Sudan Univerity of Science and Technology

College of Veterinary Medicine

Department Of Animals Medicine and Surgery

Comparative Study of Different doses of Thiopentone Soudium in Donkeys

(Equus africanus)

دراسة مقارنة لجرعات مختلفة من الثيابنتون صوديوم في الحمير

A dissertation submitted in partial fulfillment of the requirement of College of Veterinary Medicine for B.V.M

By

Alnassem Altiab Altegany

Tasabih Hassan Taha

Ramzy Salah Adam

Mawada Salah Balla

Hadia Ibrahim Abdalla

Supervisor

Dr. Amal Abo Elgasem Elzubair

September 2017

DEDICATION

This work is dedicated to:

The most precious people in our life our perseverant, hard working parents ,whom never stopped giving our guidans and inspirational, and high moral of colleges.

ACKNOWLEDGEMENTS

Second to none we would like to thank mangment of koko zoo , then with great recpect we would like to express our great thanks and deep gratitude to our supervisor Dr.Amal Abo algasim ,special thanks are also extended to Dr. Siham Elias for their kind help throughout the entire course of the study .

Also indebted to Sudan University of Science and Technology for their help and our thank to Dr. Abo bakar Said Ali , for helping in statistical analysis .

LIST OF CONTENTS

List of Table

List of abbreviations

CRIs	Centre for Railway Information systems
BP	British pharmacopeia
GABA	Gamma aminobutyric acid
CNS	Central nervous system
TH1	Thiopentone Sodium 7mg /kg
TH2	Thiopentone Sodium 12mg/kg
USP	United state pharmacopeia
TIVA	Total intravenous anaesthesia
IV	Intravenous

Abstract

The purpose of this study was to report the quantitive and qualitative aspects of intravenous anesthesia using thiopentone sodium in donkeys under field conditions.In these study ,two different dose of thiopentone were evaluated as follow: donkeys in two groups of animals each on composed of four animals . group one anesthesied by thiopentone soudium at the dose rate 7 mg /kg body weight and group two given 12mg/kg body weight . physiological paramrters(Heart rate,respiratory rate, and rectal temperature) were manitored before and after the induction at 10 minutes interval until one hour. Anaesthetic phases (induction, duration of anaesthesia,lateral recumbency, sternal recumbency and recovery) and some anesthetic reflexes were measured and recoded post induction and throughout the duration of anaesthesia.

The two tested doses of thiopentone sodium produced satisfactory induction, good muscle relaxation , quite smooth recovery.

The increased dose of thiopentone sodium from 7 to 12 mg/kg resulted in no significant increase in induction time ($P>0.05$) and significant ($P < 0.05$) increase in the duration of anaesthetic phase and recovery phase. The use of thiopentone sodium in both doses tested were accompanied by significant increase ($P < 0.05$) in heart rates, while rectal temperature showed significant fluctuation. Animals treated with both protocols showed significant decrease($P < 0.05$) in respiratory rate immediately following induction of anaesthesia.

In conclusion, this simple anaeshetic doses can be used to induce acceptable anaesthesia as well as areasonable expected recovery.

Key words: Anaesthesia , donkeys , Sodium thiopentone.

الخلاصه

كان الغرض من هذه الدراسة هو الابلاغ عن الجوانب الكمية والنوعية للتخدير عن طريق الوريد باستخدام الثيوبنتون الصوديوم في الحمير تحت الظروف الميدانية .

في هذه الدراسة, تم تقييم جرعتين مختلفتين من الثيابنتون علي النحو التالي : تم تقسيم الحمير الي مجموعتين مختلفتين كل مجموعة تحتوي علي اربعه من الحيوانات. وتم تخدير المجوعة الاولى بجرعة مقدارها 7ملغ/كجم , والمجموعة الثانية بجرعة مقدارها 12 ملغ/ كجم .تمت مراقبة القياسات السريرية التي اجرت قبل وبعد التخدير بانتظام كل 10 دقايق لمدة ساعة هي (معدل التنفس , معدل ضربات القلب ودرجه حرارة الجسم) ما الاطوار التخديرية التي تم قياسها خلال فتره التخدير فقط هي (زمن احداث التخدير , طول فتره التخدير,فتره الاستلقاء الجانبي, فتره الاستلقاء القصي , زمن الافاقه) والمنعكسات العصبيه اثناء التخدير ومع بدايته.

ادي حقن الثيابنتون جرعتين مختلفتين الي حدوث درجات مقبوله من التخدير وارتخاء العضلات والافاقه. زياده جرعه الثيابنتون من 7 الي 12 مجم/ كجم ادت الي حدوث زياده ذات دلاله معنويه في فتره التخدير وفتره الافاقه . في حين لم يلاحظ اي زياده معنويه في زمن احداث التخدير وزيادة معنوية في مدة مرحلة التخدير ,استرخاء العضلات والافاقه مقبولة في جميع الحيوانات اثناء فترة التخدير.

ورافق استخدام الثياوبنتون صوديوم في كل من الجرعات التي تم اختبارها زياده معنويه في معدل ضربات القلب , في حين انه اظهرت درجة حرارة الجسم تفاوتا ملحوظا. اظهرت الحيوانات في كل المجموعتين انخفاضا معنويا في معدل التنفس مباشره عقب بعد التخدير .

وفي الختام يمكن استخدام هذه الجرعات لاحداث تخدير بسيط يمكن ان يستخدم في الحمير مع فتره افاقه معقوله.

الكلمات المفتاحية: التخدير , الحمير, الثيوبنتون صوديوم.

INTRODUCTION

Anesthesia can be classified according to the types of drug used and/or the route of administration, basically there are two major ways to obtain general anesthesia in veterinary medicine: either via the parenteral injection of anesthetic drugs (subcutaneously, intramuscularly or intravenously) or via inhalation of volatile anesthetic agents. An ideal anesthetic produces sleep, amnesia, analgesia and muscle relaxation .As all these characteristics cannot be provided by a sole agent, a combination of drugs is used.This technique is referred to as balanced anesthesia (Thurmon and Short, 2007). Practically speaking , balanced intravenous anesthesia can be obtained be administering sedatives and analgesics in the premedication phase , as well as by using different analgesics medetomidine , ketamine , lidocaine) as continuous rate infusions or by using CRIs during the anesthesia . The analgesic and anesthetic –sparing effects of these drugs then allow reduced infusion rates of the in travenously administered general anesthetic (kastner, 2007).

The ideal Total Intravenous Anesthetic Agent (TIVA) should be water soluble and have a long period of stability when stored at room temperature. It should be painless and non-irritatant on injection, while rapidly inducing sleep with a minimum of respiratory and cardiovascular side effects. In addition, the potential for anaphylactoid and other allergic reaction should be very low (Morton 1998).

The advantages of intervenous anaesthesia include rapid and smooth induction of anaesthesia, little equipment requirements (needle, syringes, catheters), easy administration of drugs and achievement of balanced anaesthesia (Yamashita *et al.,* 2007). Intravenous anaesthesia is indicated mostly for major

surgery such as orthopaedic surgeries in animals including limb amputation ,managment,arthroscopy ,obstetrical procedures like caesarian section and orchidectomy in large animals (Hall *et al*.,2001:Umar *et al*.,2006;Kilic,2008).

The objective:

1.To study the effect of two anaethetic doses of Thiopentone sodium on the quality of both induction and recovery.

2. To study effect of two anaethetic doses of Thiopentone sodium on some selected anaethetic reflexes.

3. To study effect of two anaethetic doses of Thiopentone sodium on physiological parameter.

CHAPTER ONE

Literature Review

1. Intravenous anaesthesia in Equine

Equine are routinely presented to veterinary hospital for variety of surgical intervention and their temperament often precludes the use of local analgesia with heavy sedation (Hall and Clarke,1991). The use of(TIVA) help in reducing variety of pre-anaesthetic,anaesthetic and post anaesthetic problems such as arrhythmias, hypotension, respiratory or ventilator insufficiency, motor excitement, anxiety or post anaesthetic myopathy etc (Garcia *et al*.,2002).

Donkeys can be anaesthetized for short periods of time with horse doses of Xylazine/ Ketamine, with exception of miniature donkeys. Miniature donkeys have become fairly popular as pets; they are often owned by non horse-owning clients who are not aware of the safety concerns generally understood by horse owners (Matthews *et al*., 2002).

Ketamine is used for premedication, sedation, induction and maintenance of general anaesthesia (Huai and Chia *et al.*, 2009). Ketamine is used commonly for induction of anaesthesia in horses, usually in combination with diazepam or guaifenesin and is also used for maintenance of anaesthesia by incremental dosage (Rossetti *et al.*, 2008).

Ketamine (2.0 – 3.0 mg/kg IV) can be used in donkeys and mules for short procedures, following sedation. The half-life of Ketamine in this species is shorter

than in the horse, so it may be necessary to administer additional doses (Matthews *et al.*, 1994). however; increasing of Ketamine above 3.3 mg/kg has been associated with rough recoveries (Trawford, 2000).

Abakar and his colleagues (2014) used combination of Xylazine, Diazepam and Ketamine in donkeys. All anaesthetic protocols used produced satisfactory induction of anaesthesia and quite smooth recovery and non significant increase in the duration of anesthetic phase. While, significant increase in the duration ($P < 0.05$) of lateral recumbency, sternal recumbency, standing position, total recovery time, and reflexes was observed. Induction of anaesthesia, muscle relaxation and recoveries were acceptable in all protocols used.

Cardiopulmonary investigations involving such combinations have been published and have shown favourable responses compared to the previous barbiturate-based anaesthetic regimes (Hubbell *et al*., 1989; Radi *et al*., 2011; Radi *et al*., 2012b). Diazepam Ketamine combinatons have been suggested as an alternative induction technique for short acting barbiturates like Thiopentone (Heller *et al*., 1991). In donkeys, higher doses of Xylazine have been recommended than what is normally used in the horse, the doses of Xylazine normally used are in the range of 0.5 – 2 mg/kg (Mbiuki and Mogoa, 1994; and Mogoa *et al*., 1994). Addition of Midazolam (0.06 mg/kg) or Diazepam (0.03 – 0.06 mg/kg) therefore is recommended to provide better sedation and muscle relaxation (Matthews and Van Dijk, 2004).

1.1 Anaethesia : Thiopentone sodium

The drug introduced into veterinary practice by Wrigh (1937) and it is known as ultra short –acting barbiturate (Hall *et al.*, 2001).and commonly used in the induction phase of general. Following intravenous injection the drug rapidly

reaches the brain and causes unconsciousness within 15-30 second (Hall *et al.*, 2001).

1.1.1 Identity:

Thiopentone sodium as all of barbiturate commonly used as anaesthetic, it is usually available as sodium is mixture of six parts of anhydrous sodium carbonate and 100parts (w/w) of barbiturate to prevent precipitation of the insoluble free acid by atmospheric CO2,(Hall *et al.*, 2001)

It is white to yellowish hygroscopic; crystalline powder odorless soluble in water, alcohol and high soluble in lipid. The powder stored at controlled room temperature of $15\text{-}30^0$,because of its irritant effect shoud be taken intervenously (Hall *et al.*, 2001).

1.1.2 chemical name:

Thiopentone sodium (BP) or thiopental sodium (USP) is a mixture of monosodium salt of 5-ethyl-5(1-methylbutyl)-2-thiobarbiturate (100partw/w) and exsiccated sodium carbonate (6partw/w) (Vickers *et al*., 1984).

1.1.3 molecular formula:

$C_{11}H_{17}N_2NaO_2S$

1.1.4 Mode of action:

Barbiturates are class of drug that acts on the $GABA_A$ receptor in the brain and spinal cord. The $GABA_A$ receptor is an inhibitory channel which decreases neural activity and barbiturates enhance the inhibitory action of the $GABA_A$ receptor.

1.1.5 Toxicity of Thiopentone sodium:

As with nearly all anesthetic drugs Thiopentone causes cardiovascular and respiratory depression resulting in hypotension, apnoea and airway obstruction. side effect includes headache, emergence delirium, prolong sommolence and nausea. Intravenous of sodium Thiopentone is followed instantly by an odour sensation sometime described as deign similar to rotting onions (Hall *et al*., 2001)

1.1.6. Pharmacokinetics of Thiopentone Sodium:

Induction dose of this drug are usually between 5and10 mg/kg body weight were used for most species (Hall *et al*., 2001). The short duration of action of this agent is due to redistribution out of the CNS and into muscle and fat stores less than to rapid metabolism(Susan and Donald,2003).0nce redistributed the free fraction in blood is metabolized in the liver .Sodium Thiopentone is mainly metabolized to pentobarbital(Winters *et al* .,1955).the products of the drug metabolism are excreted mainly though the kidneys (Atkinson *et al* ., 1987),recovery from Thiopentone sodium anesthesia is reported to be quite and quiet Hall and Clarke (1991)

1.1.7 Use of Thiopentone in equines:

It used in induction of anesthesia and basal narcosis ,but don't used to maintain anesthesia in surgical procedures because in infusion ,it display zero -order elimination kinetics, leading to a long period before consciousness is regained (Morgan *et al* .,1981).

CHAPTER TWO

Materials and methods

2.1 Place of study

This study was conducted at the premises of the Devision of Animale Medicine and Surgery . Faculty of Veterinary medicine ,Sudan University of Science and Technology(SUST).

2.2 Drugs

Thiopentone sodium 5%: was used as indication agent(thiopental sodium "BP" 500 mg/ vial NEON Laboratories limited, India).

2.3 Experimental animals

A total of 8 male donkeys, 80-150Kg body weight were divided into two equal groups ,each of two group were anaethestized with two different doses.

2.4 Injection Set

Disposable syringes' 1, 5 and 10 ml, 21-24 G, and intravenous catheter (21G) were used for intravenous injection of drugs.

2.5Monitoring Tools

Phonendoscope (stethoscope) was used for monitoring heart rate. Observation of abdominal movement of stethoscope was used for monitoring respiration

. Digital thermometer used for rectal temptuers.

2.6 Anaesthetic doses

Two different anesthetic protocols were tested in this investigation as follows:

1/ Thiopentone sodium 5% at dose rate of 7mg body weight.

2/ Thiopentone sodium5% at dose rate of 12mg/kg body weigh**t**

2.7 Muscle relaxation quality:

Table 2.1 The quality of muscle relaxation was scored as follow:

Score	Quality	Character
4	Excellent	Complete relaxation
3	Good	Adequate muscle relaxation for surgical procedure
2	Moderate	Partial relaxation in muscle of head, Neck and limb
1	Poor	Rigidity in muscle of neck, head and limb

2.8 Physiological parameters:

Physiological parameters were monitored at minute's intervals(0,10,20,30,40,50,60) using standard methods as described by Kelly(1974) as follows:

2.8.1 .Respiratory rate:

Stethoscope was used for monitoring respiration.

2.8.2 .Heart rate:

Stethoscope was used for monitoring the heart rate through the left 3^{rd}_5^{th} intercostals spaces.

2.8.3. Rectal temperature:

Digital thermometer was used for monitoring rectal temperature ,the thermometer bulb was lubricant with jell then inserted into the empty rectum.

2.9. Phases of anaethesia:

2.9.1 .Induction phase:

It the state or condition in which the animal becomes unconscious, response negatively to painful stimuli with disappearance of selected reflexes (Jani *et al.*,1982)

2.9.1.1 Quality of induction:

Quality of induction of anaethesia was rated as follow:

1. Satisfactory : rapid and smooth was little danger to animal or personal (Matthews *et al.,* 2002

2. Unsatisfactory : prolonged period of incoordination muscle fasciculation (Matthews *et al*., 200

2.9.2. Anaesthetic phase:

It was considered as the period during which the animal showed signs of unconsciousness, no reflexes, response negatively to painful stimuli.(Tamisto *et al.*,1981)

2.9.3 .lateral recumbancy:

It was considered as duration at which the animal opens its eyes and reflexes were regained but it is incapable of adopting sternal position (Thurmon *et al.*,1996)

2.9.4 Sternal recombancy:

.The period during which the animal could adopt sternal recumbancy without falling to latral recombancy and without adopting standing position (Gurashi *et al*. 2007).

2.9.5. Recovery:

The animal was considered to be recovered from anaesthesia when it is capable of supporting itself in standing position and walk for ten steps without falling down(Gurashi *et al.*,2007).

2.9.5.1Rcovery quality

A score ranging from 1 to 5 as descrted by (Ringer *et al.*,2007) was used for assessment of quality of recovery from anesthesia.

Table2.2:The quality of recovery was scored as follow:

Score	**Quality**	**Charaacter**
1	Excellent	Donkey capable standing at frist stand.
2	Very good	Donky remained calm and need two attempt to stand.
3	Good	Donky remained calm but needed more than two attempts to stand.
4	Poor	Excitement during recovery with danger of injury and needed more than two attempts to stand .
5	Very poor	Sever excitement durig recovery

2.10 Reflexes

2.10.1 Palpebral reflex

The reflex was assessed by digital touch on the canthus or eyelashes if purposeful motor reflex observed, the reflex was consider positive Batoul (1990).

2.10.2 Pain reflex

The reflex was assessed by needle touch along vertebral coulom if the purposeful motor reflex observed, the reflex was consider positive .

2.10.3 Jaw relaxation reflex

Persistence of open mouth due to induced jaw retraction was considered to be a postive jaw relaxation reflex .

2.11 Statistical analysis

For physiological parameters (Respiratory rate , heart rate and rectal temperature) and anaethtic phases (Apnoea ,induction , anaethetic phase , sternal recombancy , lateral recombancy and recovery) comparison, independen T- test was used to compare mean . While anaethetic reflexes(pain, palepral and jaw relaxation reflexes) comparison by Q – square test.

The reflex was considered regained when the animal was reluctant to open its mouth .

CHAPTER THREE

Results

3.1. Quality of induction, muscle relaxation and recovery

Quality of induction in the tow doses used (thiopentone sodium at 7 or 12 mg per kg) was satisfactory (rapid and smooth with little danger to both animal and personnel). Quality of muscle relaxation and recovery ranged between excellent to good (3:3 & 3:4).

3.2. Physiologloical parameters :

3.2.1. Heart rate:

As we could observed in table (3: 5) animals anaesthetized with thiopentone sodium at dose rate 7 mg per kg showed significant increase in heart rate (tachycardia) immediately after the induction of anaesthesia and this tachycardia remained at significant high levels at time points 0, 10, 20 minutes. While animals injected with thiopentone at 12 mg per kg exhibited signification ($p < 0.05$) decrease at time point 10, 30, 40 and 60 minutes following injection of anaesthetic drug.

3.2.2 Respiratory rate:

As illustrated in table (3.5) animals anaesthetized with thiopentone sodium at dose rate7 mg per kg and 12 mg per kg showed significant ($p < 0.05$) decrease in respiratory rate immediately after the induction of the anaestheia and this decrease in respiratory rate remained significant at high level up to the to 30 minute dose rate 12 mg per kg.

3.2.3 Rectal temperature:

As we could observed in table (3.5) rectal temperature expressed significant increase following induction of anaesthesia at time points 30, 40, 50 and 60 minutes in the first group. While animals in the second group (7 mg per kg) showed only transient increase at time 30 minutes.

3.3 Duration of the different anaesthetic phases following induction of anaesthetic with Thiopenton Sodium

3.3.1 Apnoea

As shown in table (3.6) the increase in the dose of thiopetone sodium from 7 to 12 mg per kg was accompanied by no significant ($p > 0.05$) increase in the duration of apnoea.

3.3.2 Induction phase

Increasing the dose of thiopentone sodium resulted in no significant ($p > 0.05$) decrease in induction time as shown in table (3.6)**.**

3.3.3 Anaesthetic phase

Increase the dose of thiopentone sodium from 7 to 12 mg per Kg was acompainated by significant ($p < 0.05$) increase the duration of the anesthetic phase as show in table (3.6) .

3.3.4 Sternal recombancy:

As shown in table (3.6) the increase in the dose of Thiopentone sodium from 7 to 12 mg per Kg result in no significant increase in the sternal recombancy.

3.3.5 Lateral recombancy

As shown in table (3.6) the animals injected with Thiopentone sodium at dose rate 7 or 12 mg / Kg showed no significant increase in the lateral recombancy .

3.3.6 Recovery

As shown in the table (**3.**6) increase in the dose of Thiapentone sodium at dose 7 to 12 mg per kg resulted in significant ($p < 0.05$) increase in the recovery time.

3.3.7 Reflexes:

As illustrated in table (3.7& 3.8) both dose evaluated in this study resulted in the abolishment of the tested reflexes for less than 10 minutes.

Table (3.3) : Grades of muscle relaxation quality in the two tested protocols using thiopentone sodium at dose rate 7 or 12 mg /kg

doses	No. animals	Poor		Moderate		Good		Excellent	
		No	%	No	%	No	%	No	%
TH1	4	0	0	0	0	2	50%	2	50%
TH2	4	0	0	0	0	1	25%	3	75%

TH1 = thiopentone sodium 7 mg / kg

TH2 = thiopentone sodium 12 mg /kg

Table (3.4): Grades of recovery in quality in two tested protocols using Thiopentone sodium at dose rate 7 or 12 mg\kg.

doses	No of animals	Very poor		Poor		Good		Very good		Excellent	
		No	%	No	%	No	%	No	%	No	%
TH1	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**50%**	**2**	**50%**
TH2	**4**	**0**	**0**	**0**	**0**	**3**	**75**	**1**	**25%**	**0**	**0**

TH1 = thiopentone sodium 7 mg/kg

TH2 = thiopentone sodium 12 mg/kg

Table (3.5) Effect of intravenous anasethesia using thiopental sodium at 7 or 12mg per kg in donkeys on respiratory rate and rectal temperature.

Time	TH1			TH 2		
	RR Minutes	**RT Minutes**	**HR Minutes**	**RR Minutes**	**RT Minutes**	**HR Minutes**
Base	21± 1.47	37.4 ± 0.18	39±2.67	25±4.20	36.8 ± 0.19	40 ± 3.46
0	14±0.40	37.37 ± 0.20	48±5.30*	10.5 ± 0.95*	37.1 ± 0.30	56.5 ± 5.21*
10	17±0.81	37.82 ± 0.08	46 ± 2.12*	14.5± 1.5*	37.07 ± 0.32	49.5 ± 5.05*
20	12.75±3.03	37.75 ± 0.20	47 ± 6.41*	18 ± 2.16*	36.9 ± 0.31	50±6.68
30	20±1.41	37.8 ± 0.09*	44 ± 6.28*	17.5 ± 2.21*	36.95 ± 0.39	48±2.94*
40	23.5 ± 2.25	37.72 ± 0.15*	44 ± 6.01*	21 ± 3	37.2 ± 0.20	47±5.06*
50	23 ± 3.34	37.85 ± 0.15*	48 ± 5.71*	20 ± 3.46	37.32 ± 0.34*	44.5± 3.09*
60	26 ± 1.63	37.95 ± 0.18*	47.25 ± 4.49	20 ± 2.94	37.2 ± 0.57	45.5 ± 3.59*

*Means with asterisk in the same column are significantly (p below 0.05) different
TH1 = Thiopentoe sodium 7 mg/ kg
TH2 =Thiopentone sodium 12 mg/ kg

Table (3.6) duration of different anasethic parameters (mean ± SE) measured following injection in Thiopentone sodium at dose rate 7 or 12 mg per kg in donkey.

Parameters	Apnoea seconds	Induction Seconds	Anaesthetic minutes	Sternal recombancy minutes	Lateral recombancy minutes	Recovery Minutes
TH 1	24.25 ± 2.89	23.25 ± 4.25	4.84 ± 0.32*	4.58 ± 0.12	5.80 ± 1.01	20.41 ± 2.75*
TH 2	32.5 ± 4.78	12.25 ± 2.95	16.32 ± 2.89*	14.25 ± 5.64	19.25 ± 6.45	35.32 ± 6.10*

*** Mean in the same column with asterisk were considered significantly different at p below 0.05**

TH1= Thiopentone sodium 7 mg/kg

TH2= Thiopentone sodium 12 mg/kg

Table (3.7):Effect of Thiopentone sodium at dose 7 mg /kg on the different reflexes

Reflex	Base	0	10	20	30	40	50	60
Palpebral	+	-	+	+	+	+	+	+
Jaw	+	-	+	+	+	+	+	+
Pain	+	-	+	+	+	+	+	+

+ Means = reflexes present

- means = reflexes absent

Table (3.8): Effect of Thiopentone sodium at dose 12 mg /kg on the different reflexes

Reflex	Base	0	10	20	30	40	50	60
Palpebral	+	-	-	+	+	+	+	+
Jaw	+	-	-	+	+	+	+	+
Pain	+	-	-	+	+	+	+	+

+ Means = reflexes present

- means = reflexes absent

CHAPTER FOUR

4. Discussion

Lake of report on anaethesia in donkeys and growing number of this species, coupled with their positive contribution in the family economy encouraged us to investigation general anaesthesia in the species. With the expansion of surgical intervenation in the treatment and control of disease condition in animals, development in anaethetic techniques is highly required in various animal species. This investigation is directed towards testing the merits and advantages to be gained following increasing the dose of Thiopentone sodium from 7 to 12 mg/kg, with emphasis on the toxic dynamics of tested doses on cardio –pulmonary parameters, together with the quality and duration of anaesthesia and recovery.

In the first experiment, quality of induction in the two doses used (TH1 and TH2) is satisfactory (rapid and smooth) and muscle relaxation range between excellent to good. This result is in agreement with the observation of Abd – Almaseeh (2008) and Al-heani (2010) who indicated that anaethesia produced by thiopentone sodium was characterized by rapid induction and excellent quality, and the pattern of anaesthesia characterized by good muscle relaxation and narcosis. Thiopental does not effectively block motor nerve impulses and muscular relaxation can be provided only by excessive central nervous depression (Hall *et al*., 2001).

The significant increase in heart rate (tachycardia) that occurred immediately after the induction of anaesthesia in the two treated groups (TH1 and TH2) are supported by the finding of Ghurashi *et al*. (2008) and Radi *et al*.(2011), who reported the occurrence of tachycardia during induction of anaesthesia. Also

Mohammed *et al.* (2011) reported significant increase in heart rate following induction of anaesthesia in New Zealand rabbits with Thiopentone 20 mg/kg.

Thiopentone sodium was reported to has adepressing effect on respiratory rate (Atkinson *et al*., 1987: Singh and Kumar, 1988 and Taylor, 1990), donkeys anaethetized thiopentone sodium 7mg/kg and 12 mg /kg showed significant ($p < 0.05$) decrease in respiratory rate immediately after the induction of the anaesthesia. Our result is partially in agreement with Ghurashi *et al.,(*2008) .This result is not contradictory with the finding reported in the literature because the increase observed in the respiratory rate may be due to the movement made by the animals during recovery (Ghurashi *et al* ., 2008).

Rectal temperature expressed significant increase following induction of anaesthesia at time point 30, 40, 50 and 60 minutes in the first group (TH1) while animals in the second group (TH2) showed only transient increase at time 30 minutes. These results that were consistent with the observations of Radi *et al*. (2011) and Mohammed *et al*. (2011) who reported no significant change in rectal temperature following injection of Thiopentone sodium in donkeys on New Zealand Rabbits, respectively. Ghurashi *et al.* (2008) on the other hand reported no significant increase in rectal temperature in goats anaesthetized with thiopentone sodium at 15 and 20 mg /kg. The justification for that the anaethesia occured in hot weather and stress of animals.

The result of these study obtained indication that the increase in the dose of thiopentone sodium from 7 to 12 mg/kg was accompanied by no significant ($p>0.05$) increase in the duration of apnoea. A result that is consistent with the previous observations of Radi *et al.* (2011). The accurrence of apnoea was also reported by Karimi (1987) in horses and Contreras and Aspe (1992) in goats. All

barbiturate drugs cause respiratory depression and a short period of apnoea usually follows the intravenous injection of Thiopental . This is probably due to the central nervous depression caused by the initial high plasma concentration (Hall *et al.*, 2001).

Increasing the dose of Thiopentone sodium resulted in on significant ($p>0.05$) decrease in induction time. Radii *et al*.(2011) reported significant reduction in induction time due to the increase of Thiopentone sodium dose but increasing the dose of Thiopentone sodium from 7 to 12 mg/kg was accompanied by significant ($p<0.05$) increase in the duration of anaesthetic phase , a result which is in line with that obtained by Ghurashi *et al.* (2008) in desert goats. While Radi *et al.* (2011) reported prominent non significant increase in the duration of anaesthetic phase earlier reports of Singh and Kumar (1988) and Hall *et al*. (2001) indicated that the increase in the dose always results in increasing the anaesthetic effect of Thiopentone sodium. These reports are supporting our finding which showed that the increase of Thiopentone sodium dose resulted in a parallel increase in anaesthetic phase.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5. 1 CONCLUSION

Donkeys, despite their prominent role in both rurual and urban society of the county have been totally neglected.

For years, research on donkeys as lagged far behind other domestic species .In this study Thiopentone sodium was evaluated for induction of anaesthesia in sudances local donkeys in tow different doses to provide baseline data field anaesthesia and it's to conclude all anaesthetic doses used in this study were proved to be safe for the use in Sudanese donkey under field conditions , increasing the dose of thiopentone in the tested protocol resulted in significant prolongation of anaesthetic phase, while the sternal recombency increased significantly in the high dose (12 mg/kg thiopenton sodium) and may contribute to the delay in recovery ,the two doses use in the donkeys did not affect respiratory rate significantly, as profound effect was noticed in the cardiopulmonary parameters.

5.2 Recommendations

1. Further investigations are required to spot light on these anesthetic doses for surgical tolerance.

2.Futher studies are required to spot light on other anaesthetic agent as well as other premedication for use in field condition and to test for whether they have effect on cardiopulmonary parameters or not .

3.Do not anaesthetized donkeys with Thiopentone sodium which have cardiopulmonary disturbance.

References:

Abakar, J.A, Ghurashi, M.A.H, and Seri, H.I. (2014). Evaluation of some anaesthetic protocols for induction of anaesthesia in donkeys (*Equusasinus)* in Sudan .*SUST Journal of Agricultural and Veterinary Sciences*, 15(1):1-15.

Abd-Almaseeh, Z.T., (2008). Comparative anaesthetic protocols: Propofol and Thiopentone in Xylazine premedicated donkeys. *Journal of animal and veterinary advances*, 7(12):1563-1567.

Al-Heani, W. An .Y. (2010). Acoparative study of thiopental and thiopental propofol admixture with xylazine premedicated donkeys. *AL Anbar journal of veterinary science*, 3(2):78-83.

Atkinson, R, S; Rashman, G.B; and Alfredlee, J. (1987). A synopsis of anaesthesia.10thed .Wrigh, Bristol, London.

BSAVA Manual of Canine and Feline Anaesthesia and Analgesia. Second edition. British Small Animal VeteirnaryAssociation, Gloucester P.133-149.

Batoul,M.A.E.(1990). Some Aspects of Stress on Liver and Thyroid Function in Goat.M.V.Sc.Thesis College of Graduate Studies ,University of Khartoum.

Contreras., P.A., and Aspe, (1992) .Halothane anaesthesia in goat induced by xylazine or sodium Thiopentone. ***Archivos de Medicine Veterinaria (Chile), 24***(1)99-104

Garcia, A.A., Sumano, H., and Nunez, E. (2002). Pharmacological basis of short term intravenous general anaesthesia in the equines.*Veterinaria Mexico*,33(3):309-333.

Ghurashi,M.A.H.,A,T,H. Sobair ,AshwagE.A.M.,Seri,H.I(2008). Effect of Thiopentone sodium on some physiological and anaesthetic parameter in desert goat. *Assiut Veterinary Medical Journal*, 54(117):389-396

Hall, L. W. and Clarke, K. W. (1991). Anaesthesia of the horse. In Hall, L. W., and Clarke, K. W. eds. *Veterinary Anaesthesia*, 9th ed. BaillereTindall, London, Great Britian. Pp 191-235.

Hall, LW, Clarke KW and Trim CM (2001). Veterinary Anaesthesia (10th Edition). WB Saundersl, London, Pp 133-131,292-298. Pp.562.

Heller, P.W., Freeman, L. C., and Hubbell, J.A.L. (1991). Induction of anaethesia with diazepam – ketamine and midazolam – ketamine in Greyhound. *Veterinary Surgery*, 20, 143 – 147.

Huai-Chia, C., Ta-Liang, C., and Ruei-Ming, C, (2009). Cytoskeleton Interruption in Human Hepatoma HepG2 Cells Induced by ketamine Occur possibly through Suppression of Calcium Mobilization and Mitochondrial Function. *American Society for pharmacology and Experimental Therapeutic*, 37: 24-31.

Hubbell, J.A., Bednardski, R.M., and Muir, W.W. (1989). Xylazine and tiletamine-zolazepamanaesthesia in horses.*AmricanJournalofVeterinary Research*, 50:737-742.

Jani.B.M.,Patel,G.R.,and Manari, M.N,(1982).Evaluation of propandid in combination with different preanaesthetic agents in dogs .Indian Veterinary Journal,59:773-779.

Karimi, A. (1987). Comparison of the effect of two set of anaesthetics agent and posture on respiratory rate, heart rate, PH, biood gas and acid- base balance in horse ***British Veterinary Journal,*** **143**(6):506-512

Kastner S.B.R. (2007). Intravenous anaesthetics. In: Seymour C., Duke-Novakovski T. (editors).

Kelly ,W.R.(1974).Veterinary Clinical Diagnosis.Bailliere Tindal,London 3rd edition.3rd edition.374pp

Kilic N (2008). Cardiopulmonary, biochemical and hematological change after detomidine, - midozalam – ketamine Anaesthesia in calves Bulletin Veterinary InstititutePulawy, 52(3): 453-456.

Matthews, N. S,; Taylor, T.S,; Hartsfield, S. M.;Hayton, W. L.; Jones, D. H. (1994). Pharmacokinetics of ketamine in muscle and mammoth asses premedicated with xylazine.Equine Veterinary Journal, 26(3):241-243.

Matthews, N.S., Taylor, S.T.; and Sullivan, J.A. (2002). Comparison of three combinations of injectable anesthetic in miniature donkeys. *Journal of Veterinary Anaethesia and Analgesia*, 29:36-42.

Matthews. N. S., VanDijk, P. (2004). Anaesthesia and Analgesia for Donkeys (www.ivis.org), Ithaca, New York, USA.

Mbiuki, S. M, Mogoa E. G. M. (1994). Comparison of intramuscular and intravenous injection of xylazine – ketamine in donkeys with and without atropine premedication. *Bulletin of Animal Health and production in Africa*, 42:307-309.

Mogoa, E.G.M., Mbiuki, S.M., and McDermott.J. (1994). Anaesthesia in donkeys using ketamine alone and xylazine ketamine combination. *Bulletin of Animal Health and production in Africa,* 42:99-102.

Mohamed, A.A., Sayed, M.A.M., and Abdeinabi, M.A. (2011) . Anew protocol of anaesthesia using thiopental and xylazine in white New Zealand Rabbits. Australian journal of basic and applied sciences, 5(9): 1296-1300.

Morgan,D,J.,Blackman,G.L.,Paull,J.D.,Wolf,L,J(1981).Pharmacokinetics and plasma binding of thiopental.

Morton N.S. (1998). Total intravenous anaesthesia (TIVA) in paediatrics: advantages and disadvantages.Paediatric Anaesthesia 8,189-194.

Muir, W.W. and Masonen, D.E (1982). Effect of diazepam, accpromazine, detomidine and xylazine on thimylalanaesthesia, in horses.J.A m.

Radi, M.A.A, Seri, H.I., and Ghurashi, M.A.H.(2011). Effect of thiopentone sodium on some physiological and anaesthetic parameters in donkeys. *Sues Canal Veterinary Medicine Journal*, 14(1):81-88.

Radi, M.A.A. Seri, H.I., andGhurashi, M.A.H.(2012a).Clinical studies on thiopentonewith or without diazepam premedication for general anaesthesia in donkeys.*Assiut Veterinary Medical Journal* ,58(134):367-373.

Radi, M.A.A., Seri, H.I., and Ghurashi, M.A.H. (2012b). Cardiopulmonary effect of Diazepam/Thiopentone sodium when used for short duration anaesthesia in donkeys (*Equusasinus L.). Journal of Science and Technology. (JAVS)* 13(1):49-57.

Ringer, S.K.,Karin,Kalchofner,K,Boller,J.,Furst,Aand Bettschart-wolfensberger, R.(2007). A clinical comparison of two anaesthetic protocol using Lidocaine or medetomidine in horses.Veterinary Anaesthesia and Analgesia,34(4):257-268.

Rossetti. R.B., GaidoCortopassi, S. R., Intelizano T., de Lima Machado T S., and Ferreira da Cruz, R.S. (2008). Comparison of ketamine and S (+) - ketamine, with romifidine and diazepam, for total intravenous anaesthesia in horses. *VeterinaryAnaesthesia and Analgesia*, 35:30-37.

Singh, B., and Kumar, a (1988). Diazepam as premedication to thiopntone anaesthesia in goats. *Indian Veterinary journal*, 65(5):31.

Susan,K.M.and Donald C.P.(2003). Diazepam.The Elephant Formulary-Published by Elephant Care International-www.elephantcare.org

Tamisto,**T.,Arroma ,U.and Koittlla ,K.(1981)**. The role of thiopentone and fentanyle in the production of balanced anaesthesia .Survey of Anaesthesia .25(2):93-94.

Taylor. P.M. (1990).he stress response to anaesthesia in pointes: barbiturate anaesthesia .*Equine veterinary journal*, 22; 307-312.

Thurmon, J.C., Tranquilli, W.J. and Benson, G.J.(1996).preanesthetics and anesthetic adjuncts. In:Lumb and Jones ,Veterinary Anesthesia ,3 rd ed.,

Eds:J.C. Thurmon ,W.J. Tranquilli and G.J. Benson ,Lea and Febiger .pp 183-210.

Thurmon,j.c., Short, C. E. (2007). History and overview of veterinary anaesthesia. In Tranqilli W.J., ThurmonJ.C. Grimm K.A.(editors). Lumband jones

veterinary Anesthsia and Analgesia. Fourth edition. Black well publishing Ltd, Oxford P.3-6.

Trawford, A, (2000). Anaesthesia in the field (including field castration). In proceedings: The donkey: a Unique Equids, 25-30.

Umar MA, Yamashita, K, Kushior, T, and Muir, WW (2006). Evaluation of total intravenous anesthesia with propofol or ketamine- medetomidine-propofol combination in horses. *Journal of American Veterinary Medical Association*, 228(8): 1221-1227

Vet. Med. Assoc. 203(7): 1031-1038.

Winters,W.D.,Spector,E.,Wallach,D.P.,Shideman,F.E(1955)."Metabolism of Thiopental- 2- C^{14} by a rat liver mince and identification of pentobarbital as major metabolite" Journal of Pharmacology Experimental Therapeutics.114(3):343-57.

Yamashita K, WijayathilakaTP, Kushiro T, Umar MA, Taguchi K, Muir WW(2007). anaesthesia using midazolam, ketamine and medetomidine drug combination in Horses. The Journal of veterinary Medical Science, 69(1):7-13