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Electrocardiographic study of the anesthetic combination of ketamine and chlorpromazine HCL in felines

Estudo eletrocardiográfico da associação anestésica de quetamina e clorpromazina em felinos

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SUMMARY

Ketamine HCL has frequently been used in clinical and surgical practice because of the easy acquisition, application and safety of the anesthesia it provides. The objective of the present experiment was to observe possible interferences with the electrocardiographic tracing of cats submitted to the ketamine+chlorpromazine combination. The study was conducted in 10 adult cats of both sexes considered as clinically normal and provided by the animal house of the Veterinary Hospital, Faculty of Agrarian and Veterinary Sciences, campus of Jaboticabal-UNESP. Each animal received ketamine HCL at the dose of 15 mg/kg, in combination with 1 mg/kg chlorpromazine HCL, diluted in the same syringe and applied intramuscularly. The animals were then evaluated for heart and respiratory rates and rectal temperature. Electrocardiographic evaluation (ECG) was performed in the leads of the limbs, at a speed of 50 mm/s and with calibration of 1mv = 2cm, for a period of 60 minutes. Only rectal temperature, heart rate and P-R interval of the ECG presented significant differences at the different times observed. The methodology used permits us to conclude that ketamine in combination with chlorpromazine can be safely used in cats.

UNITERMS: Ketamine; Chlorpromazine; Felidae; Electrocardiography.

INTRODUCTION

Ketamine HCL has frequently been used in clinical and surgical practice because of the easy acquisition, application and safety of the anesthesia it provides. Ketamine acts at the central level through mechanisms of inhibition of the corticothalamic system and simultaneous activation of the limbic system^{6,8}. The agent produces anesthesia of the short-lasting dissociative type characterized by loss of consciousness, absence of a response to nociceptive stimuli and maintenance of protector reflexes^{4,7}.

Clark *et al.*¹ (1982) investigated the electrocardiographic changes occurring in dogs submitted to ketamine and showed that they originated from probable myocardial hypoxia. Similar data were observed by Pereira *et al.*⁹ (1992) using a combination of ketamine and chlorpromazine, with the probable hypoxia of cardiac muscle having been determined in this case due to the observation of constant infra- and S-T segment elevation. In this respect, the evaluation of hearts from felines, which accidentally died during anesthesia with ketamine combined with atropine and xylazine, showed myocardial degeneration and necrosis probably caused by

hypoxia⁵.

The use of ketamine in combination with acepromazine in cats was reported by Deppe *et al.*² (1987), who observed maintenance of heart and respiratory rates, this effect being attributed to the antagonistic action of phenothiazines in the presence of ketamine, through competition at the alpha-adrenergic receptor level.

The objective of the present experiment was evaluate the characteristics of anesthesia and their possible interference with the electrocardiographic tracing of cats submitted to the ketamine+chlorpromazine combination.

MATERIAL AND METHOD

Ten, apparently healthy felines of both sexes were obtained from the sector of Small Animals Internal Medicine, Faculty of Agrarian and Veterinary Sciences FCAV-UNESP, Jaboticabal, SP. Each animal received ketamine hydrochloride* at the dose of 15 mg/kg in combination with 1 mg/kg chlorpromazine hydrochloride**, diluted in the same syringe and applied by the intramuscular route.

Heart rate (HR), respiratory rate (RR) and rectal

Table 1

Variation of mean values (x), standard derivation (s), variation coefficient (CV) and F values of HR, RR, and T°C, obtained over the time for cats submitted to dissociative anesthesia using a combination of ketamine and chlorpromazine. Jaboticabal - SP, 1994.

	Times	T°C	RR	HR
x	0	38.77 ^a	61.60 ^a	193.52 ^b
	5	38.86 ^a	47.60 ^a	217.00 ^{ab}
	10	38.47 ^{ab}	40.80 ^a	210.00 ^{ab}
	20	38.07 ^b	38.40 ^a	202.49 ^{ab}
	30	37.52 ^c	46.00 ^a	203.60 ^{ab}
	40	37.27 ^{cd}	48.10 ^a	217.00 ^{ab}
	50	37.08 ^d	48.40 ^a	226.00 ^a
	60	36.91 ^d	55.00 ^a	220.00 ^{ab}
F test		70.07 ^{**}	1.89 ^{ns}	2.19 [*]
CV%		0.77	35.22	10.50
s		0.29	16.99	22.50

distinct characters indicate significant differences

ns - not significant

* - significant at the level of a 1st-degree equation

** - significant at the level of a 2nd-degree equation

temperature (T°C) were evaluated. Electrocardiography was used to evaluate the duration of QRS (QRSs), amplitude and duration of P wave (PmV and Ps), R wave amplitude (RmV), P-R, Q-T, R-R, and P-T intervals, and also for a study of the axis. The studies were performed by observing the tracings in leads I, II, III, AVR, AVL and AVF, obtained with an electrocardiograph^{***}.

The numerical values were obtained immediately before and at 5, 10, 20, 30, 40, 50 and 60 minutes after injection. Data were analyzed statistically by polynomial regression³, and the results are presented in tables.

* Ketalar - Lab. Parke-Davis Ltda.

** Amplictil - Rhodia-Farma Ltda.

*** RFT Electrocardiograph model 6-Neck 4

RESULTS

The animals showed lack of coordination approximately 1 minute after drug injection and stopped reacting to manipulation after 5 minutes, when it was also possible to observe the absence of a response to nociceptive stimuli. Loss of palpebral or corneal reflexes was not observed at any moment.

Rectal temperature and P-R interval varied during the experiment, being significantly higher during the initial

moments, compared to all other times. Heart rate also showed a significant variation when time 0 was compared to 50 minutes (Table 1). The remaining parameters of interest did not change in a statistically significant manner with time (Tables 1, 2). All animals took on a quadrupedal posture when stimulated, on average, 90 minutes after drug injection, and were considered to have recovered from anesthesia.

DISCUSSION

The period of latency, anesthesia and recovery were consistent with those observed by Pereira *et al.*⁹ (1992) and Massone⁷ (1994), indicating that the characteristic effect of ketamine or of ketamine+chlorpromazine was unchanged in this species. The maintenance of defence reflexes (corneal, palpebral and laryngotracheal) agreed with the observations reported by Glenn⁴ (1973) and Massone⁷ (1994).

The significant variation in rectal temperature was probably due to the action of the phenothiazine agent in the peripheral resistance system, causing hypotension and a consequent increase in heat exchange between the animal and the environment. In this respect, it is possible to infer that the competition for alpha-adrenergic receptors, described by Deppe *et al.*² (1987), is a characteristic of chlorpromazine. The evaluation of arterial pressure may be a determinant for the

Table 2

Variation of mean values (x), standard derivation (s), variation coefficient (CV) and F values of Ps, PmV, P-R, QRSs, RmV, Q-T, R-R, P-T and AXIS, obtained over the time for cats submitted to dissociative anesthesia using a combination of ketamine and chlorpromazine. Jaboticabal - SP, 1994.

	Times	Ps	PmV	P-R	QRSs	RmV	Q-T	R-R	P-T	AXIS
x	0	0.036 ^a	0.058 ^a	0.059 ^a	0.041 ^a	0.19 ^a	0.15 ^a	0.323 ^a	0.232 ^a	97.82 ^a
	5	0.036 ^a	0.078 ^a	0.053 ^{ab}	0.041 ^a	0.27 ^a	0.16 ^a	0.278 ^a	0.255 ^a	69.65 ^a
	10	0.036 ^a	0.035 ^a	0.050 ^b	0.041 ^a	0.21 ^a	0.15 ^a	0.281 ^a	0.222 ^a	57.91 ^a
	20	0.036 ^a	0.049 ^a	0.049 ^b	0.041 ^a	0.18 ^a	0.16 ^a	0.313 ^a	0.223 ^a	78.78 ^a
	30	0.035 ^a	0.038 ^a	0.048 ^b	0.041 ^a	0.18 ^a	0.17 ^a	0.299 ^a	0.218 ^a	77.23 ^a
	40	0.036 ^a	0.043 ^a	0.050 ^b	0.041 ^a	0.20 ^a	0.16 ^a	0.275 ^a	0.208 ^a	93.80 ^a
	50	0.036 ^a	0.049 ^a	0.050 ^b	0.040 ^a	0.21 ^a	0.15 ^a	0.273 ^a	0.237 ^a	95.31 ^a
	60	0.035 ^a	0.066 ^a	0.049 ^b	0.042 ^a	0.20 ^a	0.15 ^a	0.272 ^a	0.222 ^a	83.20 ^a
F test		0.20 ^{ns}	0.98 ^{ns}	2.91 ^{**}	0.034 ^{ns}	2.64 ^{ns}	1.18 ^{ns}	2.34 ^{ns}	0.92 ^{ns}	1.17 ^{ns}
CV%		3.07	82.6	11.76	7.07	33.33	9.62	13.15	9.42	46.27
s		0.0011	0.043	0.006	0.0029	0.07	0.015	0.038	0.021	37.81

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confirmation of this hypothesis.

As previously observed (Pereira *et al.*⁹, 1992), heart rate was significantly increased from 0 to 50 minutes, although in the experiment reported by those investigators the elevation of the parameter was more marked during the first 10 minutes. The explanation may reside in the fact that the depressive effect of ketamine on the central nervous system was probably ending after 50 minutes, causing animal restlessness, which in turn led to increase HR. On the other hand, the use of ketamine in animals presenting physiological HR values of about 200 bpm seems to elicit a low degree of tachycardia.

The drug combination under study did not show noteworthy

alterations in the remaining variables of interest, and the presence of signs of myocardial hypoxia such as those described (Linde-Sipman *et al.*⁵, 1992; Pereira *et al.*⁹, 1992) was not observed.

CONCLUSION

The method permits us to conclude that ketamine in combination with chlorpromazine did not produce electrocardiographic alteration, and can be safely used in felines.

RESUMO

O cloridrato de quetamina tem sido usado com frequência na prática clínico-cirúrgica, devido à facilidade de aquisição, aplicação e à segurança da anestesia obtida com seu emprego. Este experimento objetivou identificar possíveis interferências do traçado eletrocardiográfico de gatos, submetidos à associação de quetamina e clorpromazina. Foram utilizados 10 gatos, de ambos os sexos, adultos e considerados clinicamente sadios, provenientes do gatil do Hospital Veterinário da Faculdade de Ciências Agrárias e Veterinárias, campus de Jaboticabal-UNESP. Cada animal recebeu quetamina na dose de 15 mg/kg, associados a 1 mg/kg de clorpromazina, diluídos em uma mesma seringa e aplicados por via intramuscular. Foram avaliadas as frequências cardíaca e respiratória e a temperatura retal. A avaliação eletrocardiográfica foi realizada nas derivações de membros, com velocidade de 50 mm/s e calibração de 1mv = 2cm, durante um período de 60 minutos. Dos resultados obtidos, somente a temperatura retal, frequência cardíaca e o intervalo P-R apresentaram diferenças significativas nos diferentes tempos observados. Da metodologia empregada permite-se concluir que a quetamina associada à clorpromazina pode ser empregada com segurança em gatos.

UNITERMOS: Quetamina; Clorpromazina; Felidae; Eletrocardiografia.

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