ORIGINAL ARTICLE

Diseases of the Hepatobiliary System in Persons with Abdominal Obesity

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ABSTRACT

Background: Actuality: The relevance of studying the pathology of the hepatobiliary system in abdominal obesity is important from the point of view of the pathogenesis of metabolic syndrome (MS) and prognosis of the patient.
Aim: To study the role of abdominal obesity and components of MS in the development of the hepatobiliary pathology.
Methods: The study included 140 patients aged 37 to 85 years: 110 women and 30 men. All patients underwent general clinical examination, anthropometric measurements, biochemical blood tests, ultrasound of the abdominal organs with measurement of intra-abdominal fat thickness (IAF).
Results: It was found that the presence of carbohydrate metabolism disorders is associated with liver steatosis, with the presence of stones in the gallbladder. A direct correlation was revealed between WC and the presence of cholelithiasis, liver steatosis, with a gallbladder wall. Statistical analysis demonstrates the relationship between the TG level and the level of AST, ALT and the degree of hepatomegaly. HDL levels are inversely correlated with liver size. IAF thickness correlated with the degree of hepatomegaly, with the size of the head of pancreas, with the transverse size of the gallbladder on ultrasound.
Conclusion: The main component of MS – waist circumference is associated with hepatobiliary pathology (cholelithiasis, NAFLD). Among the components of the metabolic syndrome waist circumference and disorders of carbohydrate metabolism showed the great influence on the formation of hepatobiliary pathology. The thickness of IAF is associated not only with the diseases of the hepatobiliary zone, but also with the pathology of the pancreas.
Keywords: metabolic syndrome, pathology of the hepatobiliary system, intraabdominal fat

INTRODUCTION

Abdominal obesity and the closely related metabolic syndrome (MS) represent a classic model of comorbidity. In recent years, clinicians have paid attention to various visceral manifestations of MS: non-alcoholic fatty liver disease (NAFLD), gallstone disease, cardiovascular disease[1-5]. Various clinical guidelines for MS highlight NAFLD as an important component of the syndrome. The validity of this is confirmed by the results of studies indicating a direct link between hepatobiliary pathology and cardiovascular diseases[6,7] and recommending periodic assessment of cardiovascular risk to patients in NAFLD. The peculiarity of liver damage in MS is the absence of specific complaints, minor changes in biochemical blood tests with pronounced histological changes.

The objective was to study the role of abdominal obesity and components of MS in the development of the hepatobiliary pathology.

METHODS

The study was perfomed in 2017 at the Facultive Therapy Department of Ryazan State Medical University in accordance with the requirements of Good Clinical Practice and the WMA Declaration of Helsinki – Ethical principles for medical research involving human subjects. The study included 140 patients aged 37 to 85 years (the average age of patients is 61.5±1.3 years), including 110 women and 30 men. All patients underwent general clinical examination, anthropometric study included measurement of height, weight, waist circumference (WC), calculation of body mass index (BMI). Laboratory studies included biochemical blood tests (aspartate aminotransferase (AST), alanine aminotransferase (ALT), γ-glutamyltranspeptidase (γ-GTP), alkaline phosphatase (APh), bilirubin), lipid spectrum assessment (total cholesterol (TC), triglycerides (TG), low and high density lipoproteins (LDL and HDL), fasting glycemia, postprandial glycemia, glycated hemoglobin (HbAlc), glucose tolerance test as indicated). Ultrasound of the abdominal organs was done and thickness of intra-abdominal fat (IAF) was measured - as the distance between the anterior aortic wall and posterior surface of the rectus abdominal muscle midway between the umbilicus and xiphoid process. MS was diagnosed according to the criteria of the Russian scientific society of cardiologists (2009).

Statistical analysis of the obtained data was carried out using the application package Statistica 10.0. The arithmetic mean (M), the error of the arithmetic mean (m), the Spearman correlation coefficient (r) were determined. Differences were considered statistically significant at $p<0.05$.

RESULTS AND DISCUSSION

All patients had abdominal fat deposition, which is confirmed by WC: women-108.2±1.7 cm and men-112.9±2.8 cm. Also, all patients had arterial hypertension as a component of MS. Carbohydrate metabolism disorders were present in half of the patients (72 people), of which 58.4% - diabetes mellitus (DM) type 2, impaired glucose tolerance – 36% and impaired fasting glycemia

5.6%. 16% of patients were overweight according to the BMI, obesity I degree - in 42%, obesity II degree - in 28%, III degree - in 10% and IV degree - in 4% of patients.

Lipid profile of patients was atherogenic: TC 5.9±0.2 mmol/l, TG 2.1±0.2 mmol/l, HDL in women 1.3±0.01 mmol/l, in men – 1.4±0.2 mmol/l, LDL 3.7±0.2 mmol/l.

We analyzed the structure of the hepatobiliary system pathology in patients with abdominal obesity and MS. Liver steatosis was diagnosed in 78 patients (55.7%), nonalcoholic steatohepatitis of the minimum degree of activity - in 19 patients (13.5%), in the remaining 30.8% of patients clinical, ultrasound and biochemical signs of liver damage were not revealed. 67 patients (47.8%) had cholelithiasis, and 30 of them had cholecystectomy in the past history. According to Chinese researchers, the incidence of metabolic syndrome is significantly higher in patients with a history of cholecystectomy than in patients with calculous and non-calculous cholecystitis[8]. Another 35 patients (25%) had chronic noncalculous cholecystitis and 38 patients had no gallbladder pathology. The gender features of gastroenterological comorbidity in MS were as follows: nonalcoholic steatohepatitis prevailed in men (73%), cholelithiasis (53%) prevailed in women.

BMI showed correlations with the presence of cholelithiasis (r=0.18, p=0.04), a direct correlation was revealed between WC and the presence of cholelithiasis (r=0.24, p=0.005), liver steatosis (r=0.24, p=0.006), with the size of the right lobe of the liver on ultrasound (r=0.47, p=0.000001), with the transverse size of the gallbladder on ultrasound (r=0.47, p=0.000097), with a gallbladder wall thickness (r=0.24, p=0.028).

The degree of obesity in MS correlated with the presence of cholelithiasis (r=0.19, p=0.02), with hepatomegaly (r=0.33, p=0.0003), with the transverse size of the gallbladder (r=0.3, p=0.003), with the presence of sediment in the gallbladder (r=0.24, p=0.02), and these correlations characterized patients of both genders. In addition, in women, the degree of obesity correlated with the ultrasound size of the pancreatic head (r=0.25, p=0.03).

It was found that the presence of carbohydrate metabolism disorders is associated with liver steatosis (r=0.28, p=0.0008), the degree of hepatomegaly (r=0.26, p=0.003), with the presence of stones in the gallbladder (r=0.2, p=0.037).

The contribution of hypertriglyceridemia to the formation of hepatobiliary pathology in MS demonstrates the relationship between the level of TG with the level of AST (r=0.22, p=0.014), ALT (r=0.3, p=0.0006) and the degree of hepatomegaly (r=0.23, p=0.015). HDL levels are inversely correlated with the right liver lobe size on ultrasound investigation (r=-0.29, p=0.0018). Such components of MS as LDL level and arterial hypertension did not demonstrate significant links with pathology of the hepatobiliary system.

The thickness of IAF was 55.3±2.5mm. Firstly the thickness of IAF correlated with the degree of hepatomegaly (r=0,33, p=0.003), with the size of the head of pancreas (r=0,44, p=0,00023), with the transverse size of the gallbladder on ultrasound (r=0,4, p=0.001). The data of foreign authors also indicate the correlation of liver steatosis with the thickness of the IAF[9]. These results are important in elucidating the role of intraabdominal fat in the development of not only liver steatosis, but also pancreatic steatosis. In recent years, the term nonalcoholic fatty pancreas disease has appeared in the literature by analogy with NAFLD, and experimental[10] and clinical[11] studies confirm the relationship of fat deposition in the pancreas with insulin resistance, visceral fat depot, TG and ALT levels. It should be borne in mind that in the formation of pancreatic pathology, diseases of the gastrointestinal tract and biliary tract are also important.

CONCLUSION

The main component of MS – waist circumference is associated with hepatobiliary pathology (cholelithiasis, NAFLD). Among the other components of the metabolic syndrome, the greatest contribution to the formation of hepatobiliary pathology is made by disorders of carbohydrate metabolism. The thickness of intraabdominal fat is associated not only with the diseases of the hepatobiliary zone, but also with the pathology of the pancreas.

Declaration of author's competing interests: The authors declare no conflict of interest.

REFERENCES

1. Corochina I.E. The Gastroenterological aspects of metabolic syndrome. Russian Journal of Gastroenterology, Hepatology, Coloproctology**.** 2008; 1:26-35.
2. Di Ciaula A, Wang DQ, Portincasa P Cholesterol cholelithiasis: part of a systemic metabolic disease, prone to primary prevention. Expert Rev Gastroenterol Hepatol. 2019 Feb;13(2):157-171. doi: 10.1080/17474124.2019.1549988.
3. Chen LY, Qiao QH, Zhang SC. et al. Metabolic syndrome and gallstone disease. World J Gastroenterol. 2012;18(31):4215-4220.
4. Méndez-Sánchez N, Chavez-Tapia NC, Motola-Kuba D. et al. Metabolic syndrome as a risk factor for gallstone disease. World J Gastroenterol. 2005;11(11):1653-1657.
5. Wu WC, Wang CY. Association between non-alcoholic fatty pancreatic disease (NAFPD) and the metabolic syndrome: case-control retrospective study. Cardiovasc Diabetol. 2013;12:Art.77.
6. Liu H, Lu HY. Nonalcoholic fatty liver disease and cardiovascular disease. World J Gastroenterol. 2014;14;20(26): 8407-8415.
7. Méndez-Sánchez N, Bahena-Aponte J, Chávez-Tapia NC. et al. Strong association between gallstones and cardiovascular disease. Am J Gastroenterol. 2005;100(4):827-830.
8. Shen C, Wu X, Xu C, Yu C. Association of cholecystectomy with metabolic syndrome in a Chinese population. PLoS ONE 9(2): e88189. doi:10.1371/journal.pone.0088189.
9. Sabir N, Sermez Y, Kazil S, Zencir M. Correlation of abdominal fat accumulation and liver steatosis: importance of ultrasonographic and anthropometric measurements. European Journal of Ultrasound. 2001;14(2-3):121-128.
10. Mathur A, Marine M, Lu D, Swartz-Basile DA et al. Nonalcoholic fatty pancreas disease. HPB (Oxford). 2007; 9:312-318.
11. Lee JS, Kim SH, Jun DW et al. Clinical implications of fatty pancreas: correlations between fatty pancreas and metabolic syndrome. World J Gastroenterol. 2009;15:1869-1875.