A comparative study of thiopental and thiopental– propofol admixture with xylazine premedicated donkeys

W.A. Y. AL-Heani
Dep. of Surgery and Theriogenology- College of Veterinary Medicine\ University of Anbar

Abstract

The anesthetic property between thiopental (T) and thiopental–propofol mixture (TP) was evaluated in six adult donkeys premedicated with xylazine (X) . Each donkey was anesthetized one time with each dose of (T) (10 mg/kg) and (TP)(5mg/kg+1mg/kg, intravenous respectively) five minutes later of premedication with (X) (1 mg/kg, I.V.). The following anesthetic parameters; induction of anesthesia, duration and quality of anesthesia, narcosis and standing time after recovery, heart and respiratory rates, were qualitatively and quantitatively assessed.

The results did not show any significant difference at the level of ($p<0.05$) between both anesthetic protocols. But, clinically, anesthesia with (T) produce rapid, smooth, and free of excitement induction (18.50 ± 9.88 sec) with apnea (25 ± 8.8 sec). Thiopental produced anesthesia characterized by; good muscle relaxation, narcosis (30.50 ± 5.42 min) and surgical anesthesia (20.25 ± 3.47 min). Recovery was smooth and the standing time lasted for (35.50 ± 10.53 min). While anesthesia with (TP) characterized by a smooth induction (37.75 ± 11.44 sec) and without apnea, good muscle relaxation, and the duration of anesthesia (17.7 ± 1.03 min) and narcosis (23.25 ± 0.62min) was shorter than (T). Recovery was smooth and standing time after recovery was longer than (T) (47.50 ± 12.66 min).

In conclusion, both protocols produced good anesthesia in donkeys, but (TP) anesthesia may be a clinically usable technique for induction of anesthesia in donkeys.

دراسة مقارنة تأثير الثايوبنتال ومزيج الثايوبنتال والبروبوفول للحمير المعاملة بالزايلازين

وسام عبد الله يوسف الحياني
فرع الجراحة والتوليد– كلية الطب البيطري/ جامعة الأنبار

الخلاصة

هدفت الدراسة إلى مقارنة الخاصية التخديرية بين الثايوبنتال ومزيج الثايوبنتال والبروبوفول في ستة حمير بالغة كانت تحت تأثير الزايلازين. خدر كل حيوان وبوقت واحد بعد خمسة دقائق من إعطاء الزايلازين وريديا بجرعة (1ملغم/ كغم) بالثايوبنتال بجرعة (10 ملغم/ كغم) ومزيج الثايوبنتال بروبوفول بجرعة (5 ملغم/كغم± 1 ملغم/ كغم وريديا وعلى التوالي). تم إجراء الحساب الكمي والعددي للمعايير التخديرية الآتية: حثّ التخدير ومدة ونوعية التخدير والتسدير وزمن الوقوف بعد النقاهة من المخدر وكذلك معدلات التنفس وضربات القلب.

بينت نتائج التجربة عدم وجود أي فروق معنوية بين عند مستوى معنوية اقل من 5% بين نظامي التخدير لكن سريرياً التخدير الثايوبنتال نتج عنه حث تخدير سريع وسهل وخالي من التهيجات العصبية (18.50 ± 9.88 ثانية) وبفترة انقطاع تام للتنفس (25 ± 8.8 ثانية)، وكما أن التخدير بالثايوبنتال نتج عنه ارتخاء جيد للعضلات

ومدة تسدير (30.5 ± 5.42 دقيقة) ومدة تخدير جراحي (20.25 ± 3.47 دقيقة). كانت النقاهة من المخدر سهلة وزمن الوقوف (35.50 ± 10.53 دقيقة). بينما التخدير بمزيج الثايوبنتال والبروبوفول تميز بحث سهل (37.75 ± 11.44 ثانية) وبدون توقف للتنفس وكذلك ارتخاء جيد للعضلات وبمدة تخدير (17.7 ± 1.03 دقيقة) ومدة تسدير (23.25 ± 0.62 دقيقة) والتي كانت اقصر من الثايوبنتال. وكم تميزت النقاهة من المخدر بأنها سهلة وزمن الوقوف بعد النقاهة اكبر من زمن الثايوبنتال (47.50 ± 12.66 دقيقة).

يستنتج أن كلا نظامي التخدير المستخدمين في البحث ينتج عنهما تخدير جيد في الحمير لكن مزيج الثايوبنتال والبروبوفول قد يكون التقنية الأكثر استخداما في حث التخدير في الحمير.

Introduction

Thiopental is a commonly used for intravenous anesthetic usually administered by bolus injection for induction of anesthesia (1). It was introduced into veterinary practice in 1937 (2,3), and over the next 60 years came to the most widely used induction agent. It produce rapid and smooth induction with rapid loss of consciousness because it cross the blood brain barrier rapidly, it has poor analgesia. Recovery from thiopental is long because it depends upon metabolism of the drug rather than redistribution. Repeated doses are cumulative since metabolism is slow and distribution sites become saturated. Sleep will last for a few minutes and the patient will reawaken as the drug concentration falls due to redistribution to the other parts of the body (4,5).

Propofol is an alkyl phenol hypnotic (2,6–diisopropylphenol) injectable intravenous anesthetic agent unrelated to barbiturate. But, like thiopental, it is rapidly acting agent produce smooth induction and short duration of anesthesia with smooth recovery (4,6). It unlike thiopental where not damage tissue when injected perivascularly because it is not irritant. It has some analgesic property (11, 12). The drug has been used in equine species, and was found to have a desirable pharmacokinetic profile in horses, i.e., rapid onset of action, short duration of anesthesia and prompt recovery, even following continuous infusion or supplementary dose administration. Studies on combination of propofol with alpha 2-agonist (xylazine or detomidine) (13, 14, 15) and benzodiazepine (16) or ketamine (17, 18, 19 and 20), reported to have additive anesthetic effects and to decrease the dose of propofol required to maintain surgical anesthesia in human beings and animals. However, several papers report complications in horses during anesthetic induction with propofol (21,22, 23). A dose-dependent anesthetic effect of propofol has been observed in unpremeditated horses but was accompanied by side effects including excitement (21). Pre-medication with either xylazine or detomidine improved the quality of anesthesia produced by a single bolus of propofol 2mg/kg (23).

The objective of this study was to compare the effects of injectable anesthetics; thiopental and mixture of thiopental-propofol in xylazine premedicated donkeys to determine which anesthetic regimen provided satisfactory results when used in donkeys.

Materials and Methods

Six adult healthy donkeys from both sexes (2 females and 4 males) were used, the mean age 2.8 and the mean weight 125 kg. Food was withheld for 12 hr before the experiment, but water was freely accessible. The premedicated drug and the anesthetic drugs were given intravenous. Heart rate (HR) and respiratory rate (RR) were recorded as baseline values. Within 5 min of premedication with xylazine (X), (1.0 mg/kg intravenous);(CEVA Animal Health, France), anesthesia produced with thiopental (T), (10mg/kg, Egyptian International Pharmaceutical Industries Co. A.R.E, Egypt). After an elapse of clearance time (7 to 10 days), the same previous protocol was applied on the

same donkeys, except that anesthesia was produced with mixture of thiopental-propofol (TP), (Propofol; Diprivan 1%, AstraZeneca, Macclesfied Cheshire SK10 2NA, UK), at dose (5mg/kg-1mg/kg, I.V., respectively). Induction time (time taken from end of anesthetic drug administration to lie down), and quality was recorded. After induction the donkeys were intubated endotracheally and allowed to breathe fresh air and positioned in lateral recumbency. The duration or the end of anesthesia was considered when swallowing reflex was returned, at which time the endotracheal tube was removed. Also the narcosis and standing time after recovery from anesthesia(time taken from first head movement until the animal able to stand on its legs) were recorded. During the course of induction, anesthesia, and recovery with both protocols, the quality was scored according to Mama's report (22), HR, and RR were recorded every 10 min from the beginning of anesthetic injection.

Analysis of variance was used to evaluate the variations if a significant difference was identified; paired t-test was used for further analysis. A value of $p<0.05$ was considered statistically significant. Data were expressed as mean ± S.D.

Results

Time from the start of thiopental administration to lateral recumbency was (18.50 ± 9.88 sec). The quality of induction was characterized by its rapidness, and free of excitement, and the donkeys sunken to the floor smoothly without paddled and became quiet within 1 minute. Scores for induction were: two excellent, and four good. All donkeys easily intubated on the first or second attempt. Times for duration of anesthesia, narcosis and standing time after recovery from anesthesia were 20.25±3.47 min, 30.50±5.42 min, 35.50±10.53 min, respectively. No apparent complications was observed after anesthesia in all cases of this group.

While in (TP) mixture, the quality of induction was similar to that with (T), but its time was longer (37.75±11.44 sec). The induction score was good for all donkeys. All were easily intubated on first or second attempts.Times for duration of anesthesia, narcosis and standing time were 17.7±1.03 min, 23.25±0.62 min, 47.50±12.66 min, respectively

A transient apnea with thiopental induction for a mean duration of 25±8.8 sec was noticeable, but was unpredictable with (TP) mixture.

Anesthesia with thiopental and thiopenal-propofol characterized by good muscle relaxation and abolishment of reflexes. The duration of anesthesia and narcotic time in (T) relatively was longer than (TP) clinically, not statistically. The recovery in thiopental was smoothness and shorter than thiopental-propofol, which it characterized also by smoothly. The standing period after recovery was shorter in thiopental than thiopental-propofol. Both anesthetic protocols produce decrease in heart and respiratory rates.

Data analyzed by t-test and not represented any significant differences between both protocols (Table 1, 2).

Table (1) Summary of characteristic of anesthesia with (T) and (T-P) in six donkeys premedicated with xylazine

Variable	Induction time (sec)	Duration of anesthesia (min)	Narcotic time (min)	Standing time (min)	Apnea (sec)
Thiopental (10mg/kg)	18.50±9.88	20.25±3.47	30.50±5.42	35.50±10.53	25±8.8
Thiopental-propofol (5mg/kg-1mg/kg)	37.75±11.44	17.7±1.03	23.25±0.62	47.50±12.66	*

***No apnea.**

Table (2) Summary of the H.R. and R.R. in six donkeys induced with (T) and (T-P) premedicated with xylazine

Variables	Heart Rate				Respiratory Rate			
	0-time	10 min	20 min	30 min.	0-time	10 min	20 min	30 min
Thiopental 10 mg/kg	56± 9.38	58±4.8	57±2.5	47.5±4.3	28± 4.9	23 ± 5.5	22± 3.5	25± 3.4
Thiopental-propofol (2+5mg/kg)	59±.9	47± 3.4	56.5±2.4	59 ±2	25±4.1	18±2.6	25±7.2	24.5±2.9

(*) data significant at (P < 0.05)

Discussion

In current study the quality of induction was characterized by its rapidness, and free of excitement, and the donkeys sunken to the floor smoothly, this finding is in agreement with these found by (9,25) Scores for induction of thiopental were: two excellent, and four good Although induction quality varied and differed from previous reports indicating one good and five excellent inductions with thiopental use in donkeys (26).The injection of thiopental in current study cause apnea which is characteristic signs of thiopental (2,9,10) Times for duration of anesthesia, narcosis and standing time after recovery from anesthesia were not significantly differ from previous study (26).

The purpose of mixting of prpofol with thiopental is to decrease dose of propofol and thiopental when each one use alone and this lead to minimize the negative aspects of individual drugs on cardiopulmonary function,this protocol is used by (14, 21, 22) The induction score was good for all donkeys. This induction quality is in agreement with these found by (14) indicating good inductions with propofol alone use in ponies and Brazilian horses .Apnea not noticed in thiopental-propofol and this finding was resembled to these observed by (9). The synergistic hypnotic interaction has been reported between thiopental and propofol and apnea and pain on injection were not reported. The recovery with thiopental –propofol was smooth and standing period longer than thiopental where the recovery was smooth less and rapid, this is feature was founded by (8,9) Admixture of thiopental with propofol result in an additive hypnotic effect and the improvement the violent recovery of thiopental because the propofol has a smooth and free excitement recovery.

Both anesthetic protocols cause decrease in heart and respiratory rates and this effect is resemble that found by (11,6) where both agents thiopental and propofol produce similar cardiovascular and respiratory effects through depressed effect on the central nervous system and myocardium.

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