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Study on the Application Value of Liver Function and Serological Index Levels in the Diagnosis of Fatty Liver

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Abstract: *Objective:* To explore the application value of liver function and serological index detection in diagnosing fatty liver. *Methods:* Ninety patients with fatty liver disease (disease group) and ninety healthy subjects (healthy group) were selected as the subjects of this study. They all underwent liver function index testing and serological index testing. Test results were compared, and the diagnostic accuracy of single and combined tests was evaluated. *Results:* Liver function indicators of patients in the disease group were higher than those in the healthy group, with severe patients exhibiting higher levels than moderate patients and mild patients ($P < 0.05$). Serological indicators in patients in the disease group were higher than those in the healthy group, with severe patients showing higher levels than moderate patients and mild patients ($P < 0.05$). The diagnostic accuracy of liver function index testing was higher than that of serological index testing, and the accuracy of combined testing was higher than that of single testing ($P < 0.05$). *Conclusion:* In diagnosing fatty liver, combining liver function testing and serological testing enables the initial diagnosis of the disease and facilitates the accurate assessment of its severity.

Keywords: Fatty liver; Clinical diagnosis; Liver function test; Serological test

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1. Introduction

Fatty liver is a liver disease with a high clinical incidence, often associated with daily dietary habits, such as high-sugar and high-calorie intake. With people's living standards improving, the incidence of fatty liver continues to rise, making it the second most common liver disease and significantly impacting physical health. The primary pathogenesis of fatty liver involves the accumulation of excess fat within liver cells. Early stages of the disease typically present no obvious symptoms, although symptoms resembling gastrointestinal issues may manifest [1]. Consequently, early screening poses challenges. As the disease progresses, patients may experience liver area pain, lower limb edema, jaundice, lethargy, and other related symptoms [2]. Treatment becomes more difficult at this stage, often with less-than-ideal prognoses.

Early diagnosis of fatty liver is crucial for determining disease severity and implementing appropriate

treatment strategies. Serological index testing is a standard clinical examination procedure, while liver function index testing plays a significant role in liver disease diagnosis and management. This study aims to analyze the combined examination of these two approaches in fatty liver disease to assess their diagnostic value. To investigate this, 90 patients with fatty liver and 90 healthy subjects were included.

2. Materials and methods

2.1. General information

From January 2021 to December 2023, 90 patients with fatty liver were screened and admitted. During the same period, 90 healthy subjects who underwent physical examinations were selected to form a disease group and a healthy group, respectively.

Healthy group: 52 males and 38 females, aged 36 to 75 years (mean age 57.45 ± 5.23 years).

Disease group: 50 males and 40 females, aged 35 to 77 years (mean age 57.20 ± 5.41 years); disease duration 2 to 10 years (mean duration 6.05 ± 1.14 years); disease severity comprised 21 mild cases, 32 moderate cases, and 37 severe cases.

Gender and age comparisons between the two groups showed no significant difference ($P > 0.05$).

2.2. Inclusion and exclusion criteria

Inclusion criteria:

(1) The disease group consisted of 90 patients meeting clinical diagnostic criteria for fatty liver, while the physical examination results of the healthy group were normal;
(2) No recent intake of drugs affecting liver function or serological indicators;
(3) Willingness to cooperate with examination procedures;
(4) Consciousness and normal cognition;
(5) Complete clinical information.

Exclusion criteria:

(1) Presence of other liver diseases;
(2) Organ dysfunction or concomitant physical illnesses such as malignant tumors;
(3) Mental illness;
(4) Participation in other concurrent medical research projects.

2.3. Methods

Both research subjects underwent testing for liver function and serological indicators. Participants adjusted their diet three days prior by abstaining from pig blood or liver, alcohol, and high-fat and high-protein foods, maintaining a light diet. Fasting for a minimum of eight hours before the examination was ensured. On the examination day, 5 mL of venous blood was collected between 7 a.m. and 9 a.m., and serum was separated for testing. Liver function index levels, including aspartate aminotransferase (AST; normal range: 0–50 μmol/L), alanine aminotransferase (ALT; normal range: 0–40 μmol/L), and γ-glutamyl transpeptidase (γ-GT; normal range: 0–40μ/L), were measured using the rate method. Serological index levels, including total cholesterol (TC; normal range: 3.0–5.7 mmol/L), triglyceride (TG; normal range: 0.5–1.7 mmol/L), low-density lipoprotein cholesterol (LDL-C; normal range: 2.1–3.1 mmol/L), and high-density lipoprotein cholesterol (HDL-C; normal range: 0.9–1.8 mmol/L), were measure using the enzyme-linked method.

2.4. Observation indicators

Comparison of liver function and serological test results between the two research subjects and evaluation of the diagnostic accuracy of single and combined tests.

2.5. Statistical analysis

Data were analyzed using SPSS version 25.0 statistical software. Measurement data conforming to normal distribution were expressed as mean ± standard deviation (SD) and underwent either *t*-tests or F-tests (for three or more groups). Count data were presented as [*n* (%)] and underwent χ^2 tests. A significance level of $P < 0.05$ indicated statistical significance.

3. Results

3.1. Comparison of liver function indicators

As shown in **Table 1**, the levels of AST, ALT, and γ-GT in patients in the disease group were significantly higher than those in the healthy group ($P < 0.05$). As the severity of the disease increased, the levels of each liver function index gradually increased ($P < 0.05$).

3.2. Comparison of blood routine indicators

Table 2 shows that the TC and TG levels of patients in the disease group were significantly higher than those of the healthy group ($P < 0.05$). The difference in LDL-C and HDL-C levels between the two groups was insignificant ($P > 0.05$). As the severity of the disease increased, the levels of TC and TG continued to increase ($P < 0.05$), while the levels of LDL-C and HDL-C had no significant changes ($P > 0.05$).

3.3. Diagnostic effect

As presented in **Table 3**, the accuracy of liver function testing is higher than that of serological testing ($P < 0.05$), and the accuracy of combined testing is higher than that of single testing ($P < 0.05$).

Table 1. Comparison of liver function indicators (mean ± SD)

Group name	*n*	AST (μmol/L)	ALT (μmol/L)	γ-GT (μ/L)
Healthy group	90	15.34 ± 5.28	19.20 ± 5.13	26.35 ± 6.14
Disease group	90	56.96 ± 12.17	61.85 ± 12.18	81.45 ± 20.31
t	-	29.763	30.615	24.636
P	-	0.000	0.000	0.000
Mild	21	51.63 ± 5.28	46.69 ± 10.18	53.64 ± 9.47
Moderate	32	54.96 ± 8.15	52.74 ± 9.51	71.05 ± 12.28
Severe	37	59.04 ± 7.54	68.41 ± 15.08	90.45 ± 17.04
F	-	10.631	13.245	11.057
P	-	0.000	0.000	0.000

Table 2. Comparison of blood routine indicators (mean ± SD, mmol/L)

Group name	*n*	TC	TG	LDL-C	HDL-C
Healthy group	90	4.79 ± 0.54	1.89 ± 0.41	3.31 ± 0.45	1.22 ± 0.25
Disease group	90	7.12 ± 1.13	3.19 ± 0.54	3.27 ± 0.51	1.19 ± 0.27
t	-	17.650	18.190	0.558	0.773
P	-	0.000	0.000	0.578	0.440
Mild	21	5.91 ± 1.08	2.23 ± 0.65	3.21 ± 0.48	1.15 ± 0.22
Moderate	32	6.79 ± 1.14	2.98 ± 0.51	3.25 ± 0.44	1.17 ± 0.23
Severe	37	7.78 ± 1.23	3.64 ± 0.47	3.30 ± 0.50	1.21 ± 0.30
F	-	14.528	12.645	0.418	0.516
P	-	0.000	0.000	0.423	0.411

Table 3. Diagnosis results [*n* (%)]

Detection method	*n*	Confirmed	Missed diagnosis / misdiagnosis
Liver function test	90	72 (80.00)	18 (20.00)
Serological testing	90	54 (60.00)	36 (40.00)
Combined testing	90	87 (96.67)	3 (3.33)
χ^2 / *P* single testing comparison	-	8.571 / 0.003	
Comparison of χ^2 / *P* combined detection and single detection	-	36.427 / 0.000	

4. Discussion

The liver, being a vital metabolic organ, is susceptible to various liver diseases. Statistics indicate that the incidence rate of fatty liver in China is approximately 20% [3], with economically developed regions exhibiting higher rates. For instance, in first-tier cities like Beijing, Shanghai, and Guangzhou, the incidence ranges between 25% and 30% [4]. Fatty liver is more prevalent in men than in women, often associated with excessive alcohol consumption and poor dietary habits. It is both a stress-related condition and influenced by genetic factors. Dietary composition and lifestyle choices play pivotal roles in its development. Factors such as alcohol abuse, overeating, and obesity disrupt the body's fat metabolism balance, leading to the accumulation of excess fat in liver cells. Hepatocyte degeneration occurs when the fat weight in liver cells surpasses 5% of the liver's wet weight [5], progressing to liver fibrosis and potentially culminating in cirrhosis or liver failure. Apart from impacting liver function, fatty liver can also trigger cardiovascular diseases such as stroke and diabetes. Importantly, fatty liver is reversible [6]; early detection and symptomatic treatment can impede liver fibrosis progression and gradually restore liver function. Early diagnosis, therefore, forms the cornerstone of effective treatment, with liver biopsy traditionally considered the gold standard. However, due to its invasiveness and associated health risks, liver biopsy is not widely favored and may compromise patient well-being. Non-invasive diagnostic techniques, including imaging studies and serum biochemical testing, are thus recommended.

This study comprised 90 patients diagnosed with fatty liver and 90 healthy subjects, forming disease and healthy groups, respectively. Results revealed that both groups underwent liver function index testing

and serological index testing, procedures that entail minimal invasiveness by requiring only serum collection. Liver function indicators, including AST, ALT, and γ-GT, play crucial roles in diagnosing fatty liver. AST and ALT, secreted by mitochondria and cytoplasm of human cells, enter the bloodstream during pathological liver cell reactions, leading to elevated levels. γ-GT is released from the intrahepatic bile duct epithelium and liver cytoplasm when liver tissue is damaged [7,8]. The findings indicated higher levels of these liver function indicators in the disease group compared to the healthy group, with severity correlating with higher levels, underscoring their diagnostic and prognostic significance. As a bile-synthesizing organ, the liver influences lipid emulsification. Fatty liver disrupts this process, leading to elevated TC and TG levels, particularly after prolonged consumption of high-fat diets [9]. While LDL-C and HDL-C levels remained relatively stable between groups, TC and TG levels were significantly higher in the disease group, with severity correlating with elevated levels. This suggests that routine blood lipid indicators, namely TC and TG, can aid in fatty liver diagnosis and severity assessment. A comparison of single and combined liver function and serological index testing indicated higher accuracy with combined testing, highlighting the synergistic benefits of utilizing both methods.

In the early stages, fatty liver symptoms are often subtle, becoming more pronounced as the disease progresses, with specific manifestations linked to underlying causes. Early-stage symptoms may include fatigue, loss of appetite, and hepatosplenomegaly [10], progressing to nosebleeds, melena, and lower limb edema in advanced stages. While liver biopsy remains the gold standard for diagnosis, its invasive nature, associated risks, and low reproducibility limit its utility [11]. Liver function and serological index testing, on the other hand, are routine clinical procedures requiring minimal venous blood collection and boasting high patient acceptance rates [12].

In conclusion, this study's analysis underscores the prevalence of fatty liver as a common clinical condition. Liver function and blood routine index testing exhibit significant diagnostic utility in fatty liver diagnosis and merit widespread adoption.

Disclosure statement

The author declares no conflict of interest.

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