UDC 616.36-002 http://doi.org/10.5281/zenodo.2539611

MODERN DIAGNOSTIC OPPORTUNITIES FOR DETECTING NON-ALCOHOLIC FATTY LIVER DISEASE

©Mosina L., *SPIN-code: 2390-1111, ORCID: 0000-0001-6831-3116, Dr. habil., Ogarev Mordovia State University, Saransk, Russia, lardoc@rambler.ru*
©Suponkina D., *Ogarev Mordovia State University, Saransk, Russia, Daryasy@mail.ru*
©Kuzmin S., *Ogarev Mordovia State University, Saransk, Russia, Kardini@yandex.ru*
©Akhmedova N., *Ogarev Mordovia State University, Saransk, Russia, nazrin_akhmedova@mail.ru*
©Kazankina E., *Ogarev Mordovia State University, Saransk, Russia, www.pecheeenka787@gmail.com*

СОВРЕМЕННЫЕ ДИАГНОСТИЧЕСКИЕ ВОЗМОЖНОСТИ ВЫЯВЛЕНИЯ НЕАЛКОГОЛЬНОЙ ЖИРОВОЙ БОЛЕЗНИ ПЕЧЕНИ

©Мосина Л. М., *SPIN-код: 2390-1111, ORCID: 0000-0001-6831-3116, д-р. мед. наук, Национальный исследовательский Мордовский государственный университет им. Н.П. Огарева, г. Саранск, Россия, lardoc@rambler.ru*
©Супонькина Д. С., *Национальный исследовательский Мордовский государственный университет им. Н.П. Огарева, г. Саранск, Россия, Daryasy@mail.ru*
©Кузьмин С. К., *Национальный исследовательский Мордовский государственный университет им. Н.П. Огарева, г. Саранск, Россия, Kardini@yandex.ru*
©Ахмедова Н. М. *Национальный исследовательский Мордовский государственный университет им. Н.П. Огарева, г. Саранск, Россия, nazrin_akhmedova@mail.ru*
©Казанкина Е. А., *Национальный исследовательский Мордовский государственный университет им. Н.П. Огарева, г. Саранск, Россия, www.pecheeenka787@gmail.com*

Abstract. This article is devoted to non-alcoholic fatty liver disease (NAFTLD), more precisely to the modern possibilities of diagnosing non-alcoholic fatty liver disease. Today, the world practice of studying diseases is characterized by a multifactor approach, in particular, it concerns pathologies, the basis of which is a cascade of metabolic disorders. At present, NAFTLD is considered an integral part of the “metabolic syndrome”. The frequency of occurrence varies from 14 to 26%, in addition, 10% of patients show signs of steatohepatitis non-alcoholic aetiology. Clinical manifestations of NAFTLD do not differ in specificity and diversity. This pathology is quite long able to proceed asymptomatically, and pathological changes in the liver are detected quite randomly, and as clinical practice shows, such patients turn to medical organizations for completely different reasons. The authors consider in detail aspects of the clinical and anamnestic characteristics of this nosology and provide an overview of the diagnostic complex used to identify NAFTLD and possible diagnostic markers.

Аннотация. Данная статья посвящена неалкогольной жировой болезни печени (НБЖП), точнее современным возможностям диагностики неалкогольной жировой болезни печени. Сегодня мировая практика исследований заболеваний характеризуется мультифакторным подходом, в особенности это касается патологий, основу которых, составляет каскад метаболических нарушений. На сегодня НЖБП рассматривают как составную часть «метаболического синдрома». Частота встречаемости НЖБП варьирует от 14 до 26%, помимо этого у 10% пациентов выявляются признаки стеатогепатита неалкогольной этиологии. Клинические проявления НБЖП не отличаются специфичностью и многообразностью. Данная патология довольно длительно способна протекать бессимптомно, а патологические изменения в печени выявляются весьма случайно, и как показывает клиническая практика

такие пациенты обращаются в медицинские организации совершенно по другим причинам. Авторами детально рассматриваются аспекты клинико–анамнестическких характеристик данной нозологии, и приводится обзор диагностического комплекса, применяемого для идентификации НБЖП и возможные диагностические маркеры.

Keywords: non-alcoholic fatty liver disease, steatosis, steatohepatitis, diagnostics.

Ключевые слова: неалкогольная жировая болезнь печени, стеатоз, стеатогепатит, диагностика.

Today, the world practice of studying diseases is characterized by a multifactor approach [1, p. 308], in particular, it concerns pathologies, the basis of which is a cascade of metabolic disorders, where insulin resistance (IR) is at the forefront [3, p. 2008].

Many researchers consider nonalcoholic fatty liver disease (NAFTLD) as an integral part of the metabolic syndrome [2, p. 333]. The frequency of occurrence of NAFTLD varies from 14 to 26% [4, p. 5], in addition, 10% of patients show signs of steatohepatitis non-alcoholic aetiology.

Previously it was thought that NAFTLD is quite a benign pathology, until it became clear that NAFTLD leads to the development of cirrhosis in 4–30% of cases [6, p. 787], and the actual steatohepatitis predetermines the development of fibrosis, and subsequently necrosis of the liver, due to which the question of early and timely diagnostics [7, p. 7240].

Clinical manifestations of NAFTLD do not differ in specificity and diversity. This pathology is quite long-term asymptomatic, and pathological changes in the liver are detected quite randomly, and as clinical practice shows, such patients turn to medical organizations for completely different reasons (the most frequent causes of metabolic syndrome, hypothyroidism, tumours, gallstone disease). Complaints often in such patients are absent, but more than 30% of patients note the presence of dyspeptic disorders combined with pain and asthenic syndromes.

Often the clinical picture in these patients is hardly different from steatohepatitis with steatosis; in more than 43% of cases, patient complaints are associated with diseases of the biliary system; in 16% of cases — bitter taste in the mouth and dyspeptic disorders [5, p. 509].

At the first treatment in patients with NAFTLD in 55–65% of cases, there was an asymptomatic enlargement of the liver, splenomegaly was detected in 20% of patients (at the stage of steatohepatitis, the size of the spleen remains almost unchanged).

In laboratory studies, the most characteristic changes are the increase in alanine aminotransferase (ALT) and aspartate aminotransferase (AST) [12, p. 3], de Ritis coefficient does not usually exceed 1.1, but more often there is an increase in ALT activity. The activity of alkaline phosphatase (alkaline phosphatase) increases by no more than 2 times the norm; hypercholesterolemia is possible (changes in these indicators are due to the speed of initiation of alternative ways of FFA metabolization, and of course, the functionality of the protective cellular mechanisms of mitochondrial β–oxidation.) Manifestations of non-alcoholic steatohepatitis are not particularly specific and do not correlate with the degree of its severity [11, p. 329]. As noted earlier, liver damage in such patients is diagnosed during the examination of completely different manifestations of the metabolic syndrome (abdominal obesity, hypertension, diabetes, etc.). If a patient has metabolic syndrome, a biochemical syndrome of cytolysis, type 2 diabetes mellitus [10, p. 303], arterial hypertension and abdominal obesity, one should think about the presence of NAFTLD in such a patient. Diagnostic search is conducted to exclude macrovesicular steatosis and destructive changes in the liver those causes that cause cytolysis. In the case of the formation of cirrhosis, hepatocellular insufficiency also develops, but hypoalbuminemia with nonalcoholic steatohepatitis may occur in patients with diabetic nephropathy [9, p. 15], here the determination of

antinuclear antibodies may be decisive in diagnostic terms.

The verified fatty dystrophy of the liver and non-alcoholic steatohepatitis is practically indistinguishable by clinical symptoms [8, p. 355], here the intensity/intensity of the biochemical cytolysis syndrome can help the clinician to help.

Calculation tests that determine the degree of histological activity (for example FibroMax) also show high efficiency; such test complexes are based on mathematical formulas that are checked each time to obtain a highly reliable result. Such test complexes allow obtaining a quantitative and qualitative assessment of steatosis, fibrosis, the presence of necrotic changes in the liver, regardless of location.

The diagnosis of NAFTLD is based on the detection of liver steatosis in the absence of excessive (> 20 g / day) use of ethanol [13, p. 21]. Helps in the diagnosis of puncture biopsy of the liver and imaging methods. Ultrasound (CT), computed tomography (CT) and magnetic resonance imaging (MRI) can detect steatosis with relatively high accuracy. These studies have their own advantages and disadvantages in terms of cost, availability and security.

CT has a high potential in detecting steatosis [14, p. 44]. CT scan, a sign of fatty liver, is considered a density of 50–75 units. H, as well as reducing it by 10 or more units. H from the density of the spleen with intravenous contrast enhancement [15, p. 30]. The sensitivity and specificity of the method is 43–95% and 90%, respectively [16, p. 28]. The main disadvantages of the method are radiation exposure, the inability to detect the initial or moderate fibrosis and necrotic inflammation [46]. In addition, the effectiveness of the study is sharply reduced when the fat content in the hepatic parenchyma is below 5–30% [15, p. 40]. MRI in comparison with CT has the greatest potential in terms of determining the fat content and is based on the ability of hydrogen protons to change the magnetic moment, as a result of which its spatial orientation changes. The method allows determining not only the qualitative but also the quantitative content of fat [17, p. 75]. Due to this, this diagnostic method can be considered as an alternative to biopsy for assessing the effectiveness of NAFTLD therapy [13, p. 28]. The ultrasound method is less sensitive in the diagnosis of steatosis; when used to confirm a diagnosis, additional visualization or biopsy is usually required.

In cases of the absence of clinical symptoms in patients and the impossibility of conducting a histological examination, an enormous potential has the ultrasound. In steatosis of the liver, 4 of the most significant features are distinguished: vagal pattern vagueness increased liver echogenicity compared with the kidneys, diffuse hyperechogenicity of the liver parenchyma, distal signal attenuation.

The emergence of NAFTLD associated with such risk factors as obesity, metabolic syndrome, insulin resistance, diabetes mellitus is observed more and more often. However, all visualization diagnostic methods do not allow to assess the presence of signs of steatohepatitis, the degree of its activity and the stage of fibrous changes.

The puncture biopsy is still the gold standard today. This method allows differentiation of steatosis from non-alcoholic steatohepatitis, which is important for determining the treatment tactics since liver tests do not always correlate with damage, inflammation or fibrosis.

With “oxidative stress”, which is given a significant place in NAFTLD, increased production of TNF-a, as well as other forms of TNF-induced cytokines (IL-6, IL-8) [7, p. 7238], which together with atomic oxygen forms, dicarboxylic acids and oxidation derivatives contribute dissociation of oxidative phosphorylation, depletion of mitochondrial ATP, which ultimately leads to necrosis and apoptosis of hepatocytes, which makes it possible to use them as markers for diagnosing NAFTLD, but this issue requires detailed study.

So, in their studies T. Henbert et al. (2010), showed that TNF-a can be conditionally considered as an early marker of liver damage, as well as facilitating the proliferation process by fibrinolysis along with other cytokines [3, p. 2020].

The increased production of TNF-a may be due to the activation of Kupffer cells by bacterial antigens entering the portal vein into the liver. The results of the hydrogen respiratory test, in 50–70% of cases of non-alcoholic steatohepatitis revealed excessive bacterial proliferation in the small intestine. The maximum severity of bacterial growth is observed in patients with non-alcoholic steatohepatitis with an outcome in cirrhosis of the liver.

A. Greenberg and M. McDaniel (2012) showed an increased TNF-a activity in patients with NAFTLD with obesity and IR [1, p. 389]. Increased hepatic expression of TNF-a occurs when IR, experimentally induced diet with an increase in FA. Metabolic syndrome there is an increased expression of TNF-a in conjunction with other pro-inflammatory cytokines, which are additionally secreted by adipocytes of adipose tissue.

Some researchers found His63Asp HFE mutations in a number of patients with NZhBP, which are characteristic of hemochromatosis.

In a study by H. Borovsky et al. (2011), in patients with such mutations, liver fibrosis was more pronounced. E. Buganrssi (2014) believes that iron overload and HFE mutations do not contribute to the development of liver fibrosis [11, p. 330].

Other authors also note that there is no evidence of iron overload in patients with NAFTLD. R. Vorand et al. (2015) associated with hepatic iron overload with insulin resistance regardless of liver damage [5, p. 510].

Thus, there is no objective method for the differential diagnosis of NAFTLD. Require clarification of risk groups NAFTLD and the development of a diagnostic algorithm with close attention to clinical and anamnestic characteristics. The choice of the optimal method for the non-invasive evaluation of steatosis, steatohepatitis and fibrosis is topical, and despite recent advances in the medicine NAFTLD, the pathology remains poorly understood, which requires further research in this area.

References:

1. Angulo, P., Kleiner, D. E., Dam-Larsen, S., Adams, L. A., Bjornsson, E. S., Charatcharoenwitthaya, Ph., Mills, P. R., Keach, J. C., Lafferty, H. D., Stahler, A., Haflidadottir, S., & Bendtsen, F. (2015). Liver brosis, but no other histologic features, is associated with long-term outcomes of patients with nonalcoholic fatty liver disease. *Gastroenterology, 149*(2), 389-397. doi:10.1053/j.gastro.2015.04.043.

2. Anstee, Q. M., Targher, G., & Day, C. P. (2013). Progression of NAFLD to diabetes mellitus, cardiovascular disease or cirrhosis. *Nature reviews Gastroenterology & hepatology, 10*(6), 330.

3. Chalasani, N., Younossi, Z., Lavine, J. E., Diehl, A. M., Brunt, E. M., Cusi, K., Charlton, M., & Sanyal, A. J. (2012). The diagnosis and management of non-alcoholic fatty liver disease: practice guideline by the American Gastroenterological Association, American Association for the Study of Liver Diseases, and American College of Gastroenterology. *Gastroenterology, 142*(7), 1592-1609.

4. Kumar, M. S., Singh, A., Jaryal, A. K., Ranjan, P., Deepak, K. K., Sharma, S., Lakshmy, R., Pandey, R. M., & Vikram, N. K. (2016). Cardiovascular Autonomic Dysfunction in Patients of Nonalcoholic Fatty Liver Disease. *International journal of hepatology, 2016.*

5. Meex, R. C., & Watt, M. J. (2017). Hepatokines: linking nonalcoholic fatty liver disease and insulin resistance. *Nature Reviews Endocrinology, 13*(9), 509.

6. Michelotti, G. A., Machado, M. V., & Diehl, A. M. (2013). NAFLD, NASH and liver cancer. *Nature reviews Gastroenterology & hepatology, 10*(11), 656.

7. Mikolasevic, I., Orlic, L., Franjic, N., Hauser, G., Stimac, D., & Milic, S. (2016). Transient elastography (FibroScan®) with controlled attenuation parameter in the assessment of liver steatosis and fibrosis in patients with nonalcoholic fatty liver disease - Where do we stand? *World journal of gastroenterology, 22*(32), 7236.

8. Mullur, R., Liu, Y. Y., & Brent, G. A. (2014). Thyroid hormone regulation of metabolism. *Physiological reviews, 94*(2), 355-382.

9. Samuel, V. T., & Shulman, G. I. (2016). The pathogenesis of insulin resistance: integrating signaling pathways and substrate flux. *The Journal of clinical investigation*, *126*(1), 12-22.

10. Mantovani, A., Rigolon, R., Pichiri, I., Bonapace, S., Morani, G., Zoppini, G., Bonora, E., & Targher, G. (2017). Nonalcoholic fatty liver disease is associated with an increased risk of heart block in hospitalized patients with type 2 diabetes mellitus. *PloS one, 12*(10), e0185459. doi:10.1371/journal.pone.0185459.

11. Xhyheri, B., Manfrini, O., Mazzolini, M., Pizzi, C., & Bugiardini, R. (2012). Heart rate variability today. *Progress in cardiovascular diseases, 55*(3), 321-331.

12. Ardashev, A. V., Arutyunov, G. P., Zhelyakov, E. G., & Belenkov, Yu. N. The mechanisms and causes of sudden cardiac death. Factors and risk stratification in clinical practice. Definitions and terms. *Clinical practice,* (4), 3-12. (in Russian).

13. Bokeria, L. A., Bokeria, O. L., & Volkovskaya, I. V. (2009). Heart rate variability: measurement methods, interpretation, clinical use. *Annaly aritmologii,* (4), 21-32. (in Russian).

14. Bokeria, L. A., Bokeria, O. L., & Bazarsadaeva, T. S. (2009). New predictors of sudden cardiac death. *Annaly aritmologii,* (4), 41-49. (in Russian).

15. Ivashkin, V. T., Maevskaya, M. V., Pavlov, Ch. S., Tikhonov, I. N., Shirokova, E. N., Bueverov, A. O., Drapkina, O. M., Shulpekova, Yu. O., Tsukanov, V. V., Mammaev, S. N., Maev, I. V., & Palgova, L. K. (2016). Diagnostics and treatment of non-alcoholic fatty liver disease: clinical guidelines of the Russian Scientific Liver Society and the Russian gastroenterological association. *Ros. zhurnal gastroehnterologii, gepatologii, koloproktologii, 26*(2), 24-42. (in Russian).

16. Shirokova, E. N. (2017). Non-alcoholic fatty liver disease and cardiovascular risk. *Farmateka,* (2), 24-29. (in Russian).

17. Shirokova, E. I. (2017). Non-alcoholic fatty liver disease, hyperlipidemia and cardiovascular risks. *Gastroenterologiya. Prilozhenie k zhurnalu Consilium Medicum,* (2). S. 74-76.

Список литературы:

1. Angulo P., Kleiner D. E., Dam-Larsen S., Adams L. A., Bjornsson E. S., Charatcharoenwitthaya Ph., Mills P. R., Keach J. C., Lafferty H. D., Stahler A., Haflidadottir S., Bendtsen F. Liver fibrosis, but no other histologic features, is associated with long-term outcomes of patients with nonalcoholic fatty liver disease // Gastroenterology. 2015. V. 149. №2. P. 389-397. DOI: 10.1053/j.gastro.2015.04.043.

2. Anstee Q. M., Targher G., Day C. P. Progression of NAFLD to diabetes mellitus, cardiovascular disease or cirrhosis // Nature reviews Gastroenterology & hepatology. 2013. V. 10. №6. P. 330.

3. Chalasani N., Younossi Z., Lavine J. E., Diehl A. M., Brunt E. M., Cusi K., Charlton M., Sanyal A. J. The diagnosis and management of non-alcoholic fatty liver disease: practice guideline by the American Gastroenterological Association, American Association for the Study of Liver Diseases, and American College of Gastroenterology // Gastroenterology. 2012. V. 142. №7. P. 1592-1609.

4. Kumar M. S., Singh A., Jaryal A. K., Ranjan P., Deepak K. K., Sharma S., Lakshmy R., Pandey R. M., Vikram N. K. Cardiovascular autonomic dysfunction in patients of nonalcoholic

fatty liver disease // International journal of hepatology. 2016. V. 2016.

5. Meex R. C. R., Watt M. J. Hepatokines: linking nonalcoholic fatty liver disease and insulin resistance // Nature Reviews Endocrinology. 2017. V. 13. №9. P. 509.

6. Michelotti G. A., Machado M. V., Diehl A. M. NAFLD, NASH and liver cancer // Nature reviews Gastroenterology & hepatology. 2013. V. 10. №11. P. 656.

7. Mikolasevic I., Orlic L., Franjic N., Hauser G., Stimac D., Milic S. Transient elastography (FibroScan®) with controlled attenuation parameter in the assessment of liver steatosis and fibrosis in patients with nonalcoholic fatty liver disease - Where do we stand? // World journal of gastroenterology. 2016. V. 22. №32. P. 7236.

8. Mullur R., Liu Y. Y., Brent G. A. Thyroid hormone regulation of metabolism // Physiological reviews. 2014. V. 94. №2. P. 355-382.

9. Samuel V. T., Shulman G. I. The pathogenesis of insulin resistance: integrating signaling pathways and substrate flux // The Journal of clinical investigation. 2016. V. 126. №1. P. 12-22.

10. Mantovani A., Rigolon R., Pichiri I., Bonapace S., Morani G., Zoppini G., Bonora E., Targher G. Nonalcoholic fatty liver disease is associated with an increased risk of heart block in hospitalized patients with type 2 diabetes mellitus // PloS one. 2017. V. 12. №10. P. e0185459. DOI: 10.1371/journal.pone.0185459.

11. Xhyheri B., Manfrini O., Mazzolini M., Pizzi C., Bugiardini R. Heart rate variability today // Progress in cardiovascular diseases. 2012. V. 55. №3. P. 321-331.

12. Ардашев А. В., Арутюнов Г. П., Желяков Е. Г., Беленков Ю. Н. Механизмы и причины внезапной сердечной смерти. Факторы и стратификация риска в клинической практике. Основные определения и термины // Клиническая практика. 2014. №4. С. 3-12.

13. Бокерия Л. А., Бокерия О. Л., Волковская И. В. Вариабельность сердечного ритма: методы измерения, интерпретация, клиническое использование // Анналы аритмологии. 2009. №4. С. 21-32.

14. Бокерия Л. А., Бокерия О. Л., Базарсадаева Т. С. Новые предикторы внезапной сердечной смерти // Анналы аритмологии. 2009. №4. С. 41-49.

15. Ивашкин В. Т., Маевская М. В., Павлов Ч. С., Тихонов И. Н., Широкова Е. Н., Буеверов А. О., Драпкина О. М., Шульпекова Ю. О., Цуканов В. В., Маммаев С. Н., Маев И. В., Пальгова Л. К. Клинические рекомендации по диагностике и лечению неалкогольной жировой болезни печени Российского общества по изучению печени и Российской гастроэнтерологической ассоциации // Российский журнал гастроэнтерологии, гепатологии, колопроктологии. 2016. Т. 26. №2. С. 24-42.

16. Широкова Е. Н. Неалкогольная жировая болезнь печени и кардиоваскулярный риск // Фарматека. 2017. №2 (335). С. 24-29.

17. Широкова Е. И. Неалкогольная жировая болезнь печени, гиперлипидемия и сердечно-сосудистые риски // Гастроэнтерология. Приложение к журналу Consilium Medicum. 2017. № 2. С. 74-76.

Работа поступила в редакцию 22.12.2018 г.

Принята к публикации 27.12.2018 г.

Cite as (APA):

Mosina, L., Suponkina, D., Kuzmin, S., Akhmedova, N., & Kazankina, E. (2019). Modern diagnostic opportunities for detecting non-alcoholic fatty liver disease. *Bulletin of Science and Practice, 5*(1), 132-137. (in Russian).

Ссылка для цитирования:

Mosina L., Suponkina D., Kuzmin S., Akhmedova N., Kazankina E. Modern diagnostic opportunities for detecting non-alcoholic fatty liver disease // Бюллетень науки и практики. 2019. Т. 5. №1. С. 132-137. Режим доступа: http://www.bulletennauki.com/38-30 (дата обращения 15.01.2019).