THE REPUBLIC OF AZERBAIJAN

On the rights of the manuscript

ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

THE STUDY OF LIVER DYSFUNCTION AFTER ABDOMINAL SURGERY IN PATIENTS WITH OBESITY

Specialty: 3213.01- Surgery

Field of science: Medicine

Applicant: **Aygun Adalat Ibrahimova**

Baku − 2022

The dissertation was carried out at the Department of Surgical Diseases I of Azerbaijan Medical University.

Scientific supervisor: Corresponding member of the ANAS, Doctor of Medical Sciences, professor **Nuru Yusif Bayramov**

Official opponents: Doctor of Medical sciences, professor **Kenan Rafael Yusifzadeh**
Doctor of Medical sciences **Elmira Aghaali Aliyeva**
Doctor of Medical sciences, professor **Elchin Kamil Aghayev**

Dissertation Council ED 2.06 of the Supreme Attestation Commission under the President of the Republic of Azerbaijan operating under Azerbaijan Medical University

Chairman of the Dissertation Council:
Doctor of Medical sciences, professor **Surkhay Ismayil Hadiyev**

Academic Secretary of the Dissertation Council:
Doctor of Medical sciences, professor **Fariz Hidayat Jamalov**

Chairman of the Academic Seminar:
Doctor of Medical sciences, professor **Mahammad Mahammadali Karimov**

İMZANI TƏSDİQ EDİRƏM
Azərbaycan Tibb Universitetinin
ELMİ KATİBİ
Tibb elmləri doktoru, professor
Nazim Adil oğlu Pənahov
"18" 03 2022

GENERAL DESCRIPTION OF THE WORK

Relevance and degree of scientific development of the issue. Obesity is a serious social and economic health issue of the modern society. It is a serious disease that continues to grow all over the world and reaches epidemic levels especially in developed and developing countries[1]. According to the WHO, the number of people suffering from obesity in the world will exceed 300 million by 2025. Currently, 13% of the world's and 34% of the USA's elderly population suffer from obesity[2].

Obesity is a multifactorial complex metabolic disease caused by genetic and environmental factors. In addition to causing serious health problems, obesity also aggravates the course and prognosis of existing diseases, especially liver problems, diabetes, and has a devastating effect on the immune system[3].

About 60% of liver problems in obese patients include steatosis, 20-25% - non-alcoholic fatty liver disease (NAFLD), and 2-3% - cirrhosis of the organ[4]. NAFLD is the most common chronic liver disease among the elderly population in Western countries, affecting even 9% of children and adolescents[5]. 40-100% of NAFLD patients are obese. The incidence of NAFLD in these patients is 6

[1]Okunogbe, A. Economic impacts of overweight and obesity: current and future estimates for eight countries / A.Okunogbe , R.Nugent, G. Spencer [et al.] //BMJ Glob Health,– 2021. 6, –p. 1-15.

[2] Mitchell, N. Obesity: overview of an epidemic / N. Mitchell,V.Catenacci, H. Wyatt [et al] //Psychiatr Clin North Am, – 2011. 34(4), –p. 717–732.

[3] Xihua, L. Obesity: Epidemiology, Pathophysiology, and Therapeutics / L. Xihua, L Hong // Front. Endocrinol, – 2021, –p. 12706978.

[4]. Ruissen, M. Management of endocrine disease: Non-alcoholic fatty liver disease: a multidisciplinary approach towards a cardiometabolic liver diseases /M.Ruissen, A. Mak, U.Beuers, M.Tushuizen // European Journal of Endocrinology, – 2020. 183: 3, –p. 57–73.

[5] Schwimmer, J.B. Safety study: alanine aminotransferase cutoff values are set too high for reliable detection of pediatric chronic liver disease/ W. Dunn, G.J. Norman, –P.E. [et al.] // Gastroenterology, – 2010. 138, –p.1357–1364

times higher than in people with normal weight. Obesity causes the development of severe liver fibrosis in about 20% of cases[6].

Late detection of the latter and lack of adequate treatment is complemented by liver cirrhosis.[7].

The causes of hepatic dysfunction that develop after surgery, including abdominal surgery, have not been adequately studied. However, neuromuscular blockers used during general anesthesia, impaired hepatic blood flow in major surgeries, and cholecystectomy for stoneless cholecystitis, which is very rare (0.7%), have been shown to cause subsequent liver dysfunction[8].

Adverse effects of obesity on postoperative transplant outcomes in obese patients compared with normal weight transplant recipients were also investigated[9]. However, important aspects of hepatic dysfunction in the postoperative period in obese patients have not been studied in detail.

Obesity creates the risk of reduced resistance of the body to infections by adversely affecting humoral and cellular immunity, specific and non-specific immune response mechanisms, and leads to delays and serious difficulties in wound healing, including surgical wounds, and reduces quality of life and survival. Thus, wound infection is 2-5% in normal weight patients who have undergone abdominal surgery, and 4-10 times more in patients with obesity. The risk of death ratio in obese patients is 2/3 compared to normal weight patients[10].

---

[6] Monteiro P. A. Body composition variables as predictors of NAFLD by ultrasound in obese children and adolescents / Antunes B.M., Silveira L.S., Christofaro D.G. [et al.] //BMC Pediatr , – 2014. 29, –p.14-25.

[7] Suresh, D. Etiology of Hepatocellular Carcinoma: Special Focus on Fatty Liver Disease / D.Suresh, A. Srinivas D. Kumar // Oncol, – 2020. 10, –p. 601710 .

[8] Ghanem, M. Effects of sevoflurane on postoperative liver functions in morbidly obese as compared to the non- obese patients / M. Ghanem, I. Massad, B. Barazangi [et al.] // M.E.J. Anesth, – 2019. 20 (2) , – p. 207-210.

[9] Moctezuma-Velazquez C. Obesity in the Liver Transplant Setting / Márquez-Guillén E., and Torre A. // Nutrients, – 2019.11(11) , –p.255.

[10] Gaulton, T.G. The effect of obesity on clinical outcomes in presumed sepsis: a retrospective cohort study/ T.G. Gaulton, M.G.Weiner, K.H. Morales [et al.] //Intern Emerg Med, – 2014. 9(2), –p.213-1.

Functional changes in the liver after various surgeries for septic and non-septic diseases have been studied in numerous studies. However, important clinical and laboratory indicators used to assess the functional status of the liver (bilirubin, INR, albumin, indocyanine green (ICG) clearance, etc.) characterize more significant changes in severe organ dysfunctions. Changes in mild organ dysfunctions are mild and inconspicuous. In this regard, there is a need to study many important aspects of the problem at a level that is sufficient and clinically relevant.

Object and subject of the research.

Clinical studies cover 120 patients aged 18-70 who have undergone abdominal surgery for various surgical diseases at the Educational-Surgical Clinic of Azerbaijan Medical University between 2015-2020.

Aim of the research: To detect the incidence of hepatic steatosis, to study changes in liver function after surgery for septic and non-septic diseases in patients with hepatic steatosis and their clinical significance in obese and non-obese patients.

Tasks of the research:

1. To detect the incidence of hepatic steatosis in obese surgical patients;
2. To find dynamic changes in liver function after surgery in patients with obesity, systemic inflammation and hepatic steatosis;
3. To determine the effect of obesity and postoperative liver dysfunction on postoperative course;
4. To study the functional state of the liver after surgery for septic diseases in non-obese patients;
5. To study the functional status of the liver after surgery for non-septic diseases in obese patients;
6. To study the functional status of the liver after surgery for septic diseases in obese patients;
7. To study minimal hepatic encephalopathy and Critical Flicker Frequency (CFF) with HEPAtonorm Analyzer in patients included in the study;

8. To study MELD score ($MELD_s$) in the patients subject to the study;
9. To study Glasgow prognostic score (GPS), neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) in septic patients.

Research methods. According to the dissertation plan, the research covers several stages in a row. In the first stage, recent data of local and foreign researchers on epidemiology, etiopathogenesis of obesity, the impact of abdominal surgery and the postoperative period, the nature of systemic inflammation, as well as the impact of obesity and sepsis on the functional state of the liver were analyzed. For this purpose, 13 local and 230 foreign sources were used.

In the second stage, studies were performed in patients aged 18-70 who underwent abdominal surgery for various surgical diseases. Patients were primarily divided into 2 groups according to their BMI, and then each group divided into 2 subgroups based on systemic inflammation. In these patients, instrumental and laboratory parameters, systemic inflammation parameters of the liver, NLR and PLR, GPS and $MELD_s$ were calculated.

In the third stage, statistical processing of the results obtained for each group was carried out separately.

In the fourth stage, a comparative analysis of the studied indicators was carried out by groups, the effect of obesity on the course of systemic inflammation, laboratory and instrumental indicators of the liver was studied.

Key points presented for defense:

- In order to prevent hepatic complications in the postoperative period in obese patients, liver elastography should be performed in the preoperative period and liver function tests should be performed.
- GPS, NLR and PLR allow timely detection of systemic inflammatory changes in septic patients with and without obesity.
- The critical flicker frequency is important for the early detection of hepatic dysfunction and minimal hepatic encephalopathy in the postoperative period.

Scientific novelty of the research:

In obese septic and non-septic patients, the dynamics of hepatic dysfunction after abdominal surgery, especially the dynamics of minimal hepatic encephalopathy have been studied for the first time. Also, MELDs were firstly studied in these patients in the postoperative period. Also, scientific novelties of the study include the calculation of indices such as GPS, NLR and PLR to assess the severity of postoperative sepsis in obese and non-obese septic patients and studying their clinical significance, their role in the prognosis and early diagnosis of postoperative purulent-inflammatory complications, proving their importance in clinical practice using mathematical models based on the probability theory by ROC-analysis.

Practical significance of the research

- The effect of obesity on liver dysfunction in obese patients during the postoperative period was identified;
- A comparative study of NLR and PLR in groups with and without obesity revealed a negative effect of obesity on the course of systemic inflammation;
- GPS has been shown to be important in the prediction of systemic inflammation in septic patients with obesity;
- Practical recommendations were given on the importance of measuring the critical flicker frequency in the early detection of hepatic dysfunction and minimal hepatic encephalopathy during postoperative period.

Application of research results in practice.

The dissertation topic is included in the plan of scientific research of the Department of Surgical Diseases I of AMU (state registration number № BTEB-007)

Testing of dissertation materials.

Individual fragments of the dissertation were discussed at the following scientific meetings: AMU final scientific conference 2016 (2016, Baku), 3rd International Medical Congress for students and young doctors (1-2 November 2016, Baku), 1st APIMFS congress Baku and 30th Anniversary Meeting of APIMFS (15-18 May 2018, Baku), XVIII International Euroasian Conference of Surgery and

Hepatogastroenterology (11-14 September 2019, Baku), 4th Conference of Euroasian and Gastroenterological Association (18-20 October 2019, Girne, Nothern Cyprus), 14. Hepato Pancreato Biliary Surgical Congress and 5. Hepato Pancreato Biliary Surgical Nursing Congress (October 23-26, 2019, Antalya, Turkey), Conference dedicated to the 90th Anniversary of Azerbaijan Medical University (Baku, 2020), Proceedings of the 3rd International Scientific and Practical Conference, Challenges in Science of Nowadays (6-8.04.2021, Washington, USA), X International Scientific and Practical Conference, Science and Practice: Implementation to Modern Society (4-5.06.2021, Manchester, Great Britain), IV International Health, Sciences and Innovation Congress (5-6.07.2021 Baku).

The initial discussion of the dissertation was held at the meeting of Azerbaijan Medical University with the participation of the staff of the Departments of Surgical Diseases I, II, III, General Surgery, Pediatric Surgery, Traumatology and Orthopedics, Oral Cavity and Plastic Surgery on 19 October 2021 (Protocol №3). Initial testing was held on 30 December 2021 at the meeting of the Approbation Commission (Protocol №10) of the Dissertation Council ED.2.06 operating under Azerbaijan Medical University.

Application of dissertation work in practice.

The research results are applied in the daily practice of the bases of the Department of Surgical Diseases I of Azerbaijan Medical University. Also, scientific data obtained from clinical-laboratory-instrumental research are referred to in the teaching process.

Name of the organization where the dissertation work has been performed.

The dissertation work was carried out at the Educational-Surgical Clinic of Azerbaijan Medical University of AMU, Department of Surgical Diseases I.

Publications.

The main provisions and results of the dissertation were published in 10 journal articles (including 3 articles in abroad) and 10 theses (including 4 theses in abroad).

The structure and volume of the dissertation.

The dissertation consists of 162 pages (183700 characters) including the introduction (12116), I fəsil (65388), II chapter (14258), III chapter (27913), IV chapter (35114), final (25772) results (2284), practical recommendations (855) and a bibliography. The bibliography includes 243 sources published in Azerbaijani (13), Russian (3) and foreign languages (227). The dissertation is documented with 32 tables, 12 graphs and 3 figures.

RESEARCH MATERIALS AND METHODS

The clinical study was based on a comparative study of the preoperative and postoperative liver parameters of 120 patients who underwent abdominal surgery for various surgical diseases in the Surgical Departments of the Educational- Surgical Clinic of Azerbaijan Medical University during 2015-2020.

The electronic database includes patients' age, sex, BMI, WC, number of bed days, emergencies, GPS, NLR, PLR, CFF, MELDs, elastography and laboratory analysis results. Based on the results obtained, patients were divided into appropriate groups and intergroup clinical, statistical and mathematical analysis was performed.

To assess the severity of systemic inflammation, GPS, inflammatory biomarkers such as NLR and PLR were calculated. NLR <5 was considered negative, NLR> 5 - positive, PLR <200 - negative, and PLR≥200 - positive. To assess hepatic dysfunction, MELDs, critical flicker frequency (CFF) were measured with HEPAtonorm analyzer; CFF> 39Hz was assessed as norm, CFF≤39 - minimal hepatic encephalopathy (MHE).

Serum albumin, ALT, AST, GGT, ALP, total bilirubin, INR, albumin and CRP levels were studied on days 1, 3, and 5 before and after surgery.

Based on the nature of the goals and objectives set during the study, patients were divided into 4 groups: Group I - control group - 30 patients without obesity, who underwent abdominal surgery for non-septic diseases; Group II - 31 patients without obesity, who underwent abdominal surgery for septic diseases; Group III - 29

patients with obesity, who underwent abdominal surgery for non-septic diseases; Group IV patients - 30 patients with obesity, who underwent septic surgery. Body mass index was less than 25 kg/m² in non-obese patients and more than 30 kg/m² in obese patients.

As can be seen from Table 1, the average age of 120 patients included in the study was 53.0 ± 1.3 (18-69), the average number of bed days was 7.4 ± 0.4 (3-30), and the average BMI was 27.32 ± 0.39 (16.89-37.34), the average WC was 88.5 ± 1.0 (69.0-113.0).

Table 1

General characteristics of patients

Physical and other indicators	N	Average ind. ± St. error	min	max
Age	120	53,0±1,3	18,0	69,0
Bed days	120	7,4±0,4	3,0	30,0
BMI	120	27,32±0,39	16,89	37,34
WC	120	88,5±1,0	69,0	113,0

As can be seen from Table 2, 61 (51.8%) male patients (33 non-obese, 28 obese), 59 (49.2%) female patients (28 non-obese, 31 obese) were included in the study. In total, 61 (50.8%) patients were not obese (non-septic - 30 (25%); septic - 31 (25.8%) patients), and 59 patients were obese (non-septic - 29 (24.2) %); septic - 30 (25%) patients).

Table 2

Characteristics of patients by groups

		Obesity				p_{χ^2}	p_Z	p_H
		yes		no				
		n	%	n	%			
Sepsis	Non-septic	30	49,2%	29	49,2%	0,998	1,000	0,998
	Septic	31	50,8%	30	50,8%			
Age group	18 - 30	4	6,6%	4	6,8%	0,072	0,400	0,086
	30 - 39	9	14,8%	7	11,9%			
	40 - 49	10	16,3%	14	23,7%			
	50 - 59	17	27,8%	14	23,7%			
	60 - 69	21	34,4%	20	33,9%			
Sex	male	33	54,1%	28	47,5%	0,467	0,999	0,221
	female	28	45,9%	31	52,5%			
Surgery time	planned	46	75,4%	53	89,8%	0,038	0,561	0,038
	emergency	15	24,6%	6	10,2%			
Complication	yes	59	96,7%	53	89,8%	0,130	0,999	0,132
	no	2	3,3%	6	10,2%			

Note: *Statistical accuracy of the difference between the indicators was calculated under pχ2 - χ2 - Pearson, pZ - Z - Kolmogorov-Smirnov, pH - H - Kruskal-Wallis criteria.*

Out of these patients, 112 patients (93.3%) had no complications, 6 obese patients (5%) and 2 (1.7) non-obese septic patients had complications (secondary wound healing due to infection or local necrosis) (Table 2).

Statistical calculations. All figures obtained during the study were analyzed using SPSS statistical program (SPSS 16.0). A non-parametric method - Wilcoxon (Mann-Whitney) criterion (W) was used to determine the difference between the quantitative indicators in the groups, and χ^2-criterion (Pearson's compliance criterion), Kruskal-Wallis test and Student t test for qualitative analysis. ANNOVA test, correlation analysis and ROC-analysis were used to assess the importance of NLR and PLR as biomarkers. All calculations were made in Microsoft Excel spreadsheet, the results are reflected in tables and diagrams.

ANALYSIS OF RESEARCH RESULTS

To assess the changes in the liver parenchyma before abdominal surgery in the study groups, the results of hepatic elastography (HE) examination were compared between non-obese and obese patients, organic changes were identified, and correlation between waist circumference (WC) and liver changes in obese patients were studied. As a result, in patients without obesity, HE indicators were within the norm, and hepatosteatosis was not detected. In obese patients, the degree of hepatic steatosis (hepatosteatosis), the density and elasticity of liver tissue changed depending on the BMI. Thus, in patients with Grade I obesity (BMI = 30.0-34.9), during the HE examination Grade II hepatosteatosis and decrease in the elasticity of liver tissue, tissue density of 4.6 ± 0.3 kPa (4.4-5.3) were observed. These indicators were assessed as F_0–F_1 on the METAVIR scale.

While comparing the obtained values with the same indicators of non-obese groups, 43.75% increase was detected ($P<0.01$). A similar situation was observed in patients with Grade II obesity (BMI = 35.0-39.9). The density of liver tissue in these patients was 5.4 ± 0.2 kPa (5.1-6.6), which is assessed as F_1 on the METAVIR scale. This

indicator was 68.75% higher than in the non-obese group (P<0.001). In the group of non-obese patients, the waist circumference (WC) changed up to 94 cm in men and up to 80 cm in women. In this group of patients, HE values were within the norm, no hepatosteatosis was observed. However, Grade II hepatosteatosis was observed in male patients with a WC of more than 94 cm and in women more than 80 cm, with liver elasticity varying between 4,9±0.3 kPa (4,4-5,3) and 4,6±0.3 kPa (4,5-5,2), respectively. While comparing these values with the same indicators in the non-obese groups, an increase in liver density in male and female patients was found to be 28.9% (p<0.01) and 27.8% (p<0.01), respectively, which allowed to determine the statistically significant difference among the indicators. Waist circumference of more than 102 cm in male patients and more than 88 cm in female patients was correlated with Grade III hepatic steatosis. HE values ranged between 5.3 ± 0.3 kPa (5.0-6.6) and 5.4 ± 0.2 kPa (4.9-6.5), respectively. These indicators were higher than in non-obese groups. Thus, the indicators increased statistically significant in male patients by 30.5% (p<0.001) and in women by 50% (p<0.001).

As can be seen from Table 3, the examination results of patients in non-septic groups with the HEPAtonorm Analyzer were within the norm. The changes were mainly in septic groups, and in the group of non-obese septic patients, CFF was 43.5 ± 0.3 Hz (41−45) before surgery, which is 1.03 times lower than the same indicator in the control group. One day after the operation, this indicator decreased by 1.2 times (p<0.01) compared to the control group and was equal to 36.2 ± 0.3 Hz (35−46), which corresponds to the values of Grade I minimal hepatic encephalopathy. A similar situation was observed three days after the operation. Thus, compared with the control group, the indicators decreased by 1.2 times (p<0.01) and corresponded to 38.3 ± 0.3 Hz (37−44). Five days after the operation, the indicators rose to normal levels and reached 43.1 ± 0.2 Hz (40−46).

Compared to the preoperative day, the indicators decreased by 1.2 times (p2<0.01) one day, 1.13 times (p2<0.01) three days and 1.05 (p2<0, 01) times five days after the operation. In the group of obese septic patients, CFF values were statistically significantly reduced by 1.1 times (p<0.001) compared to the control group before surgery and

were equal to 41.0 ± 2.9 Hz (40−49). This indicator was 1.06 times (p0<0.01) lower than non-obese septic group and 1.07 times (p1<0.01) lower than obese non-septic group.

Table 3

Results of examinations with HA device

Examination days	Control group (n=30)	Main groups		
		Non-obese, septic group (n=31)	Obese, non-septic group (n=29)	Obese, septic group (n=30)
HEPAtonorm Analyzer_0, Hz	45±0,3 44−47	43,5±0,3 41−45 *	44,1±0,3 43−49 *, ∇ ,	41,0±2,9 40−49 ***, ∇∇,∇∇
HEPAtonorm Analyzer_1, Hz	44±0,3 43−46	36, 2±0,3 35−46 **,^^	40,3±0,4 39−44 **,^^,∇	35,8±1,5 33−44 ***,^^^, ∇∇∇, ∇∇∇
HEPAtonorm Analyzer_3, Hz	45±0,3 43−47	38,3±0,3 37−44 **, ^^	41,1±0,3 40−48 *,^^, ∇	38,0±1,9 36−47 ***, ^^^, ∇∇∇,∇∇
HEPAtonorm Analyzer_5, Hz	46,0±0,2 44−48	41,1±0,2 40−46 **, ^^	41,2±0,4 40−49 *, ^^	40,6±2,0 39−49 ***,^^, ∇∇,∇∇

Note: *_ 0, _1, _ 3, _5−shows the results before the operation, 1, 3 and 5 days after the operation, respectively;*

Statistical accuracy of the difference between the indicators of the groups:

1. *Compared to the control group: *- p<0, 05; ** - p<0,01; ***- p<0,001*
2. *Compared to the non-obese septic group: ∇- p_0<0,05; ∇∇- p_0<0,01; ∇∇∇-p_0<0, 001*
3. *Compared to the obese non-septic group: ∇ - p_1<0,05; ∇∇ - p_1<0,01; ∇∇∇- p_1<0,001*
4. *Compared to preoperative indicators: ^p_2-<0, 05; ^^p_2-<0, 001; ^^^p_2-<0, 001;*

One day after the operation the indicators decreased by 1.2 times (p<0.001) compared to the control group and were equal to 35.8 ± 1.5 Hz (33−34), which corresponds to the criterion of Grade I minimal hepatic encephalopathy. These indicators are 1.01 times (p0<0.001) lower compared to the same indicators of non-obese septic patients, 1.13 times (p1<0.001) lower compared to obese non-septic patients, and 1.15 times (p2<0.001) lower compared to preoperative level.

Three days after the operation the results were 1.18 times ($p<0.001$) statistically significantly lower than in the control group, 1.01 times ($p0<0.01$) lower than CFF results of the non-obese septic group, 1.1 times ($p1<0.01$) lower compared to the obese non-septic group, and 1.1 times ($p2<0.01$) lower compared to preoperative indicators. Although there was an improvement in indicators five days after the operation, they were 1.13 times ($p<0.001$) lower than the control group and showed 1.01 times statistically significant lower results compared to the group of non-obese septic patients ($p0<0.01$), obese non-septic patients ($p1<0.01$) and preoperative values ($p2<0.01$).

Recent studies suggest that pre-existing liver dysfunction is an important risk factor for infection with sepsis. On the other hand, the development of hepatic dysfunction during sepsis is an independent predictor of multiple organ dysfunction and death from sepsis.

Muftuoglu M.A. et al. studied the pathological course of liver damage of sepsis origin on experimental animal models. As in metabolic processes in rats, changes in the liver transcriptome occurred 6 hours after the onset of sepsis, and 15 hours later the amount of free bile acids and transaminases increased in the blood of animals. After molecular, biochemical and physiological changes, steatosis, cholestasis and hepatocellular damage associated with hepatocyte apoptosis, necrosis and neutrophil accumulation were identified.

Our results showed significant increases in liver indicators in septic groups, especially in septic patients with obesity. In non-obese septic patients, the preoperative ALT was 34.3 ± 3.4/L (6.74−51.34), which was 1.3 times ($p<0.01$) statistically significantly higher than the control group. One day after the operation, the mean ALT increased by 2.9 times ($p<0.01$) compared to the control group, 2.3 times compared to the preoperative level ($p2<0.01$), and three days after the operation it increased by 2,7 times ($p<0.01$) compared to the control group, 2.1 times compared to the preoperative level ($p2<0.01$), and five days after the operation – by 2.1 times ($p<0.01$) compared to the control group and by 1.6 times ($p2<0.01$) compared to the preoperative level (figure 1).

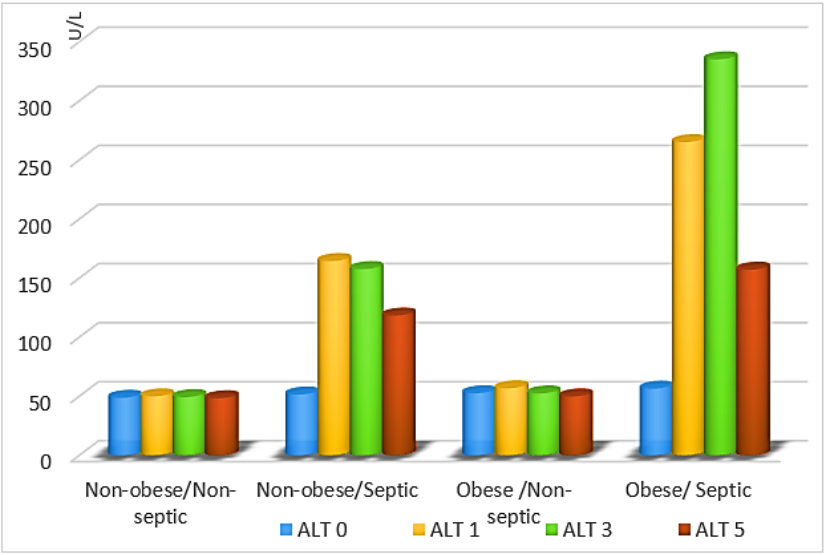


Figure1. Changes in the ALT level in groups

In the group of obese septic patients, ALT was 38.0 ± 3.4/L (10.1−86.31) before the operation, which is 1.5 times ($p<0.001$) statistically significantly higher than the control group, 1.1 times ($p0<0.01$) higher than non-obese septic patients, and 1.2 times ($p1<0.01$) higher than obese non-septic patients. One day after the operation, this indicator increased by 3.3 times ($p<0.001$) compared to the control group, 2.3 times ($p2<0.001$) compared to preoperative level, and 1.13 times ($p0<0.001$) compared to non-obese septic patients, 1.5 times ($p1<0.001$) compared to obese non-septic patients, and three days after the operation this indicator increased further by 3.5 times statistically significantly ($p<0.001$) compared to the control group, 2.4 times ($p2<0.001$) compared to preoperative level, 1.3 times ($p0<0.001$) compared to non-obese septic patients, and 1.7 times ($p1<0.001$) compared to obese non-septic patients. Five days after the operation, the indicators decreased slightly and were equal to 58.0 ± 4.2/L (18.60−157.0).

In non-obese septic patients, the preoperative AST was 29.0 ± 2.3/L (11.21−39.21), which is 1.4 times ($p<0.01$) statistically significantly higher than the control group. One day after the operation, the mean AST was 2.6 times ($p<0.01$) higher than the control group, 1.9 times ($p2<0.01$) higher than preoperative level, and three days after the operation it was 2,4 times ($p<0.01$) higher than the control group, 1.9 times ($p2<0.01$) higher than preoperative level. Five days after the operation, the values were 2 times ($p<0.01$) higher than the control group and 1.4 times higher ($p2<0.01$) than preoperative level(figure 2).

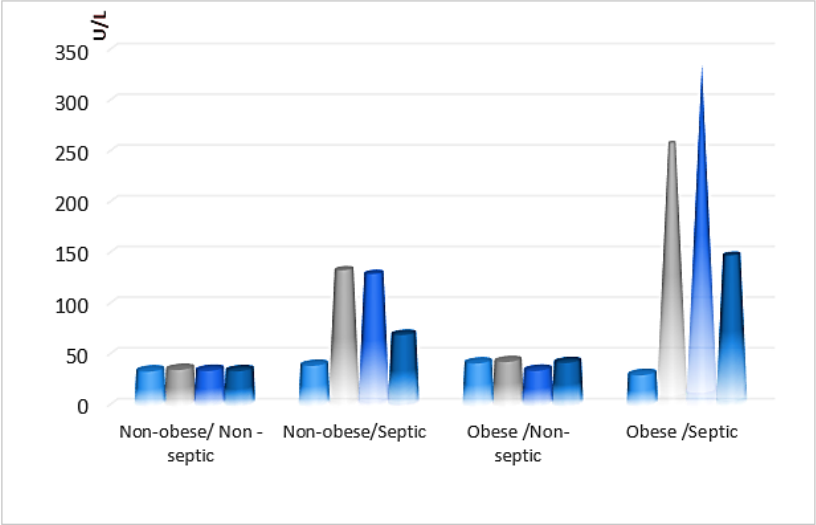


Figure 2. Changes in the AST level in groups

In the group of obese septic patients, AST was 28.6 ± 2.2/L (11.8−30.00) before the operation. One day after the operation, this figure was 2.9 times ($p<0.001$) statistically significantly higher than the control group, 2.2 times ($p2<0.001$) higher than preoperative level, and 1.12 times ($p0<0.001$) higher than non-obese septic patients and 1.5 times ($p1<0.001$) higher than obese non-septic patients, and the mean was 64.5 ± 8.1/L (15.40−257.0). Three days after the operation,

the mean AST was 2.7 times (p<0.001) statistically significantly higher than the control group, 2.1 times (p2<0.001) higher than the preoperative level, and 1.1 times (p0<0.001) higher than non-obese septic patients, and 1.5 times (p1<0.001) higher than obese non-septic patients.

Five days after the operation, although there was a slight decrease in the indicators, the mean AST was 45.6 ± 1.5/L (19.71–146.8), which is 2.3 times (p<0.001) statistically significantly higher than the control group, 1,6 times (p2<0.01) higher than the preoperative level, 1.1 times (p0<0.01) higher than non-obese septic patients and 1.3 times (p1<0.01) higher than obese non-septic patients.

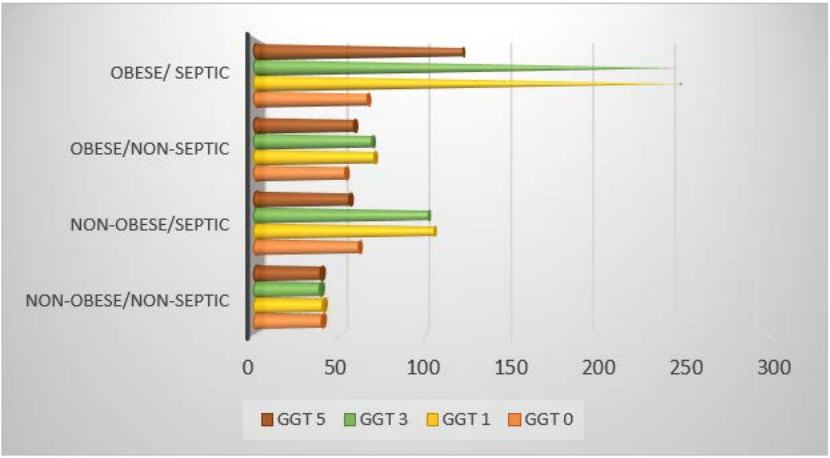


Figure 3. Changes in the GGT level in groups

In non-obese septic patients, the preoperative GGT level was 38.5 ± 3.4/L (11.0–60.9), and one day after the operation it increased by 2.2 times (p<0.01) compared to the control group and 1.3 times (p2<0.01) compared to the preoperative value and reached 50.2 ± 3.6/L (17.8– 105.1) (figure 3). Three days after the operation, the indicators were 2 times (p<0.01) higher than the control group, 1.2 times higher (p2<0.01) than the preoperative level, and five days after the operation were 1.8 times (p. <0.01) higher than the control group

and 1.04 times (p2<0.01) higher than the preoperative level. In the group of obese septic patients, the preoperative GGT level was 47.0 ± 6.0/L (17.0− 66.00), and one day after the operation it increased statistically significantly by 2.9 times (p<0.001) compared to the control group, 1.4 times (p2<0.001) compared to the preoperative level, 1.3 times (p0<0.001) compared to non-obese septic patients and 1.5 times (p1<0.001) compared to obese non-septic patients, and three days after the operation, it was 2.6 times (p<0.001) statistically significantly higher compared to the control group, 1.2 times (p2<0.001) higher than the preoperative level, and 1.3 times (p0<0.001) higher compared to non-obese septic patients, and 1.4 times (p1<0.001) compared to obese non-septic patients. Five days after the operation, there was a slight decrease in the indicators. Thus, the mean GGT was 47.3 ± 5.4/L (17.0− 122.0), which was 2.1 (p<0.001) times statistically significantly higher than the control group, 1.01 times (p2<0.01) higher than the preoperative level, 1.2 times (p0<0.01) higher than non-obese septic patients and 1.2 times (p1<0.01) higher than obese non-septic patients.

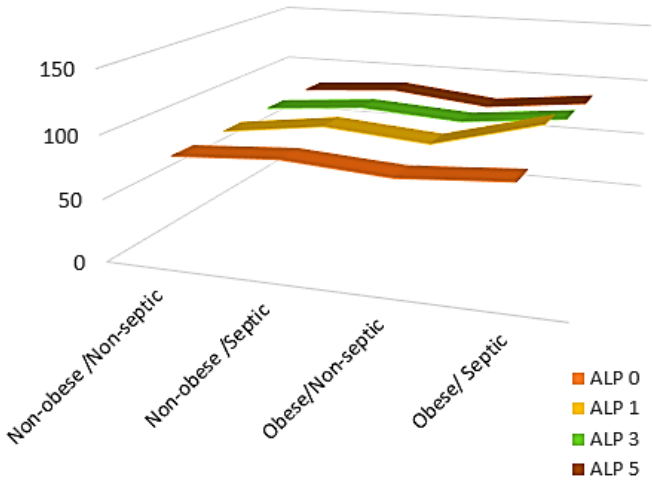


Figure 4. Changes in the ALP level in groups

According to Nesseler N. et al., early manifestations of hepatic dysfunction in patients include elevated TBil and ALP levels, and transaminase activity in later stages. The main histological changes were macular necrosis, capsule inflammation, portal inflammation, steatosis and hepatic fibrosis.

However, our research found out the opposite. Although changes in ALP and total bilirubin were statistically significant, these changes were within the norm for all groups in ALP (figure 4), and TBil slightly increased only in obese septic patients. Thus, in the group of obese septic patients, preoperative TBil was 0.518 ± 0.031 mg/dL (0.32− 0.97), which increased statistically significantly 1.4 times ($p2<0.001$) one day after surgery and became 1.3 times ($p<0.001$) statistically significantly higher than the control group, 1.06 times ($p0<0.01$) higher than non-obese septic patients, and 1.1 times ($p1<0.01$) higher than obese non-septic patients.

Three days after the operation, the mean TBil was 0.769 ± 0.035 mg/dL (0.40-1.75), which was 1.2 times ($p<0.001$) statistically significantly higher than the control group, 1.4 times ($p2<0.001$) higher than the preoperative level, 1.1 times ($p0<0.001$) higher than non-obese septic patients and 1.2 times ($p1<0.001$) higher than obese non-septic patients. Five days after the operation, there was a slight decrease in the indicators. Thus, the mean TBil was 1.1 times ($p<0.001$) higher than the control group, 1.1 times ($p2<0.01$) higher than the preoperative level, 1.05 times ($p0<0.01$) higher than non-obese septic patients and 1,07 times ($p1<0.01$) higher than obese non-septic patients (figure 5).

Yibin Z. et al. proved the importance of GPS in predicting septic complications both in preoperative and postoperative period. In our study, we proved once again that the elevated GPS indicator can be a useful index for predicting the manifestation of sepsis in septic groups, especially in obese septic groups. Thus, the increased GPS observed before the operation in septic groups was further increased in the postoperative days. Preoperative indicators were 1 score 74.2%, 2 scores 25.8% in non-obese septic patients, and 1 score 66.7% and 2 scores 33.3% in obese septic patients. The difference between the decrease and increase of GPS score between the groups was 7.5%

(P<0.05). One day after the operation GPS was observed in both groups with the highest score of 2 scores; 1 score 16,1%, 2 scores 83,9% in the non-obese septic group, and 1 score 10% and 2 scores 90% in the obese septic group. The difference between the groups was 7.5% (P<0.05). Three days after the operation GPS was 1 score 25.8%, 2 scores 74.2% in the non-obese septic group, and 1 score 13.3%, 2 scores were 86.7% in the obese septic group. The difference between the groups was 12.5% (P<0.05). Five days after the operation, the indicators improved relatively and was equal to 1 score 70, 97%, 2 scores 29.03% in non-obese septic group, and 1 score 73.3%, 2 scores 26.7% in obese septic group. The difference between the groups was 2.33% (P<0.05).

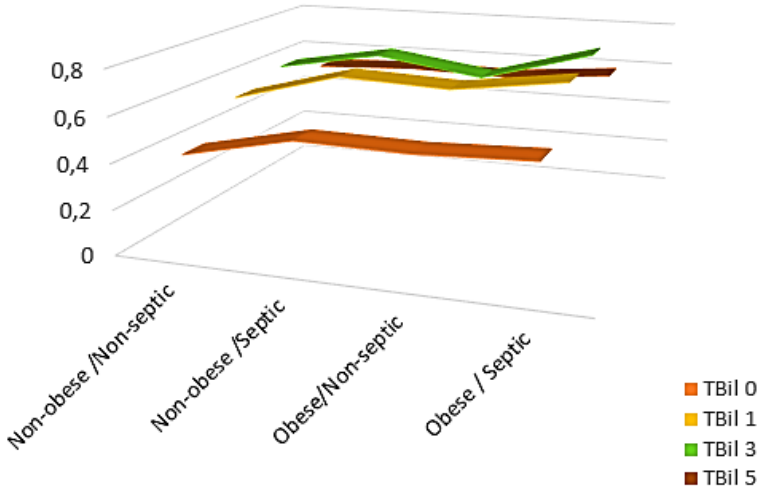


Figure 5. Changes in the TBil level in groups

The $MELD_s$ results changed statistically significantly for groups, the lowest indicator was 2.66±1.1(1.20-3.32) in non-obese non-septic patients and a highest indicator was 3.95±3.0(4.21-7.90) in obese septic patients. $MELD_s$ changes in patients included in our study indicated mild liver damage.

According to Huttunen R. et al., obese patients showed a different response to acute systemic inflammatory syndrome and an increase in mortality from sepsis compared to normal weight patients. Wurzinger B. et al. found a positive correlation between BMI and deaths from sepsis in the ICU in obese patients with septic shock and increased BMI. Nasraway S.A. et al. found a significantly positive correlation between BMI and deaths from sepsis in critically ill patients with only morbid obesity (BMI ≥40 kg/m2) and long-term treatment in the ICU.

In contrast to Nasraway S.A. et al., in our study NLR and PLR levels rose sharply in septic groups, especially in obese septic groups, after both planned and emergency surgeries. In non-obese septic patients, the preoperative NLR was 5.79 ± 0.56 (0.88−12.45), which was 2.4 times ($p<0.01$) statistically higher than the control group. One day after the operation this indicator increased by 3.7 times ($p<0.01$) compared to the control group, and 3.6 times ($p2<0.01$) compared to the preoperative level. Three days after the operation, the indicators were 8.98 ± 1.05 (4.17−35.76), which was 3.2 times ($p<0.01$) higher than the control group and 1.5 times ($p2<0.01$) higher than the preoperative level. Five days after the operation, the indicators were 2.3 times ($p<0.01$) higher than the control group and 1.02 times ($p2<0.01$) higher than the preoperative level.

In the group of obese septic patients, the preoperative NLR was 6.96 ± 1.21 (1.68−27.38). One day after the operation this figure was 5.7 times ($p<0.001$) statistically significantly higher than the control group, 2.4 times ($p2<0.001$) higher than the preoperative level, and 1.6 times ($p0<0.001$) higher than non-obese septic patients, 3.8 times ($p1<0.001$) higher than obese non-septic patients, and the mean was 17.09 ± 3.64 (4.29− 91.50). Three days after the operation the indicators further increased and the mean NLR was 10.86 ± 1.16 (3.20− 30.61), which was 3.9 times ($p<0.001$) statistically significantly higher than the control group, 1.6 times ($p2<0.001$) higher than the preoperative level, 1.2 times ($p0<0.001$) higher than non-obese septic patients and 3.1 times ($p1<0.001$) higher than obese non-septic patients. Five days after the operation, the mean NLR increased statistically significantly by 3.2 times ($p<0.001$) compared to the same control

group, 1.15 times (p2<0.01) compared to the preoperative level, and 1.3 times (p0<0.01) compared to the non-obese septic patients and 2.9 times (p1<0.01) compared to obese non-septic patients.

Changes in PLR were similar to those in NLR. Thus, the preoperative mean PLR was 234.7 ± 20.56 (67.50−487.68) in non-obese septic patients, which was 1.7 times (p<0.01) statistically significantly higher than that of the control group. One day after the operation this indicator increased by 2.07 times (p<0.01) compared to the control group and 1.2 times (p2<0.01) compared to the preoperative level and reached 290.6 ± 26.9 (125.83−361.25). Three days after the operation the indicators were 1.7 times (p<0.01) higher than the control group and 1.8 times (p2<0.01) higher than the preoperative level, and five days after the operation, the indicators were 1.9 times higher (p<0.01) than in the control group and 1.04 times (p2<0.01) higher than the preoperative level.

In the group of obese septic patients, the preoperative PLR was 334.5 ± 6.9 (270.51−500.0), which was 2.5 times (p<0.001) higher than in the control group. One day after the operation this figure was 2.5 times (p<0.001) statistically significantly higher than the control group, 1.04 times (p2<0.001) higher than the preoperative level, 1.2 times (p0<0.001) higher than non-obese septic patients and 2.2 times (p1<0.001) higher than obese non-septic patients, with the mean of 349.09 ± 3.9 (248.9−438.1). Three days after the operation the indicators further increased and the mean PLR was 2.4 times (p<0.001) statistically significantly higher than the control group, 1.03 times (p2<0.001) higher than the preoperative level, 1.4 times (p0<0.001) times higher than non-obese septic patients and 2.3 times (p1<0.001) higher than obese non-septic patients. Although the values decreased slightly five days after the operation, the mean PLR was 352.3 ± 1.8 (145.1− 500.0), which was 2.7 times (p<0.001) statistically significantly higher than the control group. 1.05 times (p2<0.01) higher than the preoperative level, 1.4 times (p0<0.01) higher than non-obese septic patients and 2.4 times (p1<0,01) higher than obese non-septic patients.

Patients with obesity have a different response to acute systemic inflammatory syndrome compared to patients of normal weight, which

requires a special approach and management in the postoperative period. Hepatic dysfunction is 39.9% in patients with sepsis, and liver failure develops in 8.5% of these patients.

Predicting the likelihood of systemic inflammatory complications in the postoperative period allows for the early detection of such cases and the timely initiation of adequate treatment.

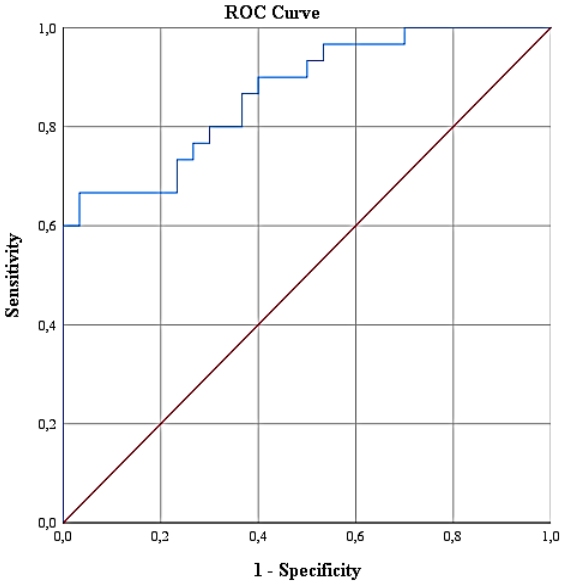
For this purpose, in our study the clinical significance of neutrophil-lymphocyte ratio and platelet-lymphocyte ratio in the prognosis and early diagnosis of systemic inflammatory complications in obese patients after abdominal surgeries was investigated using mathematical-statistical methods on the basis of the probability theory.

A variance test was performed to determine which of the statistically significant informative indicators had the highest "weight" in the diagnosis. To do this, patients' laboratory results were first analyzed on the basis of the variance test (Annova test). The test results show that the studied indicators changed by groups. Of these indicators, only prognostic criteria differing in statistical significance were assessed. From these criteria, only those with determined degree of impact on the result were selected based on statistical analysis. Correlation analysis was performed to establish the mathematical model correctly, and finally, the p-Spearman correlation analysis allowed to identify the dependent indicators and to define which indicator to include as a prognostic model. As a result of statistical analysis, the indicators with significant correlations (NLR and PLR) were selected and maintained, and the research was continued.

In the next stage, ROC-curves were established based on specificity and sensitivity indicators. The higher is the Area Under the Curve (AUC), the higher is the predictive power of the model.

As can be seen from Figure 6, for NLR, this indicator, i.e. the area under the curve AUC = 0.868 + 0.045, 95% EI; 0.780-0.956, $p<0.001$ and was statistically significant. As can be seen from the ROC curve of the NLR, this test is an important test method with high sensitivity and specificity. Figure 7 shows the results of the ROC analysis based on the PLR indicators. As can be seen from the Figure, for PLR, this indicator, i.e. the area under the curve, AUC = 0.835 +

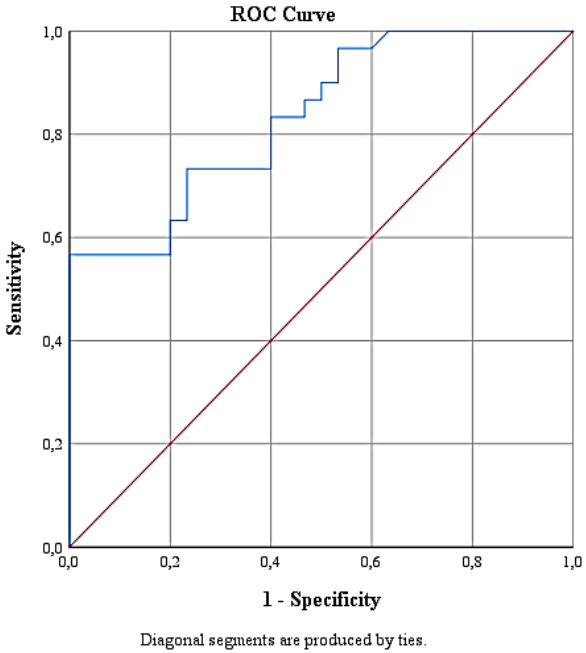
0.050, 95% EI; 0.736-0.943, p<0.001, and was statistically significant and slightly lower than the same indicator of NLR.



Area Under the Curve				
Test Result Variable: NLR				
Area	Std. Error	Asymptotic Sig.	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
0,868	0,045	0,000	0,780	0,956

Figure 6. Results of ROC analysis based on NLR indicators

In the next stage, ANNOVA test was performed to study the prognostic significance of the markers, and the impact of the markers on the forecast was calculated with the Snedecor coefficient, and upper and lower limits were estimated as 95%. (Table 4).



Area Under the Curve				
Test Result Variable: PLR				
Area	Std. Error	Asymptotic Sig.	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
0,835	0,050	0,000	0,736	0,934

Figure 7. Results of ROC analysis based on PLR indicators

Table 4

Prognostic significance of NLR and PLR (Fisher-Snedecor)

Markers	EIF% (impact of the factor)	LB $_{95}$ (lower bound than 95%)	UB $_{95}$ (upper bound than 95%)	F (Fisher coefficient)	P (Significance)
NLR	78,8	77,4	80,3	215,9	<0,001
PLR	33,4	28,8	38,0	29,1	<0,001

As can be seen from Table 4, the marker with the highest impact in the forecast was NLR (FTG = 78.8; 95% EI: 77.4-80.3). For PLR, this indicator was (FTG = 33.4; 95% EI: 28.8-38.0).

As a result of these analyzes, NLR values were higher according to the Fisher-Snedecor criterion in parallel with the diagnostic weight of the factors, and the impact of factor was 78.8% ($p<0.001$), which was proved to be the value with a more diagnostic significance.

Thus, the results of the study showed that NLR and PLR are important in the prediction of systemic inflammatory complications in obese patients, and NLR has a greater impact.

Thus, despite intensive complex treatment measures, endotoxicosis rapidly developing during sepsis in many cases leads to irreversible changes in vital organs and tissues of the body. This is primarily manifested by the development of dysfunctional and pathomorphological disorders in the liver. Pre-existing fatty liver in obese patients exacerbates the course and prognosis of the clinical condition, especially sepsis. This situation requires early diagnosis of sepsis, etiopathogenetically justified application of more effective and efficient preventive methods. One of the important aspects in the adequate solution of this problem is to provide early diagnosis of surgical and other complications with a high probability (risk) of occurrence in vital organs and tissues, especially in the liver.

RESULTS

1. The incidence of hepatic steatosis in obese patients was: I degree - 1:59 (1.7%), II degree - 30:59 (50.8%) and III degree - 28:59 (47.5%) ($p < 0.001$) [13,19].
2. Obesity, systemic inflammation, and hepatic steatosis cause overt and covert hepatic dysfunction after surgery. These postoperative changes become more pronounced in the first 1-3 days, disappear on days 5-7 [4,7,10].
3. Obesity and postoperative subclinical hepatic dysfunction increase postoperative systemic inflammation and are a risk factor for complications [4,7,8,10,18].
4. In septic patients without systemic inflammation and obesity, during the postoperative period ALT increased statistically significantly by 2.9 times ($p<0,01$), AST by 2.6 times ($p<0,01$), GGT by 2.2 times ($p<0,01$), ALP by 1.3 times ($p<0,01$) compared to the control group and these changes are more pronounced one and three days after the operation [1,2,3,7,8,9,10,13,17,18,19].
5. In obese non-septic patients, during the postoperative period ALT increased statistically significantly by 2.3 times ($p<0,01$), AST and GGT by 1.9 times ($p<0,01$), ALP by 1.05 times ($p<0,01$), TBil by 1.3 times ($p<0,01$) compared to the control group and these changes became more noticeable one day after the operation [1,4,6,7,8,10,17,18].
6. In obese septic patients with systemic inflammation, during the postoperative period ALT increased statistically significantly by 3.3 times ($p<0,001$), AST and GGT by 2.9 times ($p<0,001$), ALP by 1.3 times ($p<0,001$), TBil by 1,4 times ($p<0,01$) compared to the control group and these changes are more pronounced one and three days after the operation [1,2,3,5,6,7,8,9,18].
7. In patients with combined obesity and septic conditions, postoperative hepatic dysfunction was exacerbated, more severe changes in injury, cholestasis and inflammation indicators were observed, and first-degree minimal hepatic

encephalopathy CFF 35.8±1.5Hz (33-44) ($p<0,01$) was identified till the third day after the operation [5,7,8,10,13,14,15,20].

8. In groups with MELD score of no more than 8, the lowest indicator was 2.66±1.1(1.20-3.32) in non-obese non-septic patients and a highest indicator was 3.95±3.0(4.21-7.90) in obese septic patients. $MELD_s$ changes in patients included in our study indicated mild liver damage [3, 11,12].
9. Markers such as GPS, NLR (FTG = 78.8; 95% EI: 77.4-80.3) and PLR (FTG = 33.4; 95% EI: 28,8-38,0) allow to obtain accurate results in the prognosis of systemic inflammatory complications in obese septic patients [11,12, 14,16,17].

PRACTICAL RECOMMENDATIONS

1. It is recommended to conduct a diagnostic complex consisting of the results of US and elastography examinations of the organ in the preoperative period, as well as the study of important biochemical parameters for the correct assessment of liver function, early diagnosis of liver disease, prevention of liver complications during the postoperative period in obese patients.
2. Calculation of NLR and TLR in both preoperative and postoperative period in septic patients with and without obesity is important for the prediction of systemic complications.
3. Glasgow prognostic score parameters may be an "alarm" during the perioperative period in septic patients with and without obesity.
4. Hepatonorm examination is recommended for obese septic patients for early diagnosis, treatment and prevention of minimal hepatic encephalopathy.

LIST OF SCIENTIFIC WORKS PUBLISHED ON THE DISSERTATION TOPIC

1. İbrahimova A.Ə., Bayramov N.Y., Ömərov T.İ. Piylənmə və piylənmənin orqanizmdə törətdiyi dəyişiklər//Azərbaycan Tibb Jurnalı: N3, 89-93, 2016
2. İbrahimova A., Bayramov N. Evaluation and comparison of pre- and postoperative levels of liver function tests in obese patients versus normal patients after abdominal operations. 3rd Internatiional Medical Congress for students and young doctors (1-2 November 2016, Baku), -s. 92
3. İbrahimova A.Ə., Bayramov N.Y., Ömərov T.İ. Piylənmə olan xəstələrdə abdominal cərrahi əməliyyatlardan sonra qaraciyər disfunksiyasının araşdırılması. Təbabətin aktual problemləri EPK-ın materialları. ATU. Bakı. 2017. -s. 24
4. İbrahimova A.Ə., Bayramov N.Y., Ömərov T.İ. Aşırı piylənməsi olan cərrahi xəstələrdə ağırlaşmaların dəyərləndirilməsi və perioperativ aparılma //Cərrahiyyə jurnalı: N1, 91-95, 2017.
5. Bayramov N.Y. İbrahimova A.Ə. Sepsisin yeni tərifinin klinik əhəmiyyəti //Cərrahiyyə. 2017, №2, -s. 71-72.
6. Bayramov N.Y. İbrahimova A.Ə.Sistemik zədələyici proseslər – cərrahiyyənin fundamental nəzəriyyələrinə ümumi baxış: intoksikasiyadan günümüzdəki sirs və sepsisə //AMEA-nın Xəbərləri (biologiya və tibb elmləri). 2017, cild 72, №1, -s. 111-120.
7. İbrahimova A.A., Bayramov N.Y., Rustam A.M. Investigation of functional hepatic tests in operated patients with obesity //Klinichna khirurhiia. 2018. November; 85(11):26-28. doi: 10.26779/2522-1396. 2018.11.26.
8. İbrahimova A.Ə. Piylənməsi olan xəstələrdə abdominal əməliyyatlardan sonraki dövrdə qaraciyər göstəricilərinin araşdırılması //Cərrahiyyə. 2018, № 2, 59-61.
9. İbrahimova A.A., Bayramov N.Y. Analysis of liver function tests in obese patients after abdominal surgery //World J. of Surgery. 2018. Vol. 42. No 1. –s.24 -25.

10. İbrahimova A.A. Bayramov N.Y., Ömərov T.İ. Influence of open and closed gastrectomy operations to functional tests of liver in patients with obesity /XVIII International Euroasian Conference of Surgery and Hepatogastroenterology. 11-14 september 2019, Baku, –s. 227.
11. İbrahimova A.A. Bayramov N.Y., Comparative study of the change in liver enzymes after abdominal surgery in patients with obesity /4th Conference of Euroasian and Gastroenterolog. Association, 18-20 october 2019, Girne, Nothern Cyprus, –s. 62.
12. İbrahimova A.A. Bayramov N.Y., Omarov T.İ. Perioperative evaluation of liver function tests in septic surgical patients with obesity /14. Hepato Pankreato Bilier Cerrahi Kongresi ve 5. Hepato Pankreato Bilier Cerrahi Hemşireliği Kongresi, 23-26 oktyabr 2019, Antalya, Türkiyə, –s. 220.
13. İbrahimova A.Ə., Bayramov N.Y., Salahova S.Ş. Piylənmə olan cərrahi xəstələrdə qaraciyər elastoqrafiyasının nəticələrinin araşdırılması /Azərbaycan Tibb Universitetinin yaradılmasının 90 illik yubileyinə həsr olunmuş elmi-praktik konfrans, Bakı, 2020, –s. 220.
14. İbrahimova A. Septik cərrahi xəstələrdə neytrofil limfosit və trombosit limfosit nisbətinin əhəmiyyəti //Azərbaycan Tibb Jurnalı, xüsusi buraxılış, 2020. –s. 22-23.
15. Bayramov N.Y., İbrahimova A.A.Kəskin qaraciyər çatışmazlığının terminologiyası- bir nozoloji vahid, müxtəlif adlar//Azərbaycan Tibb Jurnalı, xüsusi buraxılış, 2020. –s. 169-171 .
16. İbrahimova A.A., Bayramov N.Y.The usefulness of neutrophil-to- lymphosyte ratio and platelet-to- lymphosyte ratio in the prognosis of bacterial sepsis /Proceedings of the 3rd International Scientific and Practical Conference, Challenges in science of nowadays (6-8.04.2021, Washington, USA), –p. 689-692.

17. İbrahimova A.A., Bayramov N.Y.Liver function tests in obese patients after abdominal surgery- A prospective study / X International Scientificand Practical Conference, Science and Practice (4-5.06.2021, Manchester, Great Britain), –p. 500-501.
18. İbrahimova A. A. Evaluation of liver function tests in obese patients after abdominal surgery / IV International health, sciences and innovation congress (5-6.07.2021 Bakı).
19. Ибрагимова А.А. Салахова С.Ш., Байрамов Н.Ю., Рустам А.М. Результаты эластографии печени у хирургических пациентов с ожирением. Хирургия. Восточная Европа, 2021. Том: 10. №3 –с. 353-8.doi: 10.34883/PI.2021.10.3.006.
19. Байрамов Н.Ю., Ибрагимова А.А. Современные концепции о печеночной недостаточности: преимущества и недостатки - взгляды общего хирурга и трансплантолога / Klinichna khirurhiia. 2021 May/June; 88(5-6):86-90. DOI: 10.26779/2522-1396.2021.5-6.86

LIST OF ABBREVIATIONS

ALP	–	alkaline phosphatase
ALT	–	alanine transaminase
AST	–	aspartate aminotransferase
BMİ	–	body mass index
CFF	–	critical flicker frequency
ESLD	–	end stage liver diseases
GGT	–	gamma-glutamyl transferase
GH	–	growth hormone
GLP	–	glucagon-like peptide
HCC	–	hepatocellular carcinoma
LE	–	liver elastography
LFT	–	liver function tests
MELD	–	Model End Stage Liver Disease
NAFLD	–	nonalcoholic fatty liver disease
NASH	–	nonalcoholic steatohepatitis
NLR	–	neutrophil to lymphocyte ratio
PLR	–	platelet to lymphocyte ratio
SE	–	septic encephalopathy
Tbil	–	total bilirubin
USG	–	ultrasonography
WC	–	waist circumference
WHO	–	World Health Organization

The defense will be held on «29» April 2022 at «14⁰⁰» in the meeting of the Dissertation Council ED 2.06 of Supreme Attestation Commission under the President of the Republic of Azerbaijan operating under Azerbaijan Medical University

Address: AZ 1022, Baku City, Bakikhanov Street 23.

Dissertation can be found at the library of Azerbaijan Medical University.

Electronic versions of dissertation and its abstract are available on the official website of Azerbaijan Medical University (amu.edu.az).

Abstract was sent to the required addresses on «18» March 2022

Signed for print: 12.03.2022
Paper format: 60 x 84 $^{1}/_{16}$
Volume:33222
Number of hard copies: 20