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Article

Liver Steatosis—Diagnosis and Controverses Involving Conventional Ultrasound Examination and Transient Elastography Assessment a Retrospective Cross-Sectional Study

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Abstract

During routine evaluation of hospitalized patients, discrepancies were frequently observed between the degree of liver steatosis assessed by conventional B-mode ultrasonography and Vibration-Controlled Transient Elastography (VCTE) with Controlled Attenuation Parameter (CAP). This study aimed to identify the factors contributing to these differences and to determine whether both imaging methods should be expected to produce comparable steatosis classifications. We conducted an observational retrospective cross-sectional study including 130 patients admitted over a two-year period who underwent laboratory testing, abdominal ultrasonography, and transient elastography. Variables analyzed included age, sex, environment, nutritional status, comorbidities, biochemical parameters (ALAT, total cholesterol, triglycerides, GGT), calculated FIB-4 score. Patients were classified in two groups: 61 with concordant steatosis grades across both methods and 69 with discordant results. Concordant results were more common in individuals with serum total cholesterol >200 mg/dL (45.9%), and those with a Fib-4 score between 1.45–3.25 (44.2%). Additionally, a trend toward a stronger correlation was observed in patients with elevated triglycerides. Viral liver disease showed a significantly higher rate of discordant results (26.2%). Total serum cholesterol >200 mg/dL, and a FIB-4 score between 1.45–3.25 can be significantly associated with concordance in steatosis grading, while serum triglyceride levels showed a nonsignificant trend toward concordance. In contrast, viral hepatitis with concomitant steatosis can be associated with discordant findings between the two imaging modalities. Although not statistically significant, a value F ≥ 2 measured by VCTE measured fibrosis and a FIB-4 score >3.25 also showed a trend toward discordance, suggesting they may contribute to variability in steatosis assessment.

Keywords: liver steatosis; liver fibrosis; viral hepatitis; conventional ultrasound; transient elastography; Fib 4 score; serum total cholesterol; metabolic syndrome

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Introduction

Fatty liver, a major challenge in current pathology, represents the accumulation of lipid molecules in hepatocytes, impairing liver function. Glycogen and hepatic fat serve as essential energy reserves, and, while muscles are mobile tissues converting chemical energy into mechanical or thermal energy, the liver is a static, multifunctional organ coordinating most metabolic processes. With the global epidemics of obesity and diabetes, liver disease related to fat overload has gained increased relevance, prompting new diagnostic and therapeutic approaches.

Pathologically, fatty liver encompasses simple steatosis, steatohepatitis, and steatosis-induced advanced fibrosis (cirrhosis). Etiologically, fat overload is linked to conditions such as alcohol intake, hepatitis C virus infection, and metabolic disorders [1]. Diagnostic methods range from basic clinical and laboratory tests to advanced qualitative or quantitative imaging tools. It remains unclear why some individuals develop only steatosis, whereas others progress to steatohepatitis or cirrhosis.

Objective assessment of liver fat can be achieved histologically; a normal liver contains <5% fat [1]. Simple steatosis involves triglyceride accumulation in >5% of hepatocytes without necrosis or ballooning [2]. Steatosis is conventionally graded as mild (5–33%), moderate (33–66%), or severe (>66%) [3,4]. When inflammation and fibrosis are present, the condition is defined as steatohepatitis [2].

Distinguishing alcoholic from non-alcoholic fatty liver disease may be difficult, especially in former alcohol users. The pathological substrate includes inflammation, necrosis, fibrosis, and features such as Mallory–Denk bodies, ballooning, activated Kupffer cells, acidophil bodies, iron deposition, or lipo-granulomas, spanning alcoholic hepatitis, MASH, viral hepatotropic infections, inherited metabolic disorders, and reactive hepatitis [5].

The term “liver fat overload” therefore includes both alcoholic and nonalcoholic forms. MASLD is strongly associated with metabolic syndrome, type 2 diabetes mellitus, and obesity, as widely documented in international studies [6–12]. Several non-invasive scores (Fatty Liver Index, Hepatic Steatosis Index, SteatoTest, MASLD liver fat score) have been developed for screening, although they cannot precisely quantify hepatic fat.

Imaging techniques include CT, qualitative and quantitative ultrasound methods (Attenuation Imaging, Speed of Sound), and magnetic resonance modalities such as MRI-PDFF and MRS—considered the most accurate but also costly and less accessible [6]. Liver biopsy remains the gold standard, though limited by sampling variability, with documented differences between left and right lobe specimens [5].

In daily practice, the most commonly used rapid tools for diagnosing liver steatosis are B-mode ultrasound and transient elastography, which evaluate fibrosis and the Controlled Attenuation Parameter (CAP), providing information on hepatic fat content [13]. Although some studies have reported suboptimal performance of transient elastography and CAP in assessing steatosis [14], numerous others demonstrated strong correlations between CAP-derived fat quantification and liver biopsy findings [15-23], as well as with MRI-based assessments [24,25].

In our clinical experience, the degree of steatosis may differ between conventional ultrasound and elastography-derived CAP, occasionally yielding discordant results.

The aim of this paper is to identify the factors causing discrepancies between the two steatosis assessment methods and to determine whether their results should align. To achieve this, we conducted a retrospective study evaluating the correlations between two commonly used investigations for fatty liver—conventional B-mode ultrasound and the controlled attenuation parameter measured by transient elastography—as well as their relationships with various clinical and paraclinical parameters.

Methods: We conducted a cross-sectional, retrospective observational study including 130 patients admitted to the Clinical County Emergency Hospital Bihor, Romania, in the Internal Medicine and Gastroenterology Departments between February 2023 and February 2025. All included participants underwent same-day laboratory testing, abdominal B-mode ultrasound, and transient elastography using the XL probe.

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Patients were excluded if the two imaging methods were not performed on the same day, if the M probe was required, or if active oncological disease was present. Participants were allocated into two groups: a concordant group, in which ultrasound and transient elastography provided identical steatosis grades, and a discordant group, in which results differed. Both groups had comparable demographic characteristics.

Collected variables included age, sex, residential environment, nutritional status, hepatic, metabolic, and cardiovascular comorbidities, as well as some biochemical markers (ALAT, GGT, total cholesterol, triglycerides). Fibrosis severity was estimated using the FIB-4 score as follows: FIB-4 = age (years) x ASAT(U/L) / Platelets (10^9 /L) x √ALAT (U/L) [26]. Laboratory investigations were performed using the automated Abbott diagnostic platform. All clinical assessments, laboratory analyses, and imaging procedures were carried out on the same day, using the same equipment and operator, to reduce procedural variability. Ultrasound and FibroScan examinations were performed in fasting patients, on the morning of admission, after blood sampling and prior to the administration of chronic medication. Liver ultrasound evaluation was performed according to international standards, with patients examined in the supine position using sagittal, transverse, and oblique sections on a Hitachi system equipped with a 1–5 MHz convex probe. All examinations were conducted by the same operator, who assessed liver size, surface, echogenicity, echotexture, hepatic and portal vein caliber, and the presence of normal hepato-petal portal flow.

Steatosis grading followed established ultrasonographic criteria, including increased liver brightness, reduced visualization of hepatic veins, focal fat sparing, and diminished visualization of the diaphragm and deep parenchyma [27–31]. Mild steatosis (grade 1) was defined by increased echogenicity; moderate steatosis (grade 2) by posterior beam attenuation; and severe steatosis (grade 3) by poor visualization of deep hepatic veins, diaphragm, or deep parenchyma [30,31].

Transient elastography was performed after ultrasound, using standard protocols, with patients in the supine position and measurements obtained in the 9th–10th intercostal space along the mid-axillary line. Ultrasound preceded elastography to ensure optimal probe placement over the right hepatic lobe.

Assessments were conducted using the Echosens FibroScan (XL probe), which provides liver stiffness and steatosis estimation via the Controlled Attenuation Parameter (CAP). Only measurements with ≥10 valid readings, a success rate >60%, and an interquartile range <30% of the median were included.

Steatosis and fibrosis were classified using the Interpretation Guide developed by Echosens, which is based on internationally accepted cut-off values for the Controlled Attenuation Parameter (CAP) and liver stiffness measurement (LSM), as validated across different liver disease etiologies, including metabolic dysfunction–associated steatosis liver disease (MASLD), metabolic dysfunction–associated steatohepatitis (MASH), viral hepatitis, alcohol-related liver disease, autoimmune hepatitis, and cholestatic liver diseases. Steatosis was assessed using CAP values (expressed in dB/m) and graded as follows: S0 < 248 dB/m, S1 248–267 dB/m, S2 268–279 dB/m, and S3 ≥ 280 dB/m. Fibrosis staging was based on LSM values (expressed in kPa) and defined as: F0–F1 < 7.0 kPa, F2 7.0–9.5 kPa, F3 9.5–12.5 kPa, and F4 ≥ 12.5 kPa.

The statistical analysis was performed using the MedCalc Software (MedCalc program, Belgium). The distribution of numerical variables was first tested by the Kolmogorov-Smirnov test. For numerical variables with normal distribution, mean value and standard deviation were calculated, while in case of non-normal distribution median values and range intervals were utilized. Differences between numerical variables were analyzed by parametric (t-test) or nonparametric tests (Mann–Whitney or Kruskal–Wallis tests) depending on data distribution of variables. Chi-square (X^2) test (with Yates' correction for continuity) was used for comparing proportions expressed as percentages (" n" designates the total number of patients included in a particular subgroup). 95% confidence intervals were calculated for each predictive test and a *p*-value less than 0.05 was regarded as significant for each statistical test.

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Factors related to discordance between liver steatosis assessed by abdominal ultrasound and transient elastography were first identified by univariate analysis. In the second step, the independent discriminative values of variables reaching a univariate statistical significance ($p<0.05$) were assessed by stepwise logistic regression analysis.

Results: We assessed 130 patients admitted to our hospital, which had the following characteristics **(Table 1.)**

Table 1. The main patients' characteristics .

Parameter	*Total of patients N=130*
Gender	
Male gender	62 (47.69%)
Female gender	68 (52.31)
Urban area	72 (55.38%)
Rural area	58 (44.62%)
Age (years) - < 50	30 (23.07%)
-50-69	72 (55.38%)
≥ 70	28 (21.55%)
Etiology	
- viral	24 (18.46%)
-alcoholic	18 (13.84%)
-autoimmune	2 (1.53%)
- other	86 (66,17%)
Fibrosis (TE)	
-F0	39 (30%)
-F1	62 (47.69%)
-F2	9 (6.92%)
-F3	6 (4.61%)
-F4	14 (10.78%)
BMI (kg/m2)	
-<20	6 (4.61%)
-20-24,9	24 (18.46%)
-25-29,9	52 (40%)
≥30	48 (36.93%)
Type 2 Diabetes mellitus	43 (33.07%)
Cardiac comorbidities	21 (16.15%)
Arterial Hypertension	72 (55.38%)
Hypothyroidism	16 (12.30%)
ALAT > ULN	23 (17.69%)
GGT > ULN	32 (24.61%)
Total Serum Cholesterol >200 mg/dl	47 (36.15%)

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Triglycerides > 150 mg/dl	37 (28.46%)
FIB 4 - < 1,45	69 (53.07%)
-1,45 -3,25	46 (35.38%)
- > 3,25	15 (11.5%)

From 130 patients, 61 (46.92%) had the same degree of steatosis using non-invasive methods (ultrasound and transient elastography) and 69 patients (53.08%) had discordant results. Among these 69 patients, 45 patients (34.61% from all patients) showed a one-grade discrepancy, 23 patients (17.71% from all patients) had a two-grade discrepancy, and 1 patient (0.76% from all patients) had a three-grade discrepancy. **(Figure 1)**

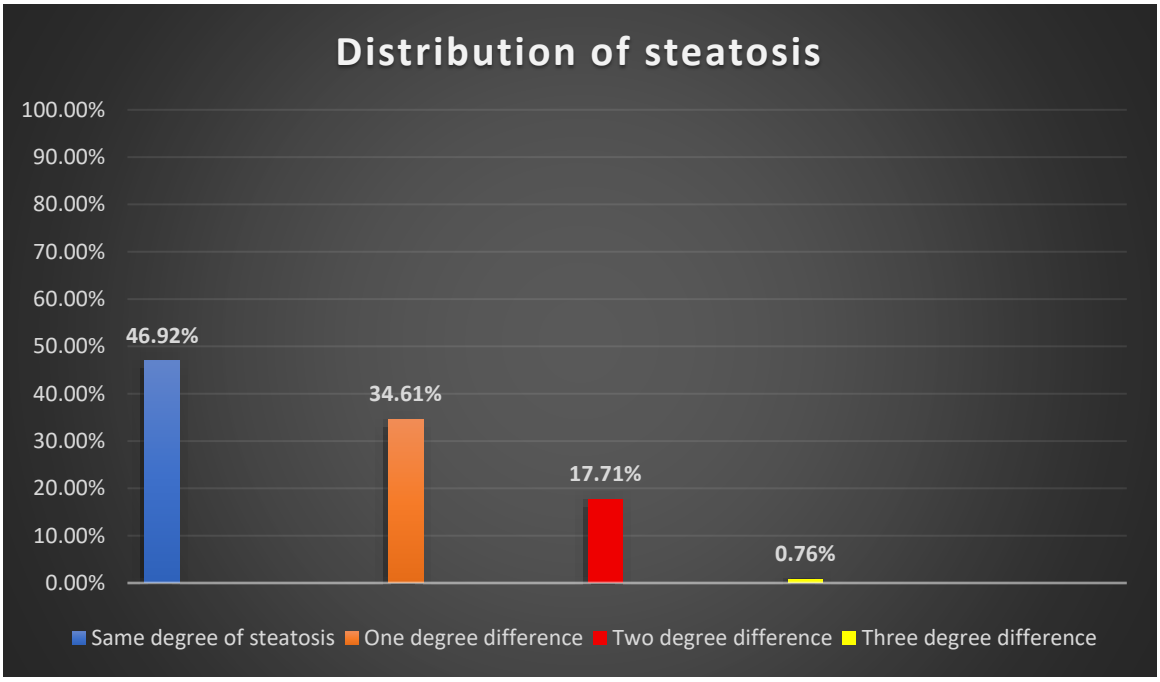

Figure 1. Distribution of the patients according the concordant or non-concordant results.

In 48 of 69 patients (69.56%) with discordant results, the higher degree of liver steatosis was reported in abdominal conventional ultrasound compared with VCTE. To understand more efficient this difference, we have split the entire lot of study into 2 groups, Group 1 which included 61 patients with concordance in the liver steatosis assessment by conventional ultrasound and transient elastography and Group 2, formed by 69 patients with discordant results.

Gender, environment, age, alcoholic and autoimmune etiology, Body Mass Index (BMI), cardio-metabolic comorbidities (such as heart failure, ischemic heart disease, atrial fibrillation, hypertension, ectopic heart beats, dilated cardiomyopathy), the level of ALAT and a predicted stage of fibrosis by calculated FIB-4 score < 1.45 or >3.25, did not influence the assessment of steatosis by abdominal ultrasound and transient elastography. (**Table 2.)**

Variables that appeared to influence the liver steatosis grading by conventional US and VCTE included high serum total cholesterol >200 mg/dL, and a calculated FIB 4 score between 1.45 and 3.25. These factors were significantly associated with agreement between the two imaging modalities, indicating a high level of concordance in hepatic steatosis assessment ($p = 0.02$ and $p = 0.04$, respectively). In addition, a trend toward better correlation was observed in patients with elevated serum triglycerides (>150 mg/dL), although this did not reach statistical significance ($p = 0.07$). (**Table 2**.)

By contrast, viral etiology emerged as a significant determinant of discordant steatosis grading between US and VCTE (p=0,01). Advanced fibrosis, defined by an elastography-assessed fibrosis

 doi:10.20944/preprints202603.0500.v1

stage ≥ F2, and calculated fibrosis risk (FIB-4 >3.25) were also associated with increased discordance; however, these last two variables did not reach statistical significance and demonstrated only a non-significant trend toward reduced agreement. (p=0,055 respectively p= 0,09) **(Table 2)**

Table 2. Univariate analysis of factors associated with significant discordances.

Parameter	**Same degree Steatosis US and TE (n=61) Group 1**	**Diferrent degree Steatosis US and TE (n=69) Group 2**	**p value**
Male gender	33 (54.1%)	29 (42.1%)	0.17
Urban area	33 (54.1%)	39 (56.5%)	0.78
Age (years) - < 50	16 (26.2%)	14 (20.3%)	0.42
-50-69	30 (49.2%)	42 (60.8%)	0.18
≥ 70	15 (24.6%)	13 (18,9%)	0.43
Etiology – **viral**	6 (9.8%)	18 (26.1%)	**0.01**
-alcoholic	7 (11.4%)	11 (15.9%)	0.45
- autoimmune	1 (1.6%)	1 (1.5%)	0.96
Fibrosis (TE) -F0	20 (32.8%)	19 (27.6%)	0,52
- F1	32 (52.4%)	30 (43.4%)	0.30
- F2	2 (3.3%)	7 (10.1%)	0.12
- F3	2 (3.3%)	4 (5.8%)	0.50
- F4	5 (8.2%)	9 (13.1%)	0.37
Fibrosis (TE) ≥ 2	9 (14.8%)	20 (29%)	**0.055**
BMI (kg/m2) -<20	4 (6.6%)	2 (2.9%)	0.31
-20-24,9	8 (13.1%)	16 (23.2%)	0.14
-25-29,9	24 (39.4%)	28 (40.6%)	0.88
≥30	25 (40.9%)	23 (33.3%)	0.37
Type 2 Diabetes mellitus	22 (36.1%)	21 (30.4%)	0.49
Cardiac comorbidities	8 (13.1%)	13 (18.8%)	0.43

 doi:10.20944/preprints202603.0500.v1

Arterial Hypertension	34 (55.7%)	38 (55.1%)	0.94
ALAT > ULN	10 (16.4%)	13 (18.8%)	0.72
GGT > ULN	13 (21.3%)	19 (27.5%)	0.41
Total Serum Cholesterol >200 mg/dl	28 (45.9%)	19 (27.5%)	**0.02**
Serum Triglycerides > 150 mg/dl	22 (36.1%)	15 (21.7%)	**0.07**
FIB 4 - < 1.45	30 (49.2%)	39 (56.6%)	0.40
-1.45 -3.25	27 (44.2%)	19 (27.5%)	**0.04**
- > 3.25	4 (6.6%)	11 (15.9%)	**0.09**

In the multivariate analysis, only the cholesterol values achieved statistical significance and remained a significant predictor, being independently associated with the outcome. **(Table 3)**

Table 3. Multivariate analysis using multiple regression.

Parameter	**Coefficient**	**Standard error**	**P**
Viral etiology	-0.53	0.60	0.37
Cholesterol > 200 mg/dl	0.80	0.37	**0.03**
FIB 4	-0.025	0.26	0.92

Discussions

There are numerous ways to assess the degree of liver fat, some of them invasive (liver puncture biopsy), some non-invasive. Nowadays, with the worldwide increase of obesity, dyslipidemia and insulin resistance, it is important to have accessible tools, which provide fast, repeatable and cost-effective methods of investigation. As a clinical observation, our patients were not very enthusiastic about performing an invasive procedure, if there are available non-invasive ones. Conventional ultrasound and transient elastography seemed to be safe, repeatable and rapid, providing reliable information, especially for the screening of liver steatosis. Also, they are cost-effective imagistic methods compare to MRI-based assessment.

In our groups, there were some variables which did not reveal a statistical significance between the two groups, even though some of them were expected to be. These variables included age, environment, gender, alcoholic and autoimmune etiology of the hepatic disease involvement, mild fibrosis degree obtained by performing transient elastography; also, in accord to other international studies, neither the BMI [32], nor the presence of T2DM (type 2 Diabetes Mellitus), high blood pressure, or other cardiovascular and metabolic comorbidities [33] such as hypothyroidism did not appear to represent factors that influence the concordance or discordance of hepatic steatosis measurements using the two methods. At the same time, contrary to different studies [34–36], the serum level of aminotransferases did not appear to be a good indicator of discordance between ultrasonography and elastography interrogation of the liver regarding the fatty overload.

 doi:10.20944/preprints202603.0500.v1

A very interesting result of our study was that the viral-induced steatosis showed a high statistical significance. There was a clear difference between the two study groups, showing that viral etiology of the liver steatosis is most likely associated with a high degree of discordant results in assessment by ultrasonography and transient elastography. [37] Our study is in agreement with previously published data in the scientific literature. It seems that the difference between conventional ultrasound and transient elastography in assessing viral-induced liver steatosis should be induced by the inflammatory mechanism involved. In viral hepatitis, the inflammation is provoking a certain degree of tissue edema and this should induce the modification of the diffusion of ultrasound, which may lead to a false decreased echogenicity of the liver in ultrasound examination and, at the same time, modifies the attenuation parameter, thus these values can be false decreased. [38–41].

CAP samples a limited hepatic region, whereas ultrasound evaluates the entire parenchyma. In viral steatosis, the fat distribution is often heterogeneous, and this sampling difference can therefore result in discrepant findings between the two methods [42–44].

The second variable that significantly influenced concordance between the two imaging methods was an elevated serum cholesterol level exceeding the upper limit of normal (serum cholesterol level > 200mg/dL), even tough, in the literature the presence of hypercholesterolemia is not associated with liver steatosis. The higher this variable in our study was, the greater was the likelihood that ultrasound and elastography will yield concordant assessments of liver steatosis. Although hypercholesterolemia does not directly affect liver enzyme levels or elastography measurements, its presence is consistent with the well-established links between dyslipidemia, hepatic steatosis, and the progression of liver fibrosis. This association highlights the necessity of accounting for underlying metabolic risk factors when interpreting non-invasive hepatic imaging findings [45–47].

High triglyceride levels (>150 mg/dL) were more common in Group 1 with concordant imaging results (36.1%) than in Group 2 (21.7%), representing a borderline difference ($p = 0.07$). Although not statistically significant, this trend suggests that concordance between ultrasound and elastography is more likely in patients with a metabolically driven lipid profile. Elevated triglycerides are associated with diffuse steatosis [48,49], which produces more uniform hepatic echogenicity and attenuation, whereas lower levels in the discordant group may reflect heterogeneous, non-metabolic patterns of steatosis.

Another association with concordance or discordance in liver steatosis assessment was observed for an estimated parameter, namely fibrosis stage based on the FIB-4 score.

In patients with low fibrosis risk (FIB-4 <1.45), no significant difference in steatosis agreement was observed between the two groups ($p = 0.40$); in contrast, patients with intermediate FIB-4 scores (1.45–3.25) demonstrated a statistically significant difference between the two groups. ($p=0.04$). At the same time, the patients with calculated advanced fibrosis (FIB-4 >3.25), although with a borderline p-value, suggested a trend toward discordance ($p = 0.09$)

Comparison between elastography-based and FIB-4-estimated fibrosis revealed moderate concordance across categories. Group 1, characterized by similar steatosis grades on both imaging modalities, showed predominantly mild fibrosis on elastography (F0–F1 = 85.2%) and low FIB-4 values (< 1.45 = 49.2%). In contrast, Group 2, with discordant steatosis results, demonstrated higher frequencies of advanced fibrosis on elastography (≥ F2 = 29.0%) and higher FIB-4 categories (> 3.25 = 15.9%). The association between higher fibrosis stage (by either method) and imaging discordance reached statistical significance.

A relatively recent study from July 2024 [50] confirmed the discordance between the results provided by FIB-4 score and transient elastography regarding fibrosis severity, suggesting that the degree of steatosis may be influenced.

The parallel trends observed between elastography-derived fibrosis stages and FIB-4 categories suggest that both tools capture the overall fibrosis burden, albeit with different sensitivities. The higher prevalence of moderate-to-advanced fibrosis among patients with discordant steatosis

 doi:10.20944/preprints202603.0500.v1

assessments (Group 2) implies that fibrosis heterogeneity and architectural distortion contribute significantly to differences between ultrasound and elastography.

In early fibrosis (predominant in Group 1), the hepatic parenchyma remains relatively homogeneous, allowing both modalities to measure fat content consistently. However, with increasing fibrosis (notably within the FIB-4 range of 1.45–3.25 or ≥ F2 on elastography), coexistent collagen deposition, uneven fat infiltration, and changes in acoustic impedance alter the backscatter and attenuation properties of liver tissue. Consequently, ultrasound echogenicity may underestimate steatosis in fibrotic regions, while elastography-based attenuation coefficients remain more sensitive to lipid content, leading to the observed modality discordance. Our findings are consistent with recent studies that reported similar associations between FIB-4 scores, fibrosis severity, and steatosis degree. [51–53]

These findings underscore that fibrosis stage is a key modifier of agreement between non-invasive imaging methods for steatosis assessment. Integrating FIB-4 or elastography-based stiffness into the interpretative framework can help identify cases where ultrasound and elastography may yield divergent results.

Conclusion: High serum total cholesterol levels >200 mg/dL and a FIB-4 score between 1.45-3.25, were associated with concordance in steatosis grading by US and transient elastography. Although not statistically significant, elevated serum triglycerides levels showed a trend toward greater concordance between ultrasound and elastography. Viral hepatitis associated with liver steatosis reached statistical significance in relation to discordance between the two imaging methods. Although not statistically significant, a FIB-4 score >3.25 and transient elastography–measured fibrosis stage ≥ F2 were also associated with a trend toward discordance, suggesting that these values may contribute to discrepancies in steatosis grading between ultrasound and elastography. However, there is a need to design a new long-term study with larger and more homogeneous cohorts, controlling for relevant variables and systematically monitoring patients' clinical and biological profiles, while also considering the potential influence of pharmacological treatment.

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Institutional Review Board Statement: The study was approved by Institutional Ethics Committee and Council of the Clinical County Emergency Hospital Bihor (Approval Number: 10193/27.03.2025) and followed the ethical standards laid out in the 1975 Declaration of Helsinki.

Informed Consent Statement: Not applicable**.** We only reviewed the patient files for this study, and we guaranteed that we would not use the information for anything other than for research purposes. This was approved by the Ethics Committee.

Consent for publication: We investigated all the patients retrospectively, and the manuscript did not reveal the patients' personal clinical information or their images. There for this section is not applicable.

Data Availability Statement: Patients' information is private and is archived in the electronic databases of the medical units where the research was done.

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Abbreviations

The following abbreviations are used in this manuscript:

VCTE - Vibration-Controlled Transient Elastography

CAP - Controlled Attenuation Parameter

ALAT- Alanine Aminotransferase

GGT – Gamma-Glutamyl Transferase

MASH – Metabolic Dysfunction – Associated Steatohepatitis

MASLD - Metabolic Dysfunction – Associated Steatotic Liver Disease

CT – Computed Tomography

MRI - Magnetic Resonance Imaging

MRI-PDFF - Magnetic Resonance Imaging – Proton Density Fat Fraction

MRS – Magnetic Resonance Spectroscopy

GPT – Glutamate Pyruvate Transaminase

FIB 4 score- Fibrosis -4 Index

ASAT – Aspartate Aminotransferase

MHz- Megahertz's

XL probe – Extra-Large probe

LSM – Liver Stiffness Measurement

dB/M – Decibel/meter

kPa – Kilopascal

BMI – Body Mass Index

T2DM – Type 2 Diabetes Mellitus

F0 – Stage 0 of Liver Fibrosis or No Liver Fibrosis

F1- Stage 1 of Liver Fibrosis

F2 – Stage 2 of Liver Fibrosis

F3 – Stage 3 of Liver Fibrosis

F4 – Stage 4 of Liver Fibrosis, or Advance Liver Fibrosis, or Liver Cirrhosis

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