content (g/dl) was 3.50 ± 0.16 and 2.60 ± 0.21 before and after premedication respectively. It was 2.90 ± 0.17, 3.10 ± 0.15 and 3.30 ± 0.15 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in the serum albumin content after premedication and an increase at 15 min after induction with propofol. The decrease in the serum albumin content after premedication and an increase at 15 min after induction with propofol was found to be non-significant.

The serum globulin content (g/dl) was 2.88 ± 0.18 and 3.10 ± 0.13 before and after premedication respectively. It was 2.57 ± 0.15, 2.60 ± 0.17 and 2.51 ± 0.16 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was an increase in the serum globulin content after premedication and a decrease at 15 min after induction with propofol. The increase in the serum globulin content after premedication was found to be non-significant.

The serum total protein content (g/dl) was 7.38 ± 0.07 and 7.98 ± 0.01 before and after premedication respectively. It was 5.31 ± 0.04, 5.10 ± 0.04 and 7.15 ± 0.09 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was an increase in the serum total protein content after premedication and a decrease at 15 min after induction with propofol which continued till

complete recovery. The decrease in the serum total protein content at 15 min after induction with propofol and at complete recovery was found to be non- significant.

The serum albumin/globulin ratio was 1.19 ± 0.19 and 0.84 ± 0.18 before and after premedication respectively. It was 1.13 ± 0.17, 1.13 ± 0.16 and 1.31 ± 0.15 at 15 minutes, after complete recovery and at 24 hours after administration of propofol respectively. There was a decrease in A/G ratio after premedication and a gradual increase in A/G ratio at 15 min after induction with propofol till complete recovery and at 24 hours postoperatively. The decrease in albumin/globulin ratio after premedication and a gradual increase in albumin/globulin ratio at 15 min after induction with propofol till complete recovery were found to be significant.

V. Observation on puppies delivered (Table 6)

1. Number of puppies delivered

Total number of puppies delivered was 27 from six dogs subjected to caesarean section.

2. Number of live/dead puppies

Out of the 27 puppies delivered, 20 were live and 7 were dead in Group II.

3. Puppy vigor

Out of the 20 puppies, nine were active and cried immediately and 11 puppies were sluggish and depressed, and took 5-10 minutes for revival.

4. Neonatal resuscitation required/not

The 11 puppies, which were sluggish and depressed were given manual resuscitation of swinging on hindlimbs and by mild compression on chest. The instillation of 2-3 drops of Doxapram* on the tongue were also tried. But the four puppies delivered from the pug died within 24 hours.

VI. Post anaesthetic and post operative complications, if any

All the dogs recovered uneventfully from anaesthesia and without any post operative complications.

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* Dopram – A.H. Robins Company Richmond, VA

Table 6. Observations on age, breed, parity, bodyweight, gestation length, total number of puppies delivered, number of live puppies and number of dead puppies. (Group II)

Animal no.	Age (months)	Breed	Parity	Bodyweight (kg)	Gestation length (days)	No. of puppies delivered	No. of live puppies		No. of dead puppies
							Active	Sluggish	
1	24	Labrador	---	21	70	3	3	--	---
2	36	Boxer	---	38	66	5	--	3	2
3	18	Dachshund	---	18	73	6	2	4	---
4	24	German shepherd dog	1	22	60	2	--	--	2
5	18	Pug	2	12	68	4	--	4	---
6	36	Labrador	2	28	65	7	4	--	3

Table 7. Induction time, duration of surgical anaesthesia, quantity of propofol administered, recovery time, degree of muscle relaxation, time required for surgical operation. (Group II) (Mean ± S.E) (n=6)

Clinical Observations	Mean ±S E
Induction time (min)	2.11 ± 1.08
Duration of surgical anaesthesia (min)	50.35 ± 1.07
Quantity of propofol administered for induction in milligrams	92.76 ± 3.21
Quantity of propofol administered for maintenance in milligrams	193.58 ±5.13
Recovery time (min)	22.68 ± 2.01
Degree of muscle relaxation	Good to excellent
Time required for surgical operation(min)	53.01 ± 1.11

Table 8. Effects of administration of propofol with xylazine-ketamine premedication on respiration rate, pulse rate, heart rate, temperature and colour of conjunctival mucous membrane. (Group II) (Mean ± S.E) (n = 6)

Parameter	Before xylazine-ketamine premedication	After xylazine-ketamine premedication	15 minutes after induction with propofol	After complete recovery	24 hours postoperatively
Respiration (per min)	71.83 ± 2.82	68.00 ± 2.03 *	31.83 ± 1.19*	60.17 ± 1.04*	68.67 ± 2.12
Pulse (per min)	121.50 ± 5.23	111.17 ± 5.33	135.00 ± 5.71	123.00 ± 5.16	119.00 ± 4.00
Heart rate (per min)	148.83 ± 8.17	138.33 ± 6.40	154.5 ± 6.69	139.17 ± 5.42	142.67 ± 6.32
Temperature (^{0}C)	38.52 ± 0.22	38.30 ± 0.19	37.40 ± 0.12	36.90 ± 0.11	38.57 ± 0.09
Colour of conjunctival mucous membrane	congested	congested	congested	congested	Pale roseate

* Significant at 5percent ($p<0.05$) level as compared to value before xylazine-ketamine premedication.

Table 9. Effects of administration of propofol with xylazine-ketamine premedication on haematological parameters (Group II) (Mean ± S.E) (n = 6)

Parameter	Before xylazine-ketamine premedication	After xylazine-ketamine premedication	15 minutes after induction with propofol	After complete recovery	24 hours postoperatively
Volume of packed red cells (%)	32.00 ± 1.31	28.83 ± 1.01	27.33 ± 1.02	25.00 ± 1.03	31.50 ± 0.76
Haemoglobin (g/dl)	11.55 ± 0.53	9.88 ± 0.52	9.78 ± 0.63	10.37 ± 0.47	12.15 ± 0.45
Total leukocyte count (10^6/mm^3)	17.93 ± 0.38	17.05 ± 0.40*	16.32 ± 0.29	17.38 ± 0.27	19.57 ± 0.86
Neutrophil count (%)	77.67 ± 3.04	84.83 ± 2.49*	80.83 ± 2.16	80.83 ± 2.13	81.33 ± 1.80
Lymphocyte count (%)	20.83 ± 2.86	14.17 ± 2.44	18.33 ±2.16	18.67 ± 2.34	17.83 ± 1.72
Eosinophil count (%)	1.00 ± 0.36	0.67 ± 0.21*	0.50 ± 0.22*	0.30 ± 0.21	0.68 ± 0.33
Monocyte count (%)	0.50 ± 0.34	0.33 ± 0.21	0.33 ± 0.21	0.17 ± 0.16	0.17 ± 0.16
Basophil count (%)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00

* Significant at 5 per cent ($p<0.05$) level as compared to value before xylazine-ketamine premedication

Table 10. Effects of administration of propofol with xylazine-ketamine premedication on serum biochemical parameters. (Group II) (Mean ± S.E) (n = 6)

Parameter	Before xylazine-ketamine premedication	After xylazine-ketamine premedication	15 minutes after induction with propofol	After complete recovery	24 hours postoperatively
Serum sodium concentration (mEq/l)	146.83 ± 0.60	136.50 ± 0.56	141.33 ± 0.86	145.83 ± 0.87	146.50 ± 0.76
Serum potassium concentration (mEq/l)	4.67 ± 0.06	4.33 ± 0.09	4.27 ± 0.12	4.57 ± 0.16	4.70 ± 0.15
Serum total protein content (g/dl)	7.38 ± 0.07	7.98 ± 0.01	5.31 ± 0.04	5.10 ± 0.04	7.15 ± 0.09
Serum albumin content (g/dl)	3.50 ± 0.16	2.60 ± 0.21	2.90 ± 0.17	3.10 ± 0.15	3.30 ± 0.15
Serum globulin content (g/dl)	2.88 ± 0.18	3.10 ± 0.13	2.57 ± 0.15	2.60 ± 0.17	2.51 ± 0.16
Serum albumin/globulin ratio	1.19 ± 0.19	0.84 ± 0.18*	1.13 ± 0.17*	1.13 ± 0.16*	1.31 ± 0.15

* Significant at 5 per cent ($p<0.05$) level as compared to value before xylazine-ketamine premedication.

Discussion

5. DISCUSSION

The anaesthetic study was conducted in twelve female dogs of different breeds subjected to caesarean section at the Veterinary College Hospitals at Mannuthy and Kokkalai. All the dogs were clinically examined and were randomly divided into two group's *viz.* Group I and Group II, each consisting of six dogs. They were serially numbered from 1 to 6.

To all the dogs, glycopyrrolate at the dose rate of 0.01 mg/kg bodyweight was administered intramuscularly, 15 minutes prior to the administration of preanaesthetic drug (s). In Group I, Xylazine at the rate of 0.5mg/kg bodyweight and in Group II, Xylazine at the rate of 0.5mg/kg and ketamine at the rate of 2.5mg/kg bodyweight as a combined injection was administered intramuscularly for premedication. In both the groups, fifteen minutes later, propofol 1% emulsion was administered by intravenous bolus injection for the induction of general anaesthesia. Thereafter, 20 ml 1% propofol emulsion was mixed with 180 ml of normal saline solution and was administered intravenously at the rate of 6 drops/ kg/min (0.4mg propofol/kg/min.) for maintenance of anaesthesia till the surgical manipulations were completed. Endotracheal intubation was carried out in all the dogs for maintaining the airway patency.

The dogs were subjected to caesarean section.

Main items of observation

I. CLINICAL OBSERVATIONS

1. Clinical signs (Table 11)

After premedication, winking of eyes, yawning and incoordination of movements with lowering of head were the commonly observed clinical symptoms in both the groups. Other symptoms like vomiting (in three dogs), and licking (in seven dogs) during induction and urination (in seven dogs) during recovery. Xylazine induced vomiting had been reported in cats by Hikasa *et al.* (1989). The probable reason for the vomiting observed in the present study may be due to the effect of xylazine and lack of fasting. In both the groups, all the dogs assumed sternal recumbency with head down posture. The recumbency assumed by the dogs may be due to the sedative effects of xylazine and xylazine-ketamine combination. (Klide *et al.*, 1975)

In the present study, salivation was scanty in both the groups, probably due to the prior administration of glycopyrrolate. Reduction in salivation had been reported following the administration of glycopyrrolate in dogs (Watney *et al.*, 1987). In the present study symptoms like seizures (Haskins *et al.* 1985) and muscle rigidity (Hall, 1985 and Thiruthalinathan *et al.*, 1995) were observed during recovery in animals which were premedicated with xylazine-ketamine combination, but these symptoms were not observed during induction period of anaesthesia in both the groups. Hence it could be presumed that the effect of ketamine persisted even after the effect of xylazine vained away.

2. Time for induction of anaesthesia

The time for induction of anaesthesia was 2.23 ± 1.04 and 2.11 ± 1.08 minutes in Group I and Group II respectively (Fig.1). It was seen that the time for induction of anaesthesia was almost the same in both the groups may be due to the administration of propofol in the same dose and infusion rate. Apnoea as reported by (Brearley *et al.*, 1988; Smith *et al.*, 1993; Muir and Gadawski, 1998 and Quandt *et al.*, 1998) were not observed (Weaver and Raptopoulos, 1990) in the present study during induction probably due to the slow rate of administration.

3. Duration of anaesthesia

Duration of anaesthesia was 49.77 ± 1.01 and 50.35 ± 1.07 minutes in Group I and Group II respectively, depending up on the time taken for completing the surgical procedures (Fig.1). Hence it could be seen that depending up on the time requirement for completing the surgery, duration of propofol can be maintained by the slow intravenous infusion (Hall and Chambers, 1987).

4. Degree of muscle relaxation

Degree of muscle relaxation was moderate to good in Group I and good to excellent in Group II as assessed by observing the resistance in opening jaws manually and the relaxation of abdominal muscles during surgery. Hence it was evident that the degree of muscle relaxation noticed in the dogs which were premedicated with xylazine-ketamine combination was excellent compared to the dogs premedicated with xylazine. Haskins

et al. (1986) reported better muscle relaxation with xylazine-ketamine combination when compared with ketamine alone.

5. Quantity of propofol administered for induction

Quantity of propofol administered for induction was 76.66 ± 2.11 and 92.76 ± 3.21 milligrams in Group I and Group II respectively. The quantity and rate of administration of propofol in the present study was found effective in producing smooth and rapid induction of anaesthesia by single intravenous bolus injection in all the dogs. Bufalari *et al.* (1998, b) stated the use of tranquilizers and sedatives to reduce the propofol dosage needed for the induction of anaesthesia. Short and Bufalari (1999) reported the dose of propofol for induction of anaesthesia in unpremedicated dogs as 6 to 8 mg/kg bodyweight intravenously. From the present study it was seen that propofol at the dose rate of 4mg/kg bodyweight was safe for the induction of general anaesthesia in dogs which were premedicated with both xylazine and xylazine-ketamine combination.

6. Quantity of propofol administered for maintenance

Quantity of propofol administered for maintenance was 188.31 ± 5.06 and 193.58 ± 5.13 milligrams in Group I and Group II respectively. Since all the dogs of both the groups were apparently normal after recovery, it could be presumed that propofol has no cumulative effect as reported by Morgan and Legge (1989)

7. Recovery time

Recovery time was 17.66 ± 1.81 and 22.68 ± 2.01 minutes in Group I and Group II respectively (Fig.1). In the present study, recovery time was slightly prolonged following the administration of propofol in dogs which were premedicated with xylazine-ketamine combination. Watkins *et al.* (1987) reported a recovery time of 25.00 ± 13.00 minutes following the propofol anaesthesia in dogs, premedicated with acepromazine.

8. Time required for surgical operation

Time required for surgical operation was 52.00 ± 1.02 and 53.01 ± 1.11 minutes in Group I and Group II respectively. Since the surgical operation performed was the same in all the dogs, duration for completion of operation was almost similar for both the groups.

II. Physiological Observations

There was a decrease in rectal temperature following the premedication and after the administration of propofol in both the groups. The decease in rectal temperature following the administration of thiopentone in xylazine premedicated dogs had been reported by Sharma *et al.* (1983), following xylazine-ketamine anaesthesia by Sharma *et al.* (1997), and during propofol anaesthesia by Muir and Gadawski (1998), and Venugopal *et al.* (2002)

There was a decrease in pulse rate following the premedication and increase during propofol anaesthesia in both the groups. The increase in

pulse rate was significant in Group I. But Watkins *et al.* (1987) reported that the changes in pulse rate were not consistent following the administration of propofol

The respiration rate was significantly reduced following the premedication and after the administration of propofol in both the groups. Decrease in respiration rate had been reported in dogs following administration of xylazine alone (Peshin *et al.*, 1980), in xylazine-ketamine anaesthesia (Haskins *et al.*, 1986), and in propofol anaesthesia (Hall and Chambers, 1987; Muir and Gadawski, 1998; Quandt *et al.*, 1998 and Venugopal *et al.*, 2002).

In both the groups, there was a decrease in heart rate following premedication due to the depressant effect of xylazine and it was increased following the administration of propofol. But the changes were non-significant as reported by Brearley *et al.* (1988).

The conjunctival mucous membrane was congested before, after premedication and till complete recovery from propofol anaesthesia, and was pale roseate by 24 hours.

III. Haemogram

There was a decrease in the volume of packed red cells following the premedication and following the administration of propofol returned to normal value by 24 hours in both the groups. Decrease in volume of packed red cells was significant in the in dogs which were premedicated with xylazine. Decrease in volume of packed red cell had been reported,

following administration of xylazine alone in dogs (Peshin *et al.*, 1980) and propofol (Venugopal *et al.*, 2002).

There was a decrease in the haemoglobin concentration following the premedication and following the administration of propofol returned to normal value by 24 hours in both the groups. The variations in haemoglobin concentration were non-significant in dogs which were premedicated with both xylazine and xylazine-ketamine combination. Decrease in the haemoglobin concentration had been reported in dogs, following administration of xylazine alone (Peshin *et al.*, 1980), xylazine and thiopentone (Sharma *et al.*, 1983) and propofol (Bayan *et al.*, 2002 and Venugopal *et al.*, 2002).

There was a decrease in the total leukocyte count after premedication and after the administration of propofol in both the groups. The decrease in the total leukocyte count was found to be significant in both the groups. Decrease in the total leukocyte count had been reported in dogs, following administration of xylazine alone (Peshin *et al.*, 1980), xylazine and thiopentone (Sharma *et al.*, 1983) and propofol (Bayan *et al.*, 2002 and Venugopal *et al.*, 2002).

There was an increase in the neutrophil count after premedication in both the groups but was decreased in the dogs which were premedicated with xylazine-ketamine combination following administration of propofol. Increase in the neutrophil count after premedication had been reported in dogs, following administration of xylazine alone (Peshin *et al.*, 1980)

There was a decrease in the lymphocyte count after premedication in both the groups but was increased in the dogs which were premedicated with xylazine-ketamine combination following administration of propofol. Decrease in the lymphocyte count after premedication had been reported in dogs, following administration of xylazine alone (Peshin *et al.*, 1980).

The variations in monocyte and eosinophil count were marginal in both the groups.

The basophil count was zero throughout the period of study in both the groups. Bayan *et al.* (2002) observed no significant change in differential leukocyte count throughout the period of study during propofol anaesthesia.

The reason for the decrease in volume of packed red cells and the total leukocyte count observed during the maximum depth of anaesthesia can be due to either spleenic dilatation or subsequent pooling of blood or haemodilution. The increase in neutrophil count with corresponding decrease in lymphocyte count observed in the study can be attributed to the stressful condition of the dogs during anaesthesia.

IV. Serum constituents

There was a decrease in the serum sodium concentration after premedication and increase after the administration of propofol in both the groups. The changes observed were marginal and within the normal limits. The biochemical value did not change and were within the normal limits at

all times throughout the period of propofol anaesthesia as reported by Muir and Gadawski (1998)

There was a decrease in the serum potassium concentration after premedication and after the administration of propofol in both the groups. The changes observed were marginal and within the normal limits. Decrease in the serum potassium concentration after premedication had been reported in dogs, following administration of xylazine alone (Peshin *et al.*, 1980). The biochemical value did not change and were within the normal limits at all times throughout the period of propofol anaesthesia as reported by Muir and Gadawski (1998).

Since the changes in the serum sodium and potassium concentrations observed in the present study were marginal, it could be inferred that there is not much haemodilution and hypoxia during anaesthesia.

There was an increase in the serum total protein content after premedication and a decrease following the administration of propofol in both the groups and reduced to normal level by 24 hours. There was a decrease in albumin/globulin ratio after premedication and a gradual increase after the administration of propofol in both the groups. The variation was found to be significant during anaesthesia in both the groups and became non-significant by 24 hours. Since the changes observed were very marginal and was within the normal limits it is inferred that the effect of propofol on liver was marginal or absent as reported by (Muir and Gadawski, 1998 and Bayan *et al.*, 2002).

V. Observation on puppies delivered

1. Number of puppies delivered

Total number of puppies delivered was 65 from twelve female dogs subjected to caesarean section.

2. Number of live/dead puppies

Out of the 38 puppies delivered, 29 were live and 9 were dead in Group I. Out of the 27 puppies delivered, 20 were live and 7 were dead in Group II.

3. Puppy vigor

In Group I, all the 29 live puppies delivered were active and cried within two minutes. In Group II, out of the 20 live puppies nine were active and cried immediately but 11 puppies were sluggish and depressed, and took 5-10 minutes for revival. Of which, the four puppies delivered from pug died within 24 hours. Robertson and Moon (2003) reported that propofol was associated with better puppy vigor than thiopentone or thiamylal and glycopyrrolate will not result in unnecessary foetal tachycardia since it could not cross the placental barrier. It was also opined that the likelihood of puppies born alive is increased if propofol or isoflurane is a part of anaesthetic protocol. Moon-Masset and Erb (2002) reported that the use of propofol for caesarean section was associated with better puppy vigor than with thiopentone or thiamylal. From the present observations it could be inferred that the sluggishness of puppies may be

associated with the depressant effect of ketamine (Navarro and Friedman, 1975).

4. Neonatal resuscitation required/not

Resuscitation by manual method along with instillation of 2-3 drops of doxapram on the tongue was required for the revival of the puppies. Navarro and Friedman (1975) also reported the use of doxapram to reduce the revival time of puppies. Xylazine (0.5-1 mg/lb bodyweight) was found not to depress the puppies delivered by caesarean section, but administration of ketamine hydrochloride in xylazine sedated pregnant dogs resulted in the depression of puppies. Luna *et al.* (2004) reported that puppies delivered from the bitches anaesthetised with propofol showed less neurological depression than puppies delivered from bitches anaesthetised with midazolam or ketamine and more respiratory depression than with thiopentone.

VI. Post anaesthetic and post operative complications, if any

All the dogs recovered uneventful from anaesthesia and without any complications.

Table 11. Induction time, duration of surgical anaesthesia, quantity of propofol administered, recovery time, degree of muscle relaxation, time required for surgical operation. (Group I and Group II) (Mean ± S.E) (n=6)

Clinical Observations	Group I	Group II
Induction time (min)	2.23 ± 1.04	2.11 ± 1.08
Duration of surgical anaesthesia (min)	49.77 ± 1.01	50.35 ± 1.07
Quantity of propofol administered for induction in milligrams	76.66 ± 2.11	92.76 ± 3.21
Quantity of propofol administered for maintenance in milligrams	188.31 ±5.06	193.58 ±5.13
Recovery time (min)	17.66 ± 1.81	22.68 ± 2.01
Degree of muscle relaxation	Moderate to good	Good to excellent
Time required for surgical operation(min)	52.00 ± 1.02	53.01 ± 1.11

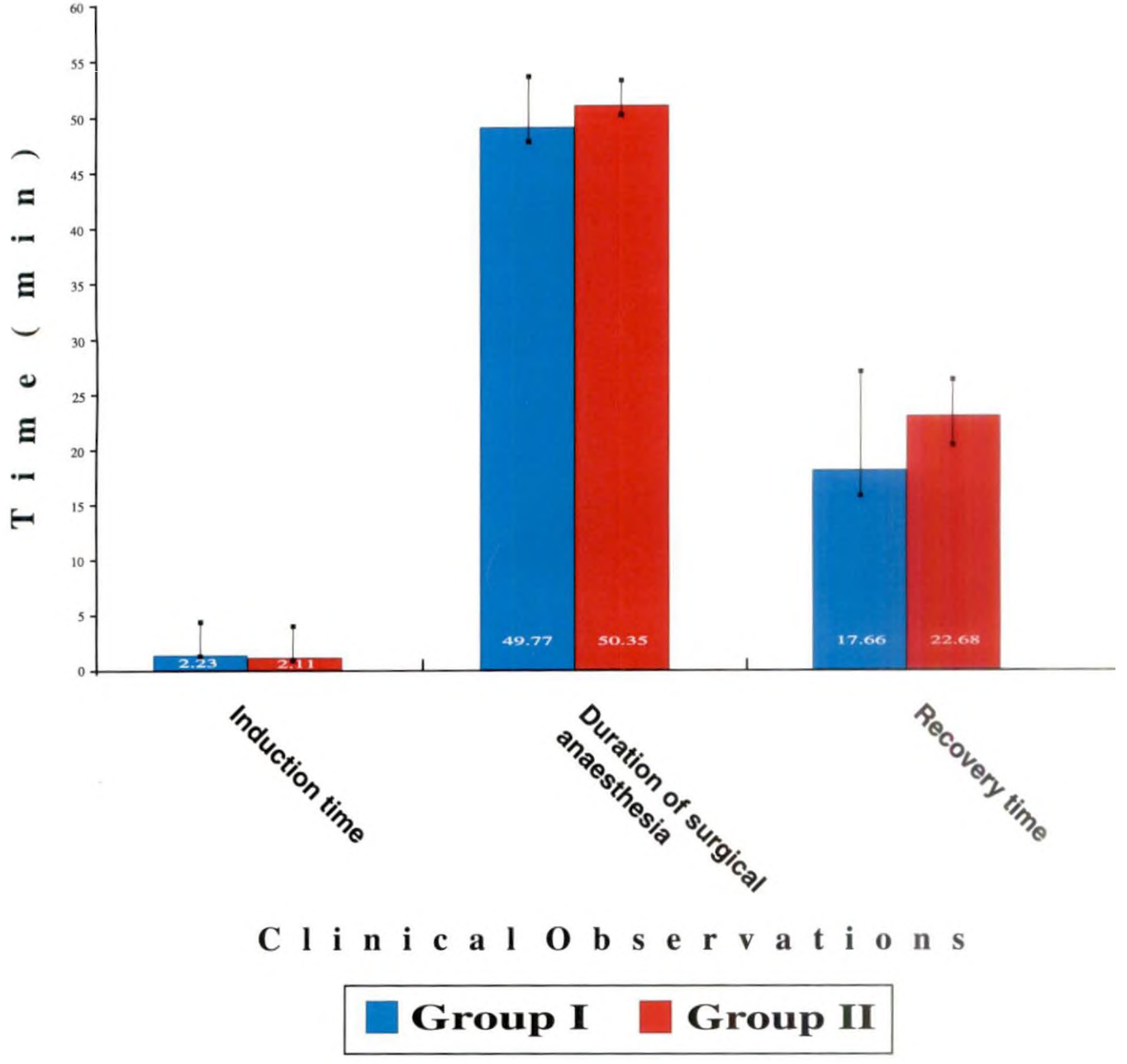

Fig. 1. Comparison of the clinical observations showing induction time, duration of surgical anaesthesia and recovery time in Propofol anaesthesia with xylazine (Group I) and with Xylazine - Ketamine combination (Group II)

Summary

6. SUMMARY

The anaesthetic study was conducted in twelve female dogs of different breeds subjected to caesarean section at the Veterinary College Hospitals at Mannuthy and Kokkalai. All the dogs were clinically examined and were randomly divided into two group's *viz.* Group I and Group II, each consisting of six dogs. They were serially numbered from 1 to 6.

To all the dogs, glycopyrrolate at the dose rate of 0.01mg/kg bodyweight was administered intramuscularly, 15 minutes prior to the administration of preanaesthetic drug (s). In Group I, Xylazine at the rate of 0.5mg/kg bodyweight and in Group II, Xylazine at the rate of 0.5 mg/kg and ketamine at the rate of 2.5mg/kg bodyweight as a combined injection was administered intramuscularly for premedication. In both the groups, fifteen minutes later, propofol 1% emulsion was administered by intravenous bolus injection for the induction of general anaesthesia. Thereafter, 20 ml 1% propofol emulsion was mixed with 180 ml of normal saline solution (i.e., 1 ml contains 1 mg propofol) and was administered intravenously at the rate of 6 drops/ kg/min (0.4 mg propofol/kg/min.) for maintenance of anaesthesia till the surgical manipulations were completed. Endotracheal intubation was carried out in all the dogs for maintaining the airway patency.

The dogs were subjected to caesarean section.

Following premedication with xylazine/xylazine-ketamine combination, clinical symptoms like winking of eyes, yawning and

incoordination of movements with lowering of head were noticed in the dogs of both the groups. The other common symptoms noticed were vomiting (in three dogs), and licking (in seven dogs) during induction and urination (in seven dogs) during recovery. In both the groups, all the dogs assumed sternal recumbency with head down posture.

In the present study, salivation was scanty in both the groups.

The induction time was 2.23 ± 1.04 and 2.11 ± 1.08 minutes in Group I and Group II respectively. The time for induction of anaesthesia was almost the same in both the groups.

Duration of anaesthesia was 49.77 ± 1.01 and 50.35 ± 1.07 minutes in Group I and Group II respectively, depending up on the time taken for completing the surgical procedures.

Degree of muscle relaxation was moderate to good in Group I and good to excellent in Group II as assessed by observing the resistance in opening jaws manually and the relaxation of abdominal muscles during surgery.

Quantity of propofol administered for induction was 76.66 ± 2.11 and 92.76 ± 3.21 milligrams in Group I and Group II respectively. The quantity and rate of administration of propofol was found effective in producing smooth and rapid induction of anaesthesia by single intravenous bolus injection in all the dogs.

Quantity of propofol administered for maintenance was 188.31 ± 5.06 and 193.58 ± 5.13 milligrams in Group I and Group II respectively depending upon the duration of surgery.

Recovery time was 17.66 ± 1.81 and 22.68 ± 2.01 minutes in Group I and Group II respectively. Recovery time was slightly prolonged following the administration of propofol in dogs which were premedicated with xylazine-ketamine combination.

Time required for surgical operation was 52.00 ± 1.02 and 53.01 ± 1.11 minutes in Group I and Group II respectively. Since the surgical operation performed was the same, duration for completion of operation was almost similar for both the groups.

There was a decrease in rectal temperature, respiration rate, and heart rate following the premedication and after the administration of propofol in both the groups.

The conjunctival mucous membrane was congested before, after premedication till complete recovery and was pale roseate at 24 hours after administration of propofol.

There was a decrease in the volume of packed red cells, haemoglobin concentration, and total leukocyte count following the premedication and after the administration of propofol in both the groups. Decrease in volume of packed red cells was significant in the dogs which were premedicated with xylazine. The variations in haemoglobin concentration were non-significant in dogs which were premedicated with

xylazine/xylazine-ketamine combination. The decrease in the total leukocyte count was found to be significant in both the groups.

There was an increase in the neutrophil count after premedication in both the groups but was decreased in the dogs which were premedicated with xylazine-ketamine combination following administration of propofol. There was a decrease in the lymphocyte count after premedication in both the groups but was increased in the dogs which were premedicated with xylazine-ketamine combination following administration of propofol. The variations in monocyte and eosinophil count were marginal in both the groups. The basophil count was zero throughout the period of study in both the groups.

There was a decrease in the serum sodium and serum potassium concentration after premedication and increase after the administration of propofol in both the groups. The changes observed very marginal and within the normal limits.

There was an increase in the serum total protein content after premedication and a decrease following the administration of propofol in both the groups and reduced to normal level by 24 hours. There was a decrease in albumin/globulin ratio after premedication and a gradual increase after the administration of propofol in both the groups.

A total number of 65 puppies were delivered from twelve female dogs subjected to caesarean section. Out of the 38 puppies delivered in Group I, 29 were live and nine were dead. Out of the 27 puppies delivered in Group II, 20 were live and seven were dead. In

Group I, all the 29 live puppies were active and cried within two minutes. In Group II, out of the 20 live puppies, nine were active and cried immediately but 11 puppies were sluggish and depressed and took 5-10 minutes for revival. But four puppies delivered from pug died within 24 hours. Neonatal resuscitation was not required in Group I puppies. Neonatal resuscitation was required for initiating respiration in Group II puppies. 2-3 drops of doxapram were instilled on the tongue along with the manual method of revival.

All the dogs recovered uneventfully and no complication was noticed.

The following conclusions could be drawn from the study:

(i) Administration of glycopyrrolate at the rate of 0.01 mg/kg bodyweight intramuscularly prior to premedication with xylazine/xylazine-ketamine combination reduced salivation.

(ii) Both xylazine and xylazine-ketamine produced satisfactory sedation in dogs but puppies delivered from the dogs premedicated with xylazine-ketamine combination were seen depressed.

(iii) Propofol 1% emulsion at the dose rate of 4mg/kg bodyweight as intravenous bolus injection was found effective in producing smooth and rapid induction of anaesthesia by single intravenous bolus injection in all the dogs.

(iv) Propofol 1% emulsion diluted with normal saline (20 ml propofol 1% emulsion in 180 ml normal saline) at the rate of 6 drops/kg/min 0.4 mg/kg /min was found satisfactory for maintaining general anaesthesia in dogs for caesarean section.

(v) The quantity of propofol required for the maintenance of anaesthesia was almost same in both xylazine and xylazine-ketamine premedicated dogs.

(vi) Repeated administration of propofol to maintain anaesthesia had no cumulative effect in the dogs.

(vii) The recovery from propofol anaesthesia was rapid and excitement free in the dogs premedicated with xylazine and xylazine-ketamine combination.

(viii) The changes in the cardiovascular and respiratory systems, and blood and serum constituents were transient.

From the study it is recommended that propofol 1% emulsion at the rate of 4 mg/kg bodyweight as an intravenous bolus injection for induction of anaesthesia and diluted with normal saline, at a rate of 0.4 mg/kg/min as an intravenous infusion for maintenance of anaesthesia with xylazine premedication at the rate of 0.5 mg/kg bodyweight intramuscularly is a safe anaesthetic regimen for caesarean section in dogs. The use of ketamine premedication in propofol anaesthesia for caesarean section in dogs was found to have depressant effect on puppies and hence not recommended for caesarean section in dogs with live puppies.

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COMPARATIVE EFFICACY OF XYLAZINE AND XYLAZINE-KETAMINE PREMEDICATION ON PROPOFOL ANAESTHESIA FOR CAESAREAN SECTION IN DOGS

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ABSTRACT

A study was conducted to evaluate the comparative efficacy of xylazine and xylazine-ketamine premedication on propofol anaesthesia in twelve female dogs of different breeds subjected to caesarean section at the Veterinary College Hospitals at Mannuthy and Kokkalai. All the dogs were clinically examined and were randomly divided into two group's *viz.* Group I and Group II, each consisting of six dogs. They were serially numbered from 1 to 6.

To all the dogs, glycopyrrolate at the dose rate of 0.01 mg/kg bodyweight was administered intramuscularly, 15 minutes prior to the administration of preanaesthetic drug (s). In Group I, Xylazine at the rate of 0.5mg/kg bodyweight and in Group II, Xylazine at the rate of 0.5mg/kg and ketamine at the rate of 2.5mg/kg bodyweight as a combined injection was administered intramuscularly for premedication. In both the groups, fifteen minutes later, propofol 1% emulsion was administered by intravenous bolus injection for the induction of general anaesthesia. Thereafter, 20 ml 1% propofol emulsion was mixed with 180 ml of normal saline solution (i.e. 1 ml contains 1 mg propofol) and was administered intravenously at the rate of 6 drops / kg / min (0.4mg propofol / kg /min.) for maintenance of anaesthesia till the surgical manipulations were completed. Endotracheal intubation was carried out in all the dogs for maintaining the airway patency.

The dogs were subjected to caesarean section.

Following premedication with xylazine/xylazine-ketamine combination, clinical symptoms like winking of eyes, yawning and incoordination of movements with lowering of head were noticed in the dogs of both the groups. The other common symptoms noticed were vomiting (in three dogs), and licking (in seven dogs) during induction and urination (in seven dogs) during recovery. In both the groups, all the dogs assumed sternal recumbency with head down posture.

In the present study, salivation was scanty in both the groups. The induction time was 2.23 ± 1.04 and 2.11 ± 1.08 minutes in Group I and Group II respectively.

Duration of anaesthesia was 49.77 ± 1.01 and 50.35 ± 1.07 minutes in Group I and Group II respectively, depending up on the time taken for completing the surgical procedures. Degree of muscle relaxation was moderate to good in Group I and good to excellent in Group II.

Quantity of propofol administered for induction was 76.66 ± 2.11 and 92.76 ± 3.21 and for maintenance it was 188.31 ± 5.06 and 193.58 ± 5.13 milligrams in Group I and Group II respectively.

Time required for surgical operation was 52.00 ± 1.02 and 53.01 ± 1.11 minutes in Group I and Group II respectively. Recovery time was 17.66 ± 1.81 and 22.68 ± 2.01 minutes in Group I and Group II respectively.

There was a decrease in rectal temperature, respiration rate, and heart rate following the premedication and after the administration of

propofol in both the groups. But the pulse rate was decreased following the premedication and increased during propofol anaesthesia in both the groups. The conjunctival mucous membrane was congested before, after premedication and till complete recovery and was pale roseate by 24 hours after administration of propofol.

There was a decrease in the volume of packed red cells, haemoglobin concentration, and total leukocyte count following the premedication and after the administration of propofol in both the groups.

There was an increase in the neutrophil count with decrease in lymphocyte count after premedication and decrease in the lymphocyte count with increase in neutrophil count following administration of propofol in both the groups. The variations in monocyte and eosinophil counts were marginal in both the groups. The basophil count was zero throughout the period of study.

There was a decrease in the serum sodium and serum potassium concentration after premedication and increase after the administration of propofol in both the groups. The changes were marginal and within the normal limits.

There was an increase in the serum total protein content with decrease in albumin/globulin ratio after premedication and a decrease in serum total protein content with a gradual increase in albumin/globulin ratio after the administration of propofol in both the groups.

Total number of puppies delivered was 65 from twelve female dogs subjected to caesarean section. Out of the 38 puppies delivered, 29 were live and nine were dead in Group I. Out of the 27 puppies delivered, 20 were live and seven were dead in Group II. In Group I, all the 29 live puppies were active and cried crying within two minutes. In Group II, out of the 20 live puppies, nine were active and cried immediately, but 11 puppies were sluggish and depressed and took 5-10 minutes for revival. But the four puppies delivered from pug died within 24 hours.

All the dogs had an uneventful recovery from anaesthesia and were without any postoperative complications.