Cholecystectomy: Long term effect on serum lipid profile and Vitamin D

Mohammad Fathi 1, Mohsen Soori 2, Fariborz Rashnoo 2*, Esmaeil Hajinasrollah 3

1. Resident of General Surgery. Department of General Surgery, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
2. Assistant Professor of General Surgery. Department of General Surgery, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
3. Professor of General Surgery. Department of General Surgery, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

*Corresponding Author:
Address: Department of General Surgery, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
Email: fariborz.rashnoo@yahoo.com

Date Received: April, 2018       Date Accepted: January, 2019       Online Publication: June 15, 2019

Abstract

**Background:** The association between cholecystectomy and abnormal lipids and later increase in the risk of diseases related to dyslipidemia showed controversial results. This study aims to evaluate the association of lipid profile and Vitamin D level before and after cholecystectomy.

**Materials and Methods:** Ninety-eight patients with symptomatic gallstones were studied prospectively. Plasma concentration of cholesterol, triglycerides, LDL, HDL and vitamin D was analyzed preoperatively and postoperatively after six months of cholecystectomy. None of the patients received any lipid-lowering drug or dietary restriction.

**Results:** Sixty-seven (68.4%) female and 31 (31.6%) male patients were studied for six months. There was a significant increase in total serum cholesterol besides a significant decrease in vitamin D and HDL serum level after six months. Also, there was a non-significant increase in the serum level of LDL and triglyceride. In stone based sub analysis the same results achieved.

**Conclusion:** There was a significant decrease in plasma concentration of vitamin D and HDL and the significant increase in cholesterol, triglyceride, and LDL in cholecystectomy patients postoperatively. These changes in plasma lipids and Vitamin D are likely to have a significant effect on the development of different disease related to dyslipidemia such as coronary artery disease and low bone density after cholecystectomy in the long term.

**Keywords:** Cholesterol, Cholecystectomy, Triglycerides, vitamin D
**Introduction**

Gallstone disease is one of the common gastrointestinal diseases with a substantial burden to the health-care delivery system (1). Cholelithiasis is one of the most common gastrointestinal disorders being prevalent in about 10-15% of adults in developing countries (2). The most common symptom of gallbladder stones are severe abdominal pain, and surgical removal of the gallbladder is the treatment of choice by the time they are symptomatic (3).

It is now widely accepted that the primary event in the pathogenesis of cholesterol gallstones is an altered lipid metabolism, because of which there is a relative increase in the cholesterol levels compared to other lipids secreted by the liver into the bile (4).

Many studies have shown an association between cholecystectomy and abnormal lipids. Even though lipid and bile acid metabolisms are functionally related, there are different results about long-term effects of gallbladder removal on serum lipids and vitamin D as fat-soluble nutrition (5-7).

This study aimed to determine the long-term pattern of serum levels of lipids and vitamin D change in patients with gallbladder stone before and after cholecystectomy.

**Materials and Methods**

In this prospective study, 98 patients with symptomatic cholelithiasis (based standard clinical and laboratory criteria as practiced in the hospital) who were a candidate for cholecystectomy were enrolled in the study. After obtaining permission from the Ethics Committee of Shahid Beheshti University of Medical Sciences, and obtaining consent, patient’s details and clinical findings including detailed lipid profile (serum cholesterol, triglycerides, LDL cholesterol, and HDL cholesterol) and vitamin D of all patients was obtained preoperatively were recorded.

All these patients underwent cholecystectomy subsequently for symptomatic cholelithiasis. Patients were followed for six months and a lipid profile and Vitamin D level at six months postoperatively was also obtained. None of the patients was put on any lipid-lowering drug or any dietary restriction.

The results in patients (pre and postcholecystectomy) were compared statistically by paired t-test, and Wilcoxon ranks test (in case of skewed distribution) with SPSS-23.

**Results**

Ninety-eight patients including 31 males and 67 females participated in this study. The mean age and average body mass index of patients were 45.2±12.7 and 31.24±8.3 kg/m² respectively.

The mean levels of serum cholesterol significantly elevated while HDL and vitamin D significantly reduced after six months of post-operation (Table 1).

<table>
<thead>
<tr>
<th>Lipid Profile</th>
<th>Before Surgery (n=98)</th>
<th>After Surgery (n=98)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol</td>
<td>168.9±47.92</td>
<td>181.4±60.38</td>
<td>*0.047</td>
</tr>
<tr>
<td>LDL</td>
<td>107±39.3</td>
<td>112±41.1</td>
<td>*0.23</td>
</tr>
<tr>
<td>HDL</td>
<td>45.8±10.2</td>
<td>45.5±12.2</td>
<td>0.019</td>
</tr>
<tr>
<td>TG</td>
<td>136.4±66.8</td>
<td>138.2±81.7</td>
<td>*0.42</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>36.4±18.1</td>
<td>31.9±14.1</td>
<td>*0.037</td>
</tr>
</tbody>
</table>

*Paired T-test

Same results achieved in the subanalysis of data, based gallbladder stone type (Table 2).

<table>
<thead>
<tr>
<th>Stone Type</th>
<th>Lipid Profile</th>
<th>Before Surgery (n=98)</th>
<th>After Surgery (n=98)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Cholesterol</td>
<td>132.5±34.6</td>
<td>178.4±60.9</td>
<td><em>0.001</em></td>
</tr>
<tr>
<td>LDL</td>
<td>106±40.5</td>
<td>135±36.5</td>
<td>*0.14</td>
<td></td>
</tr>
<tr>
<td>HDL</td>
<td>45.6±11.6</td>
<td>36±12.1</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>120±38.8</td>
<td>123±43.1</td>
<td>*0.08</td>
<td></td>
</tr>
<tr>
<td>Vitamin D</td>
<td>45.6±11.6</td>
<td>36±12.1</td>
<td>*0.025</td>
<td></td>
</tr>
</tbody>
</table>

*Paired T-test

The biochemical analysis of stones revealed that the majority of stones were cholesterol stones (61.2%) followed by pigment stones (26.5%) and mix (12.2%). Seventy-nine (80.6%) of patients presented with multiple stones.

**Discussion**

This study aimed to investigate the changes in lipid profiles and serum vitamin D level after cholecystectomy. The results of this study showed the comparison to the measured lipid profile serum level before cholecystectomy, after six months, the level of cholesterol significantly increased, as well as HDL,
Vitamin D significantly decreased. Serum levels of LDL and triglyceride also increased, but this increase was not statistically significant.

Recently, investigators focus on changes in lipid profile in patients with cholelithiasis after cholecystectomy. The importance of the aspect of cholelithiasis treatment is that it can be helpful to the decision-making through pharmacological interventions to normalize lipid profile and vitamin D after surgery to prevent further more complications due to lipid profile and vitamin D imbalance in the long term.

In an animal study by Javed et al., cholecystectomy results in a significant increase in plasma levels of TC, TG, VLDL, and LDL (5). Other studies on animal models showed that, during the formation of cholesterol gallbladder stone, the HDL-C receptors on hepatocytes were reduced that caused a significant decrease of HDL after cholecystectomy (8).

So far, various clinical studies have been conducted in this area, which in most cases only investigate the level of lipid profile in the early days after surgery. Moazen Bistgani et al., found that LDL, TG, total cholesterol and HDL serum levels significantly reduced three days after cholecystectomy (7). Malik et al. study, also showed the same results, and there were a significant decrease in total cholesterol, TG and LDL serum levels three days after cholecystectomy (9). However, Gills et al. showed that in third days after cholecystectomy, LDL serum levels increased significantly; While after one month, LDL levels start to decrease(10).

However, other studies have shown different results in the long-term follow up. In the study, Juvonen et al. showed that after one year, patients undergoing cholecystectomy experienced a significant increase in LDL serum level (11). Another study by Walmsley and colleagues also showed that although total cholesterol levels decreased six days after cholecystectomy, but significantly increased after six months (12).

The results of this study, consistent with the results of the two recent studies, showed that in the long term follow up after cholecystectomy, patients had a significant increase in the profile of the lipid profile. Reduce of Vitamin D serum level after six months was another finding in this study. Polat et al. showed that early cholecystectomy in women could be associated with a significant reduction in vitamin D and bone density in the long term (13). In other studies, this finding confirmed that cholecystectomy could be associated with chronic vitamin D deficiency (14). The results of this study, consistent with the results of previous studies, showed that cholecystectomy could be related to vitamin D deficiency in the long term.

In the discussion, although cholecystectomy in the short term can reduce the level of lipid profiles in patients and, in the long term, patients experience high serum level of serum lipids that may cause to risk of dyslipidemia related disease in the absence of appropriate post-surgical medical care strategies. Also, given the significant reduction in vitamin D levels in these patients, long-term use of proper diet or vitamin D supplements can be helpful to the prevention of vitamin D deficiency. It is suggested that multiple measurements of serum lipids level and vitamin D after surgery in a long time, as well as designing clinical trials, could help the physicians with better understand of the lipid profile and vitamin D changes pattern after cholecystectomy and their management.

Acknowledgement

The authors would like to thank the Clinical Research Development Unit (CRDU) of Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran, for their support, cooperation and assistance throughout the period of study.

Conflict of interest

Authors declare no conflict of interest.
References: