Laboratory and instrumental parameters of patients with ischemic heart disease in dependence of gallbladder condition: correlational analysis

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The correlations of right coronary artery (RCA) diameter with gallbladder (GB) width and GB distension with the development of coronary arteries anomalies have already been described. Accordingly, the GB disorders are accompanied by structural and functional heart changes, but its exact criteria have not yet been established. Therefore, the substantiation of the prognostic role of GB distension as a risk factor for the coronary arteries anomalies development determined the usefulness of our study.

The aim of this study was to establish correlations of GB condition with clinical, laboratory and instrumental parameters in patients with ischemic heart disease (IHD).

Materials and methods. We analyzed 35 clinical, laboratory and instrumental parameters of 98 patients with verified IHD (40 % – acute myocardial infarction, 60 % – unstable angina pectoris; 79 % males and 21 % females; mean age – 61.7 ± 1.6 years). These patients were divided into groups depending on GB condition (intact GB, n = 29; sludge and cholesterosis, n = 13; bend GB body, n = 13; GB neck deformations and cholecytitis, n = 27; cholecystitis, n = 11; cholecystectomy in anamnesis, n = 5). Obtained data were analyzed with the help of correlation analysis (correlations of quantitative parameters – by Pearson’s method and correlations of qualitative parameters – by Spearman’s method).

We took into account only significant correlations (P < 0.05). Ranking of GB condition was held on the background of GB disorders’ pathogenesis: changes usually start from sludge and cholesterosis, which in case of various GB deformations together with bile flow difficulties and impaired GB motility lead to cholecystitis. Complications of cholecystitis can lead to cholecystectomy, which was rated the worst GB condition.

Results. The GB condition significantly correlated with RCA affection grade, alanine aminotransferase (ALT) activity and prothrombin time; worsening of GB condition was accompanied by increase of RCA stenosis grade on the background of decrease in prothrombin time (which shows tendency to hypercoagulability and thrombi formation) and absence of hepatocytes cytolysis. Correlations of RCA stenosis grade depended on GB conditions including metabolic, inflammatory and haemostatic parameters, size and blood supply of left atrium. Prothrombin time increasing was associated with left ventricle hypertrophy, hyperkaliemia, diastolic dysfunction and higher grade of RCA affection. ALT activity was proportional to ejection fraction together with general fibrogen in case of GB sludge and to fasting glucose level in case of bent GB body.

Conclusions. Established reliable correlations of both type and degree of GB damage with RCA stenosis grade and other clinical, laboratory and instrumental parameters (prothrombin time, fibrinogen and ALT levels, hypertrophy and diastolic dysfunction of the left ventricle etc.) are associated with a tendency to hypercoagulability and thrombi formation, hyperkaliemia, and define both morphological and functional interrelations of GB disorders with coronary arteries anomalies. Thus, monitoring of these parameters has a significant prognostic value in the clinical practice and must influence the choice of appropriate therapeutic tactics.
Introduction
The fact that gallbladder (GB) disorders are accompanied by structural and functional heart changes (namely, cholecystocardiologic syndrome) has been known since long ago, but its exact criteria have not yet been established. Literature data on this topic are also scarce [1]. There is a description of right coronary artery (RCA) diameter correlation with GB width [2] and biliary tracts condition [3]. Some authors state that GB distension has a prognostic role in development of right coronary artery (RCA) diameter correlation with GB width [2] and biliary tracts condition [3]. Some authors state that GB distension has a prognostic role in development of right coronary artery (RCA) diameter correlation with GB width [2] and biliary tracts condition [3]. Some authors state that GB distension has a prognostic role in development of right coronary artery (RCA) diameter correlation with GB width [2] and biliary tracts condition [3]. Some authors state that GB distension has a prognostic role in development of right coronary artery (RCA) diameter correlation with GB width [2] and biliary tracts condition [3]. Some authors state that GB distension has a prognostic role in development of right coronary artery (RCA) diameter correlation with GB width [2] and biliary tracts condition [3]. Some authors state that GB distension has a prognostic role in development of right coronary artery (RCA) diameter correlation with GB width [2] and biliary tracts condition [3]. Some authors state that GB distension has a prognostic role in development of right coronary artery (RCA) diameter correlation with GB width [2] and biliary tracts condition [3]. Some authors state that GB distension has a prognostic role in development of right coronary artery (RCA) diameter correlation with GB width [2] and biliary tracts condition [3]. Some authors state that GB distension has a prognostic role in development of right coronary artery (RCA) diameter correlation with GB width [2] and biliary tracts condition [3]. Some authors state that GB distension has a prognostic role in development of right coronary artery (RCA) diameter correlation with GB width [2] and biliary tracts condition [3].

Our aim was to establish correlations of GB condition with clinical, laboratory and instrumental parameters in patients with verified ischemic heart disease (IHD).

Materials and methods
We analyzed 98 patients preoperational examination results with clinically and instrumentally (including coronarography) verified diagnosis of IHD, who were planned to undergo coronary artery bypass graft surgery (CBG) (40 % – acute myocardial infarction, 60 % – unstable angina pectoris; 79 % males and 21 % females; mean age 61.7 ± 1.6 years). These patients were divided into groups depending on GB condition (intact GB, n = 29; sludge and cholesterol, 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 Decrees №436 dated by 03.07.2006 and №816 dated by 23.11.2011 using standard methods. Digital data was processed with the help of Statistica 6.0 software (Statsoft, USA). Correlation analysis of 35 clinical, laboratory and instrumental parameters was carried out with the help of Pearson’s method (quantitative parameters) and Spearman’s method (qualitative parameters). We took into account only significant correlations (P < 0.05). Ranking of GB condition was held on the background of GB disorders’ pathogenesis: changes usually start from sludge and cholesterolosis, which in case of GB body and neck deformations together with bile flow difficulties and impaired GB motility lead to cholelithiasis. Complications of cholelithiasis can lead to cholecystectomy, which was rated as the worst GB condition.
Results and discussion

According to carried out correlation analysis, GB condition directly correlated with RCA stenosis grade (r = 0.27, P < 0.05), inversely — with alanine aminotransferase (ALT) activity (r = -0.29, P < 0.05) and prothrombin time (r = -0.26, P < 0.05). Direct association of GB condition with RCA stenosis grade not just proves previously described correlation between RCA and GB width [2,3], but also shows that this correlation is both morphological and functional. This fact is crucial for clinical usage, because it means that GB disorders progression is parallel to RCA occlusion grade.

Taking into account the importance of this finding, we separately analyzed significant correlations of RCA stenosis grade in case of different GB condition: intact, sludge and cholesterolosis, bent GB body, GB neck deformations and cholecystitis, cholelithiasis, cholecystectomy in anamnesis. It has been established in patients with intact GB RCA affection grade was directly proportional to affection of circumflex coronary artery (r = 0.63, P < 0.05), whose atrial and ventricular branches provide blood supply of 20 % of myocardium; left atrium size (r = 0.59, P < 0.05), increase of which is a sign of diastolic dysfunction; and hematocrit (r = 0.84, P < 0.05). The last correlation indicates that blood viscosity increasing goes parallel to RCA stenosis. In case of sludge and GB cholesterolosis RCA stenosis grade correlated only with urea concentration (r = -0.79, P < 0.05). In patients with bent GB body RCA affection did not correlate to any studied parameters. In contrast to that, in group with GB neck deformations, which can be considered signs of chronic cholecystitis in the past, RCA stenosis grade significantly associated with coagulation and inflammation parameters — prothrombin index (r = 0.44, P < 0.05) and general fibrinogen level (r = -0.42, P < 0.05). In case of GB cholelithiasis grade of RCA stenosis was inversely proportional to β-lipoproteids level (r = -0.73, P < 0.05) and serum urea concentration (r = -0.62, P < 0.05). In patients with GB removed because of cholelithiasis RCA affection grade directly correlated to general cholesterol level (r = 0.96, P < 0.05) and inversely — to prothrombin time (r = -0.98, P < 0.05) and hematocrit (r = -0.97, P < 0.05).

The revealed inverse correlation of GB condition with prothrombin time must also be considered very important for clinical practice. This association could be the sign of parallel progression of GB disorders and hypercoagulability because of all components of external coagulation mechanism activation. That is why patients with major GB changes (cholelithiasis, condition after cholecystectomy, GB neck deformations and chronic cholecystitis) require active antithrombotic therapy.

We also analyzed significant correlations of prothrombin time with included clinical, laboratory and instrumental parameters depending on GB condition. Needless to say that prothrombin time had the direct correlation with prothrombin index in all groups, but other tendencies were different. In case of intact GB prothrombin time was directly proportional to right ventricle size (r = 0.48, P < 0.05) and thickness of left ventricle posterior wall (r = 0.50, P < 0.05); in patients with sludge and cholelithiasis there were not any significant correlations; in case of bent GB body we revealed correlations with thickness of left ventricle posterior wall (r = -0.56, P < 0.05) and potassium level (r = -0.97, P < 0.05); in case of GB neck deformations — with left atrium size (r = -0.45, P < 0.05). In patients after cholecystectomy — prothrombin time correlated with RCA affection grade (r = -0.98, P < 0.05) and peripheral blood hemoglobin level (r = 0.91, P < 0.05). Thus, development of hypercoagulability as a result of external coagulation mechanism activation depends on GB condition. Such hypercoagulability is associated with left ventricle hypertrophy in case of bent GB body, with hyperkaliemia and diastolic dysfunction in case of GB neck deformations and with RCA affection grade in patients after cholecystectomy. In patients with intact GB hypercoagulability is not accompanied by right ventricle dilatation and left ventricle hypertrophy.

It is quite interesting that, according to our results, progress of GB affection is not associated with increase of liver-specific transaminase — ALT (inverse correlation), meaning that GB changes develop autonomously. In general, correlations of ALT also were dependent on GB condition, but there were significantly less of them. Apart from significant associations with activity of aspartate aminotransferase (AST), which were noticed in all groups, we revealed quite strong bonds of ALT and ejection fraction (r = 0.60, P < 0.05) and general fibrinogen level (r = 0.72, P < 0.05) in case of sludge and with fasting glucose concentration (r = 0.65, P < 0.05) in case of bent GB body. Thus, hepatic cytolysis is not an obligatory accompaniment of GB disorders, but progress of GB affection correlates with decrease of left ventricle ejection fraction together with activation of inflammation in case of sludge and with impaired glucose tolerance in case of bent GB body. Investigation of transaminases prognostic role in 2417 patients after percutaneous coronary intervention because of myocardial infarction showed that increase of ALT level correlated with stenosis of anterior interventricular artery and RCA. Increase of ALT concentration in these patients was associated with increased mortality immediately after intervention and in the remote period [5].

Conclusions

1. GB condition significantly correlated with RCA affection grade, ALT activity and prothrombin time: worsening of GB condition was accompanied by increased of RCA stenosis grade on the background of prothrombin time shortening (which shows tendency to hypercoagulability and thrombi formation) and absence of hepatocytes cytolysis. Correlations of RCA stenosis grade were dependent on GB conditions. They included metabolic, inflammatory and haemostatic parameters, size and blood supply of left atrium.
   2. Prothrombin time prolongation was associated with left ventricle hypertrophy, hyperkaliemia, diastolic dysfunction and higher grade of RCA affection.
   3. ALT activity was proportional to ejection fraction together with general fibrinogen in case of sludge and to fasting glucose level in case of bent GB body.

The further investigation of GB condition dynamics and other clinical, laboratory and instrumental parameters together with coronary arteries pathology and the establishment of their parallel interrelations is a promising field of a future research.

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