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# Исследование функциональных тестов печени у оперированных пациентов с ожирением

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# Investigation of functional hepatic tests in operated patients with obesity

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**Реферат**

**Цель.** Изучить связь между показателями функциональных тестов печени после операции и индексом массы тела (ИМТ) пациентов.

**Материалы и методы.** У 59 оперированных пациентов измеряли ИМТ и биохимические параметры печени: активность в сыворотке крови аланинаминотрансферазы (АЛТ), аспартатаминотрансферазы (АСТ), γ–глутамилтрансферазы (γ–ГТ) и содержание общего билирубина. На основании показателей ИМТ всех пациентов разделили на три группы. В 1–ю группу включили 30 пациентов с ИМТ 18,5 – 24,9 кг/м², во 2–ю группу – 20 пациентов с избыточной массой тела, показатели ИМТ 25,0 – 29,9 кг/м², в 3–ю группу – 9 пациентов с ожирением, показатели ИМТ больше 30 кг/м². Сывороточную активность АЛТ, АСТ, γ–ГТ, щелочной фосфатазы, показатели билирубина, международного нормализованного отношения и С–реактивного белка определяли стандартными методами. У всех пациентов анализировали данные тестов функции печени до операции и через 1, 3, 5 дней после операции.

**Результаты.** В 1–й и 2–й группах показатели АЛТ, АСТ и γ–ГТ были в пределах нормального диапазона. Изменения наблюдали в 1–й и 3–й дни после операции в 3–й группе.

Средняя активность (±SD) сывороточных АЛТ и АСТ в 1–й группе составила (25,7 ± 9,8) и (24,9 ± 7,8) U/L ($p < 0,01$), во 2–й группе – (32,5 ± 9,1) и (25,2 ± 7,1) U/L ($p < 0,01$), в 3–й группе – (46,2 ± 13,5) и (31,9 ± 10,6) U/L ($p < 0,01$).

**Выводы.** При высоком ИМТ у пациентов, которые имели жировую дистрофию печени, была значительно повышена активность печеночных ферментов по сравнению с пациентами, у которых не было жировой дистрофии печени. Повышенная активность ферментов печени в сыворотке крови связана с высоким ИМТ, следовательно, высокую частоту жировой дистрофии печени наблюдают у пациентов с повышенным ИМТ.

**Ключевые слова:** печень; ожирение; минимальная гепатоэнцефалопатия.

**Abstract**

**Objective.** To study up a connection between indices of the functional hepatic tests and the body mass index (BMI) in patients after the operation.

**Materials and methods.** In 59 operated patients a BMI was calculated, as well as biochemical hepatic tests: activity of alaninaminotransferase (AlAT) in the blood serum, aspartataminotransferase (AsAT), γ–glutamintransferase (γ–GT) and a general bilirubin content. Basing on the BMI indices, all the patients were divided into three groups. Into Group I 30 patients were included with BMI 18.5 – 24.9 kg/m², into Group II – 20 patients with excessive body mass, the BMI values 25.0 – 29.9 kg/m², and into Group III – 9 patients with obesity, the BMI values more than 30 kg/m². The blood serum activity of AlAT, AsAT, γ–GT, alkaline phosphatase, indices of bilirubin, international normalized ratio and C–reactive protein were determined in accordnce to standard mrthods. In all the patients the data of hepatic function testing were analyzed before the operation and in 1, 3, 5 days after the operation.

**Results.** In Groups I and II the values of AlAT, AsAT and γ–GT were in borders of normal range. The changes were observed on the first and third postoperative day in Group III.

Average activity (±SD) of the blood serum AlaT and AsAT in Group I have constituted (25.7 ± 9.8) and (24.9 ± 7.8) U/L ($p < 0.01$), in Group II – (32.5 ± 9.1) and (25.2 ± 7.1) U/L ($p < 0.01$), in Group III – (46.2 ± 13.5) and (31.9 ± 10.6) U/L ($p < 0.01$).

**Conclusion.** In high BMI in patients, who had hepatic fatty degeneration, a hepatic enzymes activity was raised significantly, comparing with patients who had not hepatic fatty degeneration. Raised activity of hepatic enzymes in the blood serum was connected with high BMI. That's why a high rate of hepatic fatty degeneration is observed in patients with raised BMI.

**Keywords:** liver; obesity; minimal hepatoencephalopathy.

Obesity is a complex, multifactorial, and largely preventable disease, affecting a third of the world's population today [1]. If secular trends continue, by 2030 an estimated 38% of the world's adult population will be overweight and another 20% will be obese [2]. Sixty percent of liver diseases in obese patients include steatosis, 20–25% – non–alcoholic fatty liver disease (NALFD), 2–3% – cirrhosis [2, 3]. The incidence rate of NAFLD in these patients has found to be six times more than those with normal weight [4, 5].

The biochemical tests that reflect liver cell damage, synthetic and excretion function are the main indicators of liver status and functions. These tests include liver enzymes – ala-

Table 1. **Change in preoperative liver enzyme activity in different groups (x̄ ± SD)**

| Groups | Indicators | | | | | |
|---|---|---|---|---|---|---|
| | BMI, kg/m² | ALT, U/L | AST, U/L | ALP, U/L | γ-GT, U/L | Bilirubin, mg/dL |
| Group I | 18.2±3.5 | 25.2±8.5 | 24.1±6.6 | 71.8±13.9 | 14.4±4.2 | 0.3±0.1 |
| Group II | 25.1±3.5 | 31.7±8.6 | 24.1±7.6 | 72.1±16.9 | 16.6±5.1 | 0.5±0.2 |
| Group III | 30.4±5.6 | 44.9±11.2 | 27.7±8.6 | 73.4±14.5 | 20.9±15.1 | 0.7±0.1 |

Table 2. **Change in postoperative liver enzyme activity in different groups (x̄ ± SD)**

| Groups | Indicators | | | | | |
|---|---|---|---|---|---|---|
| | BMI, kg/m² | ALT, U/L | AST, U/L | ALP, U/L | γ-GT, U/L | Bilirubin, mg/dL |
| Group I | 18.2±3.5 | 25.7±9.8 | 24.9±7.8 | 72.8±14.1 | 22.1±5.6 | 0.4±0.1 |
| Group II | 25.1±3.5 | 32.5±9.1 | 25.2±7.1 | 72 ±17.3 | 28.5±3.9 | 0.5±0.3 |
| Group III | 30.4±5.6 | 46.2±13.5 | 31.9±10.6 | 77.5±17.6 | 34.9±8.1 | 0.7±0.3 |

nine aminotransaminase (ALT), aspartate aminotransaminase (AST), alkaline phosphatase (ALK) and γ–glutamyl transpeptidase (γ–ГТ). The other important tests are serum bilirubin, albumin and international normalized ratio (INR).

In obese subjects, the liver function tests (LFT) derangements are noticed to be more frequent than in non–obese ones due to the high prevalence of non–alcoholic fatty liver disease (NALFD) and its consequences [1, 3].

Neuropsychiatric disorders such as depression, subclinical or minimal hepatic encephalopathy (MHE) caused by fatty liver disease are common in severely obese patients [5, 6].

There are a number of criteria for measuring overweight and obesity. The Obesity Committee of the World Health Organization (WHO) has suggested the classification system based on body mass index (BMI) as a universal method. BMI, also known as Quetelet's index, is calculated by dividing bodyweight in kilograms by height in metres square. BMI of 18,5–24,9 is considered as normal weight; 25–29,9 – overweight; BMI>30 – obesity [1–3, 6].

Although the reason of liver dysfunction after abdominal surgery in obese patients is unknown, the neuromuscular blocking agents used during the anesthesia have been identified to cause the weakening of blood flow to the liver in major surgeries, and liver dysfunction after acalculous cholecystitis in rare cases (0.7%) [7–9].

The aim of our study was to investigate the changes in liver functions before and after abdominal surgeries in obese patients and analyze its clinic significance.

## Materials and methods

The study was conducted on 59 patients aged 35–74, who undergone abdominal surgery for different surgical diseases at Educational–Surgical Clinic of Azerbaijan Medical University during 2015–2017. Out of 59 patients, 21 were males, 38 were females, 45 were undergone elective surgery, 14 – emergency surgery.

The obesity was measured under Quetelet's index, and the patients were classified as normal–weight (Group I), overweight (Group II) and obese (Group III) patients.

29 patients were recorded as normal–weight (12 males and 17 females), 21 – overweight (5 males and 16 females), and 9 – obese (4 males and 5 females).

The patients were undergone Complete Blood Count, biochemical blood test, critical flicker frequency test before and 1, 3 and 5 days after the operations, and the results were compared.

Serum ALT, AST, ALT, γ–GT, bilirubin were tested with the reactive kit of Roche (USA) brand. Biochemical tests were carried out in the biochemical laboratory of the Educational–Surgical Clinic of Azerbaijan Medical University.

MHE was diagnosed by conducting a number of neuropsychological tests, including digit–span test, picture completion test and critical flicker frequency test with Hepatonorm analyzer (Accelab GmbH, D–72127 Kusterdingen, Germany).

The findings were undergone mathematical–statistical analysis using IBM SPSS Statistic 16,0 software. Data was analysed by unpaired student t test. Results were expressed as mean ± standard deviation.

## Results

The analysis of findings revealed that change in liver indicators was normal before and after surgery in Group I and II patients (table 1), and there was no significant difference between the indicators of both groups. No MHE was observed.

In obese – Group III patients, liver indicators were normal or at upper normal level before the surgery, ALT and AST levels relatively increased on the postoperative first and third day, normalized on fifth day, and other indicators changed within the normal level (table 2). MHE was observed in six males one day after the surgery. The indicators of other patients in this group changed within the normal level.

## Discussion

These results are consistent with those of previous studies that suggested a positive association between BMI and increased serum activities of liver enzymes [2, 6]. Zhao Y et al. in their study found that population with a mean ± SD body mass index (BMI) of 26.1±4.3 kg/m², both ALT and γ–GT were significantly influenced by BMI ($p<0.001$). For ALT, a significant interaction also occurred between BMI and age ($p<0.005$) [2]. Ahn MB et al. study results suggest a significant positive association between serum ALT level and obesity indices in male adolescents [6]. Viko Coku et al. study suggests that an increase in γ–GT concentrations is a sensitive and early biomarker of unfavorable body fat distribution [8].

The studies indicate that the obesity increases the livers disease risk. The correlation between the postoperative BMI

increase and increase in liver enzymes proves it once again.

**Conclusions**

1. Obesity has been recognized as a risk factor for liver disease.

2. Among subjects having high BMI, those with fatty liver showed significantly higher incidence of elevated hepatic enzymes, compared to those without fatty liver.

3. Our findings suggest that an elevated liver enzymes level may be an independent predictor of postoprative liver disfunction in obese patients.

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