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**CARDIOVASCULAR EVALUATION IN SPORT HORSES  
BY ELECTROCARDIOGRAM, BLOOD PRESSURE AND CARDIAC TROPONIN T**

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**Abstract:** The continuous development of equestrian sports in Romania has increased interest in the medical monitoring of horses involved in competitive activities. In this context, the warmblood population represents one of the main genetic resources used in show jumping and other equestrian disciplines. Repeated physical exertion induces physiological cardiovascular adaptations; however, in certain individuals it may also promote transient functional disturbances or processes of myocardial overload. The present study aimed to provide an integrated evaluation of the cardiovascular response to exercise through electrocardiography, arterial blood pressure assessment, and cardiac troponin T measurement. Six adult sport horse individuals were examined at rest, immediately after a standardized warm-up protocol, and after 10 minutes of recovery. The results revealed post-exercise sinus tachycardia, variable heart rate recovery, marked increases in systolic blood pressure, and mild changes in the amplitude of electrocardiographic complexes. Cardiac troponin T increased from 2.818 pg/mL before exercise to 3.062 pg/mL after exercise, without statistical significance ( $p > 0.05$ ). The findings confirm the value of integrated cardiovascular monitoring in the medical management of sport horses, both for optimizing training programs and for the early detection of cardiac overload.

**Keywords:** warmblood horse, equine cardiology, exercise training management

**Introduction**

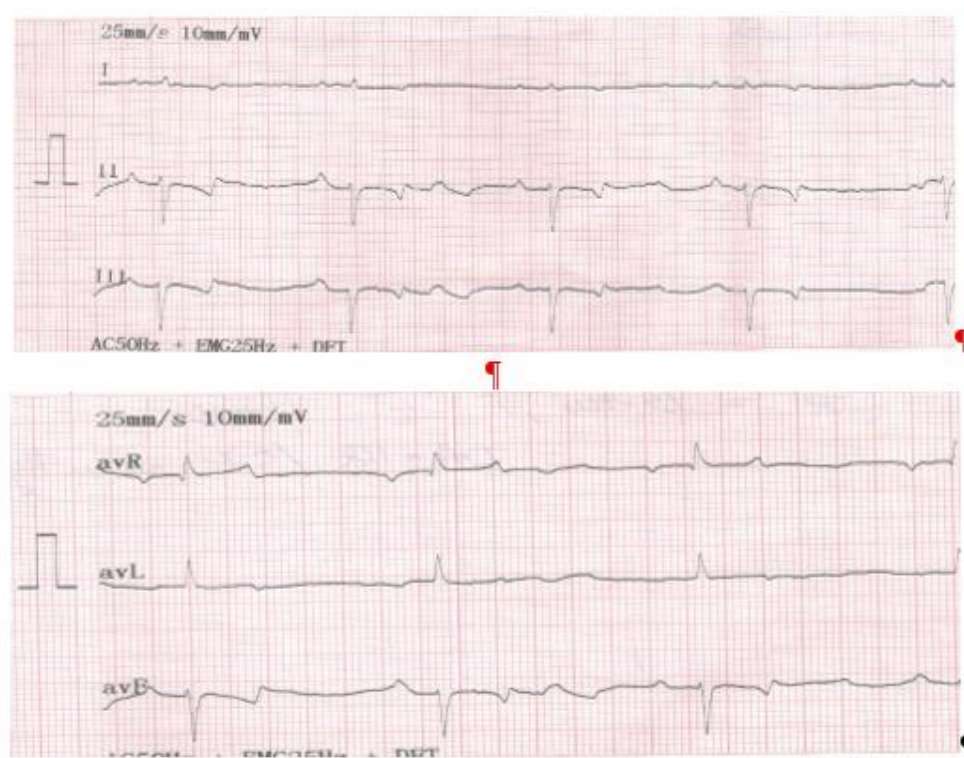
The increasing use of Sport Horses in equestrian competitions has highlighted the importance of cardiovascular monitoring during exercise. Electrocardiography, blood pressure assessment, and cardiac troponin T evaluation are useful methods for assessing exercise adaptation and detecting cardiovascular changes associated with physical effort. Therefore, this study aimed to evaluate electrocardiographic parameters, blood pressure variations, and cardiac troponin T levels in Sport Horses at rest, after exercise, and during recovery.

**Material and method**

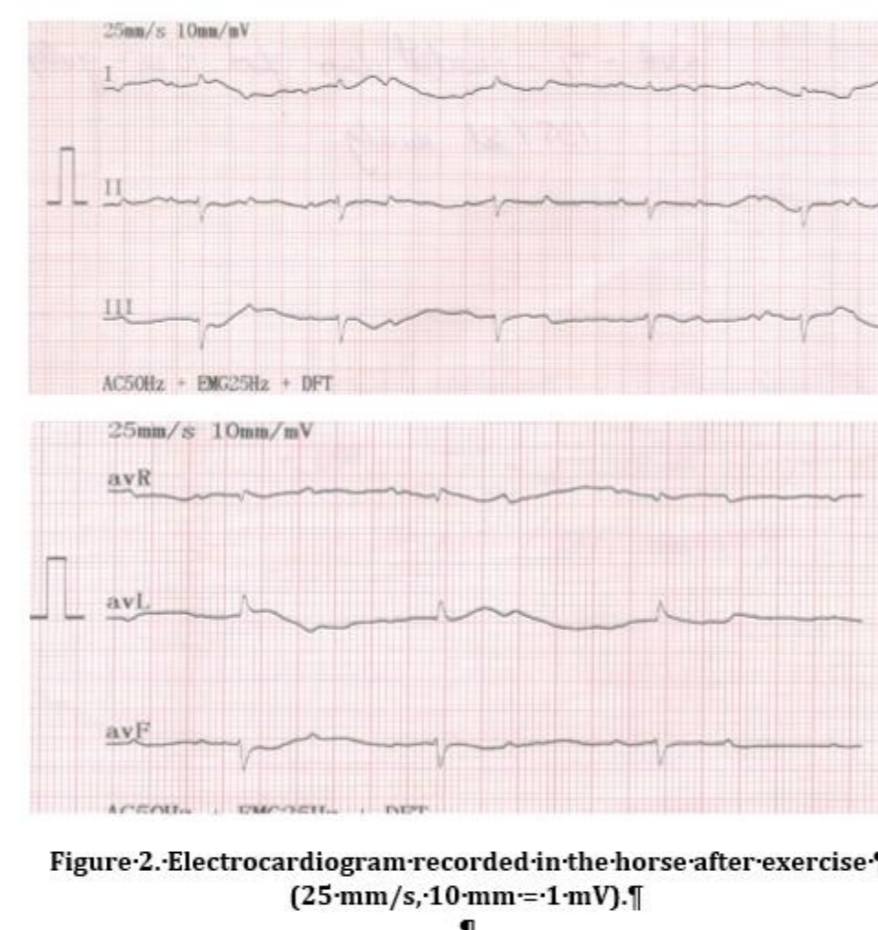
- The prospective study included six clinically healthy Romanian Sport Horses (4 mares and 2 stallions), aged between 8 and 16 years, used for show jumping.
- Cardiovascular evaluation was performed at rest, immediately after exercise, and after a 10-minute recovery period.
- The exercise protocol included lunging exercises consisting of walking, trotting, and cantering (30–40 minutes total).
- Electrocardiographic examination was performed using 12-lead digital electrocardiographs in base–apex configuration.
- Heart rate, cardiac rhythm, and conduction or repolarization abnormalities were evaluated.
- Jugular venous blood samples were collected for cardiac troponin I (cTnI) determination.
- Statistical analysis was performed using IBM SPSS Statistics 23.

**Results and discussions**

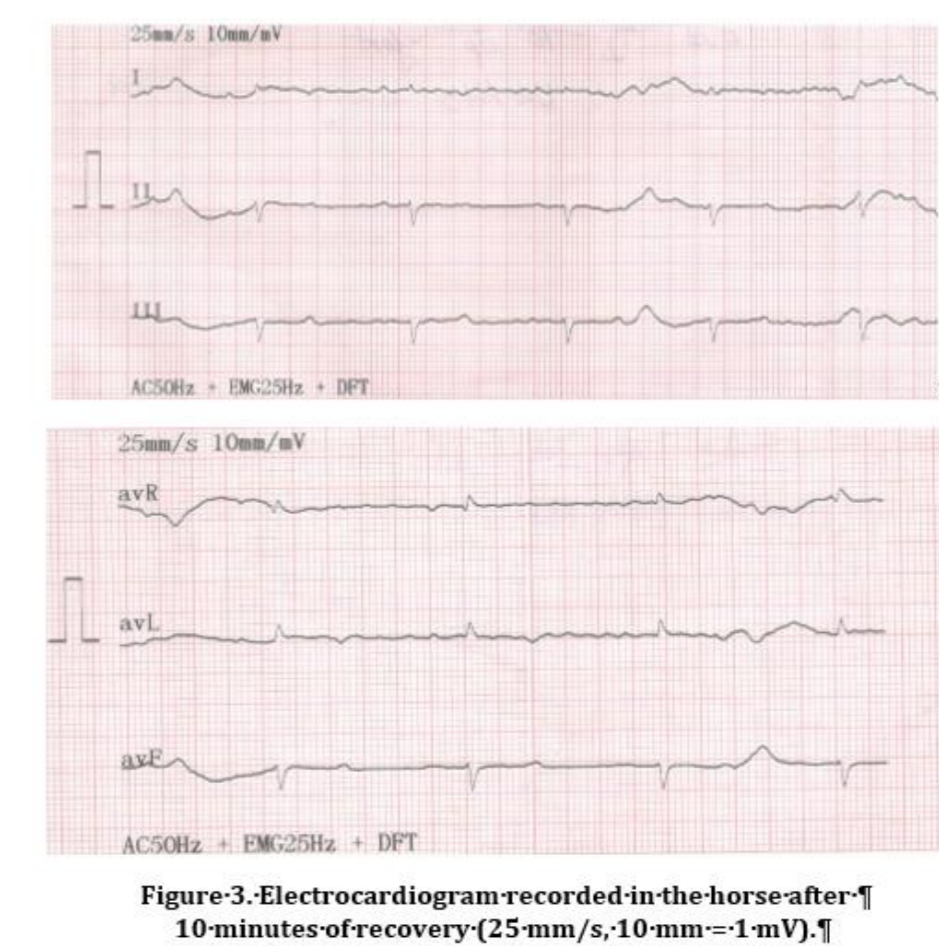
Figures 1–3 illustrate the electrocardiographic tracings recorded in Sport Horses during the three experimental stages: at rest, immediately after exercise, and after the 10-minute recovery period.



At rest (Fig. 1), the ECG showed a regular sinus rhythm, with functional indices within physiological limits (VSI=31%, ASI=18%, DSC=2.5).



Immediately after exercise (Fig. 2), sinus tachycardia (60–80 bpm) and transient systolic overload (VSI=51%) were observed, associated with reduced diastolic duration (DSC=1.7).



During recovery (Fig. 3), heart rate returned close to resting values (~40 bpm), while functional indices remained within physiological limits (VSI=40%, ASI=20%, DSC=1.6).

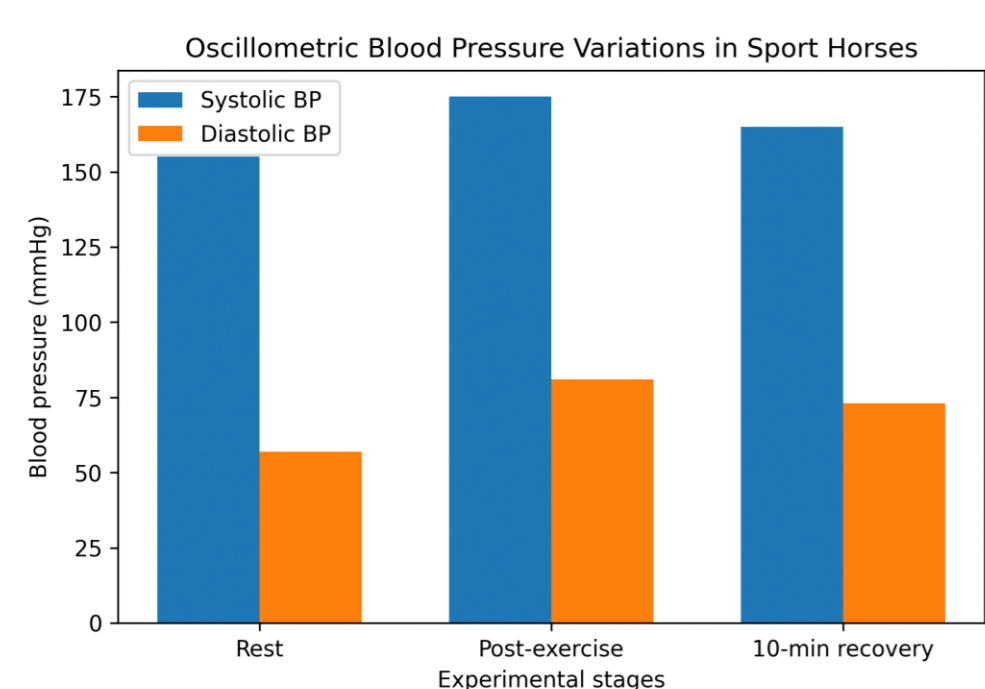


Fig. 4. Oscillometric Blood Pressure Variations in Sport Horses During Exercise and Recovery

Oscillometric monitoring revealed progressive increases in systolic blood pressure from rest (155/57 mmHg) to post-exercise values (175/81 mmHg), followed by incomplete recovery after 10 minutes (165/73 mmHg). The increased systolic pressure and reduced diastolic values suggested transient exercise-induced hypertension, altered peripheral vascular resistance, and limited post-exercise cardiovascular recovery.

Table 1. Mean values and statistical indices of cardiac Troponin T (pg/nm)

Specification	Mean	Standard Error of the Mean	Standard Deviation	Variance	Coefficient of Variation
Before exercise	2.818 <sup>a</sup>	0.698	1.710	2.923	60.66
After exercise	3.062 <sup>a</sup>	0.739	1.811	3.281	59.16

a-a p>0.05

Cardiac troponin T values showed a slight post-exercise increase (2.818 vs. 3.062 pg/nm), suggesting transient myocardial stress associated with exercise, despite the absence of statistically significant differences ( $p > 0.05$ ).

Overall, the correlated analysis of electrocardiographic, hemodynamic, and biochemical parameters demonstrated the existence of significant individual variability regarding cardiovascular adaptation to exercise. Horses that exhibited rapid recovery of heart rate and normal electrocardiographic index values may be considered well adapted to physical exertion. In contrast, the persistence of tachycardia, increased ventricular systolic index (VSI) values, and systolic hypertension suggest limited adaptive capacity and a potential risk of cardiovascular overload.

**Conclusions**

The results highlight the importance of electrocardiography, blood pressure monitoring, and cardiac troponin T evaluation in assessing cardiovascular adaptation to exercise in Sport Horses. Post-exercise electrocardiographic and hemodynamic changes, together with slight increases in cardiac troponin T, suggested transient cardiovascular and myocardial stress associated with physical effort. Periodic cardiovascular monitoring may improve the evaluation and medical management of performance horses.

