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A Study of Liver Enzymes Analysis Following Laparoscopic Cholecystectomy in A Tertiary Care Hospital

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ABSTRACT

Laparoscopic cholecystectomy requires the creation of a pneumoperitoneum via insufflations of carbon dioxide, which may result in adverse haemodynamic disturbances leading to visceral organ ischaemia including hepatic dysfunction. There have been few studies in tertiary care hospital to evaluate the potential harmful effects of laparoscopic surgery on hepatic function. This study was intended to assess the alteration and clinical significance of unexplained disturbances in liver enzymes following laparoscopic cholecystectomy. And to correlate the duration of laparoscopic surgery and the causes and clinical significance of unexplained disturbances in liver enzymes. To study the liver enzymes and its variation post laparoscopic cholecystectomy in tertiary care hospital. This is a prospective observational study was conducted in teriary care hospital, comprised of 30 patients, of symptomatic cholelithiasis and in all patient laparoscopic cholecystectomy was done between 1st May 2021 to 1st May 2022. In all the patients, liver function tests were done pre-operatively and post operatively (within 24 hrs). The obtained data was analysed for effect of laparoscopy cholecystectomy on liver function test of the patients. Twenty-four hours after the procedure the mean liver enzymes were raised, there was statistically significant elevation of AST (70.46, $p<0.001$) and ALT (79.00, $p<0.001$) . But the raise was transient and fell off to normal or near normal levels in 7-10 days postoperatively. In conclusion, transient mild abnormality in liver function tests is a usual finding after laparoscopic cholecystectomy without clinical significance. It is mainly attributed to the high intraabdominal pressure of carbon dioxide pneumoperitoneum, which may compromise the hepatic blood flow causing alterations in the microcirculation but a proper reason has still not been established. Hence it is always better to have a close monitoring of the liver enzymes during the procedure laparoscopic cholecystectomy.

INTRODUCTION

The credit of performing first ever cholecystectomy goes to Carl Langenbach 1882. However, Muhe presented the first report of laparoscopic cholecystectomy at Germany in 1986. Reddick and Olsen described the technique of laparoscopic cholecystectomy (LC) which is commonly practiced today[1].

However, for laparoscopy, pneumoperitoneum is required to create workspace between the abdominal wall and intra-abdominal organs. It is created by insufflating carbon dioxide gas into the peritoneal cavity and then holding it at constant pressure till the end of surgery when it is released at the time of withdrawal of the ports[2]. Carbon dioxide after absorption is readily excreted via lung. Usually 12 mmHg is sufficient to give a working space in a fully relaxed patient but when higher pressures are used, they are associated with various adverse complications. The increased intra-abdominal pressure have been associated with impaired functioning of the pulmonary, cardiovascular and intra-abdominal organs, especially the renal and hepatic functions[3]. Furthermore, an elevation of serum liver enzymes after uncomplicated laparoscopic cholecystectomy has been reported[4-8] and that seems to be attributed to splanchnic ischemia[9]. Due to all these observations, gasless laparoscopy has been proposed by some surgeons[10]. This study was planned explore further the incidence and clinical significance of serum liver test changes after uneventful laparoscopic cholecystectomy.

MATERIAL AND METHODS

The study was conducted in Tertiary care hospital, comprised of 30 patients, of symptomatic cholelithiasis and in all patient laparoscopic cholecystectomy (LC) was done between 1st May 2021 to 5th May 2022. In all the patients, liver function tests were done pre-operatively and post operatively (within 24 hrs). The obtained data was analysed for effect of laparoscopy cholecystectomy on liver function test Patients with concomitant bile duct stones, high levels of liver enzymes before operation, in whom complications such as bile duct injury or bleeding from the liver bed were observed, were excluded from the study. Patients with co-morbidities such as diabetes mellitus and positive serology for hepatitis B or C viruses were also excluded.

In all patients, a standard laparoscopic cholecystectomy was performed under general anaesthesia with the patients in slight reverse Trendelenburg position and use of 4-trocars technique. The pneumoperitoneum was created by insufflations of CO2 via open technique. Intra-abdominal pressure was maintained stable at 12-14 mmHg (Standard Pressure). Monopolar diathermy was used for haemostasis and to detach the gall bladder from its liver bed. After the extraction of gall bladder, surgical

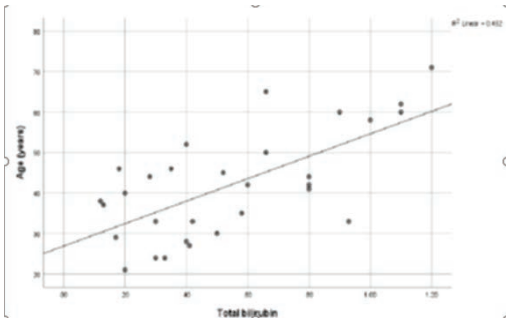

Fig. 1: Total bilirubin

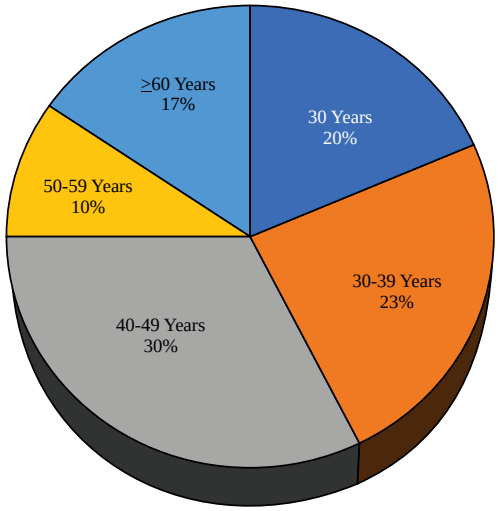

Fig. 2: Age distribution

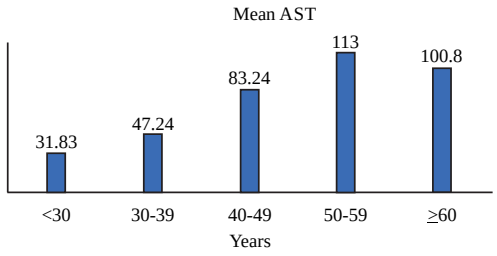

Fig. 3: Mean AST

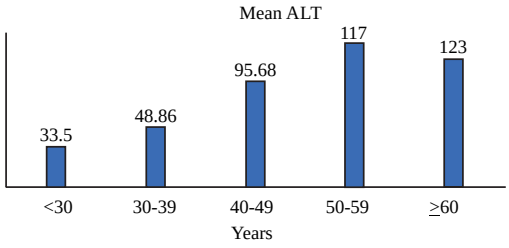

Fig. 4: Mean ALT

Table 1: Liver function tests

LFT measures	Pre op (Mean)	Post p (mean)	p-value
Total Bilirubin (mg^{-1} dL)	0.17	0.54	0.001
Direct Bilirubin (mg^{-1} dL)	0.41	0.58	0.004
AST (IU L)	17.7	70.46	<0.001
ALT (IU L)	24.6	79.00	<0.001
Alkaline phosphatase	48.9	29.7	0.001

drain was placed in subhepatic space. The procedure in all the patients was performed by the same team of experienced consultants. Duration of operation was noted. Post-operative symptoms were examined like pain, vomiting, dyspepsia, flatulence and complications like bile leakage, haemorrhage, wound infection etc and were noted.

Statistical analysis was done by Student paired t test. The P value less than 0.05 was considered to be statistically significant.

RESULTS

The comparative study was carried out from May2021 to May 2022 in 30 patients undergoing laparoscopic cholecycstectomy . The distribution of age of patients varied from 21 to 75 years in both groups. There were 8 male and 22 female patients. There was no conversion to open procedure in the study group.

Liver function tests (table 1): The pre-op. and post-op. mean values of total bilirubin were 0.17mg dL^{-1} and 0.54 mg dL^{-1} respectively, with p<0.001. This showed statistically highly significant rise in total *S. bilirubin* levels 24 hrs after surgery.

Likewise, the preoperative Direct bilirubin 0.41mg^{-1} mL was increased postoperatively 0.58 mg^{-1} mL. This was statistically significant (p<0.004). The change in the values of aminotransferases was more remarkable. The preoperative AST 0.17 U mL was increased postoperatively 70.46U mL. This was statistically significant (p<0.001).

The preoperative ALT 24.6 U mL was increased postoperatively 79.0 U mL. This was also statistically significant (p<0.001). The preoperative alkaline phosphatase was decreased postoperatively from 48.9 to 29.7.This was statistically significant (p = 0.001).

Statistical analysis: Data was entered in Microsoft Excel v.2019 and was analyzed using SPSS (Statistical Package for Social Sciences) v.23 trial version. Categorical variables were represented in the form of frequencies and percentages. Continuous variables were summarized as means and their standard deviations. Appropriate graphical representations were also included for easier understanding of the data. Relationship between age and various LFT measures was statistically analysed using ANOVA (Analysis of Variance) test and Pearso's correlation co-efficient. Unpaired t-test was used to test the gender-based difference in LFT measures. A p<0.05 was considered as statistically significant.

DISCUSSION

Liver function tests (LFT) are used as an indicator for evaluation of biliary obstruction in the preoperative period where there are elevated levels of alkaline phosphatase and also in postoperative period for assessment of biliary injury or ligation where the liver functions are immediately deranged. However, many studies have disclosed unexplained changes in post-operative liver function after laparoscopic procedures[11]. During laparoscopic surgery, there is an elevation and depression of intra-abdominal pressure (IAP) in a short time, this sudden alteration of IAP could cause undulation of portal blood flow. This undulation in blood flow and re-irrigation of organs may give rise to ischaemia and re-irrigation damage of tissues and organs, especially the Kupffer and endothelial cells of hepatic sinusoids. This can cause free radical generation. 8 The role of reperfusion related mechanisms after laparoscopy and the production of free radicals are however smaller than the role of total surgical injury during open cholecystectomy.

Knowing the fact that normal portal venous pressure is 7-10 mmHg and about half of the hepatic blood flow comes from the portal venous system, 14 mmHg of pneumoperitoneum created with CO2 is stated to be the major cause of transient hepatic ischemia during LC[12-15]. Jakimowicz *et al.* showed that 14 mmHg of intraperitoneal pressure reduced the portal blood flow by 53% using the Doppler technique. 10 During laparoscopic procedure the sudden alteration of intraperitoneal pressure could cause the undulation of portal blood flow, which may give rise to ischemia and damage of tissues and organs, especially the Kupffer cells and the endothelial cells of the hepatic sinusoids[15]. Another possible mechanism for alterations of serum liver enzymes is the “squeeze pressure” effect on the liver. By traction of the gall bladder by fourth port leading to folding of liver may release the liver enzymes into the blood circulation. In our study, all the patients were subjected to traction on the fundus of the gall bladder and squeeze pressure theory could be a contributing factor for raised liver function test. Prolonged use of diathermy to the liver surface in laparoscopic cholecystectomy and the spread of heat to liver parenchyma 12 may cause damage to hepatic tissue and this hypothesis is supported by some studies[16].

CONCLUSION

In conclusion, transient mild abnormality in liver function tests is a usual finding after laparoscopic

cholecystectomy without clinical significance. It is mainly attributed to the high intra abdominal pressure of carbon dioxide pneumoperitoneum, which may compromise the hepatic blood flow causing alterations in the microcirculation. Despite the fact that it has not any consequences in otherwise healthy patients, it could deteriorate the liver function in patients with severe liver disease who undergo long lasting pneumoperitoneum. In such cases the low pressure pneumoperitoneum or gasless laparoscopy by abdominal wall lifting could be reasonable alternatives.

REFERENCE

1. Crossen, R.J. and S. Moore, 1928. Cholecystographic studies in pregnancy. Am. J. Obstet. Gynecol., 12: 142-144.
2. Chok, K.S., W.K. Yuen, H. Lau and S.T. Fan, 2006. Prospective randomized trial on low-pressure versus standard-pressure pneumoperitoneum in outpatient laparoscopic cholecystectomy. Surg. Laparoscopy, Endoscopy Percutaneous Tech.s., 16: 383-386.
3. Gutt, C.N., T. Oniu, A. Mehrabi, P. Schemmer, A. Kashfi, T. Kraus and M.W. Büchler, 2004. Circulatory and respiratory complications of carbon dioxide insufflation. Digestive Surg., 21: 95-105.
4. Al-Jaberi, T.M., M.F. Tolba, M. Dwaba and M. Hafiz, 2002. Liver function disturbances following laparoscopic cholecystectomy: Incidence and significance. J. Laparoendoscopic and Adv. Surg. Tech.s., 12: 407-410.
5. Nesek-Adam, V., Z. Rašic, J. Kos and D. Vnuk, 2004. Aminotransferases after experimental pneumoperitoneum in dogs. Acta. Anaesthesiologica. Scand., 48: 862-866.
6. Halevy, A., R. Gold-Deutch, M. Negri, G. Lin and N. Shlamkovich et al., 1994. Are elevated liver enzymes and bilirubin levels significant after laparoscopic cholecystectomy in the absence of bile duct injury? Ann. Surg., 219: 362-364.
7. Dain, N., 1964. Concepts of Insanity in the United States, 1789-1865. By Norman Dain. (New Brunswick, N. J. Rutgers University Press. 1964. Pp. xv, 304. $9.00.) American. Historical. Revie., 70: 477-478.
8. Andrei, V.E., M.S. Chein, M. Margolis, J.C. Rucinski and L. Wise, 1998. Liver enzymes are commonly elevated following laparoscopic cholecystectomy: Is elevated intra-abdominal pressure the cause? Digestive Surg., 15: 256-259.
9. Morino, M., G. Giraudo and V. Festa, 1998. Alterations in hepatic function during laparoscopic surgery. Surg. Endoscopy., 12: 968-972.
10. Freeman, H., 1999. Attitudes towards mental illness among relatives of former patients. Am. Soc. Rev., 26: 59-66.
11. Tan, M., 2003. Changes in the level of serum liver enzymes after laparoscopic surgery. World J. Gastroenterol., 9: 364-0.
12. Nathwani, R.A., S.R. Kumar, T.B. Reynolds and N. Kaplowitz, 2005. Marked elevation in serum transaminases: An atypical presentation of choledocholithiasis. The Am. J. Gastroenterol., 100: 295-298.
13. Khan, M.H., T.J. Howard, E.L. Fogel, S. Sherman and L. McHenry et al., 2007. Frequency of biliary complications after laparoscopic cholecystectomy detected by ercp: Experience at a large tertiary referral center. Gastrointestinal Endoscopy, 65: 247-252.
14. Jakimowicz, J., G. Stultiëns and F. Smulders, 1998. Laparoscopic insufflation of the abdomen reduces portal venous flow. Surg. Endoscopy., 12: 129-132.
15. Lu, S.N., W.Y. Chang, L.Y. Wang, M.Y. Hsieh and W.L. Chuang et al., 1990. Risk factors for gallstones among Chinese in Taiwan a community sonographic survey. J. Clin. Gastroenterol., 12: 542-546.
16. Raut, V., N. Bhat, J. Kinsella, J.G. Toner, A.R. Sinnathuray and M. Stevenson, 2001. Bipolar scissors versus cold dissection tonsillectomy: A prospective, randomized, multi-unit study. The Laryngoscope., 111: 2178-2182.