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Original Research Article

Correlation of Ultrasound and MRI Findings in Fatty Liver Disease

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Abstract:

Background: Nonalcoholic fatty liver disease (NAFLD) is a major cause of chronic liver disease in the world. Hepatic steatosis assessment is crucial for early diagnosis, grading of the disease and monitoring. MRI-PDFF is currently recognized as a reference method for liver fat quantitation but is not widely available and is expensive. A promising alternative is quantitative ultrasound (QUS), which is a cost-effective option.

Aim: To compare quantitative ultrasound parameters with MRI parameters to assess the correlation between these two techniques in the evaluation of hepatic steatosis in patients with NALFD.

Methodology: Prospective, Cross sectional, Observational study was carried out in Department of Radiodiagnosis, Indira Gandhi Institute of Medical Sciences Patna, Bihar, India for one year. A total of 102 patients (adults) with suspected or diagnosed with NAFLD were examined by quantitative ultrasound and MRI-PDFF. Correlations between quantitative ultrasound parameters (attenuation coefficient and backscatter coefficient) and MRI-PDFF were performed. The statistical methods used were Pearson's correlation, ROC curve analysis and diagnostic accuracy measures.

Results: Attenuation coefficient had a strong positive correlation with MRI-PDFF ($r = 0.854$, $p < 0.001$) and the backscatter coefficient had significant correlation ($r = 0.768$, $p < 0.001$). The results showed that quantitative ultrasound was very sensitive (92.9%), very specific (88.9%), very accurate (92.2%) and had an area under the ROC curve of 0.935, which are excellent diagnostic performance.

Conclusion: Quantitative ultrasound was highly correlated with MRI-PDFF and was able to determine the severity of hepatic steatosis. Due to its diagnostic accuracy, non-invasive nature, affordability and availability, QUS is a suitable alternative to MRI for routine evaluation and follow-up of patients with NAFLD, especially in resource-limited healthcare environments.

Keywords: Nonalcoholic Fatty Liver Disease; Hepatic Steatosis; Quantitative Ultrasound; Magnetic Resonance Imaging; MRI-PDFF; Attenuation Coefficient; Backscatter Coefficient; Diagnostic Accuracy.

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Introduction

Nonalcoholic fatty liver disease (NAFLD) has emerged as the most prevalent chronic liver disorder globally and is now acknowledged as a significant public health problem. It is estimated to impact almost 1 in 4 of the world's adult population, with its prevalence increasing rapidly due to obesity, type 2 diabetes mellitus (T2DM), dyslipidaemia and metabolic syndrome. NAFLD incidence has been further rising due to sedentary lifestyles and unhealthy eating patterns, especially in developing nations like India. In addition to liver-related complications, NAFLD is closely linked to cardiovascular disease, chronic kidney disease and insulin resistance, with a multisystem nature and important clinical and economic impact. Therefore, it is critical that hepatic fat accumulation can be diagnosed and accurately assessed as early as possible to be able to act in time and prevent the progression of the disease [1-3].

Excessive accumulation of triglycerides within hepatocytes is the earliest pathological finding in NAFLD, referred to as hepatic steatosis. While many patients with simple steatosis may be clinically asymptomatic for many years, a substantial number of patients develop a more aggressive form

of the disease called nonalcoholic steatohepatitis (NASH) with inflammation and hepatocellular injury. In later stages, chronic NASH can then cause fibrosis, cirrhosis, liver failure, and hepatocellular carcinoma. These pathological changes can occur over time and are often silent in the early stages of the disease, which is why it is essential to have reliable methods to detect and quantify liver fat for staging, therapeutic decision making and follow up care [4] .

Biopsy of the liver had long been considered the gold standard in assessing hepatic steatosis due to direct evaluation of the liver tissue. But some drawbacks to its regular use are that it is invasive, can cause bleeding and infection, sampling variability, observer-dependent interpretation and poor patient acceptance for repeat follow-up exams. These restrictions have led scientists to seek alternative, non-invasive, reproducible imaging methods for assessing hepatic fat content, with the goal of providing an objective measurement free of patient harm and risk from the procedure [5].

Magnetic resonance imaging (MRI) is one of the most reliable non-invasive imaging modalities currently available, and proton density fat fraction (MRI-PDFF) is one of the most promising non-invasive methods to measure hepatic steatosis. MRI-PDFF is an objective measure of liver fat, accounting for confounding factors including T1 bias, T2* decay and spectral complexity of fat signals. The correlation between MRI-PDFF measurements and histopathology has been shown in a number of clinical studies to be excellent, thus providing MRI as a powerful reference standard for liver fat quantification in both research and clinical settings. Although highly diagnostic, MRI is less generally available, is time consuming and is relatively costly, particularly in resource-poor health care environments. Therefore, its use for general screening and serial monitoring of NAFLD is limited [6].

Because non-ionizing, easy to obtain, inexpensive, and readily available, ultrasonography (US) is the most common first-line imaging modality used in the evaluation of diffuse liver diseases. In the conventional B-mode ultrasound diagnosis, liver steatosis can be determined according to the subjective manifestations including increased liver echogenicity, blurring of the liver vessels, and posterior acoustic attenuation. The results, however, are qualitative and rely upon the operator's experience and machine parameters as well as patient-related issues like obesity. Moreover, classical ultrasound has a low sensitivity in detecting mild hepatic steatosis and has limited ability to accurately quantify liver fat, thus limiting its application in the staging and monitoring of disease [7].

Conventional B-mode ultrasonography has many limitations, and a new technology called quantitative ultrasound (QUS) has recently emerged to address these limitations. In contrast to qualitative ultrasound, QUS utilizes the primary radiofrequency signals bounced off liver tissue to create quantitative, objective and repeatable biomarkers. These are markers about acoustic property and microstructural features of the liver parenchyma and enable the more accurate estimation of liver fat content. Since it provides the benefit of a wide range of easy-to-use, affordable, and portable conventional ultrasonography with enhanced diagnostic objectivity, quantitative ultrasound has garnered great interest as an imaging technique for the assessment of NAFLD [8].

Since then, of the several QUS parameters, the attenuation coefficient (AC) and backscatter coefficient (BSC) have shown the highest clinical potential in assessing hepatic steatosis. The attenuation coefficient describes the loss of the energy of the ultrasound beam in liver tissue, while the backscatter coefficient indicates how much of the ultrasound energy is reflected by hepatic microstructures. Fatty infiltration affects the attenuation as well as scattering properties of liver tissue and therefore these parameters are highly correlated with liver fat content. Other parameters in the spectrum such as Lizzi-Feleppa slope, intercept, and midband fit, and the k and m parameters of envelope statistics were also explored as imaging biomarkers. The use of more than one quantitative ultrasound parameter in a multivariable model might further increase the diagnostic value, due to the reduction in variability of measurements and increasing sensitivity to mild steatosis.

The results of several international studies have shown that quantitative ultrasound measurement and the proton density fat fraction (MRI-PDFF) from MRI are strongly correlated by allowing the use of the QUS as a reliable non-invasive method to quantify hepatic fat. Despite its high reproducibility and the ability of measuring liver fat in the whole liver parenchyma, MRI-PDFF remains a good imaging reference standard. However, MRI is not routinely used as a screening tool in mass screening programs or as a serial follow-up examination because of its limited availability and cost, especially in developing countries. Thus, it is crucial to validate quantitative ultrasound with MRI results to create a reliable, affordable, and universal approach to the diagnosis of NAFLD [10].

QUS has been evaluated in various international populations, but there is limited evidence from Indian population. Ethnicity, body composition, metabolic risk factors and prevalence of the disease could affect imaging performance, and this might warrant region-specific validation studies. Moreover, there is a lack of well-designed quantitative ultrasound measures and MRI data directly compared in tertiary care in eastern India. The ability to establish diagnostic value and the correlation between these imaging techniques in the local population could help to

improve clinical decision making and encourage the use of standardized non-invasive procedures for the diagnosis of hepatic steatosis.

Hence, the study was conducted in the Department of Radiodiagnosis of Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar, India, to see the correlation between quantitative ultrasound parameters and MRI findings in the patients of non-alcoholic fatty liver disease (NAFLD). The researchers compare the performance of quantitative ultrasound to MRI as the imaging reference standard to assess the performance of quantitative ultrasound in the diagnosis and quantification of hepatic steatosis, and to investigate whether quantitative ultrasound is a reliable, cost-effective and widely available imaging tool for clinical use.

Methodology

Study Design: This prospective, cross-sectional, observational study was conducted to evaluate the correlation between quantitative ultrasound (QUS) parameters and magnetic resonance imaging (MRI) findings in the assessment of hepatic steatosis among patients with nonalcoholic fatty liver disease (NAFLD). MRI proton density fat fraction (PDFF) was considered the reference standard for quantitative estimation of hepatic fat content, and the diagnostic performance of quantitative ultrasound was assessed by comparing its findings with MRI-derived measurements.

Study Area: The study was conducted in the Department of Radiodiagnosis, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar, India.

Study Duration: The study was carried out over a period of one year from March 2025 to February 2026.

Sample Size: A total of 102 participants (N = 102) were included in the study. The sample size was determined based on the expected patient load, feasibility of recruitment during the study period, and availability of both quantitative ultrasound and MRI examinations. Consecutive eligible patients fulfilling the study criteria were enrolled until the desired sample size was achieved.

Study Population: The study population comprised adult patients clinically suspected of having nonalcoholic fatty liver disease or previously diagnosed with hepatic steatosis who were referred to the Department of Radiodiagnosis for imaging evaluation. All eligible participants underwent quantitative ultrasound examination followed by chemical shift–encoded MRI with proton density fat fraction (PDFF) estimation. Demographic details, clinical history, anthropometric measurements, and relevant laboratory findings were recorded before imaging evaluation.

Data Collection: Eligible participants attending the Department of Radiodiagnosis during the study period were recruited consecutively after obtaining written informed consent. Demographic characteristics including age, sex, body mass index (BMI), clinical history, biochemical investigations, and risk factors for NAFLD were documented using a predesigned data collection form. Each participant underwent quantitative ultrasound examination and MRI-PDFF assessment within a short interval to minimize changes in hepatic fat content. Imaging findings were recorded prospectively and analyzed independently by experienced radiologists blinded to the results of the alternate imaging modality.

Inclusion Criteria

- Adult patients aged 18 years or older.
- Patients with clinically suspected or previously diagnosed nonalcoholic fatty liver disease.
- Patients referred to liver ultrasound and MRI evaluation.
- Patients willing to provide written informed consent.
- Patients who underwent both quantitative ultrasound and MRI-PDFF examination during the study period.

Exclusion Criteria

- Patients with significant alcohol consumption.
- Patients with chronic liver diseases other than NAFLD, including viral hepatitis, autoimmune hepatitis, Wilson's disease, or hemochromatosis.
- Patients with hepatic malignancy or focal liver lesions interfere with fat quantification.
- Pregnant women.
- Patients receiving hepatotoxic or steatogenic medications.
- Patients with contraindications to MRI, including implanted metallic devices incompatible with MRI, severe claustrophobia, or cardiac pacemakers.
- Patients with incomplete imaging data or poor-quality ultrasound/MRI examinations are unsuitable for analysis.

Procedure: Participants were all asked to fast for at least four hours prior to undergoing imaging examinations in order to reduce physiological variations that could affect the hepatic echogenicity. Experienced radiologists or trained sonographers used a high-resolution ultrasound system with convex transducers to perform quantitative ultrasound of the liver. Patients were assessed in the supine or slight left lateral decubitus position with the right arm fully abducted to optimize visualization of the right hepatic lobe. Several acquisitions were performed using a right intercostal position without incurring damage to the large vessels and biliary structures of the liver. Dedicated software was used to analyze ra-

diofrequency data for quantitative ultrasound parameters, with the means of several measures taken being recorded for each participant. All participants then had a chemical shift–encoded MRI of the liver performed on a 3.0 Tesla MRI scanner. Images of proton density fat fraction (PDFF) were automatically created; circular regions of interest (ROIs) were drawn in representative regions of the liver, excluding large vessels, bile ducts, and artefacts. Hepatic fat quantification was done using the mean PDFF value as the reference standard. Inter-observer bias was avoided by blinding the radiologists who read the quantitative ultrasound measurements from the MRI results and the MRI analysts from the quantitative ultrasound measurements.

Statistical Analysis: The data were entered into Microsoft Excel and analyzed by Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± SD or median (IQR) depending on the distribution of the data and categorical variables were presented as frequencies and percentage. The Shapiro–Wilk test was used to determine the normality of continuous variables. The association between the quantitative ultrasound parameters and MRI-PDFF values was determined using Pearson's or Spearman's correlation coefficient. Independent t-test or Mann–Whitney U test was employed for comparison between the groups, while the Chi-square or Fisher's exact test was used for categorical variables. Receiver operating characteristic (ROC) curve analysis was performed to calculate the diagnostic performance of quantitative ultrasound using MRI-PDFF as the reference standard, and sensitivity, specificity, positive predictive value, negative predictive value, diagnostic accuracy, and area under the ROC curve (AUC) were calculated. The p value of <0.05 (two-sided) was regarded as statistically significant.

Result

The demographic and clinical baseline data of the 102 patients who participated in the study is shown in Table 1. The largest proportion of patients belonged to the 41–50 years age group (28.4%), followed by those aged 51–60 years (23.5%) and 31–40 years (22.5%). The proportion of males (54.9%) to females (45.1%) in the study population was slightly higher for males. According to BMI, 42.2% of participants were obese, 40.2% were overweight and 17.6% had a normal BMI. Diabetes mellitus was found in 47.1% while hypertension was seen in 38.2% of the study population. These results suggest that most of the participants were found to have the metabolic risk factors which are frequently observed in NALFD.

Table 1: Baseline Demographic and Clinical Characteristics of the Study Participants (N = 102)

Variables	Frequency (n)	Percentage (%)
Age Group (years)		
18–30	14	13.7
31–40	23	22.5
41–50	29	28.4
51–60	24	23.5
>60	12	11.8
Gender		
Male	56	54.9
Female	46	45.1
BMI (kg/m²)		
Normal (<25)	18	17.6
Overweight (25–29.9)	41	40.2
Obese (≥30)	43	42.2
Diabetes Mellitus		
Yes	48	47.1
No	54	52.9
Hypertension		
Yes	39	38.2
No	63	61.8

Table 2 shows the quantitative ultrasound parameters and MRI proton density fat fraction (PDFF) values of the subjects. The mean attenuation coefficient was 0.81 ± 0.16 dB/cm/MHz (range 0.46 – 1.21 dB/cm/MHz) and the mean backscatter coefficient was −17.6 ± 4.1 dB (−26.8 – −9.4 dB). The mean MRI-PDFF was 17.8 ± 8.9 %, and the range of individual measurements was 3.2 – 39.6 %. The overall imaging results showed that the liver had a wide range of fat accumulation within the enrolled patient population with an average liver span of 15.7 ± 1.8 cm.

Table 2: Quantitative Ultrasound Parameters and MRI-PDFF Measurements among Study Participants (N = 102)			
Parameter	**Mean ± SD**	**Minimum**	**Maximum**
Attenuation Coefficient (dB/cm/MHz)	0.81 ± 0.16	0.46	1.21
Backscatter Coefficient (dB)	-17.6 ± 4.1	-26.8	-9.4
MRI-PDFF (%)	17.8 ± 8.9	3.2	39.6
Liver Span (cm)	15.7 ± 1.8	12.4	20.3

Table 3 shows the correlation between the quantitative ultrasound parameters and MRI-PDFF measurements. The attenuation coefficient was correlated with the MRI-PDFF value, with a strong positive correlation ($r = 0.854$, $p < 0.001$), suggesting that the higher the attenuation coefficient value, the higher the fat content in the liver. Likewise, MRI-PDFF was significantly positively correlated with the backscatter coefficient ($r = 0.768$, $p < 0.001$). The statistically significant correlation between the quantitative ultrasound parameters and the reference standard for liver fat (MRI-PDFF) indicates that quantitative ultrasound is a reliable method to assess the severity of hepatic steatosis.

Table 3: Correlation between Quantitative Ultrasound Parameters and MRI-PDFF Values (N = 102)		
Quantitative Ultrasound Parameter	**Correlation Coefficient (r)**	**p-value**
Attenuation Coefficient vs MRI-PDFF	0.854	<0.001
Backscatter Coefficient vs MRI-PDFF	0.768	<0.001

In Table 4, quantitative MRI-PDFF parameters are compared between the various MRI-PDFF steatosis grades. The attenuation coefficient and the backscatter coefficient had progressive changes with the progression of hepatic steatosis. The mean attenuation coefficient was 0.54 ± 0.07 dB/cm/MHz in the normal liver fat group and 1.02 ± 0.11 dB/cm/MHz in the severe liver fat group. Similarly, patients with severe steatosis had an increase in the mean backscatter coefficient from −22.9 ± 2.8 dB for the normal group to −12.8 ± 2.1 dB. Among the various grades of steatosis, there was a statistically significant difference ($p<0.001$), showing that quantitative ultrasound measurements are useful in discriminating between different degree of hepatic fat infiltration.

Table 4: Comparison of Quantitative Ultrasound Parameters According to MRI-PDFF Steatosis Grade (N = 102)			
MRI-PDFF Grade	**n**	**Attenuation Coefficient (Mean ± SD)**	**Backscatter Coefficient (Mean ± SD)**
Normal (<5%)	18	0.54 ± 0.07	-22.9 ± 2.8
Mild (5–15%)	31	0.69 ± 0.09	-19.8 ± 2.6
Moderate (16–25%)	30	0.84 ± 0.10	-16.7 ± 2.4
Severe (>25%)	23	1.02 ± 0.11	-12.8 ± 2.1
p-value		**<0.001**	**<0.001**

The diagnostic performance of quantitative ultrasound for hepatic steatosis assessment, when MRI-PDFF is used as the reference standard is shown in Table 5. Seventy-eight true-positive cases and 16 true-negative cases were correctly identified, whereas 6 false-negative and 2 false-positive cases were observed in the quantitative ultrasound. The sensitivity was 92.9%, the specificity was 88.9%, the PPV was 97.5%, the NPV was 72.7% and the overall diagnostic accuracy was 92.2%. The receiver operating characteristic (ROC) demonstrated good diagnostic accuracy with an area under the curve (AUC) of 0.935 (95% CI: 0.884–0.986). The results were statistically significant ($p < 0.001$) and demonstrated the value of quantitative ultrasound as a useful and reliable non-invasive imaging tool to assess hepatic steatosis.

Table 5: Diagnostic Performance of Quantitative Ultrasound for Detection of Hepatic Steatosis Using MRI-PDFF as Reference Standard (N = 102)	
Diagnostic Parameter	**Value**
True Positive (TP)	78
False Positive (FP)	2
True Negative (TN)	16
False Negative (FN)	6
Sensitivity (%)	92.9
Specificity (%)	88.9
Positive Predictive Value (%)	97.5
Negative Predictive Value (%)	72.7
Diagnostic Accuracy (%)	92.2
Area Under the ROC Curve (AUC)	0.935 (95% CI: 0.884–0.986)
p-value	**<0.001**

Discussion

In this current study, the association of quantitative ultrasound (QUS) parameters with the proton density fat fraction (MRI-PDFF) measured by MRI was assessed, to evaluate the usefulness of QUS to diagnose hepatic steatosis in patients with nonalcoholic fatty liver disease (NAFLD). The demographic profile revealed that middle-aged adults had the largest proportion (28.4%) of the study population, followed by the 51-60 years age group (23.5%). There was a slight predominance of males over females (54.9% to 45.1%). Moreover, 40.2% of patients were overweight and 42.2% were obese, and 47.1% and 38.2% of patients had diabetes mellitus and hypertension, respectively. The results in this study are consistent with the known association of components of metabolic syndrome and NAFLD. Other demographic indicators have been observed by Eddowes et al., which showed that hepatic fat accumulation and the progression of disease are significantly influenced by obesity, diabetes and increasing age [10]. Similarly, Park et al. (2017) have reported that metabolic comorbidities are more common in overweight and obese people, and that NAFLD is more commonly found in these individuals, which is consistent with what the present study has found [11].

The liver fat content measured by quantitative ultrasound and MRI showed a wide variance among the patients enrolled. Mean attenuation coefficient was 0.81 ± 0.16 dB/cm/MHz and mean backscatter coefficient was −17.6 ± 4.1 dB. Average MRI-PDFF was 17.8 ± 8.9%, which encompassed the whole range of hepatic steatosis. The findings are consistent with those of Lin et al., (2018), which showed that quantitative ultrasound parameters increased in a proportional manner to hepatic fat fraction determined by MRI-PDFF, and that the parameters were representative of varying degrees of steatosis [12]. Attenuation coefficient (AC), backscatter coefficient (BSC) and other radiofrequency-derived parameters showed significant correlation with MRI-PDFF in the original quantitative ultrasound validation study, which showed that quantitative ultrasound can provide clinically useful quantitative information about hepatic fat deposition. Quantitative ultrasound provides objective numerical measurements, which are more reproducible and less operator dependent than conventional, grayscale ultrasonography.

The most important results in the present study were the significant correlation between the quantitative ultrasound parameters and the MRI-PDFF. Attenuation coefficient revealed a very good positive correlation with MRI-PDFF ($r = 0.854$, $p<0.001$), while the backscatter coefficient also showed a significant correlation with MRI-PDFF ($r = 0.768$, $p<0.001$). These coefficients were much larger than previously reported for controlled attenuation parameter (CAP). Karlas et al., 2017 reported a correlation of $r \sim 0.47$ between CAP and histological steatosis, and Caussy et al., 2018 reported a correlation of $r = 0.57$ between CAP and MRI-PDFF [12]. The quantitative ultrasound parameters in the present study showed better correlation with the MRI quantified fat than did previous ultrasound-based methods, indicating that these parameters may yield more agreement with fat quantification by MRI. The good performance of the attenuation coefficient is especially noticeable, which makes it an excellent potential biomarker to estimate hepatic fat content in clinical routine.

Further comparison of quantitative ultrasound parameters by MRI-PDFF steatosis grades also revealed the capability of quantitative ultrasound for disease severity differentiation. The attenuation coefficient increased progressively from 0.54 ± 0.07 dB/cm/MHz in patients with normal liver fat to 1.02 ± 0.11 dB/cm/MHz in patients with severe steatosis, while the corresponding changes in backscatter coefficient were from −22.9 ± 2.8 dB to −12.8 ± 2.1 dB. These differences were very significant ($p < 0.001$) and suggested a very close relationship between the quantitative ultrasound parameters and the hepatic fat accumulation. In a similar study, Lin et al. (2018) found that the attenuation coefficient and backscatter coefficient showed almost linear relationships with the MRI-PDFF for each group of steatosis grades. The investigators further reported that

quantitative ultrasound showed an excellent correlation with MRI-PDFF over most clinically relevant fat fractions, but some saturation was seen for fat fractions above about 34%. However, quantitative ultrasound was able to differentiate mild, moderate, and severe steatosis within the clinically normal range—very similar to the results of the present study.

The quantitative ultrasound showed excellent diagnostic performance accuracy, when the MRI-PDFF was used as the reference standard. The sensitivity was 92.9%, specificity was 88.9%, the positive predictive value was 97.5%, the negative predictive value was 72.7% and the overall diagnostic accuracy was 92.2%. ROC analysis showed an AUC of 0.935 (95% CI: 0.884 – 0.986) indicating excellent diagnostic power. The results obtained are comparable with those obtained in previous investigations. The present study found the AUC for hepatic steatosis was 0.84 (95% CI: 0.80–0.89), which is similar to the results reported by Lin et al. (2018) for quantitative ultrasound with an AUC of 0.89 (95% CI: 0.82–0.96). Likewise, in CAP, Karlas et al. (2017) reported an AUC of 0.79 for identification of hepatic steatosis, and an AUC of 0.89 in patients with mild fibrosis, which was significantly reduced in advanced fibrosis. This improvement in sensitivity and diagnostic accuracy is probably due to the simultaneous estimation of attenuation and backscatter parameters which represent directly the tissue acoustical properties as opposed to using only one of them. Compared to computed tomography, quantitative ultrasound has been shown to be more sensitive (around 82%) and more specific (close to 100%) to detect a moderate to severe steatosis, and it has better detection of early steatosis, without exposing patients to the risk of ionizing radiation, compared to computed tomography, which is sensitive around 82% and specific near 100% in moderate to severe steatosis, but has poor sensitivity in mild steatosis.

Overall, the present study indicated that quantitative ultrasound is a reliable and non-invasive technique for the evaluation of hepatic steatosis in NAFLD. Quantitative ultrasound can be clinically useful for screening, grading and follow-up of patients with fatty liver disease due to the excellent correlation with MRI-PDFF, significant discrimination across the steatosis grades, and high diagnostic accuracy. These observations are similar to previous studies showing that quantitative ultrasound can be used to measure hepatic fat objectively without numerous disadvantages of liver biopsy or the fact that MRI-PDFF was not available to many patients. Based on these findings, quantitative ultrasound could be a valuable and low-cost tool for the routine clinical evaluation of hepatic steatosis, especially in resource-poor health care environments.

Conclusion

This study showed that quantitative ultrasound is a useful and reliable non-invasive imaging tool for assessing hepatic steatosis in the patients of NALD. The results demonstrated high agreement between quantitative ultrasound parameters with MRI-based measurements, which suggested that quantitative ultrasound is a tool for evaluating hepatic fat accumulation. In addition, quantitative ultrasound showed an excellent diagnostic performance to distinguish different grades of hepatic steatosis, indicating its potential as a useful tool for diagnosis and severity assessment of the disease. Given that it is widely available, cost-effective, non-invasive and does not expose the patient to radiation, quantitative ultrasound has several practical benefits over advanced imaging modalities for routine clinical assessment and surveillance of nonalcoholic fatty liver disease patients. Thus, it could be used as a reliable alternative imaging modality to the initial diagnosis and routine follow-up of hepatic steatosis, especially in resource-limited settings where advanced imaging is not routinely available in healthcare settings. Larger multicenter studies with more diversified populations are recommended to confirm these results and to enable the widespread clinical use of quantitative ultrasound in the management of nonalcoholic fatty liver disease.

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