Central Asian Journal of Medicine

STUDY OF NAFLD DYNAMICS USING FIBROSCAN IN THE CONTEXT OF BARIATRIC SURGERY

Barno Kh. Shagazatova [1], Sitora Kh. Rakhimova [2]

1 MD, DSc, Professor, Tashkent Medical Academy, Tashkent, Uzbekistan

2 Basic doctoral student, Tashkent Medical Academy, Tashkent, Uzbekistan

ABSTRACT

This study is dedicated to evaluating liver condition in patients with obesity before and after bariatric surgery using the FibroScan method. Non-alcoholic fatty liver disease (NAFLD) is one of the most common causes of chronic liver diseases, and 12 to 14% of patients have an aggressive form of NAFLD known as non-alcoholic steatohepatitis (NASH). NASH can progress to liver fibrosis, cirrhosis, or liver cancer, especially in individuals with obesity and/or type 2 diabetes. The study included 44 patients treated in the endocrinology department of TMA and the Medion Family Hospital from 2022 to 2024. The patients were divided into two groups: gastric bypass (n=19) and sleeve resection (n=25). Biochemical and hormonal parameters, as well as lipid profiles, were assessed before and after surgery. The results showed significant improvement in lipid profiles and reduction in liver fibrosis 24 months after surgery, confirming the effectiveness of bariatric surgery in treating NAFLD and associated metabolic disorders.

Key words: non-alcoholic fatty liver disease, NAFLD, bariatric surgery, gastric bypass, sleeve resection, transient elastography, ultrasound shear wave elastography, fibroscan, liver fibrosis, liver steatosis.

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is one of the leading causes of chronic liver disease worldwide. Approximately 12-14% of patients with this condition develop non-alcoholic steatohepatitis (NASH), which can lead to significant fibrosis, cirrhosis or liver cancer. According to a study by E. Powell, V. Wing and M. Rinela, NAFLD occupies a central place among the causes of cirrhosis and hepatocellular carcinoma, covering the full spectrum from steatosis to NASH with inflammation and accelerated fibrosis [11]. Studies such as the Daniel Q. Huang study confirm that NAFLD and NASH are the main factors contributing to the progression to fibrosis and liver cancer, and the prevalence of these conditions increases along with an increase in the number of cases of obesity and

type 2 diabetes [7]. NASH is the second most common cause of liver transplantation in the United States after hepatitis C [19]. Studies show that the incidence of cirrhosis associated with NAS increased by 170% from 2004 to 2013, and by 2018 NAS had become a more common cause of liver transplantation than hepatitis C [14].

Liver biopsy — This is a method used to diagnose liver diseases, but not every patient is ready to go through this procedure. It can be invasive and cause some discomfort. Fortunately, modern diagnostic methods offer less invasive and no less informative alternatives. Let's look at them in more detail.

One such alternative is elastography. This ultrasound method allows you to assess the elasticity of liver tissue, which helps to identify early signs of fibrosis and cirrhosis without the need for an invasive procedure. Elastography provides important information about the condition of the liver, which was previously available only through biopsy.

Another important method is ultrasound (ultrasound). This is a standard and painless way to visualize organs, including the liver, which allows you to detect pathological changes in its structure. Ultrasound is widely used due to its accessibility and safety for the patient.

However, for a more accurate assessment of the degree of fibrosis, there is an even more effective method — fibroscan. This is a modern non-invasive method that quickly and painlessly measures the degree of stiffness of the liver. Fibroscan provides important information for diagnosis and optimal treatment selection, which makes it an indispensable tool in the arsenal of modern diagnostic tools.

Thus, thanks to an integrated approach and the use of advanced techniques such as elastography and fibroscan, doctors can more accurately and safely diagnose liver diseases. This allows you to prescribe timely and effective treatment, minimizing discomfort for the patient. Timely diagnosis of NAFLD is extremely important and includes the detection of excess fat in the liver using instrumental and morphological studies [3]. To assess the stage of liver fibrosis, it is recommended to measure the elasticity of liver tissue using elastometry methods [6].

Transient elastography (TE) is a non-invasive method for measuring liver elasticity and evaluating fibrosis [18]. An alternative to TE is shear wave ultrasound elastography (ESW) with elastometry нативой ТЭ является ультразвуковая эластография сдвиговой волной (ЭСВ) с эластометрией [15]. Оба метода считаются надежными для оценки фиброза печени и мониторинга состояния орг Both methods are considered reliable for assessing liver fibrosis and monitoring the condition of the organ [8]. To exclude the late

stages of the disease and determine the degree of liver fibrosis, it is recommended to use elastometry [13]. The work of C. Cassinotto and J. Boursier demonstrates that the combination of laboratory tests with vibration-controlled transient elastography (VCTE) or two-dimensional shear wave ultrasound elastography (2D-SWE) makes it possible to accurately diagnose advanced liver fibrosis in patients with NAFLD (Cassinotto et al., 2020). A. Furlan's research compares the accuracy of liver stiffness measurements obtained using MR elastography (MRE), transient elastography (TE) and two-dimensional shear wave ultrasound elastography (2D-SWE), showing that all three methods have similar accuracy for the diagnosis of significant and advanced fibrosis [5]. The work of M. Luxor-Platon emphasizes that VCTE and 2D-SWE are effective for staging liver fibrosis in NAFLD and improve patient monitoring [8]. Transient elastography and shear wave ultrasound elastography are the main methods of liver diagnosis and monitoring in patients with NAFLD, providing non-invasive and accurate measurements of fibrosis.

The purpose of the study. To study the condition of the liver in obese patients before and after bariatric surgery using the fibroscan method, as well as to compare the effectiveness of gastroschunt and resection on the condition of the liver in non-alcoholic fatty liver disease (NAFLD) in Uzbekistan.

Materials and methods. The study was conducted on the basis of the Department of Endocrinology THERE and the CHEKA Medion Family Hospital, where surgical interventions were performed. The study included 44 patients who underwent bariatric surgery between 2022 and 2024. The average age of the patients was 38.59±8.77 years, 4 men (9.1%) and 40 women (90.9%). The average weight of the patients was 108.88±15.70 kg, and the BMI before surgery was 40.19±5.97 kg/m^2.

The patients were divided into two groups depending on the method of surgical intervention: gastroschunt (n=19) and resection (n=25). The liver condition was assessed using the FibroScan touch 502 device manufactured in France for non-invasive determination of the degree of liver fibrosis by transient elastometry, as well as measurement of ultrasound attenuation: CAP™ (option) - determination of the level of steatosis (sensitive and objective test). This method allows the diagnosis of an early stage of fibrosis corresponding to F1 according to METAVIR, makes it possible to diagnose the disease as early as possible and decide on therapy. The specificity and sensitivity of the method at the stages of fibrosis F3/F4 is approaching 100%. FibroScan makes it possible to select patients with advanced fibrosis for antiviral therapy as a matter of priority, taking into account the immediate risks of negative prospects. The volume under study is 100-200 times larger than in a liver biopsy. The comparative analysis was carried out

before and after surgical interventions. The follow-up period of the patients was 24 months.

Results and discussion. Our study involved 44 patients, of whom 90.9% were women and 9.1% were men. The average age of the participants was 38.59 years, the average weight was 108.88 kg, and the average body mass index (BMI) before surgery was 40.19 kg/m^2. The patients were divided into two groups depending on the type of surgical intervention: gastroschunt and drain resection.

Changes in body mass index (BMI) and liver condition in obese patients before and after various types of surgery were analyzed. Figure 1 shows the dynamics of BMI before surgery and at various times after surgery in patients undergoing drain resection (CP) and gastroshunt (GS). Studies demonstrate that, however, resection and gastric bypass surgery provide a significant reduction in BMI, confirmed by statistically significant data. A study by M. Barzin and colleagues shows that both operations lead to a significant decrease in BMI after 3, 6 months, 1 year and 2 years, confirming their effectiveness in the fight against obesity [2]. In addition, T. Poghosyan and his team found a statistically significant difference (P<0.01) in BMI before and after surgery, emphasizing the high effectiveness of both CP and GS [10].

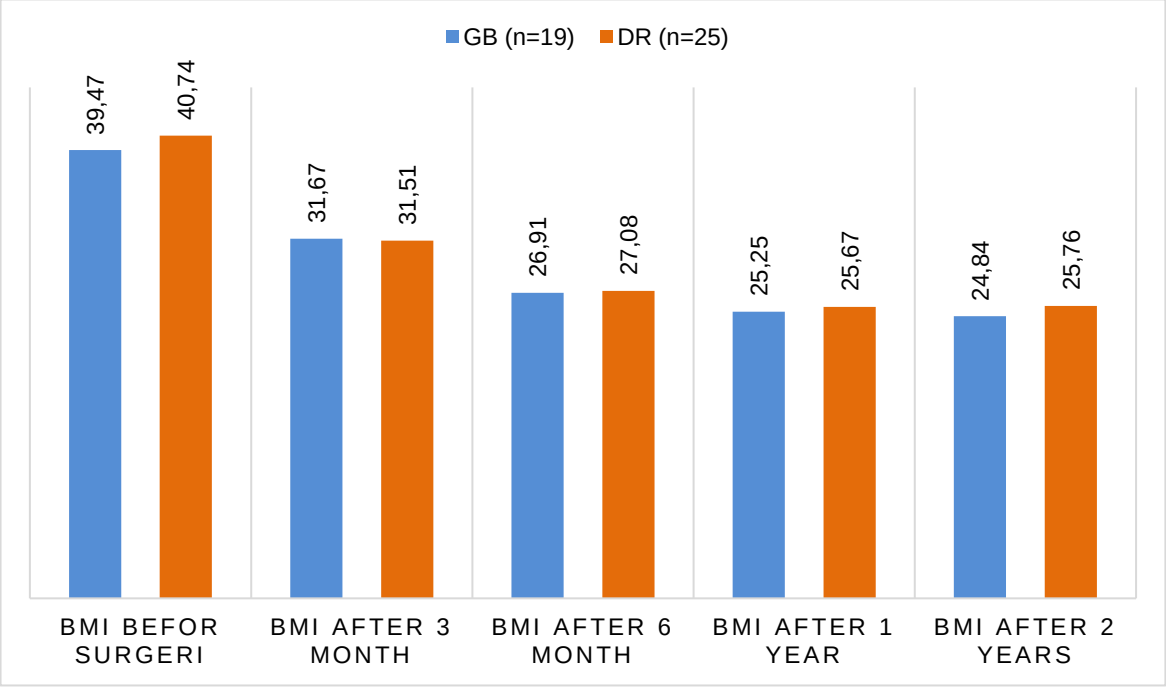

Fig. 1 Dynamics of BMI before and after surgery in surgical intervention groups. Note: GB – gastric bypass surgery, DR – drain resection surgery, in all follow-up periods, there was a statistical difference in comparison with the BMI index before and after surgery, P<0.01.

Studying the comparative characteristics of the liver condition in the surgery groups before and after surgery, we came to the conclusion that the values of E and CAP after surgery decreased significantly in both groups, indicating an

improvement in the liver condition (Табл 1). Particularly significant changes were observed in the gastric bypass group, where the E and CAP values decreased to 5.92±0.56 kPa and 221.95±11.23 dB/m, respectively (P<0.05 and P<0.001). The work of Fernando de Barros and A. Fonseca confirms that the indicators of transient elastography (TE) and the controlled attenuation parameter (CAP) significantly decrease after resection and gastroschunt draining, while a more pronounced decrease is observed in patients after resection draining [1].

Table No. 1

Comparative characteristics of the surgical intervention groups before and after surgery

Indicator	**Gastric bypass surgery (n=19)**		**drain resection (n=25)**	
	Before the operation	**After the operation**	**Before the operation**	**After the operation**
Liver fibrosis data				
E (kPA)	8,76±0,27	5,92±0,56*	10,34±0,49	5,79±0,37**
F1	2 (10,5%)	14 (73,7%)	6 (24,0%)	20 (80,0%)
F2	10 (52,6%)	3 (15,8%)	15 (60,0%)	3 (12,0%)
F3	4 (21,1%)	0 (0,0%)	2 (8,0%)	0 (0,0%)
F4	3 (15,8%)	2 (10,5%)	2 (8,0%)	2 (8,0%)
Liver steatosis data				
CAP (dB/m)	363,00±10,65	221,95±11,23**	341,60±8,27	225,76±12,22**
C1	0 (0,0%)	17 (89,5%)	2 (8,0%)	18 (72,0%)
C2	4 (21,1%)	2 (10,5%)	5 (20,0%)	7 (28,0%)
C3	15 (78,9%)	0 (0,0%)	18 (72,0%)	0 (0,0%)

*Note: the differences were compared between the surgical intervention groups, before and after treatment, respectively. * - P<0,05, ** - P<0,001*

Also, the analysis of Deepa V. Cherla and his colleagues showed that both drain resection and Roux-en-Y gastric bypass (RYGB) significantly improve liver fibrosis and steatosis, while no significant differences were found between the methods [4]. The data confirm that drainage resection and gastroschunting effectively reduce liver fibrosis and steatosis. Mini-gastric bypass surgery demonstrates somewhat greater efficiency, and a significant decrease in E and CAP indicators after operations confirms their high effectiveness. A study conducted by M. Mostafa and colleagues showed that both drain resection (CP) and mini-gastric bypass (MGB) lead to a significant improvement in CAP and kPa

indicators a year after surgery, and MGB showed great effectiveness in reducing these indicators [9]. Other research, such as the work of K. Seeberg and his colleagues confirm that both drain resection and Roux-en-Y gastric bypass (RYGB) effectively reduce the level of steatosis and liver fibrosis, without revealing significant differences between the methods [12].

In general, the results of our study confirm the effectiveness of surgical intervention not only in reducing body weight, but also in improving the condition of the liver in obese patients. Our data are consistent with the results of other studies, which also indicate the positive effects of bariatric surgery on metabolic health and liver function in obese patients.

A decrease in BMI after bariatric surgery is associated with a decrease in fat mass, which, in turn, reduces the load on the liver and contributes to the regression of steatosis and fibrosis. A study by Shanwen Charleen Yeo and colleagues confirms a significant improvement in liver fibrosis and steatosis after surgery, which correlates with weight loss [17]. In addition, a study by D. Toman et al noted a significant reduction in liver steatosis and fibrosis in obese patients one year after bariatric surgery [16].

In conclusion, a decrease in BMI after bariatric surgery reduces fat mass, reduces liver load, and promotes regression of steatosis and fibrosis. This improves the overall health of patients and reduces the risk of complications such as cirrhosis and liver failure.

Conclusion. Our study confirms the effectiveness of bariatric surgery in improving liver health in patients with obesity and non-alcoholic fatty liver disease (NAFLD). The use of gastric bypass and drain resection demonstrated a significant reduction in liver fibrosis and steatosis 24 months after surgery, which was confirmed by transient elastography and controlled attenuation data. The results show that both surgical techniques lead to a significant reduction in body mass index (BMI). Reducing fat mass reduces the load on the liver, promoting regression of steatosis and fibrosis, which has a positive effect on the metabolic health of patients and reduces the risk of developing complications such as cirrhosis and liver cancer. Patients who underwent gastric bypass showed a greater reduction in liver fibrosis and steatosis compared with those who chose fusion resection. However, both methods have been shown to be significant in reducing fibrosis and steatosis, confirming their important role in the treatment of NAFLD in obese patients. Our data are consistent with other studies, highlighting the importance of bariatric surgery as an effective treatment for metabolic disorders associated with obesity and NAFLD. A decrease in BMI after surgery correlates with an improvement in liver parameters, which confirms the need to include these

operations in the comprehensive treatment of patients with NAFLD and obesity. In summary, the study results highlight the importance and effectiveness of bariatric surgery in the treatment of non-alcoholic fatty liver disease and associated metabolic disorders in obese patients.

REFERENCES

1. Barros, F., & Fonseca, A. (2020). Bariatric surgery during the evolution of fatty liver–A randomized clinical trial comparing gastric bypass and sleeve gastrectomy based on transient elastography. *Clinical Obesity*, 10.

2. Barzin, M., Ebadinejad, A., Aminian, A., Khalaj, et. al. (2023). Does one-anastomosis gastric bypass provide better outcomes than sleeve gastrectomy in patients with BMI greater than 50? A systematic review and meta-analysis. *International Journal of Surgery (London, England)*, 109, 277 - 286.

3. Berzigotti, A. (2015). Non-invasive assessment of non-alcoholic fatty liver disease: ultrasound and transient elastography.. *Reviews on recent clinical trials*, 9 3, 170-7 .

4. Cherla, D., Rodriguez, N., Vangoitsenhoven, R., Singh, T., et. al. (2019). Impact of sleeve gastrectomy and Roux-en-Y gastric bypass on biopsy-proven non-alcoholic fatty liver disease. *Surgical Endoscopy*, 34, 2266-2272.

5. Furlan, A., Tublin, M., Yu, L., Chopra, K., Lippello, A., & Behari, J. (2019). Comparison of 2D Shear Wave Elastography, Transient Elastography, and MR Elastography for the Diagnosis of Fibrosis in Patients With Nonalcoholic Fatty Liver Disease.. *AJR. American journal of roentgenology*, 1-7 .

6. Honda, Y., Yoneda, M., Imajo, K., & Nakajima, A. (2020). Elastography Techniques for the Assessment of Liver Fibrosis in Non-Alcoholic Fatty Liver Disease. *International Journal of Molecular Sciences*, 21.

7. Huang, D., El-Serag, H., & Loomba, R. (2020). Global epidemiology of NAFLD-related HCC: trends, predictions, risk factors and prevention. *Nature Reviews Gastroenterology & Hepatology*, 18, 223 - 238.

8. Lupsor-Platon, M., Serban, T., Silion, A., Tirpe, A., & Florea, M. (2020). Hepatocellular Carcinoma and Non-Alcoholic Fatty Liver Disease: A Step Forward for Better Evaluation Using Ultrasound Elastography. *Cancers*, 12.

9. Mostafa, M., Moustafa, A., Sayed, M., Eskandaros, M., & Hussein, A. (2021). Prospective randomized study to compare between the effect of sleeve gastrectomy and mini-gastric bypass on nonalcoholic steatohepatitis in morbidly obese patients. *The Egyptian Journal of Surgery*, 40, 1357 - 1364.

10. Poghosyan, T., Alameh, A., Bruzzi, M., Faul, A., Rives-Lange, C., Zinzindohoué, F., Douard, R., & Chevallier, J. (2019). Conversion of Sleeve

Gastrectomy to One Anastomosis Gastric Bypass for Weight Loss Failure. *Obesity Surgery*, 1-6.

11. Powell, E., Wong, V., & Rinella, M. (2021). Non-alcoholic fatty liver disease. *The Lancet*, 397, 2212-2224.

12. Seeberg, K., Borgeraas, H., Hofsø, D., Småstuen, M., et. al. (2021). Gastric Bypass Versus Sleeve Gastrectomy in Type 2 Diabetes: Effects on Hepatic Steatosis and Fibrosis. *Annals of Internal Medicine*, 175, 74 - 83.

13. Selvaraj, E., Mózes, F., Jayaswal, A., Zafarmand, M., Vali, Y., Lee, J., Levick, C., Young, L., et. al. (2021). Diagnostic accuracy of elastography and magnetic resonance imaging in patients with NAFLD: a systematic review and meta-analysis.. *Journal of hepatology*.

14. Shetty, A., Giron, F., Divatia, M., Ahmad, M., Kodali, S., & Victor, D. (2021). Nonalcoholic Fatty Liver Disease after Liver Transplant. *Journal of Clinical and Translational Hepatology*, 9, 428 - 435.

15. Taru, M., Neamți, L., Țâru, V., Procopciuc, L., Procopet, B., & Lupsor-Platon, M. (2023). How to Identify Advanced Fibrosis in Adult Patients with Non-Alcoholic Fatty Liver Disease (NAFLD) and Non-Alcoholic Steatohepatitis (NASH) Using Ultrasound Elastography—A Review of the Literature and Proposed Multistep Approach. *Diagnostics*, 13.

16. Toman, D., Vávra, P., Jelínek, P., Ostruszka, P., Ihnát, P., Foltys, A., Pelikán, A., & Roman, J. (2021). Effect of bariatric surgery on fatty liver disease in obese patients: A prospective one year follow-up study.. *Biomedical papers of the Medical Faculty of the University Palacky, Olomouc, Czechoslovakia*. https://doi.org/10.5507/bp.2021.021.

17. Yeo, S., Ong, W., Cheng, K., & Tan, C. (2019). Weight Loss After Bariatric Surgery Predicts an Improvement in the Non-alcoholic Fatty Liver Disease (NAFLD) Fibrosis Score. *Obesity Surgery*, 29, 1295-1300.

18. Yoneda, M., Yoneda, M., Fujita, K., Inamori, M., Tamano, M., Hiriishi, H., & Nakajima, A. (2007). Transient elastography in patients with non-alcoholic fatty liver disease (NAFLD). *Gut*, 56, 1330 - 1331.

19. Younossi, Z., Stepanova, M., Ong, J., Trimble, G., Alqahtani, S., Younossi, I., Ahmed, A., Racila, A., & Henry, L. (2020). Nonalcoholic Steatohepatitis is the Most Rapidly Increasing Indication for Liver Transplantation in the United States.. *Clinical gastroenterology and hepatology : the official clinical practice journal of the American Gastroenterological Association*.