УДК 612.172.4 - 616.127-005.8 - 616.127-002

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ELECTROCARDIOGRAPHIC MISTAKES BETWEEN MYOCARDIAL INFARCTION AND NON-CORONARY HEART DISEASE - OWN EXPERIENCE AND LITERATURE DATA
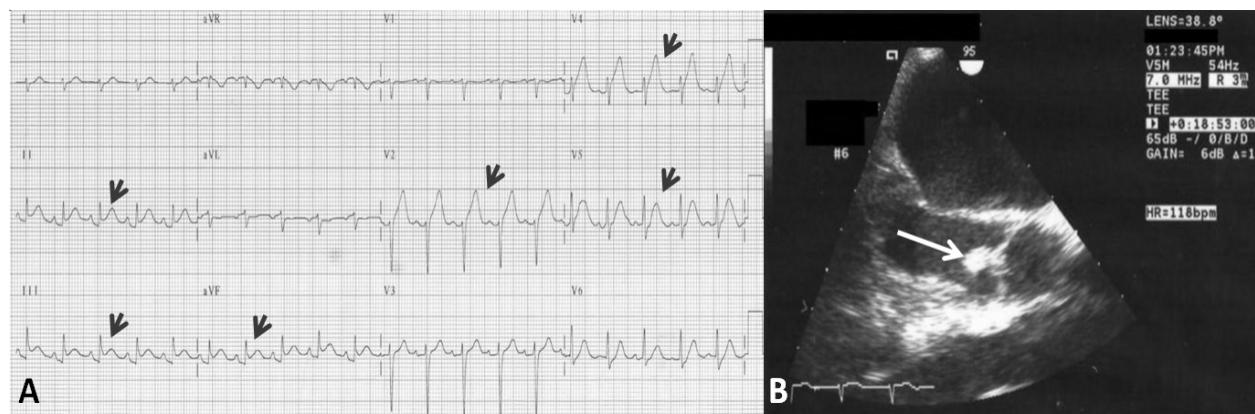
Key words: *non-coronary heart disease, myocarditis, myocardial infarction, electrocardiograms, differential diagnosis, coronary computed tomographic angiography.*

Abstract. *The mistakes of electrocardiograms (ECG) at myocardial infarction andnon-coronary heart disease in the differential diagnosis is based on clinical examinations (ECG, echocardiography, markers of inflammation (C-reactive protein), cardiac enzyme tests, coronary computed tomographic angiography (CCTA), cardiac magnetic resonance imaging or invasive coronary angiography. The CCTA can confirm diagnosis of the myocarditis notthe myocardial infarction in our study.*

When in 1920th Harold Pardee said about changes of electrocardiogram (ECG) in case of myocardial infarction (MI) he did not know that in future Ukrainian doctors will speak about "Pardee arc" or in English language world about "R.I.P."(as a "tombstone" for this change).

What now we know about ECG mistake of different change of ECG in MI or other variants of ECG changes? The first mistake in ECG diagnostics of MI is avatar of pseudo ischemic transformation of ECG in non-coronary heart disease groupwith an inflammatory genesis (pericarditis, myocarditis, endocarditis etc). Interest but in final ESC guidelineswe founded no mention about of the role of the ECG in the diagnosis of this disease [3]. Investigator V.Dimov at Cleveland Clinic [2] demonstrated changes of ECG similar to MI but this case was registered at endocarditis in a heroin abuser (pict. 1). But in this case author demonstrated the typical changes at ultrasound study - echocardiography (EchoCG) of the heart with a large vegetation on the aortic valve (pict. 1).

Pict. 1. (A) ECG-changes and (B) ultrasound changes at endocarditis in a heroin abuser (arrows shown in the images changes of ECG similar to MI in leads II, III, aVF, V2-5 and a large vegetation on the aortic valve) [2])

What is the ECG mistake at MI and non-coronary heart disease?

So the one of them is pericarditis. We know that at pericarditis on an ECG following changes (pict. 2,3) are present.

What is characteristics of ECG changes in pericarditis (pict. 3)?

1.Concave-up ST-segment elevations similar to MI but not connect with coronary artery ECG-projections in system of related leads.

2.Depression of PR-interval in this leads with elevations of ST-segment.

3.ST-segment and PR-interval returns to baseline and next T-wave inversion in the treatment of pericarditis;
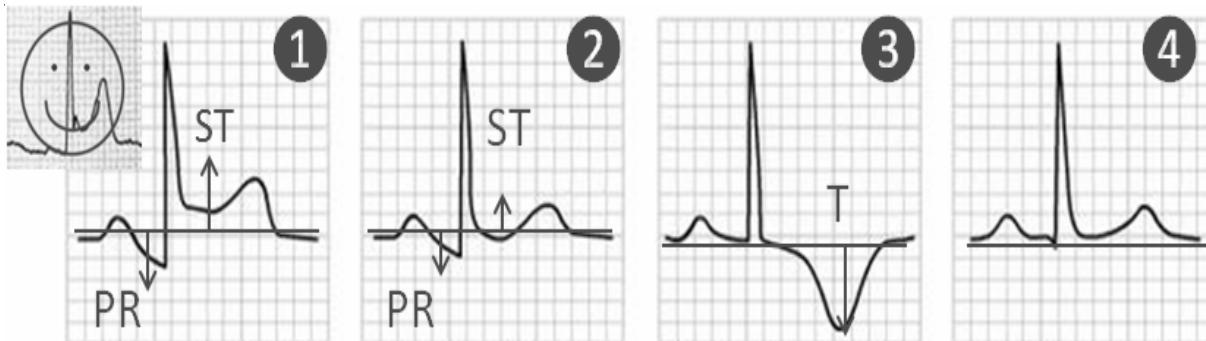
4.Normalizes of ECG in case of successful treatment.

Other non-coronary heart disease and ECG changes similar to MI -of course myocarditis!
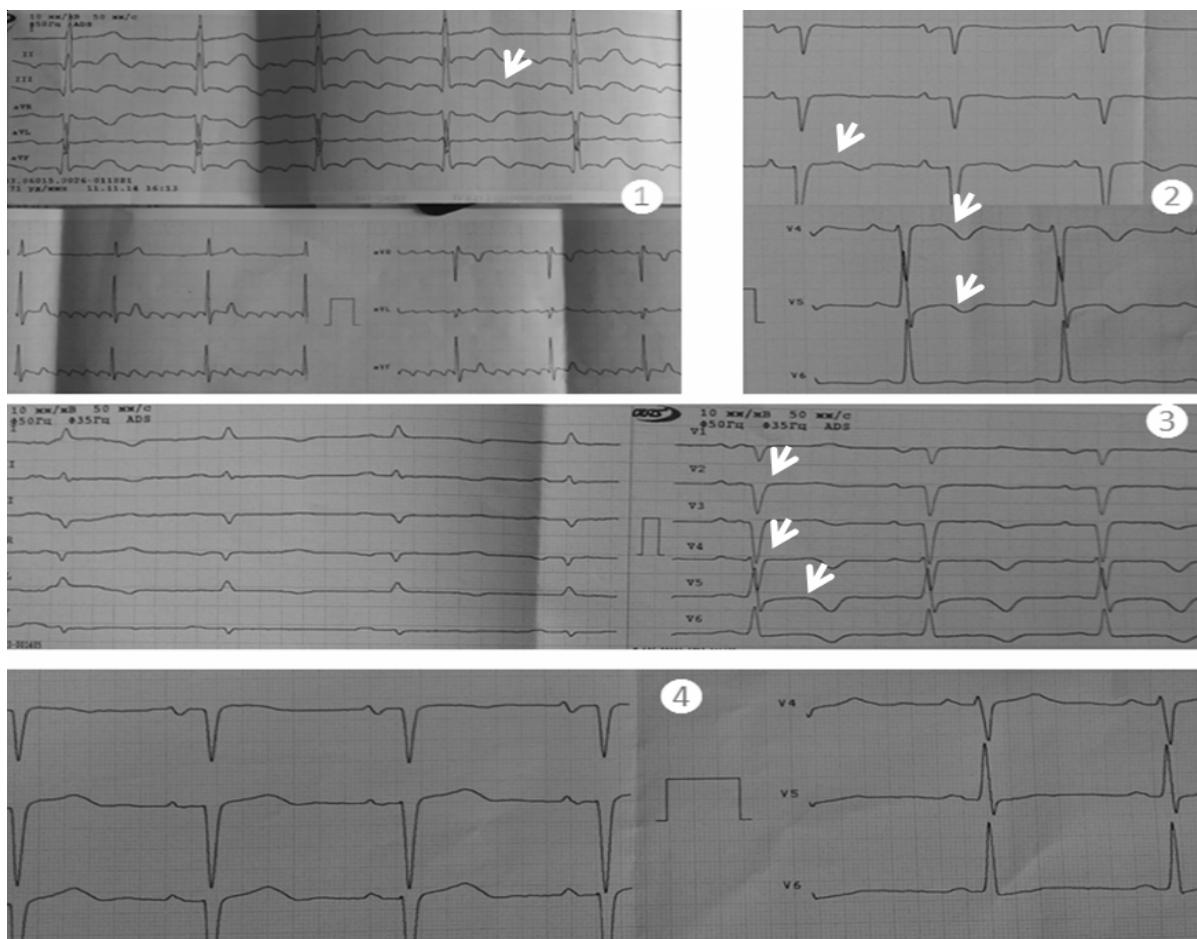
At the picture 4 we present case of our patients:men, 29 years old, with cardialgia,moderate signs of inflammation in history, negative troponin test, a moderate increase in markers of inflammation (C-reactive protein, CRP, 32,0 g/L), pseudo-coronary ECG changes(atrial fibrillation, reduction in the growth of R wave in the leads V1-V4,negative T

Pict. 2. The ECG-changes at pericarditis (similar to MI in leads I, II, aVL, V2-5)

Pict. 3. Dynamics of the ECG-changes at pericarditis

Pict. 4. Dynamics of the ECG-changes at myocarditis of our patients (1 - entrance, 2,3 - before and after 3-rd day, 4 - leave hospital)
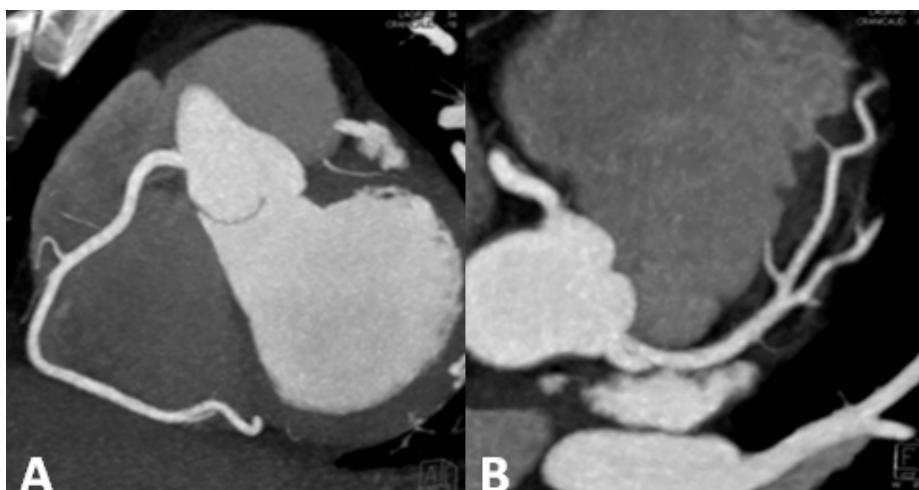
wave in the leads V3-V5 principally, as it shown at the picture 4), by EchoCG dimension of ejection fraction (EF = 35%) with global hypokinesis, and no signs of atherosclerotic lesions by the coronary computed tomographic angiography (CCTA).

In our opinion, the best conclusions are:

1. young patients with chest pain,

2. without elevated of the myocardial enzymes,

3. with ECG changes similar to coronary artery disease

4. without coronary plaques byCCTA(pict. 5),

so myocarditis can be the leading diagnosis.

The results from the prospective multicenter ACCURACY (Assessment by Coronary Computed Tomographic Angiography of Individuals Undergoing Invasive Coronary Angiography) trialof chest pain patients without known coronary artery disease (CAD), 64-multidetector row CCTA possesses high diagnostic accuracy for detection of obstructive coronary stenosis. Importantly the 99% negative predictive value at the patient and vessel level establishes CCTA as an effective noninvasive alternative to

Pict. 5. The coronary computed tomographic angiography of a 29 year old male who complained of chest pain (image of the right coronary artery (A) and the left coronary artery (B)). The study was normal giving a high degree of confidence that coronary artery disease was not present

invasive coronary angiography to rule out obstructive coronary artery stenosis [1].

In article "Focal Myocarditis Mimicking Acute ST-Elevation Myocardial Infarction" J.M. Testani et al. (2006) [5] said about similar case (22-year-old woman with no relevant medical history presented, with severe, substernal, crushing chest pain of 45 minutes' duration; in recurrent chest pain up to 8-mm ST elevation is seen in leads V1 through V3(pict. 6); results of initial cardiac enzyme tests revealed a troponin I of 29,5 ng/mL (normal<0,4 ng/mL), creatine kinase (CK) of 272 U/L (normal 20-150 U/L) and CK-MB isoenzyme fraction of 32,8 ng/mL (normal<5,0 ng/mL);EF of 45% and disproportionate septal hypokinesis; hypokinesis of the basal septum by cardiac magnetic resonance imaging (MRI); with the ST segments had normalized on ECG by the 4th day of hospitalization and left coronary angiogram in a right anterior oblique-caudal projection shows no significant coronary artery disease. Conclusion by opinion of authors in patients who have chest pain with elevated myocardial enzymes and the absence of coronary artery disease, myocarditis is often the leading diagnosis.

Or in the article of S.Rijal and J.L. Cavalcante (2015) [4] says about 25-year-old male, with new onset severe retrosternal chest pain, lateral ST-segment elevations in leads I and AVL with inferior ST-segment depression (pict. 7, panel A);quickly rising of troponin I to >200 ng/mL within first 8 h with episodes of non-sustained ventricular tachycardia; Cardiac MRI (CMR) study revealed moderately reduced systolic function (EF = 42%) with regional wall motion abnormalities and diffuse circumferential increased T2-signal in the midwall and epicardial regions corresponding to the areas of acute oedema/inflammation seen on pre-contrast T2 mapping (B); Late gadolinium-enhancement (LGE) images revealed similar circumferential midwall and epicardial ring enhancement suggesting acute myocarditis with substantial myocardial necrosis (C); a 30-day follow-up CMR study demonstrated less prominent circumferential LGE suggesting remarkable transformation of necrosis to fibrosis (D), as it shown at the picture 7, but in urine toxicology screen was positive for cocaine and marijuana.

The differential diagnosis between acute MI or CAD and non-coronary heart disease group is based on clinical exams and imaging(ECG, EchoCG, CRP, cardiac enzyme tests - CK and CK-MB, troponin test, CCTA, CMR with gadolinium, invasive coronary angiography etc) [1-5], but only a CCTA can

confirm diagnosis in our study.

Conclusion

The coronary computed tomographic angiograpyis a noninvasive method to image the coronary arteries and the most effective way to detect early coronary calcification from atherosclerosis or detectnon-coronary heart disease group.

Prospects for further research

Optimization of diagnostics between myocardial infarction and non-coronary heart disease will be associated with the creation of computer programs of quantitative assessment of ECG.

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ЕЛЕКТРОКАРДІОГРАФІЧНІ ПОМИЛКИ МІЖ ІНФАРКТОМ МІОКАРДА І НЕ-КОРОНАРНИМИ ЗАХВОРЮВАННЯМИ СЕРЦЯ- ВЛАСНИЙ ДОСВІД І ЛІТЕРАТУРНІ ДАНІ

В.К.Тащук

Резюме. Помилки електрокардіограми (ЕКГ) при інфаркті міокарда і не-коронарних захворюваннях серця в диференційній діагностиці грунтується на клінічних дослідженнях (ЕКГ, ехокардіографія, маркери запалення (С-реактивний білок), міокардіальних ензимах пошкодження, комп'ютерної томографії коронарних артерій (КТКА), кардіальної магнітно-резонансної томографії або інвазивної коронарографії. КТКА може підтвердити діагноз міокардиту в розділі з інфарктом міокарда в нашому дослідженні.

Ключові слова: не-коронарні захворювання серця, міокардит, інфаркт міокарда, електрокардіограма, диференційна діагностика, комп'ютерна томографія коронарних артерій.

ЭЛЕКТРОКАРДИОГРАФИЧЕСКИЕ ОШИБКИ МЕЖДУ ИНФАРКТОМ МИОКАРДА ИНЕ-КОРОНАРНЫМИ ЗАБОЛЕВАНИЯМИ СЕРДЦА - СОБСТВЕННЫЙ ОПЫТ И ЛИТЕРАТУРНЫЕ ДАННЫЕ

В.К.Тащук

Резюме. Ошибки электрокардиограммы (ЭКГ) при инфаркте миокарда и не-коронарными заболеваниями сердца в дифференциальной диагностике основывается на клинических исследованиях (ЭКГ, эхокардиография, маркеры воспаления (С-реактивный белок), миокардиальных энзимах повреждения, компьютерной томографии коронарных артерий (КТКА), кардиальной магнитно-резонансной томографии или инвазивной коронарографии. КТКА может подтвердить диагноз миокардита в разделе с инфарктом миокарда в нашем исследовании.

Ключевые слова: не-коронарные заболевания сердца, миокардит, инфаркт миокарда, электрокардиограмма, дифференциальная диагностика, коронарная КТ-ангиография.

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