



Cross-sectional Study

Comparison of preoperative and one-month postoperative serum cholesterol after cholecystectomy[☆]

Ali Pooria^a, Afsoun Pourya^b, Alireza Gheini^{a,*}^a Department of Cardiology, School of Medicine, Lorestan University of Medical Sciences, Khorramabad, Iran^b Student of Research Committee, Tehran University of Medical Sciences, Tehran, Iran

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ABSTRACT

Objective: Cholecystectomy is a gold-standard procedure for symptomatic gallbladder stones. However, dyslipidemia is reported in about 50% of these patients. The aim of this study is to evaluate the change in the levels of total cholesterol following cholecystectomy.

Methods: In this cross-sectional study, patients who underwent cholecystectomy for gallstone in (XXX) Nursing Home were included. Preoperative cholesterol levels and those following a month of the surgery were measured in the patients. A form, comprising of the demographic details, along with clinical outcomes was prepared for each patient and the data were analyzed using SPSS v25.0 software.

Results: 33 patients were included in this study, of which 29 were females and 4 were males. 48.5% of our patient's population were aged above 50 years. The mean of preoperative cholesterol levels was 203.78 mg/dL. One month after the surgery, the mean cholesterol level was found to be 197.03 mg/dL. Overall, there was no statistical difference between the preoperative and one-month postoperative cholesterol level.

Conclusion: Our patients did not present hypercholesterolemia with gallstone disease. Furthermore, one month after the surgical intervention (Cholecystectomy), we did not find any significant changes in the cholesterol levels. Detailed investigation of complete lipid profile with long-term follow up in a larger population is thereby required.

1. Introduction

Gallstone disease is one of the frequent gastrointestinal diseases that can be characterized by asymptomatic gall stones to acute cholecystitis [1,2]. About 10–15% of the adult population is known to present gall stones with obesity, advanced age, metabolic syndrome, liver disease and female gender as the common risk factors. Owing to one of the common causes of hospitalization, surgical interventions are required for symptomatic gallbladder stones, for which, laparoscopic cholecystectomy had gained popularity within a past few years [3,4]. Gallstones are known to be involved with hyperlipidemia [5–7]. The removal of the gallbladder is thereby, known to affect the production of bile acids and lipid metabolism [8]. Absorption of cholesterol is chiefly facilitated by the action of bile salts and phospholipids. Excess of cholesterol or insufficiency of bile salts or phospholipids can lead to the nucleation of cholesterol crystals, which can cause gall stones [9,10]. To it, secretion of cholesterol-rich bile acids, levels of bile acids and phospholipids that

mediate cholesterol accumulation and reabsorption of deoxycholic in large intestine are some of the known causes of gallstones [11]. Dyslipidemia is also reported to be a risk factor of gall stones [4,12,13] and is presented in more than 50% of the patients with gallstones [14,15]. The aim of this study is to evaluate the levels of total cholesterol in gallstone patients before cholecystectomy and a month following the surgery. We hypothesize that removal of bile stones is likely to be associated with the correction of dyslipidemia, in terms of cholesterol level.

2. Method

This is a cross-sectional study, which included all patients who underwent cholecystectomy at (XXX) Nursing Home. After the approval of the plan and coordination with the relevant laboratory, blood samples from these patients were sent for lab testing. A registration form containing age and sex was completed by the project partner. One month following the surgery, blood samples were from these patients were

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* Corresponding author. Lorestan University of Medical Sciences, Khorramabad, Iran.

E-mail address: gheini.alireza.md@gmail.com (A. Gheini).

again sent to the same laboratory for measuring cholesterol levels, also which was performed by one technician (under standard conditions). Patients were nothing by mouth (NPO) for at least 8 h prior to the sampling, therefore the patient's diet had no effect on cholesterol levels. Preoperative sampling was achieved 6 h prior to the surgery and post-operative sampling was done between 26 and 46 days. All the blood samples were analyzed in the same laboratory at the same hospital. A history of taking the anti-hyperlipidemic drugs and hyperlipidemia was also taken. The gallbladder removal indication questionnaire included the following items.

- 1 Patients with symptomatic gallstones
- 2 Aged diabetic patients with symptomatic gallbladder disease were not given any specific diet and were advised to continue their diet at least one month after the cholecystectomy procedure

We used simple sampling method, and the sample size was 33 patients, due to the unavailability of standard deviation, a pilot study on 33 patients and its results will be used to calculate the exact sample size for a larger study.

$$N = 2(Z_1 - \alpha/2 + Z_1 - \beta)^2 \sigma^2 / d^2$$

After collecting the data, questionnaires and laboratory data were analyzed using SPSS v25.0 (IBM, IL, Chicago, USA) software, where, mean, standard deviation and frequency were used to describe the data. Paired *t*-test was used to compare serum cholesterol levels at two different period and fisher exact test was used to compare normal or abnormal cholesterol levels. One of the limitations of this study was the failure was to obtain blood samples from the patients a month after the procedure, mostly, due to the changes in the contact information. Given the number of cholecystectomy cases and the cost of double testing (before and one month after surgery), blood cholesterol testing is not expensive, can be easily implemented and have high applicability. Patients were risk-free, detailed explanation of the procedure was provided to them and 10 CC of the blood was obtained for the overall procedure. Consent was obtained from every patient for two-staged blood sampling. This study was approved by the Research Ethics Board of (XXX).

Unique identifying number is: researchregistry7428.

The methods are stated according to STROCSS 2021 guidelines [16].

3. Results

In this study, serum cholesterol levels were measured before and one month after cholecystectomy in patients referred to Shohada Ashayer Hospital. A total of 33 patients were studied, of whom 29 were female and 4 were male (87.9% and 12.1%, respectively). In terms of age distribution, there were 8 patients were aged under 40 years, 9 were aged 40–50 years and 16 were over 50 years, which included 24.2%, 27.3% and 48.5% of the patients' population, respectively. In terms of age distribution, the majority of the subjects were over 40 years of age with the mean age of 51 ± 17.13 years. Preoperative serum cholesterol levels were $203.78 \text{ mg/dl} \pm 48.86 \text{ mg/dl}$. Preoperative serum cholesterol levels in 3 patients (9.1%) were below 150 mg/dl, 18 patients (54.5%) had normal cholesterol range (150–220 mg/dl) and 12 patients (36.4%) were above the normal mg/dL (Table 1). Following cholecystectomy, the mean serum cholesterol level was $197.03 \text{ mg/dL} \pm 48.6 \text{ mg/dL}$. After cholecystectomy, serum cholesterol levels were lower than 150 in 4

Table 1
Frequency distribution of plasma cholesterol after cholecystectomy.

Cholesterol	Frequency	Percentage
150 \geq	4	12.1
150–220	20	60.6
220 $<$	9	27.3
Total	33	100

patients, within the normal range (220–250) in 20 patients and higher than 220 mg/dL in 9 patients, which was 12.1%, 60.6% and 27.3%, respectively. At this stage, greater frequency of the patients was found to fall within the normal range. A paired *t*-test was used to compare serum cholesterol level in two stages. These tests showed overall no significant difference in serum cholesterol levels before the surgery and one month after surgery ($p \geq 0.05$). Paired *t*-test showed that there was no significant difference in serum cholesterol levels before and after surgery between males and females ($p \geq 0.05$). Similarly, there was no statistically significant difference in serum cholesterol levels before and a month after the surgery ($p \geq 0.05$) (Fig. 1).

4. Discussion

Our study also shows that most of our patients who underwent cholecystectomy for cholelithiasis were above 50 years of age and belonged to female gender group. Our results showed that there was no significant difference in serum cholesterol levels before and after cholecystectomy. There was no significant difference in pre and post cholesterol levels between sex and age groups. To it, preoperative cholesterol levels in these patients were 193.17 mg/dL. Whereas, a month succeeding the surgery, levels were dropped to the mean of 166 mg/dL. No such difference was found in our study.

Kanakala, Borowski [17] reported that the number of females who underwent cholecystectomy was 2.8 times more than men. However, compared to our study, the sample size of the study was larger ($n = 2117$ patients). Moreover, a meta-analysis has shown that increased BMI, female sex, increased age, and increased cholesterol levels are associated with an increased risk of gallstones [18]. Gill and Gupta [19] in their study showed that of 60 patients who underwent cholecystectomy for gallstones, 52 of them were female, and great percentage of their patients were aged from 40 to 60 years. To the date, female gender is a proven risk factor of gallstones from the number of studies. Increased alcohol consumption and cessation of hormone therapy are negatively related to the development of gallstones in females [20]. In a study conducted in Shahr e Kord city of Iran by Moazeni bistgani, Kheiri [8], it has been reported that three days following cholecystectomy, serum total cholesterol levels, along with low and high-density lipoproteins and triglycerides were reduced in the patients. However, a month and a year after the surgery, no changes were reported in these parameters. The mean age of the patients in the study was 49.7 years. Thereby, conclusions from this study are very well aligned with those of ours. Nonetheless, in a recent study by Gill and Gupta [19], cholecystectomy in patients with cholelithiasis presenting hyperlipidemia was associated with reduced cholesterol and triglyceride levels, one month following the surgical procedure. Furthermore, Singh [21] also reported that, one year after the surgery, a significant decrease in the levels of cholesterol, triglycerides and low-density lipoproteins were seen in the patients.

The limitations of our study include small sample size, absence of long-term follow-up record and this study doesn't provide data regarding the entire lipid profile.

5. Conclusion

Our findings show that the overall mean cholesterol level did not differ significantly, before and after the surgery and gender-wise. Dyslipidemia is prevalent with cholelithiasis, however, following the surgery, its correction may be significantly. We therefore recommend further studies with greater sample size, long term follow-up and measurement of postoperative cholesterol and lipid levels at more frequent time intervals.

Provenance and peer review

Not commissioned, externally peer-reviewed.

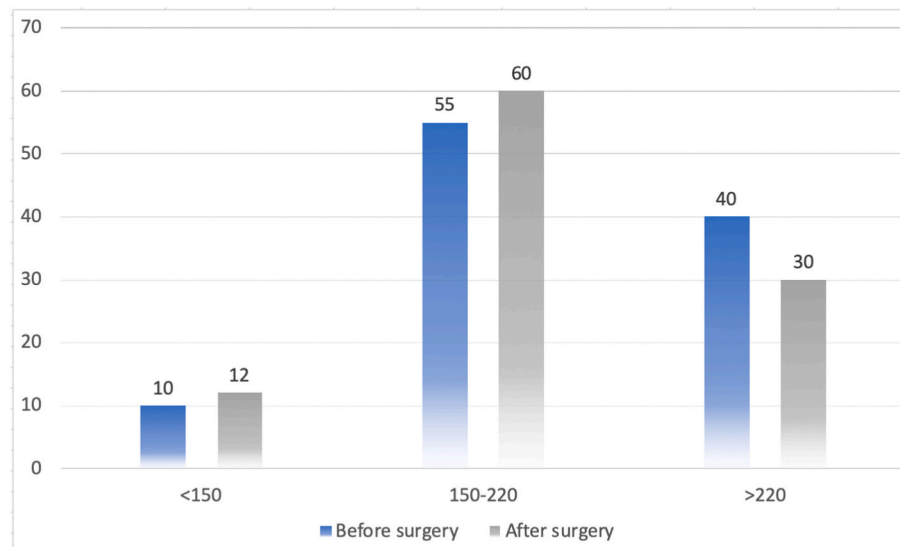


Fig. 1. Comparison of serum cholesterol levels before and after cholecystectomy.

Ethical approval and consent to participate

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Contributors' statement

Dr. Ali Pooria: conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript. Dr. Alireza Gheini: Designed the data collection instruments, collected data, carried out the initial analyses, and reviewed and revised the manuscript. Dr. Afsoun Pourya: Coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content.

Consent to participate

From the under 16 years old was given by a parent or legal guardian.

Consent for publication

Not applicable.

Availability of data and material

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Consent

Not applicable.

Guarantor

Ali Pooria.

Declaration of competing interest

The authors deny any conflict of interest in any terms or by any means during the study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2022.104016>.

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