**Introduction**

- Hyperthyroidism leads to an unexpected improvement in the lipid profile in previously hyperlipidemic patients.
- Reduction in the atherogenic LDL-cholesterol is a hallmark of hyperthyroidism. It is thought to be caused by the increased transcription of LDL receptors along with rapid clearance of LDL cholesterol from the circulation (figure A).
- We describe a case of new onset hyperthyroidism with significant improvement in LDL-C, Total Cholesterol (TC) and a significant decrease in the LDL particle (LDL-P) concentration.

**Case**

- A 55 year old man with a known history of dyslipidemia presented with shortness of breath, palpitations and a decreased appetite.
- Further work-up revealed a TSH of 0.244 uIU/mL, Free Thyroxine (FT4) of 5.45 ng/dl consistent with hyperthyroidism.
- A prior fasting lipid panel revealed TC of 222 mg/dl, LDL-C of 149 mg/dl and low-density lipoprotein particle (LDL-P) of 1276 nmol/L, high-density lipoprotein cholesterol (HDLC) 56 mg/dl, triglycerides (TG) of 71 mg/dL.
- Repeat lipid panel in the hyperthyroid state revealed TC (119 mg/dl), HDL-C (34 mg/dl), LDL-C 73 mg/dl, and LDL-P of 788 nmol/L, with unchanged TG levels.
- When comparing the patient’s current lipid profile to his previous profile, there was a 46% drop in TC, 51% drop in LDL-C with a 38% reduction in his LDL-P.

**Table 1** Percent Reduction Off Lipid-lowering Medication, Controlled for Diet/Exercise

<table>
<thead>
<tr>
<th></th>
<th>Prior Visit</th>
<th>Current Visit</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>222</td>
<td>119</td>
<td>46</td>
</tr>
<tr>
<td>LDL-C</td>
<td>149</td>
<td>73</td>
<td>51</td>
</tr>
<tr>
<td>LDL-P</td>
<td>1276</td>
<td>788</td>
<td>38</td>
</tr>
<tr>
<td>HDL-C</td>
<td>56</td>
<td>34</td>
<td>39</td>
</tr>
</tbody>
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TC, total cholesterol; LDL-C, low-density lipoprotein cholesterol; LDL-P, low-density lipoprotein particle; HDL-C, high-density lipoprotein cholesterol

**Discussion**

- A growing body of evidence now suggests that in addition to total LDL-cholesterol content, the total number of atherogenic lipoproteins as measured by apolipoprotein B or LDL-P, are also important predictors of cardiovascular risk.
- Several Anti-hyperlipidemic medications lower LDL-C to a greater extent as compared to LDL-P. Our patient demonstrated a 51% reduction in LDL cholesterol when compared to only a 38% reduction in his LDL particle number (Table 1).

**Conclusions**

- Hyperthyroidism exerts significant effects on cholesterol and lipoprotein metabolism by lowering the atherogenic cholesterol particles.
- Hepatic actions of thyroid hormone receptors lead to lowering of PCSK9, LDL-cholesterol levels along with a reduction of apoB and Lp(a).
- This LDL lowering effect has stimulated the development of thyromimetic agents that have beneficial effects on the lipid profile. As such we would expect they would have similar impact on lipid and lipoprotein parameters.

**References**

- Kwakernaak AJ Adiposity blunts the positive relationship of thyrotropin with proprotein convertase subtilisin-kexin type 9 levels in euthyroid subjects. Thyroid. 2013