

Deviations of electrocardiogram parameters of different age groups of horses in cardiac pathologies

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Abstract. This article presents the results of an electrocardiographic study of English thoroughbred racehorses with cardiac pathologies. Diagnosis was performed on 4-, 5-, and 6-year-old horses before and after exercise. It was noted that tachycardia and various cardiac abnormalities were observed in many animals. Currently, there is an increase in the number of pathologies related to the cardiovascular system diagnosed in sport horses, which can lead to early culling of the animal and reduce the economic efficiency of their maintenance.

1 Introduction

At present, there is a tendency of revival of horse breeding in the Russian Federation. That is why the detection of pathologies of the cardiovascular system in clinical studies of sport horse breeds has become one of the main problems of horse breeding. Heart diseases can occur due to non-normalised feeding, improper ration formulation (including compliance with the exact dosage of vitamins, macro- and microelements, which play an important role for the correct functioning of the cardiovascular system of farm animals) [2]. Veterinary diagnostics has a wide range of services and clinical equipment for timely investigation of the presence of cardiac abnormalities in horses. Assessment of the cardiovascular system plays an important role in the life of the horse, as it is the early detection of pathology that allows timely competent actions to be taken to preserve the health of the animal, increase the duration of their exploitation, which will increase economic efficiency in their maintenance [6].

Objective. To study the features of changes in electrocardiogram parameters and some cardiac indices in racehorses with cardiac pathologies.

Objectives. To implement the results of the conducted study in clinical and practical horse breeding. To show to owners of horse breeding farms and private entrepreneurs the importance of cardiovascular system research. On the basis of the obtained results to give recommendations on maintenance, feeding, diagnostics and prevention of cardiac pathologies.

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2 Materials and Methods

Groups of English thoroughbred horses (n=31) aged 4-6 years, divided into groups by age: 4-, 5-, 6-year-olds, kept in a private stable in the Stavropol region (North Caucasian Federal District) were selected for the experiment. The rations were in accordance with the feeding norms, and the normative concentrations of macro- and microelements were observed. From anamnesis it was known that this group of horses had various cardiac pathologies. No drugs to stop these pathologies were taken. Instrumental methods of investigation including electrocardiography (ECG) [5] were applied during the experiment. Electrocardiography was performed using the "CardioFlash ECG PetNet" apparatus; the studies were performed both at rest and after physical exertion [4].

3 Results of the study

The results of the studies revealed on electrocardiography (ECG) various changes in cardiac activity, namely, excesses and decreases in the indices of cogs and intervals from the mean normal values. (Table 1)

Table 1. Electrocardiogram and cardiac parameters of racehorses (M±m)

Indicator or	Average normativ e values	Group of 4-year-old horses (n=10)		Group of 5-year-old horses (n=10)		Group of 6-year-old horses (n=11)	
		Before the load	After the load	Before the load	After the load	Before the load	After the load
Height of teeth, mV							
P	0.09-0.4	0.23±0.02	0.21±0.03	0.25±0.02	0.30±0.02	0.28±0.03	0.29±0.09
Q	0.05-0.3	0.09±0.02	0.16±0.05	0.11±0.06	0.17±0.05	0.42±0.20	0.51±0.20
R	0.4-2.0	0.67±0.14	0.78±0.15	0.63±0.13	0.58±0.06	0.40±0.20	0.28±0.10
S	0.05-0.35	0.01±0.02	0.07±0.06	0.08±0.03	0.19±0.05	0.01±0.03	0.02±0.01
T	0.25-1.0	0.38±0.10	0.34±0.05	0.55±0.10	0.39±0.08	0.42±0.10	0.37±0.04
Duration of intervals, s							
PQ	0.28-0.38	0.29±0.018	0.26±0.29	0.36±0.012	0.28±0.015	0.32±0.05	0.30±0.01
QRS	0.05-0.1	0.06±0.10	0.08±0.01	0.08±0.02	0.13±0.01	0.08±0.01	0.08±0.08
QT	0.45-0.56	0.46±0.03	0.39±0.05	0.50±0.08	0.47±0.07	0.50±0.01	0.48±0.02
RR	1.4-2.2	1.62±0.25	1.28±0.10	2.01±0.24	1.61±0.13	1.81±0.23	1.34±0.19
Cardiac parameters							
HR, bpm	24-42	46.2±0.17	54.8±0.20	39.1±6.21	41.1±1.21	43.8±4.10	50.3±1.31
PDD, cycles/ minute	8-12	8.12±0.30	19.1±0.12	21.3±0.30	15.6±0.25	10.16±2.35	15.7±3.80

In 4-year-old animals, there was a decrease in the height of P and T (0.23±0.02 mV and 0.38±0.10 mV), compared with the average normal values. It was also found that after

physical exertion the P waveform was reduced by 6,1%, and the R waveform was increased by 23,1%, indicating pathology in repolarisation and depolarisation processes in atrial and ventricular myocardium. On ECG decoding, the R spike in 15,6% was serrated and in 24,1% of horses was split. Positive T wave remained after exercise in 72% of the animals studied, in the remaining horses it became negative. After loading, a 34,2% increase in the volatility of the Q tooth was observed, indicating cardiac pathology in the direction of ischaemia. Atrial flutter was observed in 2 of the studied animals, which was evident from the signs of tachycardia and confirmed by ECG. In all horses of this group, the heart rate did not come to the average normal values before and after exercise. In 5 year old animals, compared to 4 year old animals, an increase in volatility of P by 46,1% and Q by 27,4% was found. After exercise, the volatility of P was increased by 5,2% and Q by 7,4%, which also indicated pathology in the processes of myocardial repolarisation and depolarisation. The R spike in 45,2% was M-shaped split. In animals of this group it was noted that HR was at maximum threshold values both before and after loading. In 6-year-old horses, there was an increase in the volatility of P and Q teeth on electrocardiography by 61,5%, compared to the studied animals of 4-year-old age, and by 31,8%, compared to 5-year-old age. It was observed that after exercise, there was no significant change on ECG in favour of deterioration or improvement of cardiac activity. But it should be noted that after exercise there was a decrease in the height of R by 8,1% and T by 10,3%, this is an indicator of weakening of the processes of recovery and excitation of the ventricular myocardium. Also in animals of 6 years of age, in comparison with subjects of other age, prolongation of ventricular electrical systole was registered, namely increase of Q-T intervals by 17%. It was found that due to this pathological condition of the cardiovascular system, the horses were subjected to physiological overload, which led to disturbances in the excitation and recovery processes in the myocardium.

4 Conclusions

After the conducted studies, it can be concluded that racehorses have tendencies to develop cardiac pathologies associated with age-related changes. Various diseases of the cardiovascular system in different degrees of pathogenesis were detected in all animals. It should be noted that in the studied animals of 4 years of age, incorrect repolarisation and depolarisation in the myocardium of ventricles and atria were observed, also bifurcation of P tooth was detected, which is a physiological norm for electrocardiography of horses. Horses of 5 year old age group showed pathological changes in the ECG structure, namely abnormalities of the R tooth. In 6 year old horses, abnormalities in electrocardiography were found, namely prolongation of the R tooth and reduction of the QT interval. This may indicate improper operation and violations in horse feeding technologies, namely, not observing the correct dosage of chemical elements and vitamins, which directly affects the activity of the cardiovascular system of farm animals, including horses [3]. Monitoring of cardiac activity and systematic electrocardiographic examination allows to detect cardiac pathologies at early stages and competently prescribe treatment, thereby prolonging life and increasing the economic efficiency of animal husbandry.

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