Clinical Importance of the Evaluation of Blood Non-HDL Cholesterol Levels in a Hypercholesterolemia Education Class

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Atherosclerotic disease is the leading cause of death in Japan as well as in most western countries. Lifestyle behaviors, including diet and exercise, are the cornerstone of lipoprotein-lipid management in the prevention of atherosclerotic disease. Therefore, internists have often implemented hypercholesterolemia education classes (HECs) in primary care. From our experience, reductions in blood total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C) concentrations sometimes do not occur during HECs, particularly in postmenopausal women with hypercholesterolemia. Recently, non-high-density lipoprotein cholesterol (non-HDL-C), which is easily calculated by subtracting HDL-C from TC and includes all apolipoprotein B-containing lipoproteins identified to be atherogenic, has been recommended as a management marker especially in patients with high triglyceride (TG) concentrations (i.e., >200 mg/dl) (1-3). Since there have been no studies on the clinical significance of non-HDL-C in settings such as HECs until now, this report mentions the changes in non-HDL-C as compared to LDL-C, which is currently a main therapeutic target in hyperlipidemia, in HECs for a population with relatively low TG levels.

We analyzed 102 postmenopausal women who made the recommended lifestyle in a 6-month intervention of HECs in a series of community settings, aged 55-79 [mean 67.2±5.3 (SD)] years, with primary type II hypercholesterolemia, after the exclusion of the following subjects from the analysis: 1) 36 subjects who did not make any lifestyle modification during the intervention period, 2) 1 subject with a smoking habit, 3) 2 subjects with alcohol drinking habits. We did not recruit the following subjects in our HECs: 1) those with any disease history other than hypercholesterolemia, 2) those with fasting serum TC values >280 mg/dl, because subjects with these levels would be advised to receive medical referrals and pharmacological therapy, 3) those with fasting serum TG values >200 mg/dl, since non-HDL-C is already thought as a management marker over these levels (1-3), 4) those with any medication to influence lipoprotein-lipid metabolism. TC and TG values were determined by enzymatic methods. HDL-C and LDL-C were determined by homogenous methods.

In the nutritional segment of our HECs, subjects were recommended to modify their total energy intake according to their dietary patterns and weight and to reduce the energy provided by fat to <25% of total energy intake. Daily intakes of <300 mg of cholesterol were also advised. Increases in physical activity, the frequency of which was set to at least 3 times/week and >30 minutes per session, were recommended.

The mean body mass index level of the analyzed subjects was 23.4±2.5 kg/m². Overall, our intervention lowered the means of TC by 1.5%, LDL-C by 1.1%, TG by 15.0% and non-HDL-C by 3.2%, while increasing HDL-C by 3.3% from baseline (Table 1). After the intervention, there was a significant decrease in TG and non-HDL-C, and a significant increase in HDL-C, without significant changes in either TC or LDL-C (by a paired t-test; significant levels, p<0.05).

Our lifestyle intervention thus produced an improvement in serum lipoprotein-lipid profiles, when we focused on non-HDL-C rather than TC or LDL-C. In our results, the significant reduction in non-HDL-C seemed to be caused in great part by the reduction in triglycerides (TGs), implying the significance of not only non-HDL-C but also of TG levels on the evaluation of HECs. However, some studies have recently indicated that non-HDL-C is a better predictor of cardiovascular diseases than LDL-C, regardless of TC, LDL-C or TG levels (1, 3-5). The clinical implications of non-HDL-C are strongly suggested in the Japanese population (2, 3). Taking these previous reports into account, although there has not been enough evidence on the prognostic utility of non-HDL-C in HECs, non-HDL-C might be a somewhat better potential atherogenic index than TGs, and a much better index than LDL-C even at relatively low TG levels as in our study population.

Non-HDL-C has many practical advantages in settings such as HECs: it is easily estimated (from information readily available in standard lipoprotein-lipid profiles), without the influence of TG concentrations or fasting durations (3).

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Table 1. Changes in Serum Lipoprotein-lipid Parameters before and after the Lifestyle-intervention

<table>
<thead>
<tr>
<th>Parameter</th>
<th>before</th>
<th>after</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cholesterol</td>
<td>234.7±4.0</td>
<td>231.1±17.6</td>
<td>NS</td>
</tr>
<tr>
<td>LDL cholesterol</td>
<td>146.3±14.9</td>
<td>144.6±18.1</td>
<td>NS</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>61.3±13.5</td>
<td>61.3±13.0</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>TG</td>
<td>135.4±52.2</td>
<td>115.1±56.6</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Non-HDL cholesterol</td>
<td>173.4±18.2</td>
<td>167.3±21.5</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Values are expressed as mean±SD (mg/dl). *P<0.05 was set as statistically significant using a paired t-test. HDL: high-density lipoprotein, LDL: low-density lipoprotein, TG: triglyceride, NS: not significant.

Change levels in non-HDL-C are generally larger than those in LDL-C, so subjects can more easily notice the effects of lipoprotein-lipid changes. The measurement of non-HDL-C rather than LDL-C might become a helpful tool in routine HECs.

In conclusion, since non-HDL-C likely has specific aspects of a dyslipidemic phenotype along with educational benefits, we should try to evaluate non-HDL-C even though HECs fail to reduce TC and LDL-C levels. Further studies using non-HDL-C as a management marker in HECs will be needed with a larger sample size and a longer follow-up.

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References


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