



CASE REPORT

Ultrasound-Derived Fat Fraction (UDFF) for Monitoring Liver Steatosis in MASLD: A Case Report

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Abstract

**Background:** Metabolic dysfunction-associated steatotic liver disease (MASLD), formerly known as non-alcoholic fatty liver disease (NAFLD), is prevalent among individuals with metabolic risk factors. Accurate, non-invasive quantification of hepatic steatosis is crucial for diagnosis and management. **Case Presentation:** We report a 52-year-old male (BMI 30.6 kg/m<sup>2</sup>) with prediabetes and mild dyslipidemia, who underwent lifestyle modification including dietary changes and increased physical activity. Baseline hepatic fat content was assessed using UDFF on the Siemens ACUSON Sequoia system, yielding a mean UDFF of 17%, consistent with moderate hepatic steatosis. After a 6-month intervention period, the patient achieved a BMI reduction to 26.5 kg/m<sup>2</sup>. Follow-up UDFF showed a mean value of 5%, indicating resolution of steatosis. **Results:** Quantitative analysis demonstrated a substantial reduction in liver fat fraction (from 17% to 5%) accompanied by an improvement in body composition. **Conclusion:** UDFF effectively monitored changes in hepatic steatosis corresponding with lifestyle-induced weight loss. Its non-invasive nature and accessibility make it a valuable tool for managing MASLD in clinical settings.

**Keywords:** Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD), Non-Alcoholic Fatty Liver Disease (NAFLD), Body Mass Index (BMI), Ultrasound-Derived Fat Fraction (UDFF)

1. Introduction:

Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD) encompasses hepatic steatosis linked to metabolic risk factors such as obesity, insulin resistance, type 2 diabetes, and dyslipidemia [1,2]. Accurate assessment of liver fat content is essential for diagnosis, monitoring, and evaluating therapeutic interventions.

While magnetic resonance imaging-proton density fat fraction (MRI-PDFF) is considered the gold standard for quantifying liver fat, its high cost and limited availability restrict routine use. Ultrasound-Derived Fat Fraction (UDFF) offers a cost-effective, non-invasive alternative, providing real-time quantification of hepatic steatosis [3,4].

2. Case Presentation:

Patient Profile:

- Age/Sex: 52-year-old male
BMI: 30.6 kg/m2
Medical History: Prediabetes, mild dyslipidemia, no alcohol consumption

Clinical Course:

The patient-initiated lifestyle modifications, including dietary improvements and increased physical activity. Over six months, he achieved significant weight loss, reducing his BMI to 26.5 kg/m2.

UDFF Assessment:

Liver fat content was measured using the Siemens ACUSON Sequoia ultrasound system with a DAX convex transducer. The UDFF method estimates hepatic fat content by analyzing the attenuation coefficient (AC) and Backscatter Coefficient (BSC) within a Region-Of-Interest (ROI) in the liver. Values >5% indicate steatosis.

3. Results:

- Pre-Intervention: UDFF measured at 17%, indicating moderate hepatic steatosis.

- Post-Intervention: UDFF decreased to 5%, suggesting normalization of liver fat content.

Baseline UDFF Scan Showing Moderate Hepatic Steatosis:

Baseline scan with a mean UDFF of 17.0%. ROI measurements at two liver sites showed values of 19% and 15%, consistent with moderate steatosis.

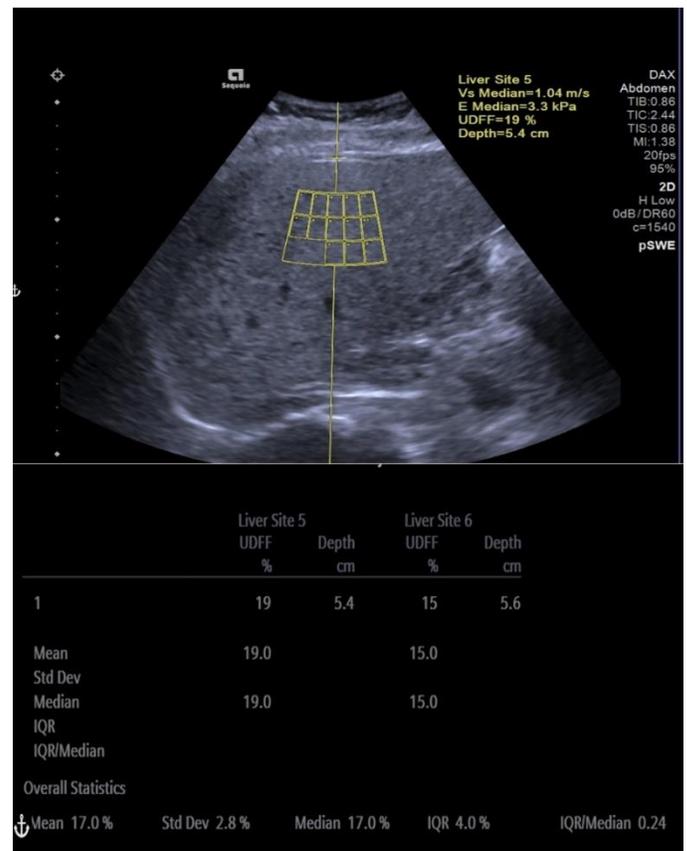


Figure 1: Ultrasound-Derived Fat Fraction (UDFF) scan showing hepatic steatosis.

B-mode ultrasound image obtained using the Siemens ACUSON Sequoia system with a DAX convex transducer. The region-of-interest (ROI) grid is placed within the right hepatic lobe for fat quantification. The region-of-interest (ROI) grid is clearly demarcated.

UDFF measurements were recorded at two liver sites as follows:

- **Liver Site 5:**
  - UDFF: 19%
  - Depth: 5.4 cm
- **Liver Site 6:**
  - UDFF: 15%
  - Depth: 5.6 cm

**Overall Summary Statistics:**

- Mean UDFF: **17.0%**
- Median UDFF: **17.0%**

**Interpretation:**

These values indicate **moderate hepatic steatosis**, consistent with UDFF criteria and diagnostic thresholds (UDFF >5% suggest steatosis). The consistency of measurements between two liver sites and the relatively low IQR/Median ratio (0.24) supports the technical reliability of this scan (measurement).

**Follow-up UDFF Scan Demonstrating Normalized Hepatic Fat**

Follow-up scan six months' post-intervention revealed a UDFF of 5.0% across all measurement sites, meeting criteria for normal hepatic fat.

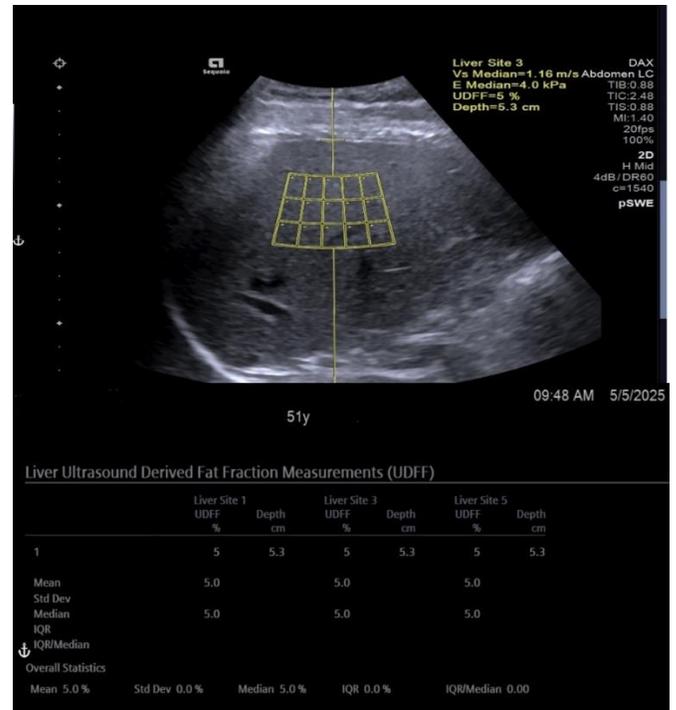
This follow-up B-mode ultrasound scan was performed using the Siemens ACUSON Sequoia system with a DAX convex transducer after 6 months' interventions. Region-of-interest (ROI) measurements were taken at multiple liver sites:

**Liver Sites 1, 3, and 5:**

- UDFF = 5%
- Depth = 5.3 cm

**Summary Statistics:**

- **Mean UDFF:** 5.0%
- **Median UDFF:** 5.0%



**Figure 2. Follow-Up Ultrasound-Derived Fat Fraction (UDFF) scan demonstrating normalized hepatic fat content.**

**Interpretation:**

The UDFF value of 5% is at the threshold of normal liver fat content. No evidence of steatosis is seen on this scan, demonstrating a significant reduction from the previous scan (17%), consistent with clinical improvement following weight loss and lifestyle changes.

**4. Discussion:**

This case illustrates a significant reduction in hepatic fat content (from 17% to 5%) following modest weight loss. It demonstrates the efficacy of UDFF in monitoring hepatic steatosis in response to lifestyle interventions. The significant reduction in liver fat content aligns with existing evidence that modest weight loss can substantially improve hepatic steatosis in MASLD patients.

UDFF's non-invasive, radiation-free, accessible method and cost-effective nature makes it

suitable for routine clinical use, particularly in outpatient settings. Its ability to provide immediate feedback can enhance patient adherence to lifestyle modifications and facilitate ongoing management of MASLD.

UDFF effectively tracked these changes, aligning with known benefits of lifestyle intervention in MASLD. As a non-invasive and accessible method, UDFF holds promise for integration into routine clinical practice for monitoring therapeutic outcomes.

### 5. Conclusion:

UDFF is a reliable and practical tool for assessing and monitoring hepatic steatosis in MASLD patients. Its integration into clinical practice can aid in evaluating treatment responses and guiding management strategies. This case supports its utility in both primary care and hepatology settings, particularly where MRI is not feasible.

**Informed Consent Statement:** Informed written consent was obtained from the patient for publication of this report and any accompanying images.

**Conflict-of-Interest Statement:** Yes, the authors declare that there are no potential competing interests.

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**Author Statement:** The manuscript is not submitted to a particular special issue.

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