ISSN(online): 2589-8698
ISSN(print): 2589-868X

International Journal of Medical and Biomedical Studies

Available Online at www.ijmbs.info

Volume 1, Issue 4; July-August: 2017; Page No. 08-15

ANALYSIS OF LIVER FUNCTION TEST RESULTS IN PATIENTS UNDERWENT CHOLECYSTECTOMY

Dr. Ram Milan Prajapati

Associate Professor, Dept. of Surgery, M.S.Ramaiah Medical College, MSR Nagar, Banglore.

ABSTRACT:

Introduction: Open cholecystectomy can treat gallstones faster and with fewer complications. Studies suggest fewer post-surgery complications than open cholecystectomy. Some say surgery affects liver enzyme levels temporarily. Potential biliary injuries must be identified and treated quickly. Due to advances, outpatient open cholecystectomy generally raises liver function tests. Impaired testing does not always indicate open surgery. Research examines whether liver function should be measured before and after open cholecystectomy.

Aims and Objective: To assess alterations in liver function following cholecystectomy by analyzing the results of liver function tests in patients.

Methods: A one-year prospective cross-sectional study on open cholecystectomy patients measured ALT/SGPT (<40 UL-1), serum bilirubin (<1 mg/dL), and serum ALP (60-170 UL-1) before and after operation Pre-operative measurements were taken once, and post-operative measures were on Day 1 and Day 3 (if LFT rose). CO2 insufflation, pneumoperitoneum duration, intra-abdominal pressure, and anaesthesia were recorded. The investigation sought substantial liver enzyme alterations and age-LFT correlations.

Results: The majority (25.00%) of the 120 patients undergoing open cholecystectomy were male and in the 31-40 age bracket. Results from liver function tests showed that people between the ages of 51 and 70 had significantly higher levels of bilirubin and transaminase compared to younger age groups. The needs to take into account both age and specific liver indicators for a thorough evaluation of health is highlighted by the fact that there are age-specific patterns of liver function abnormalities.

Conclusion: The study concluded that the levels of bilirubin, SGOT, SGPT, ALP, and SGOT elevated considerably post open cholecystectomy.

Keywords: Opencholecystectomy, anaesthesia, liver function, gallstones.

INTRODUCTION:

The most frequent therapy for gallstones, a common gastrointestinal ailment, has been cholecystectomy since 1882. Currently, nevertheless, the previously described traditional procedure has been superseded by open cholecystectomy (LC). The key benefits of this technique include quicker recovery times for patients, fewer problems, shorter hospital stays, and smaller surgical incisions [1]. Studies show that the incidence of problems following laparotomic cholecystectomy ranges from 5 to 17%, but that with the laparoscopic method, the incidence drops to 2-10%. Open cholecystectomy is currently recognized as the gold standard therapy for symptomatic gallstones because to the aforementioned benefits. Any changes is the liver enzyme levels after abdominal surgery, particularly a cholecystectomy, may cause problems thereafter [2]. Numerous research findings have been provided thus far, some of which appear to contradict one another. While some research indicates that open cholecystectomy has no effect on tests for liver function, other studies suggest that there may be brief changes that occur even 72 hours after the treatment [3]. It has been suggested that anesthetic drugs and decreased blood flow from the operation may be factors in the alteration in these acids and bilirubin, even if the precise process is yet unknown. An infusion of carbon dioxide (CO2) or its absorption may cause a rise in intra-abdominal pressure if there is impaired blood flow because of cardiovascular problems. The aforementioned ailment and the reverse Trendelenburg posture may be potential causes [4].

Ever since the laparoscopic cholecystectomy was first introduced in 1987, there has been an increase in understanding of the possible risks and challenges related to the treatment. The key to this procedure's success is the modernization of technical abilities to overcome obstacles and the early diagnosis and prompt management of problems [5]. While laparoscopic cholecystectomy has essentially occurs more than open cholecystectomy, the latter surgery has a greater risk of iatrogenic duct damage. The incidence and kind of biliary injuries resulting from open cholecystectomy differ, and prompt identification and treatment are essential for the patient's overall health [6]. Biochemical examination of liver enzymes constitutes one of the standard clinical procedures for assessing biliary damage, along with other methods. It has been discovered that LFTs have a sensitivity of more than 90% in identifying bile flow blockages [7]. The doctor is always concerned about any increase in these levels and believes that more research is necessary to identify the underlying disease. Hepatocellular function is commonly measured by AST and ALT. When a biliary duct system is obstructed, the levels of ALP rise; hemolysis or restriction of the bile flow can cause bilirubin levels to rise. Serum transaminase values that are extremely high may also indicate the presence of typical bile duct (CBD) stone [8].

Recent developments in minimum access surgery have ushered in a time when open cholecystectomy is performed as an outpatient treatment. Very soon after surgery, elevated LFTs are typical. Usually, the elevation is temporary, and without any help, the LFTs revert to their regular levels [9]. Impaired liver function tests (LFTs) were not linked to a higher likelihood of conversion, despite being considered as one of the potential prognostic markers for the conversion during open surgery to an open cholecystectomy.The present research sought to ascertain if regular liver function measurement was required before to and following open cholecystectomy [10].

Method

Research design

A prospective, cross-sectional study was carried out for one year period on patients receiving open cholecystectomy in our hospital. The following laboratory tests were conducted before and after the operation: UL-1 (normal range <40 UL-1) for ALT/SGPT, <1 mg/dL for serum bilirubin, and a range of 60–170 UL-1 for serum ALP. The pre-operative measurement was taken once, while the post-operative measurements were taken on Day 1 and Day 3 (only for patients with increased LFT on POD1). The duration of the pneumoperitoneum, intra-abdominal pressure (IAP) used, and the period of CO_2 insufflation were documented for each procedure. Prior to the surgery, all patients underwent catheterization, and the specific anaesthesia procedure was documented. All participants had the same anaesthesia regimen and received a standardised set of analgesic drugs before and after the surgery. A descriptive analysis was conducted to provide a detailed description of the research group. This study was conducted with the purpose of determining whether or not there was a significant change in the liver enzyme parameter values before and after the operation. The relationship between the pre-operative and post-operative LFT levels and age was also investigated. This study was conducted with the purpose of determining whether or not there was a significant change in the liver enzyme parameter values before and after the operation. The relationship between the pre-operative and post-operative LFT levels and age was also investigated.

Inclusion and Exclusion

Inclusion

- Patients had ALT/SGPT, AST/SGOT, serum bilirubin, and serum ALP tested pre-op.
- Pre-surgery catheterization patients.
- Patients who got the study's anaesthesia protocol.
- Patients who received pre- and post-operative analgesics.

Exclusion

- Patients having incomplete liver function tests, surgery, or other data.
- Patients who violated anaesthesia and analgesic protocols.
- Patients who had surgeries other than the study's.
- Patients with liver problems that potentially compromise liver function before surgery.

Statistical analysis

Pre- and post-operative liver enzyme values, pneumoperitoneum duration, intra-abdominal pressure, and CO2 insufflation time were described using descriptive statistics. Paired t-tests were used to detect pre- and post-operative liver enzyme changes. Age-liver function correlations were examined. Statistical significance was set at $p < 0.05$. The anaesthesia and analgesia procedures were consistent. This brief investigation examined surgical effects on liver function to reveal correlations and improve perioperative dynamics.

Result

Table 1 presents the distribution of age and gender within a sample population consisting of 120 individuals. The largest segment of the population belongs to the age group of 31-40, accounting for 25.00% of the total. Among this group, there is a higher percentage of males (30.30%) compared to females (24.09%). The age range of 20-30 comprises 17.50% of the total population, with a somewhat greater proportion of males (21.21%) compared to females (16.86%). The age groups of 41-50 and 61-70 account for 19.16% and 12.50% of the population, respectively, exhibiting significant gender disparities. Overall, the data offers valuable information about the demographic makeup, emphasising age-specific and gender-specific trends within the sample.

Table 1: Age and gender distribution

Age groups (years)	Total, n (%)	Male, n (%)	Female, n (%)
20-30	21 (17.50%)	7 (21.21%)	14 (16.86%)
31-40	30 (25.00%)	10 (30.30%)	20 (24.09%)
41-50	23 (19.16%)	3 (9.09%)	20 (24.09%)
51-60	15 (12.50%)	5 15.15%)	10 (12.04%)
61-70	15 (12.50%)	5 (15.15%)	10 (12.04%)
71-80	12 (10.00%)	3 (9.09%)	9 (10.84%)
Total	120 (100.00%)	33 (100.00%)	83 (100.00%)

Table 2 displays the correlation between levels of liver function tests on the first day and different age groups. The data presents the average levels of numerous liver enzymes across several age groups. It is worth mentioning that those between the ages of 51 and 60, as well as those between 61 and 70, have elevated levels of total bilirubin and SGOT, which may suggest the presence of liver disease. Elevated levels of direct bilirubin are observed in individuals aged 31-40 and 51-60. The table additionally presents the count of individuals with abnormal levels for each liver enzyme within each age category. This data indicates that liver function can vary with age, and particular age groups have a higher occurrence of aberrant results in specific liver enzymes.

Table 2: Relationship between liver function test levels and age groups

Liver enzymes on day 1	Age groups (years)					
	20-30	31-40	41-50	51-60	61-70	71-80
Total bilirubin	0.930±0.04	1.060±0.19	0.920±0.09	1.311±0.70	1.08±0.30	0.73±0.19
Direct bilirubin	0.249±0.09	0.36.1±0.14	0.279±0.09	0.270±0.20	0.29±0.20	0.99±0.1
SGOT	31.9±12.9	40.39±10.7	35.69±10.9	72.9±23.2	97.2±15.2	92.8±6.9
SGPT	27.4±2.0	33.60±11.3	30.1±10.1	50.5±30.2	69.6±17.3	69.6±3.6
ALP	100±23.9	108.8±29.7	130.1±25.2	102.5±24.7	119.7±38	90.1±39.5
LFT levels and age group on number of people with deranged values						
Liver enzymes on day 1	**Age groups (years)**					
	20-30	31-40	41-50	51-60	61-70	71-80
Total bilirubin	0	1	0	4	5	0
Direct bilirubin	2	6	2	6	5	0
SGOT	2	7	6	5	10	3
SGPT	0	2	2	2	0	0
ALP	0	0	0	0	2	0

Figure 1 depicts the correlation between serum glutamic-pyruvic transaminase (SGOT) and glutamic-oxaloacetic transaminase (SGPT) levels in relation to age. The data indicates a gradual rise in the levels of both enzymes as individuals. The levels of SGOT increase from 32.2 in individuals aged 20-30 to 96.2 in those aged 61-70, reaching a peak of 93 in the 71-80 age range. Likewise, the levels of SGPT exhibit a parallel pattern, rising from 26.5 in the age group of 20-30 to 74.5 in the age group of 71-80. These findings indicate that liver function may be affected by age, as evidenced by elevated transaminase levels in older individuals. Therefore, it is necessary to conduct additional research on liver health in the elderly.

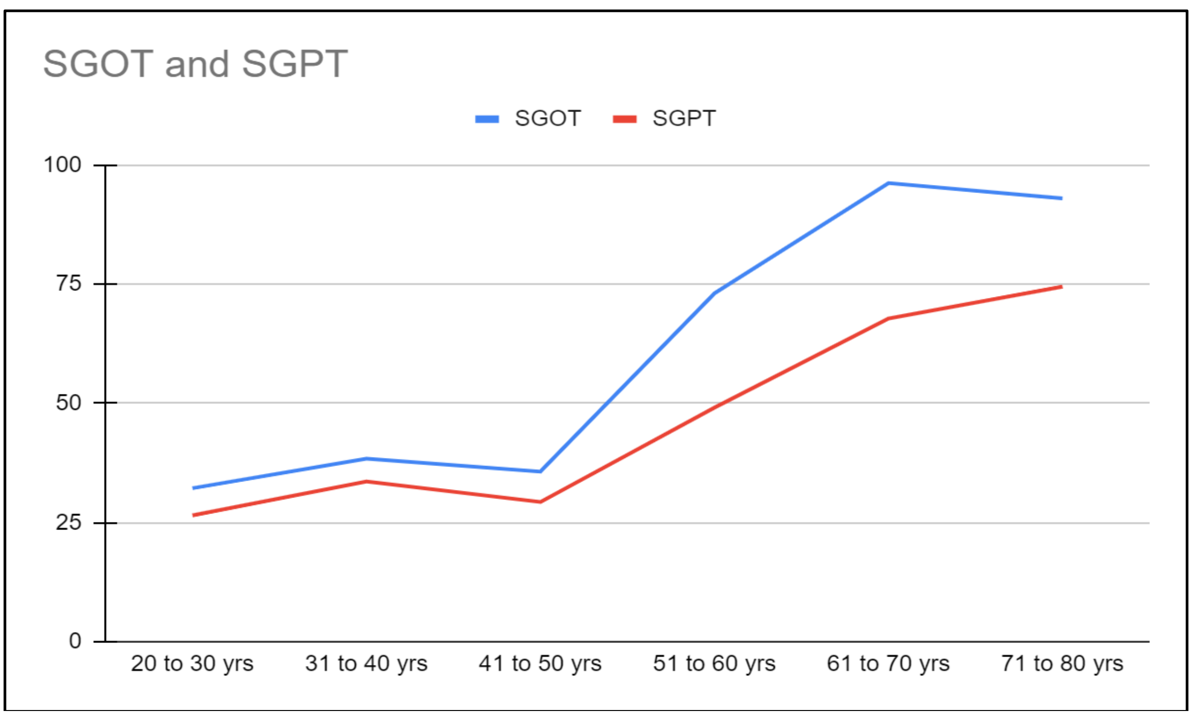

Figure 1: Age-related connection between serum glutamic-pyruvic and glutamic-oxaloacetic transaminases

Figure 2 shows the correlation between age, abnormal liver function test results, and the frequency of individuals with these findings. Abnormal readings are more common in the 31 to 40 and 51 to 60 age groups for both total and direct bilirubin levels, respectively. In the 51 to 60 age bracket, there is an uptick in anomalies for SGOT and SGPT, which could indicate liver impairment. It is only in the age bracket of 61 to 70 when ALP levels become abnormal. In order to properly evaluate and track liver health across various age groups, it is crucial to take into account both age and particular liver indicators, as shown in this figure, which reveals age-specific patterns of liver function problems.

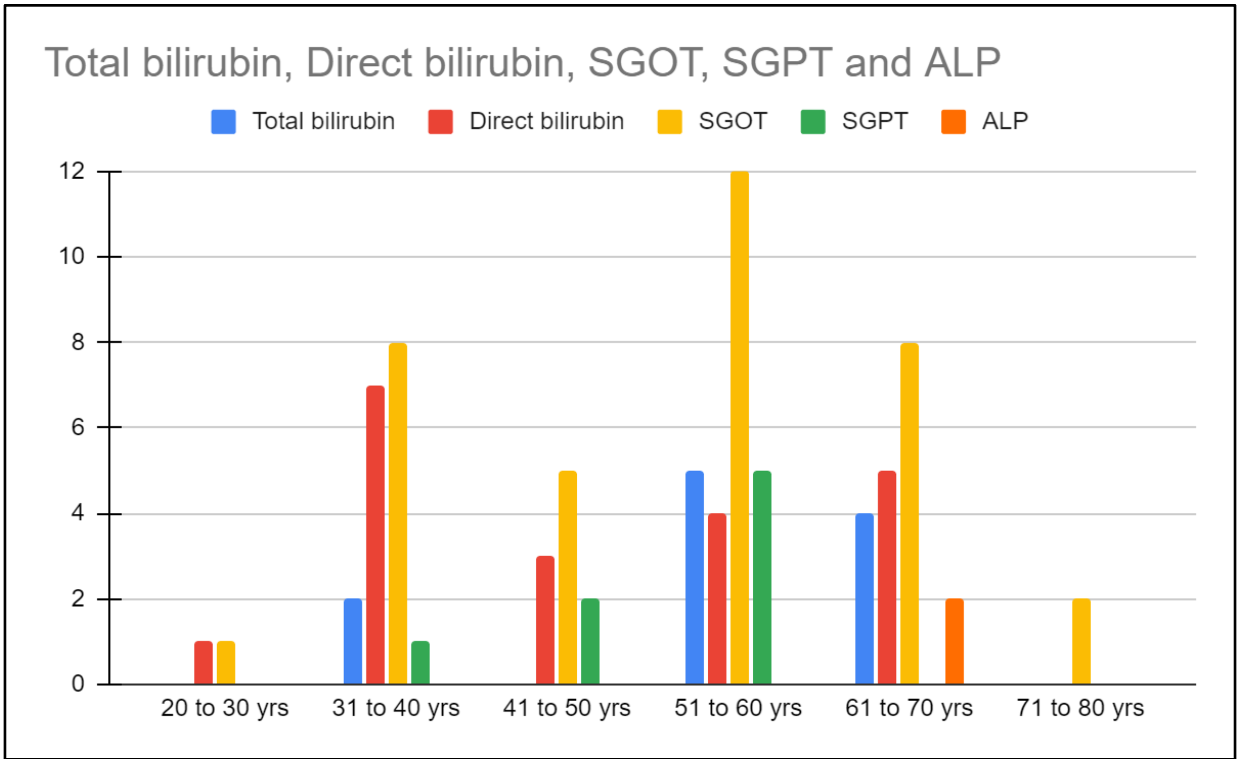

Figure 2: Relationship between liver function test results, age, and the frequency of patients with abnormal results

Discussion

Liver function tests, or LFTs, are frequently ordered by many surgeons following all open cholecystectomies. Some contend that LFTs prolong hospital stays for patients and add unnecessary costs and time to their care. Finding out if regular postoperative LFTs can predict problems was the aim of this investigation [11]. The investigation comprised 109 individuals who underwent open cholecystectomy in a sequential manner. There were nine postoperative problems in total: one cystic duct stump leaks and eight common bile tract stones that remained in place after surgery. Postoperative retrograde endoscopy was used to identify all of them. Out of the nine individuals, only four had elevated bilirubin levels [12]. Hyperbilirubinemia following cholecystectomy affected 39 patients in all, three of them experienced problems (retained stones while one experienced a bile leak). There was no difference in aspartate aminotransferase and total bilirubin levels across postoperative periods for the whole study cohort [13]. Pre- and postoperative levels of alkaline phosphatase and alanine aminotransferase differed statistically significantly. After open cholecystectomy, postoperative increases in liver function tests are commonly observed. Postoperative problems are not predicted by these increases. LFTs ought to only be acquired when they are clinically necessary [14].

During a open cholecystectomy (LC), carbon dioxide insufflations must be used to create a pneumoperitoneum. This raises the intraperitoneal pressure and partial pressure of CO_2, altering hemodynamic measures and pulmonary function.

Due to reduced flow, hypercarbia causes visceral organ ischemia, which includes liver and venous stasis/thromboembolism, or both [15]. The goal of the current study is to determine if tests for liver function (LFTs) alter following laparoscopic or open cholecystectomy (OC), how frequently these changes occur, how they relate to age, sex, and the length of the procedure, and what the clinical implications of these abnormalities are. To assess the relationship between patients who received LC and those who underwent OC in terms on bilirubin, the enzyme alanine transaminase (ALT), the enzyme aspartate transaminase (AST), and alkaline phosphatase (ALP) levels in their serum [16]. Serum bilirubin, AST, and ALT temporarily rise following LC or OC. The changes in the liver enzymes can be ascribed to many causes such as diathermy, CO2 pneumoperitoneum, surgical maneuvers, patient positioning, and vascular damage [17]. The biliary tree's integrity may nevertheless bother the surgeon despite these abnormalities returning to normal 3–4 days after the treatment and having no clinical repercussions in individuals with normal liver function [18].

Up to 80% of 67 patients having open cholecystectomy (LC) had "unexplained" alterations in their postpartum liver function tests (LFTs), according to a prior study. There was no recorded cause for these rises. Our goal was to evaluate the frequency, etiology, and clinical relevance of "unexplained" changes in liver enzyme levels after LC [19]. 34% of patients experience "unexplained" disruptions in ALT after LC, which seem to be clinically insignificant. The sole factor not present in the OC group is pneumoperitoneum-related intra-abdominal hypertension, which is proposed to be the cause of this phenomena [20].

The aim in the research was to examine the effects of open surgery upon the function of the liver in people, as well as potential processes behind this effect. Hepatic transaminases temporarily increased following open surgery [21]. The CO2 pneumoperitoneum seems to be the primary causal cause. The temporary rise of blood liver enzymes in the majority of open surgery patients did not appear to have any clinical significance. However, open surgery might not be the ideal option for treating patients with specific abdominal disorders if the patient's liver function was extremely low before to the procedure [22].

The purpose of the study was to compare the changes in liver function tests between patients who underwent an open procedure (OC) and those who underwent open cholecystectomy (LC). The study also examined the effects of pneumoperitoneum in liver function tests, including serum aminotransferase aspartate (AST), the aminotransferase alanine (ALT), the gamma glutamyl-transferase (GGT), milk protein dehydrogenase (LDH), and alkaline phosphatase (ALP) [23]. Changes in hepatic blood flow following open cholecystectomy could be related to the impact of intraoperative pneumoperitoneum. if this does not appear to be clinically significant, caution should be used before undertaking Open cholecystectomy for individuals with hepatic insufficiency, even if the majority of these abnormalities recover to normal limits within three weeks following surgery [24].

Conclusion

The study concluded that the levels of bilirubin, SGOT, SGPT, ALP, and SGOT elevated considerably post open cholecystectomy. It was found that the majority of the patients were female. Levels of bilirubin, SGOT, SGPT, ALP, and SGOT were almost normal on the day before the operation. All of the LFT levels had risen considerably by the following day. Because pneumoperitoneum lasted longer on day 1, SGOT and SGPT levels were positively correlated. Levels of SGOT and SGPT tend to rise with increasing age. Total bilirubin levels also rose with getting older, albeit this time the increase was not statistically noteworthy. There was no significant change in direct bilirubin and ALP levels with age.The reasons for age-specific liver enzyme level alterations are still unknown despite extensive research into liver function changes after open cholecystectomy. Bilirubin and transaminase levels differ between age groups, however the study does not investigate why. Additionally, outpatient open cholecystectomy's effect on liver function tests needs further study. More research is needed on the molecular and physiological factors that affect post-cholecystectomy liver function with age. Long-term effects of outpatient operations and pre-and post-operative liver function screening regimens could improve patient care. Investigators could also examine patient characteristics and liver enzyme changes after surgery.

References

1. Hasukic S, Kosuta D, Muminhodzic K. Comparison of postoperative hepatic function between open and open cholecystectomy. *Medical Principles and Practice.* 2005;14(3):147–150.
2. Kotake Y, Takeda J, Matsumoto M, Tagawa M, Kikuchi H. Subclinical hepatic dysfunction in open cholecystectomy and open colectomy. *British journal of anaesthesia.* 2001;87(5):774–777.
3. Bostanci EB, Yol S, Teke Z, Kayaalp C, Sakaogullari Z, Turkcu UO, et al. Effects of carbon dioxide pneumoperitoneum on hepatic function in obstructive jaundice: an experimental study in a rat model. *Langenbeck's archives of surgery.* 2010;395(6):667–676.
4. Giraudo G, Contul RB, Caccetta M, Morino M. Gasless laparoscopy could avoid alterations in hepatic function. *Surgical endoscopy.* 2001;15(7):741–746.
5. Meierhenrich R, Gauss A, Vandenesch P, Georgieff M, Poch B, Schutz W. The effects of intraabdominally insufflated carbon dioxide on hepatic blood flow during open surgery assessed by transesophageal echocardiography. *Anesthesia & Analgesia.* 2005;100(2):340–347.
6. Mujicić E, Durić A, Radovanovioć J. Influence of CO2 pneumoperitoneum on liver function. *Med Arch.* 2006;60(2):87–89.
7. Richardson MC, Bell G, Fullarton GM. Incidence and nature of bile duct injuries following open cholecystectomy: an audit of 5913 cases. West of Scotland Open Cholecystectomy Audit Group. *Br J Surg.* 1996;83(10):1356–1360
8. Khan MH, Howard TJ, Fogel EL, et al. Frequency of biliary complications after open cholecystectomy detected by ERCP: experience at a large tertiary referral center. *GastrointestEndosc.* 2007;65(2):247–252
9. Tham TC, Collins JS, Watson RG, et al. Diagnosis of common bile duct stones by intravenous cholangiography: prediction by ultrasound and liver function tests compared with endoscopic retrograde cholangiography. *GastrointestEndosc.* 1996;44(2):158–163
10. Nathwani RA, Kumar SR, Reynolds BT, et al. Marked elevation in serum transaminases: An atypical presentation of choledocholithiasis. *Am J Gastroenterol.* 2005;100(2):295–298
11. Morino M, Giraudo G, Festa V. Alterations in hepatic function during open surgery. An experimental clinical study. *SurgEndosc.* 1998;12(7):968–972
12. Kaldor A, Akopian G, Recabaren J, Alexander M. Utility of liver function tests after open cholecystectomy. Am Surg. 2006 Dec;72(12):1238-40. PMID: 17216828.
13. Gurusamy KS, Samraj K, Davidson BR. Low pressure versus standard pressure pneumoperitoneum in open cholecystectomy. Cochrane Database Syst Rev 2009;CD006930.
14. Gupta R, Kaman L, Dahiya D, et al. Effects of varying intraperitoneal pressure on liver function tests during open cholecystectomy. J LaparoendoscAdvSurg Tech A 2013;23:339-42.
15. Avraamidou A, Marinis A, Asonitis S, et al. The impact of ischemic preconditioning on hemodynamic, biochemical and inflammatory alterations induced by intra-abdominal hypertension: an experimental study in a porcine model. Langenbecks Arch Surg2012;397:1333-41.
16. Al-Luwaizia KR, Hamad SO. Changes of liver enzymes and serum bilirubin after open cholecystectomy. Ann Coll Med Mosul 2013;39:113-17.
17. Koirala R, Shakya VC, Khania S, et al. Rise in liver enzymes after laproscopic cholecystectomy: a transient phenomenon. Nepal Med Coll J 2012;14:223-6. [PubMed]
18. Saber AA, Laraja RD, Nalbandian HI, et al. Changes in liver function tests after open cholecystectomy: not so rare, not always ominous. Am Surg2000;66:699-702.
19. Hagras MA. Alterations in liver function tests following open. Pak J Surg2013;29:245-47.
20. Andrei VE, Schein M, Margolis M, Rucinski JC, Wise L. Liver enzymes are commonly elevated following open cholecystectomy: is

elevated intra-abdominal pressure the cause? Dig Surg. 1998;15(3):256-9. doi: 10.1159/000018624. PMID: 9845595.
21. Tan M, Xu FF, Peng JS, Li DM, Chen LH, Lv BJ, Zhao ZX, Huang C, Zheng CX. Changes in the level of serum liver enzymes after open surgery. World J Gastroenterol. 2003 Feb;9(2):364-7. doi: 10.3748/wjg.v9.i2.364. PMID: 12532468; PMCID: PMC4611348.
22. Slater K, Strong RW, Wall DR, et al. Iatrogenic bile duct injury: The scourge of open cholecystectomy. Aust N Z J Surg. 2002; 72 (2): 83-88.
23. Williams MD, Murr PC. Open insufflation of the abdomen depresses cardiopulmonary function. SurgEndosc. 1993; 7(1): 12-16.
24. Marathe US, Lilly RE, Silvestry SC, et al. Alterations in hemodynamics and left ventricular contractility during carbon dioxide pneumoperitoneum. SurgEndosc. 1996; 10 (10): 974-978.