Characterization of atherogenic dyslipidemia using a novel NMR-based advanced lipoprotein test in type 2 diabetic subjects

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1. BACKGROUND AND AIM
- Type 2 diabetic subjects (DM2) tend to present atherogenic dyslipidemia (AD), characterized by high triglycerides, low HDL levels, and a preponderance of small LDL particles.
- The number of LDL particles (LDL-P) has been suggested to be a better predictor of cardiovascular risk than LDL cholesterol (LDL-C) in patients with high cardiometabolic risk.
- We aimed to use a novel NMR-based advanced lipoprotein test (ALT) to compare the lipid and lipoprotein profiles of non-diabetic with DM2 subjects (with and without AD).

2. MATERIALS AND METHODS

Study population
- In this study, 59 non-diabetic subjects (Control), 222 DM2 subjects and 100 DM2 subjects with AD were enrolled.

Lipids and other measurements
- The concentration of triglycerides, total cholesterol and HDL were determined using standard assays. LDL-C was estimated using the Friedewald formula. IMT measurements were also performed.

NMR analysis
- Serum samples were also analyzed using a novel NMR-based ALT to obtain the concentration of LDL-P.

3. RESULTS

Clinical Characteristics

<table>
<thead>
<tr>
<th>Control (n=59)</th>
<th>DM2 (n=222)</th>
<th>DM2 with AD (n=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI, kg/m²</td>
<td>25.0 ± 0.4</td>
<td>32.6 ± 0.5</td>
</tr>
<tr>
<td>Age, years</td>
<td>47 ± 1</td>
<td>62 ± 1</td>
</tr>
<tr>
<td>SBP, mmHg</td>
<td>114 ± 2</td>
<td>141 ± 1</td>
</tr>
<tr>
<td>Sex, %</td>
<td>42</td>
<td>51</td>
</tr>
<tr>
<td>Hypertension, %</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Smoking, %</td>
<td>0</td>
<td>48</td>
</tr>
<tr>
<td>Total Cholesterol, mg/dL</td>
<td>191 ± 4</td>
<td>205 ± 4</td>
</tr>
<tr>
<td>Triglycerides, mg/dL</td>
<td>69 ± 4</td>
<td>123 ± 5</td>
</tr>
<tr>
<td>HDL, mg/dL</td>
<td>53 ± 2</td>
<td>51 ± 1</td>
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</table>

Discordance analysis
- Although LDL-C and LDL-P measures showed the same trend, we further analyzed the cases when these measures were discordant on the basis of population percentiles, i.e., when LDL-C was increased and LDL-P was normal (cholesterol-enriched particles predominate) and when LDL-P was increased but LDL-C was normal (cholesterol-depleted particles predominate).
- For those individuals with cholesterol-depleted LDL particles, only LDL-P was associated with IMT (r=0.29). This association remained significant after adjusting for potential confounders.

4. CONCLUSIONS
- For individuals with cholesterol-depleted LDL particles, the LDL-attributable atherosclerotic risk was associated with LDL-P but not with LDL-C.
- The standardization of the different advanced lipoprotein tests, the definition of the population in which the use of LDL-P would be most valuable and the evaluation of the cost-effectiveness of using LDL-P are a must in order to incorporate their use in clinical practice.

REFERENCES
1. M. H. Davidson et al., Clinical utility of inflammatory markers and advanced lipoprotein testing: advice from an expert panel of lipid specialists, Journal of Clinical Lipidology, 2011, 5, 338-367
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