Journal of Translational Gastroenterology **2026** | Epub
DOI: 10.14218/JTG.2026.00028

Letter to the Editor

Standardization Matters: Optimizing Ultrasound Attenuation Imaging for Reliable Quantification of Hepatic Steatosis

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Received: August 03, 2026 | **Revised:** August 28, 2026 | **Accepted:** September 14, 2026 | **Published online:** September 20, 2026

Dear Editor,

We read with great interest the article entitled "The Effect of Measurement Depth and Technical Considerations in Performing Liver Attenuation Imaging" by Adamson *et al.*,[1] published in the *Journal of Translational Gastroenterology*. The authors systematically investigated the influence of region-of-interest (ROI) depth and technical factors on ultrasound attenuation coefficient measurements and demonstrated that ROI placement significantly affects the diagnostic performance of attenuation imaging (ATI) for detecting hepatic steatosis. In this Letter, we aim to highlight several considerations that complement the findings of Adamson *et al.*,[1] with particular emphasis on the clinical and translational importance of measurement standardization, reproducibility, and quality control in hepatic ATI.

Metabolic dysfunction–associated steatotic liver disease represents a major global health burden, and the development of accurate, non-invasive, and accessible imaging biomarkers is urgently needed. Although MRI-based proton density fat fraction (MRI-PDFF) provides excellent quantitative assessment of hepatic fat content, its clinical application is limited by cost and accessibility. Therefore, quantitative ultrasound techniques such as ATI have attracted increasing attention because of their convenience, low cost, and radiation-free characteristics.

MRI-PDFF has demonstrated high agreement with histological steatosis grading and has been widely accepted as a reliable quantitative biomarker for liver fat assessment.[2]

Previous studies have demonstrated that ATI can provide quantitative evaluation of hepatic steatosis and show a significant correlation with MRI-PDFF. Jeon *et al.*[3] reported that ATI-derived attenuation coefficients were significantly associated with MRI-PDFF and achieved good diagnostic performance for detecting hepatic steatosis in patients with chronic liver disease. Similarly, Ferraioli *et al.*[4] demonstrated the feasibility of ATI using MRI-PDFF as the reference standard, supporting its potential role as a non-invasive quantitative imaging biomarker for liver fat assessment. More recently, a prospective multicenter study of 562 patients further demonstrated the diagnostic performance of ATI against MRI-PDFF and evaluated its performance across different body mass index and skin-to-liver capsule distance categories, providing further evidence for the clinical applicability of ATI.[5]

The study by Adamson *et al.*[1] makes an important contribution by demonstrating that measurement depth is an important determinant of the resulting attenuation coefficient. Importantly, Adamson *et al*.[1] themselves noted that the 6-cm depth may be most suitable for patients with a body mass index of at least 30 kg/m² and that ROI placement should be adjusted according to body habitus and subcutaneous tissue thickness. A recent pilot study in healthy volunteers further demonstrated depth-dependent variability in ATI measurements, supporting the importance of carefully considering measurement depth when interpreting attenuation values.[6] Moreover, as measurement depth was defined from the skin surface, differences in subcutaneous tissue thickness may result in substantially different anatomical ROI locations among individuals.

These findings highlight an important consideration for measurement standardization: applying the same numerical depth may not ensure anatomically equivalent measurements across patients. Future studies should therefore explore anatomically referenced or patient-adapted ROI positioning strategies, considering factors such as the distance from the liver capsule or subcutaneous tissue thickness, to achieve more reproducible attenuation measurements across different body habitus.

The emphasis on standardization is consistent with American Institute of Ultrasound in Medicine–Radiological Society of North America Quantitative Imaging Biomarkers Alliance Pulse-Echo Quantitative Ultrasound Initiative recommendations, which highlight standardized acquisition, quality control, and reproducibility assessment as prerequisites for reliable quantitative ultrasound biomarkers.[7] Several issues also warrant further investigation. Ultrasound attenuation measurements may vary across vendors, transducers, and acquisition parameters, underscoring the need for multicenter validation across different platforms. In addition, operator-dependent ROI placement remains a potential source of variability, and artificial intelligence–based quality assessment and automated ROI positioning may offer opportun-

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How to cite this article: Chen J, Lu W. Standardization Matters: Optimizing Ultrasound Attenuation Imaging for Reliable Quantification of Hepatic Steatosis. *J Transl Gastroenterol*. Published online: Sep 16, 2026. DOI: https://doi.org/10.14218/JTG.2026.00028.

ities to improve measurement robustness.

In conclusion, Adamson *et al.*[1] provide valuable evidence that measurement depth substantially affects hepatic ATI. Consistent with their caveat that a 6-cm depth may be most suitable for patients with a body mass index of at least 30 kg/m², their findings support the broader principle that effective standardization should balance reproducibility with patient-specific anatomical variation. Establishing anatomically consistent and patient-adapted acquisition strategies may be an important step toward the broader clinical application of ATI for hepatic steatosis assessment and monitoring in patients with metabolic dysfunction–associated steatotic liver disease.

Acknowledgments

None.

Funding

None.

Conflict of interest

The authors declare no conflicts of interest.

Author contributions

Writing—original draft (JC), writing—review & editing (WL). Both authors have read and approved the final manuscript.

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