Influence of gallbladder condition on parameters of electrocardiography, echocardiography and coronaroangiography

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Key words: cholecystocardial syndrome, ischemic heart disease, electrocardiography, echocardiography, coronaroangiography

Introduction. The fact that gallbladder (GB) disorders are accompanied by heart changes (cholecystocardial syndrome) is established long ago, but precise criteria of this syndrome are still not set, including criteria according to results of main investigation methods in cardiology, namely, electrocardiography (ECG), echocardiography (EchoCG) and coronaroangiography (CAG). Inversion or voltage decrease of T wave, depression of ST interval or its elevation in case of coronary heart disease, elongation of P wave, atrioventricular conduction impairment, elongation of ST interval or its pseudocoronary changes, isolated right bundle branch block or both bundle branches block and so on are described as displays of cholecystocardial syndrome [4, 3, 6]. Talking about EchoCG and CAG, literature data is very scarce: we found only an investigation of EchoCG role in prognosis of outcomes of GB surgery [1] and a description of right coronary artery diameter correlation with GB width [5]. These facts determined relevance of our investigation.

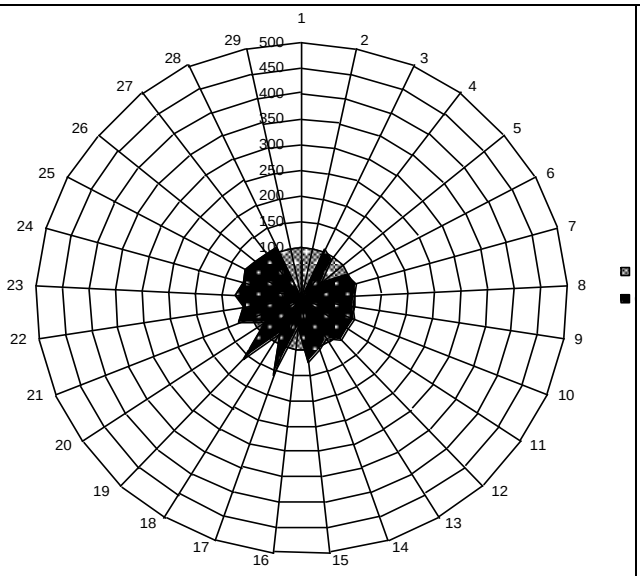
The aim of this paper was to establish typical changes of ECG, EchoCG and CAG in dependence of GB condition in patients with ischemic heart disease (IHD).

Materials and methods. We analyzed data of 98 patients with clinically and instrumentally verified diagnosis of IHD (40% - acute myocardial infarction, 60% - angina pectoris), 79% males and 21% females, mean age 61.7±1.6 years. Patients were divided into groups in dependence of GB condition, defined by ultrasound (intact GB, n=29; sludge and cholesterosis, n=13; bent GB body, n=13; GB neck deformations and cholecystitis, n=27; cholelithiasis, n=11; cholecystectomy in anamnesis, n=5). Diagnostics and treatment were held according to Ministry of Health Orders №436 issued 3.07.2006 and №816 issued 23.11.2011 (About approval of protocols of medical aid in “Cardiology” field; namely “Ischemic heart diasease:

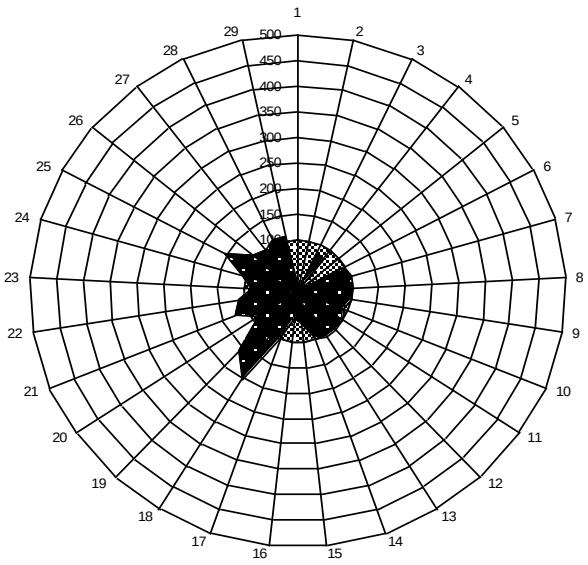
stable angina pectoris" protocol). ECG at rest, EchoCG and CAG were held according to standard methodical rules. ECG analysis included heart rate, detection of rhythms and conductivity disorders, scar changes, signs of left ventricle hypertrophy, ST interval depression; EchoCG – structural parameters of right and left ventricles (RV, LV), left atrium (LA) and aorta, thicknesses of interventricular septum and posterior wall of LV (IVS, PWLV), ejection fraction, frequency of detection of hypo- and akinetic zones, valve changes; coronaroangiography – frequency and grades of stenosis of main coronary arteries: left (LCA), anterior interventricular branch (AIVB), circumflex coronary artery (CFCA) and right (RCA), frequency of mono- and polyarterial disorders and different types of blood supply (balanced, left, right). Digital data was analyzed with the help of software package Statistica 6.0 (StatSoft, Russia); all parameters were compared to values of intact GB group, which were taken as 100%. Results were considered significant if $p<0.05$.

Results and discussion. Investigation groups did not differ by age, concomitant diseases, duration and quality of inpatient treatment, but, in contrast to other groups, among patients with cholelithiasis and past cholecystectomy there were significantly more women (40.0% an 60.0% respectively).

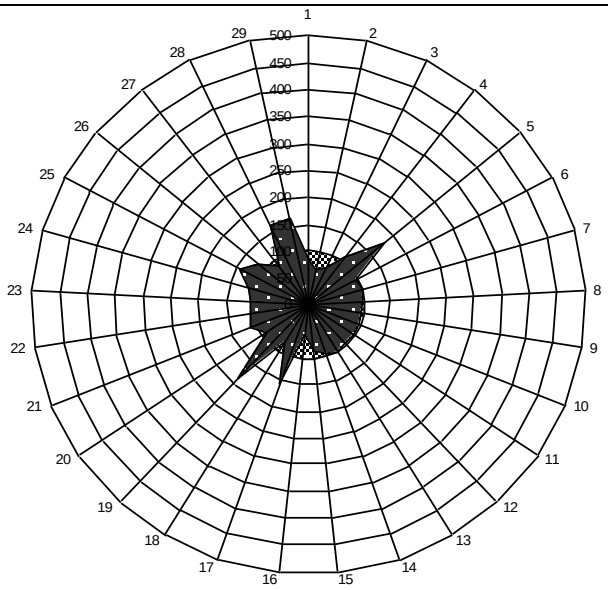
It was established that some parameters of instrumental heart diagnostics were dependent of GB condition, whereas other were almost similar in patients with different GB disorders and intact GB (pic. 1). Results of comparative analysis of ECG are demonstrated on axis 1-6, EchoCG – 7-15, CAG – 16-29.



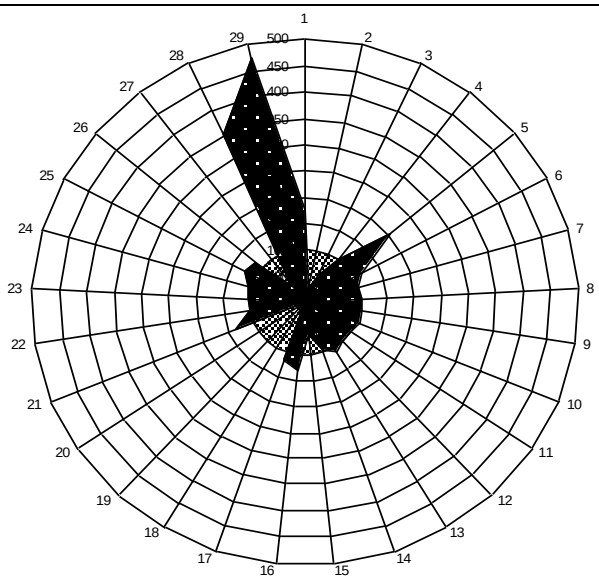
A



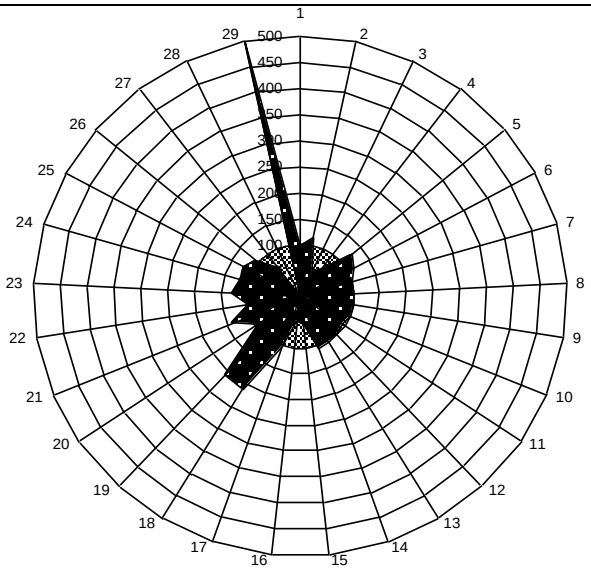
B



C



D



E

1-frequency of rhythm disorders, %
2-frequency of conductivity disorders, %
3-frequency of scar tissue detection, %
4-frequency of left ventricle hypertrophy, %
5-frequency of ST depression detection, %
6-heart rate, bpm
7-right ventricle, cm
8-left atrium, cm
9-aorta, cm
10-interventricular septum, cm
11-posterior wall of left ventricle, cm
12-left ventricle, cm
13-ejection fraction, %
14-Tass, m/s
15-frequency of hypokinetic zones, %
16- frequency of one CA stenosis, %
17- frequency of two CA stenosis, %
18- frequency of three CA stenosis, %
19- frequency of LCA stenosis, %
20-grade of LCA stenosis, %
21- frequency of AIVB stenosis, %
22-grade of AIVB stenosis, %
23- frequency of CFCA stenosis, %
24-grade of CFCA stenosis, %
25- frequency of RCA stenosis, %
26-grade of RCA stenosis, %
27- frequency of balanced blood supply type, %
28- frequency of left blood supply type, %
29- frequency of right blood supply type, %

A - sludge
B – bent GB body
C – GB neck deformations
D – cholelithiasis
E – past cholecystectomy

Fig. 1. Influence of GB condition of ECG, EchoCG and CAG characteristics of patients with verified IHD (parameters of intact GB group are considered as 100%)

As it is visible in the picture, the most pronounced differences can be seen in hystograms of groups with cholelithiasis and cholecystectomy in anamnesis (pic.1, D, E), which were alike. These groups were characterized by significant increase of frequency of right blood supply type and more often stenosis of all main branches of coronary arteries, especially AIVB and RCA. There also was similarity between hystograms of groups with sludge and bent GB body (pic. 1, A, B). These patients mostly differed from intact GB group by different frequencies of detection of rhythm and conductivity disorders, ST interval depressions, zones of hypokinesia, mono- and multivascular affection of coronary arteries, especially, RCA. Group with GB neck deformations, which usually are a result of cholecyctitis and complicate gall passage, was similar to cholelithiasis group according ECG- and EchoCG-characteristics (pic.1, C, D), whereas according to CAG changes it was alike sludge and cholesterosis group (pic.1, C, B). GB condition almost did not have any influence on absolute values of structural heart parameters (sizes of RV, LV, LA, aorta, IVS, PWLV), ejection fraction and heart rate. In general, in patients with different GB condition main changes of structural and functional condition of heart and coronary vessels included ECG-characteristics (frequencies of rhythm and conductivity disorders, ST interval depressions and signs of LV hypertrophy), EchoCG-characteristics (frequency of detection of myocardial hypokinesias) and changes on CAG (frequency of different blood supply types, quantitative and qualitative characteristics of main CA affection), which means that GB condition mainly influences electrophysiological heart parameters and vessel condition.

Such heart changes can be explained by some mechanisms. The main of them is reflex influence of afferent pathological impulsation [3, 2], namely, visceral organ cross-sensitization, which is realized through viscero-visceral somatic convergent neurons [7, 2].

Conclusions. 1. In patients with different GB condition main changes of structural and functional condition of heart and coronary vessels included mainly

different frequencies of rhythm and conductivity disorders, ST interval depressions and signs of LV hypertrophy, detection of myocardial hypokinesias, different blood supply types, and also quantitative and qualitative characteristics of main CA affection. 2. Heart changes were alike in patients with cholelithiasis and past cholecystectomy, and also in patients with sludge and bent GB body. 3. GB condition almost did not have any influence on structural heart parameters, revealed by EchoCG, ejection fraction and heart rate.

References

1. Значение эхокардиографии в прогнозе исхода операций при холецистите у пожилых людей / Б. К.Панфилов, А. А.Шелепин, Н. В.Степанов [и др.] // Хирургия. — 2002. — №3. — С. 11–13.
2. Brumovsky P. R. Visceral organ cross-sensitization — an integrated perspective / P. R. Brumovsky, G. F. Gebhart // Auton Neurosci. — 2010. — Vol. 153, №1–2. — P. 106–109.
3. Demarchi M. S. Electrocardiographic Changes and False-Positive Troponin I in a Patient with Acute Cholecystitis / M. S. Demarchi, L. Regusci, F. Fasolini // Case Re. Gastroenterol. — 2012. — Vol. 6, No 2. — P. 410–414.
4. Krasna M. J. Electrocardiographic changes in cardiac patients with acute gallbladder disease / M. J. Krasna, L. Flancbaum // Am. Surg . — 1986. — Vol. 52, No 10. — P. 541–543.
5. Relationship between gallbladder distension and lipid profiles in Kawasaki disease / K.-W. Kim, H. Y. Kim, J.-K. Chun [et al.] // Korean Circ. J. — 2010. — Vol. 40. — P. 137–140.
6. Right Bundle Branch Block and Coved-Type ST-Segment Elevation Mimicked by Acute Cholecystitis / M. Furuhashi, K. Uno, Sh. Satoh [et al.] // Circ. J. — 2003. — Vol. 67. — P. 802–804.
7. Viscero-visceral hyperalgesia: characterization in different clinical models / M. A. Giamberardino, R. Costantini, G. Affaitati [et al.] // Pain. — 2010. — Vol. 151, No 2. — P. 307–322.

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Precise criteria of cholecystocardial syndrome according to results of electrocardiography (ECG), echocardiography (EchoCG) and coronaroangiography (CAG) are not established yet. That's why the aim of our paper was to identify typical changes in ECG, EchoCG and CAG in dependence of gallbladder (GB) condition. We analyzed data of 98 patients with clinically and instrumentally verified diagnosis of ischemic heart disease (40% — acute myocardial infarction, 60% — angina pectoris), 79% males and 21% females, mean age 61,7±1,6 years. Patients were divided into groups according to GB condition, assessed by ultrasound (intact GB, n=29; sludge and cholesterosis, n=13; bent GB body, n=13; GB neck deformations and cholecystitis, n=27; cholelithiasis, n=11; past cholecystectomy, n=5). All parameters were compared to values of intact GB group, which were taken as 100%. It was established that histograms of structural and functional condition of heart were dependant of GB disorder. In patients with different GB conditions main changes of heart and coronary vessels were mainly related to the frequencies of rhythm and conductivity disorders, ST interval depressions, signs of left ventricle hypertrophy, hypokinetic zones detection, different types of blood supply, qualitative and quantitative characteristics of main coronary arteries abnormalities. Heart changes were alike in patients with cholelithiasis and past cholecystectomy, and in patients with sludge and bent GB body. Heart rate, EchoCG parameters of heart structure and ejection fraction were almost not dependant of GB condition.