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ПРИМИНЕНИЕ НОВОЙ СИСТЕМЫ НАЛОЖЕНИЯ ЭЛЕКТРОДОВ ЭКГ ПРИ СТЕП-ТЕСТЕ

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USE OF A NEW ELECTRODE APPLICATION SYSTEM FOR ECG RECORDING DURING A STEP TEST

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Резюме. В данной статье, сравнивается новая система наложения электродов ЭКГ (KORAL) с Холтером и стандартным методом 12 отведений на продолжительность сегментов, амплитуд волн и колебаний изоэлектрической линии, в покое и при степ-тесте.

Ключевые слова: система отведений КОРАЛ, ЭКГ, степ-тест, Холтер, альтернативное ЭКГ.

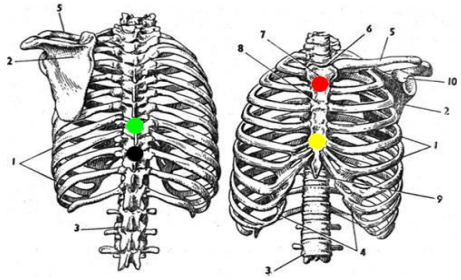
Resume. In this paper, a newly proposed ECG electrode placement system (KORAL) is compared with standard 12 lead and Holter lead system on the basis of the durations, amplitudes of segments and deviations of the isoelectric line at rest and during a step test.

Keywords: KORAL lead system, ECG, step test, Holter, alternative ECG.

Introduction. Depending on the nature and purpose of the study, various options for applying electrodes are used to record an electrocardiogram (ECG): according to Mason-Likar, according to Gupta et al., lead CM-5 according to Holter, and others, considering the anatomical features and functional conditions of a person. [1, 2]

Objective: to compare the quality of ECG recording at rest and when performing a step test using the KORAL lead system and the Holter lead CM-5.

Materials and methods. The study involved 10 students of the Belarusian State Medical University aged 21-28 years (Me = 23 years (Q_{25}=22; Q_{75}=23). Due to the refusal to complete testing for various reasons, ECG recordings were analyzed in four students. An ECG recording was performed at rest using a standard 12-axis lead system, the KORAL system (proposed by Associate Professor of the Department of Normal Physiology D.A. Alexandrov and Assistant E.M.O. Kornienko), and the lead CM-5 according to Holter.



Img. 1 – Scheme of CORAL electrode placement

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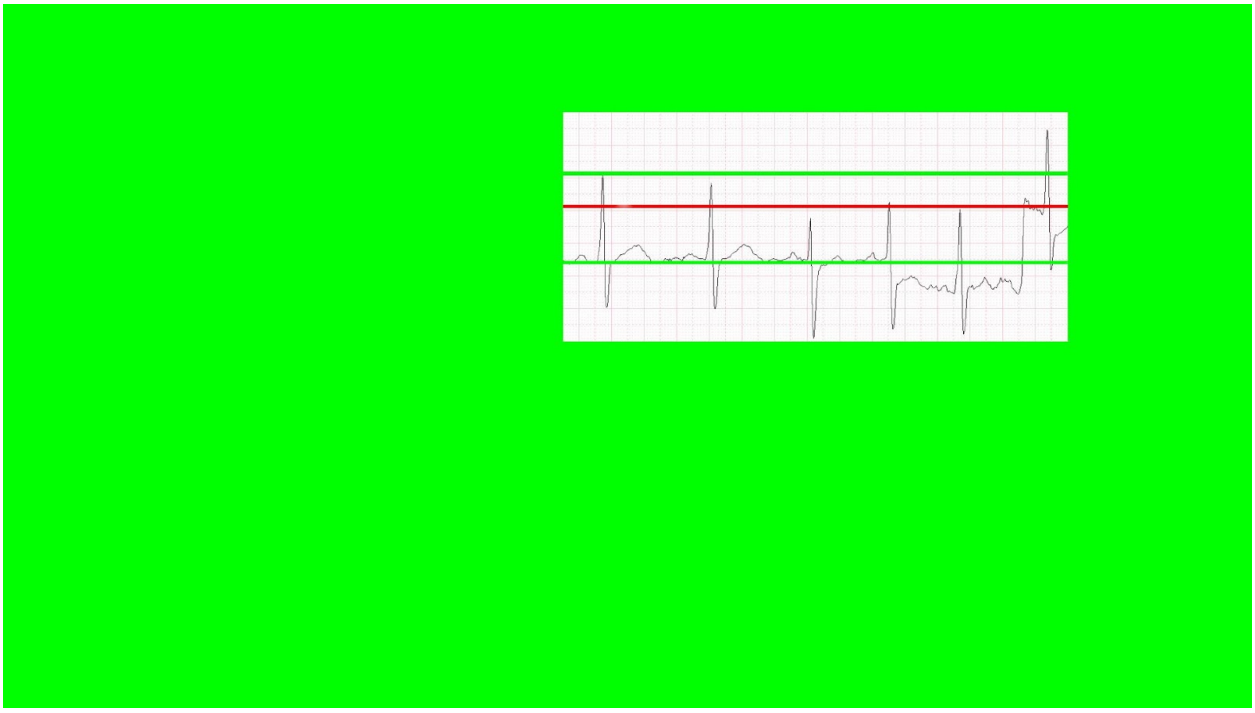
When performing the step test, a 5-minute recording was made of the lead CM-5 of Holter test and one of the leads of the KORAL system with the greatest amplitude of the R wave. The similarity of the morphology of ECG elements in different leads, their amplitude and time characteristics, as well as the quality of the recording obtained when performing a step test (drift of the isoelectric line, omissions or additional intersections of the ECG curve with a conditional line located at a height of 2/3 of the maximum amplitude of the R wave, the presence of other artifacts) were analyzed.



Img. 2 – Level of conditional line for R wave intersection measurement with its intersections shown on a sample of CM-5 recording

The obtained data were processed using variation statistics methods.

Results and their discussion. The average duration of the P, Q, R, S and T waves in the second standard ECG lead was 0.12, 0.04, 0.04, 0.04, 0.18 seconds, in the lead CM-5 according to Holter at rest 0.12, 0.02, 0.04, 0.04, 0.2 seconds, according to KORAL at rest 0.12, 0.04, 0.04, 0, 0.16 seconds, in the lead CM-5 according to Holter under load 0.12, 0.04, 0.08, 0.04, 0.36 seconds, and according to KORAL under load 0.08, 0.04, 0.12 seconds, respectively. The duration of the PQ, QRS, ST and RR segments in the second standard ECG lead were 0.2, 0.08, 0.32 and 0.8 seconds, in the lead CM-5 according to Holter at rest 0.16, 0.12, 0.32, 0.8 seconds, according to KORAL at rest 0.32, 0.08, 0.24, 0.64 seconds, in the lead CM-5 according to Holter under load 0.16, 0.2, 0.4, 0.9 seconds, and according to KORAL under load 0.24, 0.2, 0.36, 0.84 seconds, respectively. The number of additional intersections of the ECG curve with a conditional line located at a height of 2/3 of the maximum amplitude of the R wave at rest when recording a standard 12-axis ECG lead system was 0 cases, in the lead CM-5 according to Holter it was observed in 2 cases, according to the KORAL system at rest it was not observed. When performing a step test in the lead CM-5 according to Holter, the number of such intersections were 61 cases, while according to the KORAL system, when performing a test with physical activity, 7 such

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episodes were recorded. The number of downward deviations of the isoelectric line, in which the peak of the R wave did not reach the level of the conditional line located at a height of 2/3 of the maximum amplitude of the first R wave, when recording a standard 12-axis ECG lead system was 0 episode, in the lead CM-5 according to Holter at rest – 4 cases, according to KORAL – 3 cases. When performing a step test in the lead CM-5 according to Holter – 73 episodes and according to KORAL – 14 episodes were observed.

Conclusion. When performing a step test the use of the KORAL lead system allows for recording ECG waves of higher quality than when using the lead CM-5 according to Holter. However, further research is required to develop standards for the amplitude and time characteristics of ECG elements in the KORAL system.

Literature

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