Improving the Efficiency of Noninvasive Electrocardiography Screening System

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Problem: *standard ECS recording does not register lesion areas smaller than 30% of the left ventricular area and makes it difficult to diagnose the right ventricle and the posterior wall of the left ventricle (requires additional electrodes V4R, V8, V9).*

Purpose: *to increase the efficiency of a screening system for non-invasive electrocardiodiagnostics (NESS) based on registration of multiple leads of electrocardiac signal.*

Materials and methods: *The closest in functionality is the Holter virtual monitoring method. However, this method does not perform: registration of multiple leads of ECS; pre-processing of ECS; express-evaluation of criti-cal heart condition; modeling and visualization of HEA.*

Results: *To increase the efficiency of the NESS, it is necessary to eliminate the disadvantages of the known method of virtual Holter monitoring. The proposed screening system of noninvasive electrocardiodiagnostics has the following distinctive features:*

- *uses a large number of leads (in our case - 120) located on the entire surface of the chest;*
- *provides an opportunity to synchronize all ECS and present the data in the form of sequential (momentary), integral and isointegral maps of potential distribution;*
- *provides an opportunity to study multipole EEGS and more accurate estimation of local electrical activity of the heart muscle.*

For registration of multiple leads it is proposed to use a block, the scheme of which is shown in Fig. 1. Rapid assessment of the patient's heart condition is performed in conditions of free-motor activity of the patient according to the results of preliminary processing and analysis of the ECS according to the algorithm in Fig. 2.

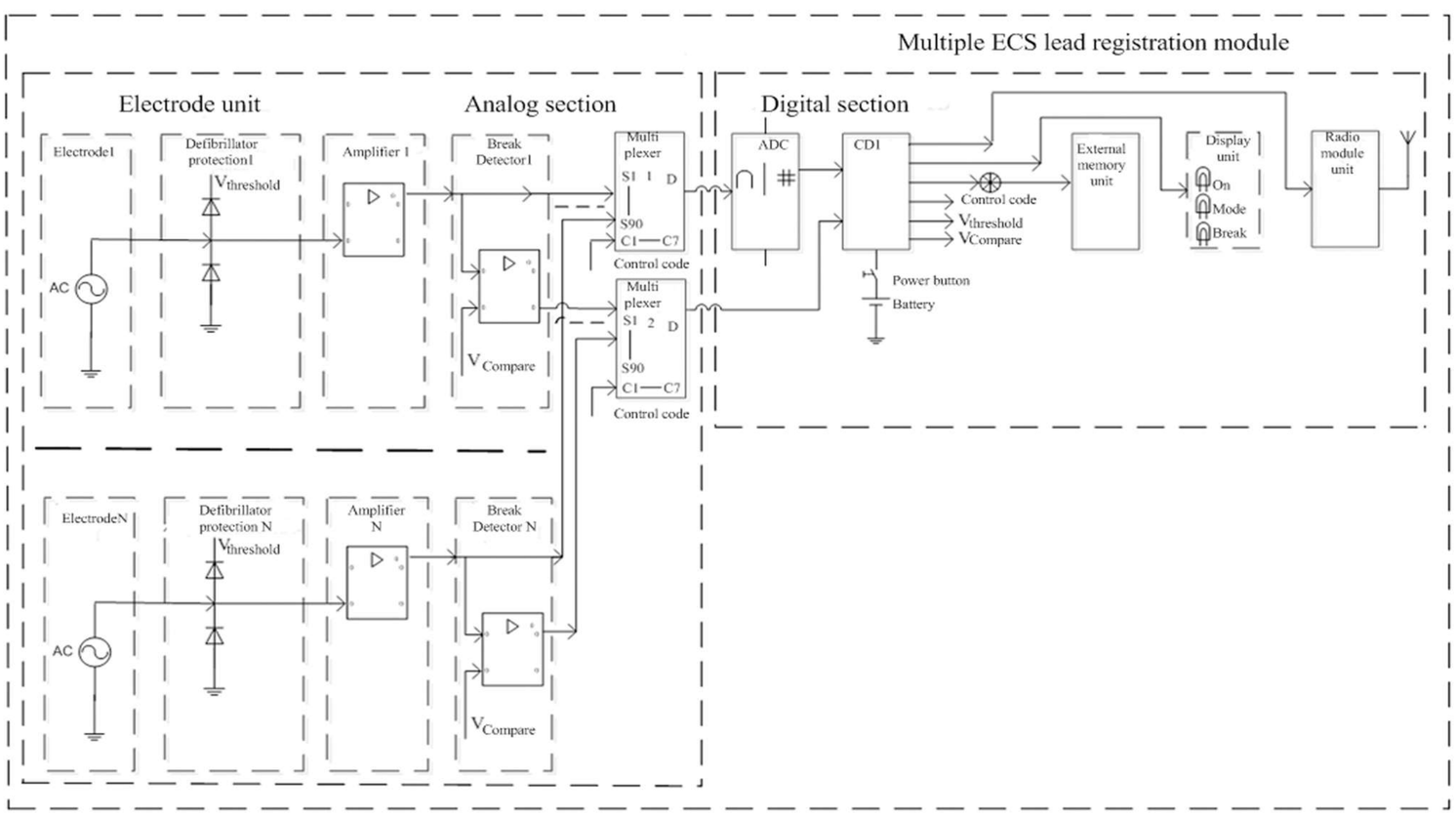

Fig. 1. Block diagram of the multiple lead registration unit

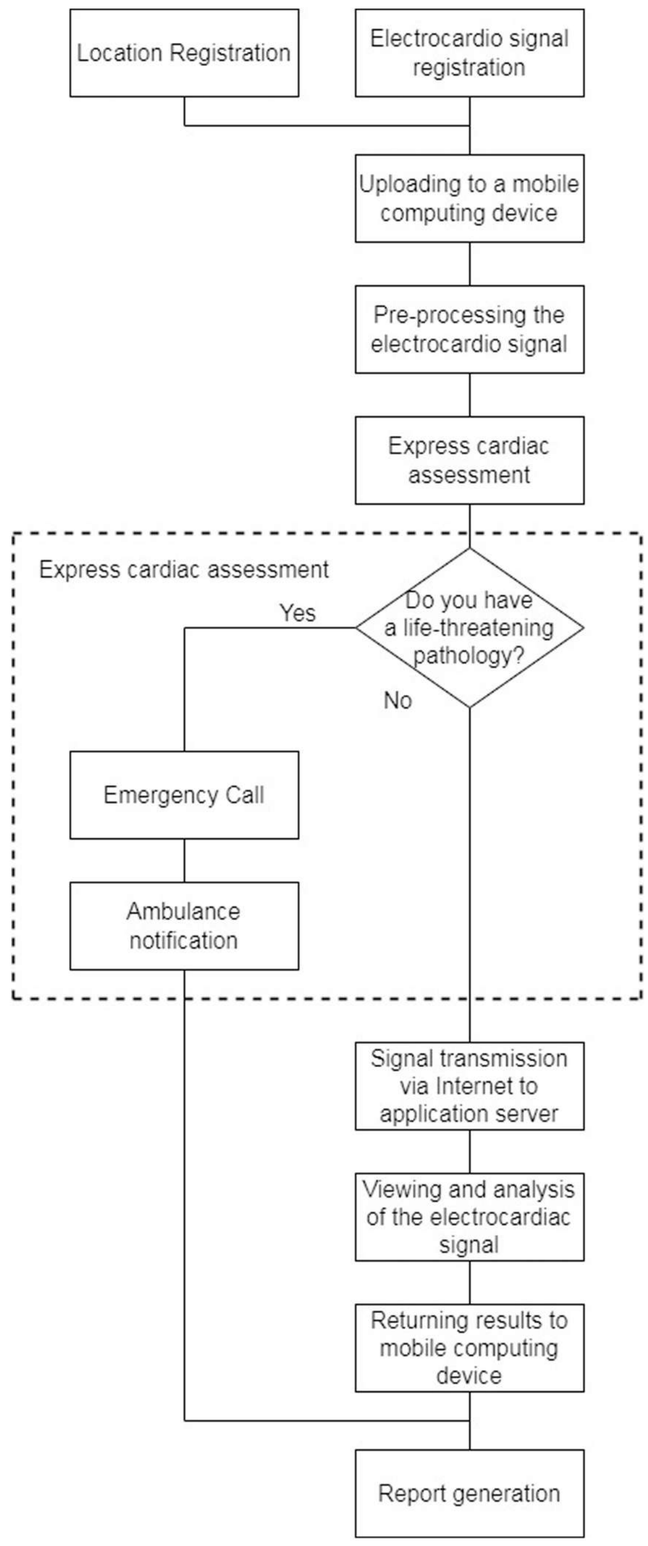

Fig. 2. A schematic diagram of the express cardiac assessment algorithm

Fig. 3. Stages of noninvasive determination of cardiac electrophysiological characteristics

The method of noninvasive determination of cardiac electrophysiological characteristics is based on tsubsequent display of cardiac electrophysiological characteristics according to the algorithm in Fig. 3. The spatial and temporal characteristics of both surface-type EEGH for diagnosing conduction disorders and dipole-type EEGH for diagnosing ischemia are presented within a single examination (the track is shown in Fig. 4).

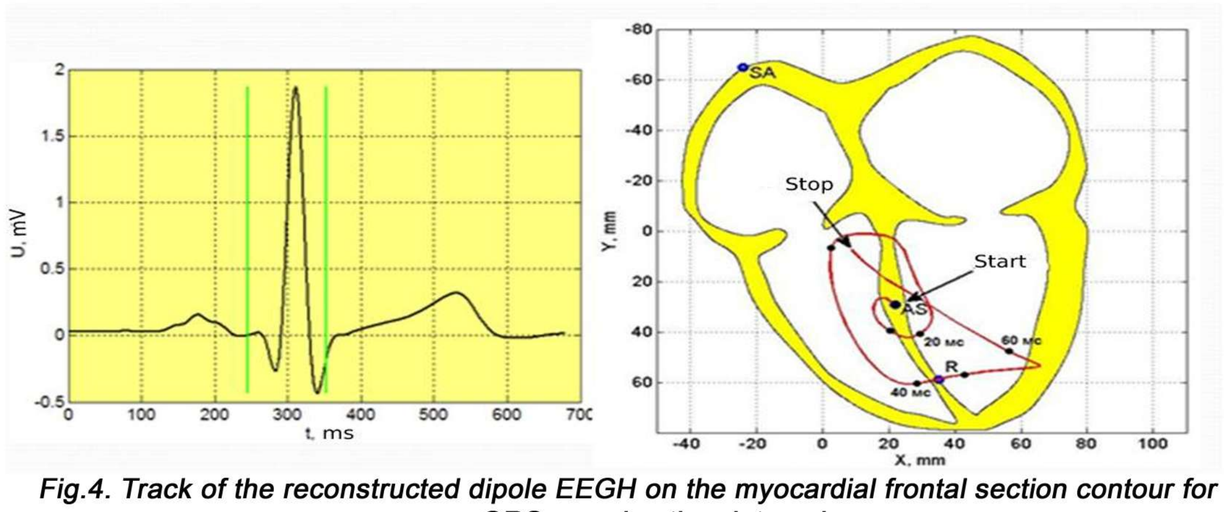

Fig.4. Track of the reconstructed dipole EEGH on the myocardial frontal section contour for the QRS complex time interval

Conclusion:*The use of NESS based on multiple lead registration, rapid assessment, modeling, and imaging of cardiac conditions increases the sensitivity of electrocardiological screening by at least 10%.*