Journal of Animal and Veterinary Advances 9 (15): 2025-2029, 2010
ISSN: 1680-5593

Clinical Evaluation of Ketamine-Xylazine Anesthesia in Bozova Greyhounds

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Abstract: In this study the anesthetic effect of the ketamine and xylazine were investigated in 8 Greyhounds which were in different age, body weight and sex. The animals were injected with the ketamine (10 mg kg^{-1}) and xylazine (1 mg kg^{-1}) intramuscularly. Clinical findings including inductions of anesthesia, heart rate, respiration rate, rectal temperature were recorded before and during anesthesia. The Greyhouns of Bozova that injected with ketamine and xylazine had a mean value of 8.33 min induction period and 55.52 min surgical anesthetic duration. It is seems that heart rate, respiration rate, rectal temperature values decries and good effect of muscular relaxation and positive anesthetic conditions during the anesthesia in Greyhounds. In this study results demonstrated that the combinations of ketamine and xylazine can be used in practice as anesthetics in Greyhounds.

Key words: Ketamine, xylazine, anesthesia, bozova greyhound, intramuscularly, Turkey

INTRODUCTION

Ketamine hydrochloride, a general anesthetic and tranquilizer (not a barbiturate) is administered intravenously or intramuscularly. The anesthetic state produced by ketamine has been termed dissociative anesthesia in that it appears to selectively interrupt association pathways of the brain before producing somesthetic sensory blockade (Stoelting, 1999; Hall and Clarke, 1991).

Ketamine is a rapid acting general anesthetic producing an anesthetic state characterized by profound analgesia, normal pharyngeal-laryngeal reflexes, without muscle relaxation, cardiovascular and respiratory stimulation and occasionally a transient and minimal respiratory depression (Hall and Clarke, 1991; Haskins *et al*., 1986). Ketamin's muscle relaxation is poor but is improved by sedatives such as diazepam or xylazine (Hall *et al*., 2001; Hirota and Lambert, 1996).

Xylazine (Rompun, Bayer) is a α_2-adrenoceptor agonist (Green and Thurman, 1981). For the induction of general anesthesia it is used as a premedicant and has a favourable myorelaxant effect (Paddleford and Harvey, 1999).

The combination of the α_2-adrenergic agonist, xylazine HCl and the cyclohexane, ketamine HCl has been used to immobilize numerous wild and domestic carnivores (Knight, 1980; Herbstl *et al*., 1985; Terry *et al*., 1986; Haskins *et al*., 1986; England and Clarke, 1989; Tranquili and Benson, 1992). These drugs usually result in a smooth induction and recovery with the pressor and cataleptic effects of ketamine HCl being ameliorated by the depressor, sedative and myorelaxing effects of xylazine HCl (Parry *et al*., 1981; Terry *et al*., 1986).

All mentioned investigations have been showed that use of xylazine result in bradycardia and associated bradyarrhythmias and administration of ketamine increase and correct heart rate (Diamond *et al*., 1993; Kerr *et al*., 1994). Combination of ketamine and xylazine decreased respiratory rate, heart rate and rectal temperature in the dogs (England and Clarke, 1989; Pettifer and Dyson, 1993; Atalan *et al*., 2002; Demirkan *et al*., 2002; Afshar *et al*., 2005).

Bozova Greyhounds were raised villages of around Bozova town of Sanliurfa city in Turkey and they were used to hunting. To the knowledge, no study has been reported on ketamine and xylazine anesthesia on Bozova Greyhounds and no many reported on the other Greyhounds. Therefore, the purpose of this study was to determined clinical effects of xylazine and ketamine anesthesia on Bozova Greyhounds.

MATERIALS AND METHODS

This study was carried out on eight mature Bozova Greyhounds which were in different age, body weight and sex were used. All were health and with no congenital or acquired abnormalities.

Greyhounds were fasted for 12 h but permitted to drink water and then they were used in the study. The Greyhounds were nominated for the administration of

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xylazine and ketamine their body weight varied from 15-25 kg with an average of 21,62 kg and the age varied between 1 and 7 years (average 3.13 years). There were 2 females and 6 males Greyhounds were used in the study. Pulse, respiratory rate, rectal body temperature, reflexes (pupilla, pedal, ear, tail) were recorded on a formatted paper before applying medication (BA, before anesthetic values). Then weigh of Greyhounds estimated for give drugs.

The Greyhounds were given 1 mg kg^{-1} of xylazine HCl and 10 mg kg^{-1} of ketamine HCl were mixed and administrated by Intramuscular (im) route. When Greyhounds get into anesthesia all of differences were recorded. The Greyhounds were placed on a padded table and positioned at lateral recumbency. Pulse, respiratory rate and body temperature were taken before drugs administration and were repeated at 5, 10, 20, 30 and 45 min during the anesthesia.

Heart and respiratory rates were recorded with a stethoscope and counting thorax respiratory movements min^{-1} rectal temperature was taken with a digital thermometer.

All physical discomfort sign of animals (vomiting, defecation, urination, convulsions or delirium) were recorded throughout the study.

For the sedative and anesthetic effects of the drugs were evaluation, nociceptive stimulus were applied and findings were recorded. The myorelaxant effects of the drugs were determined by checking tail and ear movements.

After the Greyhounds were recovering the sign of recovery (first movie, sternal recovery and walking time) were recorded until they were began to walk. Following the study no food or water was given by oral route for 2 h. Data were reported as mean and standard deviation. One-way analysis of variance was applied to unpaired data for comparisons within the group to detect differences in heart rate, respiratory rate and body temperature.

RESULTS AND DISCUSSION

Induction times and physical differences from the injection to anesthesia of greyhounds were shown in Table 1. Induction took average 8.3 (mean 500.0±194.5 sec) min from the time of intramuscular injection. While Greyhounds go into anesthesia at first began to lurch (mean 133.9±64.2 sec) then fall down (mean 208.8±75.3 sec), lie down (mean 350.0±122.9 sec), at the end anesthesia (mean 500.0±194.5 sec) was began (Table 1).

Table 1: Induction of anesthesia

Factors	Mean±SD	Minimum	Maximum
Lurch (sec)	133.9±64.20	60.0	236.0
Fall down (sec)	208.8±75.30	100.0	300.0
Lie down (sec)	350.0±122.9	190.0	507.0
Time of anesthesia (sec)	500.0±194.5	300.0	880.0

Table 2: Recovery from the anesthesia

Recovery state	Mean±SD	Minimum	Maximum
First movement	55.25±6.180	47.00	66.00
Sternal recovery	73.13±8.200	65.00	87.00
Walk time	92.00±13.89	75.00	110.00

The average duration of anesthesia (from induction to first movement with conscious) 55.25 min, duration of sternal recovery 73.15, duration of walking 92 min were included (Table 2).

The mean heart rate decreased significantly at 30-45 min following anesthetic induction. Pulse were chartarised with Arrhythmia. Respiratory rate were decreased significantly at 5-45 min following anestetic induction and rectal temperature began to decries significantly at 20-45 min of anesthesia (Table 3).

Eyes of all Greyhouns were opened during the anesthesia. Greyhounds have different moves when recovery from anesthesia. One by ear moving (Greyhounds 1), one by tail moving (Greyhounds 3), six by head moving (2, 4, 5, 6, 7 and 8) recovery from the anesthesia.

Shivering was seen during the anesthesia in one greyhound (case 4, 32nd min) with 2 min. The snarling vomiting and head hitting the ground was seen in one (case 8, 67th min) during awaking from the anesthesia. Howl was seen in one (case 1, 47th min) after awaking from the anesthesia.

Reflexes didn't changed during the anesthesia. It is seen that good anesthetic conditions were determined in the all of Greyhounds via applying nociceptive stimulus during the anesthesia.

The combination of the α_2-adrenergic agonist, xylazine HCl and the cyclohexane, ketamine HCl has been used to immobilize numerous wild and domestic carnivores (Knight, 1980; Herbstl *et al*., 1985; Terry *et al*., 1986; England and Clarke, 1989; Tranquili and Benson, 1992). Ketamine is a rapid-acting general anesthetic producing an anesthetic state characterized by profound analgesia, normal pharyngeal-laryngeal reflexes without muscle relaxation, cardiovascular and respiratory stimulation and occasionally a transient and minimal respiratory depression (Hall and Clarke, 1991; Haskins *et al*., 1986). These drugs usually result in a smooth induction and recovery with the pressor and cataleptic effects of ketamine HCl being ameliorated by the depressor, sedative and myorelaxing effects of xylazine HCl (Parry *et al*., 1981; Terry *et al*., 1986). In this

Table 3: Clinical values of Bozova Greyhounds before and during anesthesia

Clnical values	BA	5	10	20	30	45	p-value
Pulse	85.12±13.24^{a}	76.250±24.380^{ab}	65.500±16.230^{abc}	59.630±12.530^{abcd}	51.250±8.730^{cd}	49.750±14.380^{ef}	***
Respiratory rate	30.50±11.019^{a}	18.250±6.319^{b}	18.130±3.091^{bc}	19.750±6.902^{abcd}	19.000±7.131^{bcde}	21.250±6.714 ^{abcde}	***
Rectal temperature	39.12±3.60^{a}	38.990±2.360^{ab}	38.610±3.090 ^{abc}	38.35±3.07^{cd}	37.960±5.480^{de}	37.630±5.040^{ef}	***

Values on the same line with same superscripts (a-f) are not statistically significant (***p<0.001), SD = Standard Deviation, BA = Before Anesthesia

study, Induction took average 8.3 min from the time of intramuscular injection. There were not encountered any problem during the induction and anesthesia. Reflexes didn't change during the anesthesia. It is seen that good anesthetic conditions were determined in the all of Greyhounds via applying nociceptive stimulus during the anesthesia. The average duration of anesthesia 55.25 min, duration of sternal recovery 73.15, duration of walking 92.00 min were included.

In accordance with some researchers (Dart, 1999; Tranquili and Benson, 1992) 50% of dogs treated with xylazine-ketamine combinations showed emetic sign. In this study, snarling, vomiting and head hitting the ground was seen in one case (case 8, 67th min) during awaking from the anesthesia.

Xylazine premedication in healthy dogs has been associated with an increase in mortality rate compared with other pre-anesthetic regimes (Clarke and Hall, 1990; Dyson *et al*., 1998). There was not any mortality in this study.

Ketamine is a anesthetic state characterized cardiovascular and respiratory stimulation and occasionally a transient and minimal respiratory depression (Hall and Clarke, 1991; Haskins *et al*., 1986). All mentioned investigations have been showed that use of xylazine result in bradycardia and associated bradyarrhythmias and administration of ketamine increase and correct heart rate (Diamond *et al*., 1993; Kerr *et al*., 1994). The mean heart rate decreased significantly at 15-60 min following ketamine administration (Afshar *et al*., 2005; Hall *et al*., 2001; Kul *et al*., 2000). The major side effects of α_2-adrenoreceptor agonists on the cardiovascular system may have contributed to the decreased heart rate in this anaesthetic regimen (Hall *et al*., 2001; Kul *et al*., 2000). Although ketamine may increase the heart rate by the increased sympathetic activity and decreased vagal tone, xylazine overrides these effects by excitatory carotid baroreceptor reflex induced by hypotension and decreased sympathetic and increased vagal activity. Kul *et al*. (2000) found a prolonged decrease in the heart rate to 120 min in their study with xylazine-ketamine administration in dogs and Moens and Fargetton (1990) showed a 27% decrease in the heart rate at 45 min. A similar result was also observed in this study, 1 mg kg^{-1} of xylazine and 10 mg kg^{-1} of ketamine inititated bradycardia at 30 min. If xylazine is used alone, the decrease in the heart rate could reach serious levels (Atalan *et al*., 2002; Demirkan *et al*., 2002). However, decreasing in heart rate was not life threatening as it was normal in 60 min (Atalan *et al*., 2002). A similar result was also observed in this study. The mean heart rate began to decrised from the injection but especially decreased significantly at 30-45 min following anestetic induction.

About 1 mg kg^{-1} of xylazine and 10 mg kg^{-1} of ketamine inititated bradycardia at 30 min and they caused arrhythmia until 60 min. It was reported that xylazine induced sinus bradycardia and arrhythmogenic effects in a dogs heart (Haskins *et al*., 1986). The majority of the dogs in Xylazine-ketamine had sinus bradycardia and arrhythmia at 5, 15, 30 and 60 min (Atalan *et al*., 2002). Findings of heart arrhythmia and bradycardia in ketamine-xylazine combinations were in agreement with the other reports (Dart, 1999; Haskins *et al*., 1986).

The anaesthetic regim of ketamine-xylazine had no significant influence on respiratory rate (Afshar *et al*., 2005) but Kul *et al*. (2000) showed significant changes at 15, 30 and 60 min after xylazine-ketamine administration in dogs. Respiratory rate significantly remained lower than baseline throughout the anesthesia (Demirkan *et al*., 2002; Atalan *et al*., 2002; Cormick and Hartsfield, 1992; Haskins *et al*., 1986; Tranquili and Benson, 1992; Hall and Clarke, 1991; Gleed, 1987). In this study, respiratory rates also were decreased significantly at 5-45 min following anestetic induction.

Demirkan *et al*. (2002) and Atalan *et al*. (2002) emphased that rectal temperature decreased during the anaesthesia. Afshar *et al*. (2005) said that the anaesthetic combination decreased significantly the mean rectal temperature at 30-60 min and the decline was highly significant at 60 min. Gleed (1987) and Short (1987) explained that the decrease in rectal temperature might be due to the depression of the thermo-regulator center. The decreases in rectal temperature in this study were in agreement with other studies (Short, 1987; Demirkan *et al*., 2002; Atalan *et al*., 2002; Afshar *et al*., 2005; Gleed, 1987). Because In the present study, Rectal temperature began to decrise from the injection but

decreased significantly at 20-45 min of anesthesia. In the present study reflexes were remained and the eyes were opened during the anesthesia but no found any impulse for nociceptive stimulus throught the anesthesia.

CONCLUSION

In this study during the anesthesia heart rate, respiratory rate and rectal temperature were decreased with ketamin-xylazin were not life threatening. Ketamine and xylazine could be used for Bozova and others Greyhounds Anesthesia safetly.

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