Non-invasive imaging modalities for assessment of fibrosis, inflammation and steatosis in a Japanese NASH population

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Background/Aim

Non-alcoholic fatty liver disease (NAFLD) and its more severe form, non-alcoholic steatohepatitis (NASH), remains undiagnosed in clinical practice. Often, detection occurs when disease has progressed to a later, irreversible stage. Current guidelines for non-alcoholic steatohepatitis (NASH) diagnosis rely on liver biopsy which is limited by its cost and invasiveness.

LiverMultiScan® is a non-invasive multiparametric MRI (mpMRI) diagnostic tool which includes two key measures for NASH assessment:

- **cT1 (corrected T1)** is a quantitative measure of iron-corrected T1-relaxation time that has been shown to correlate with fibrosis and inflammation. 1-4
- **PDFF (proton density fat fraction)** is a quantitative measure of fat that has been shown to correlate with hepatic fat. 5-6

The first in a Japanese cohort, this prospective study aims to evaluate the diagnostic performance of mpMRI-based biomarkers (LMS-cT1 and LMS-PDFF) and other non-invasive imaging modalities compared to the gold standard, liver biopsy, for assessment of fibrosis, inflammation and steatosis in patients with suspected NASH.

Methods

97 adult patients suspected of NASH were recruited from a liver clinic in Yokohama, Japan (UMIN000026145). Liver biopsies were assessed by two pathologists in a double-blind manner with consensus using the NASH CRN scoring system where NAFLD activity score (NAS) ranged from 0 to 8, while stage of liver fibrosis was assessed according to the Kleiner-Brunt (KB) criteria (0–4).

Patients were screened with cT1 and PDFF using LiverMultiScan (LMS), Liver Stiffness Measurement (LSM) using magnetic resonance elastography (MRE), LSM and Controlled Attenuation Parameter (CAP) using vibration-controlled transient elastography (VCTE).

MRI-based data were collected on a 3T GE Discovery 750w. VCTE-based data were collected with M and XL probes. Failure is defined as zero valid readings. Unreliable result is defined as <10 valid readings, <60% success rate and interquartile range >30% of median value. Where available, result from XL probe were considered when M probe reading failed/was unreliable.

Diagnostic performance were assessed based on valid and reliable measurements using area under receiver operating curve (AUROC).

Results

**Table 1. General characteristics and demographics of patients diagnosed with NASH or non-NASH based on biopsy**

<table>
<thead>
<tr>
<th>Variable</th>
<th>NASH (n=60)</th>
<th>non-NASH (n=37)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years (mean±SD)</td>
<td>63.3±12.9</td>
<td>58.3±12.9</td>
</tr>
<tr>
<td>Male, n (%)</td>
<td>34 (57)</td>
<td>26 (70)</td>
</tr>
<tr>
<td>Weight, kg (mean±SD)</td>
<td>78.5±15.2</td>
<td>76.6±18.6</td>
</tr>
<tr>
<td>BMI, kg/m² (mean±SD)</td>
<td>29.6±4.4</td>
<td>28.0±5.1</td>
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<tr>
<td>Obesity (BMI ≥25), n (%)</td>
<td>50 (83)</td>
<td>27 (73)</td>
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</table>

**PDFF and cT1 values are superior for the assessment of steatosis and NASH respectively**

**MRE-LSM and VCTE-LSM are superior for assessment of fibrosis however, VCTE has lower success rates**

**Conclusion**

- Multiparametric MRI using LiverMultiScan® is the best-performing modality with high success rates for assessment of steatosis and NASH.
- MRE-LSM and VCTE-LSM are good imaging modalities for assessment of fibrosis; VCTE however, has lower success rates.
- Study highlights complementarity of techniques for non-invasive assessment for histopathological features of NASH.

References