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Comparative Study Of Changes In Hepatic Function After Laparoscopic Cholecystectomy And Open Cholecystectomy

General Surgery

KEYWORDS: cholecystectomy, laparoscopic, pneumoperitoneum, hepatic function.

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ABSTRACT

Background: laparoscopic cholecystectomy is the surgery of choice in any gall bladder surgery around the world nowadays. The main advantage is the reduction in trauma, reduced adhesion formation, early ambulation, short hospital stay, less medication & early return to work and daily activities.our aim was to compare the changes in liver functions after minimal invasive and open cholecystectomy. **Materials and methods:** the study was conducted Ina tertiary care teaching centre in Kerala after getting ethical committee clearance and institutional research committee clearance.we selected 30 consecutive patients undergoing laparoscopic cholecystectomy and 16 patients undergoing open cholecystectomy. **Inclusion criteria:** patients between 13 to 60 years, with normal preoperative liver function tests only was considered. **Exclusion criteria:** Patients with preoperative liver failure, portal hypertension and cirrhosis ,with any previous history of intra abdominal operations in the upper abdomen were excluded from the study. Patients who developed complications such as bile duct injury, obstruction,infection, bile leakage, and high grade fever in the post operative period were excluded from the study. Patients who underwent endoscopic procedures within one week prior to operation were also excluded from the study. **Results:** In our study, there was a statistically significant difference in the changes in liver functions in the laparoscopic group as compared to the open cholecystectomy on the first post an operative day. Moreover, there were no statistically significant changes in the liver function test at the end of first week from the preoperative value in the laparoscopic group compared to open cholecystectomy group.**Discussion:** In laparoscopic surgery, there is a short term elevation in the liver function test in patients in the immediate post operative period which recover to preoperative values as compared to the open cholecystectomy group. This elevation in the liver function test could be due to the effect of reduced blood flow to the liver due to pressure effects produced by the pneumoperitoneum.

Introduction

Laparoscopic surgery, which has been considered synonymous with minimal access surgery has changed the face of General Surgery since the last three decades(1). Laparoscopic surgery has been universally accepted and is the most popular and patient friendly procedure now(2). It provides access to the peritoneal cavity by minimal invasion and helps the surgeon perform all invasive procedures which could have been accomplished only with laparotomies previously(3). The main advantage of laparoscopic surgery which makes it patient friendly include the reduction in tissue trauma and reduction in adhesion formation(4-7). This enables the patient early ambulation, shortening of hospital stay, less medication and early return to normal routine work. During the last two decades, many studies have occurred comparing the physiological changes in various open and laparoscopic surgical procedures, of which the most important change is regarding post operative liver function test. Studies have demonstrated transient elevation of hepatic enzymes following laparoscopic procedures. The factors attributing to hepatic cellular dysfunction may be secondary to Carbon dioxidepneumoperitoneum, diathermy induced liver injury, iatrogenic hepatic artery ischemia, general anesthetic drug toxicity, prolonged procedure, etc(8, 9).

In comparing laparoscopic cholecystectomy with open, factors that come into play are positioning of patient and carbon dioxide insufflations. In early decades of laparoscopy, during the learning phase, laparoscopic surgeries used to consume many hours and the prolonged exposure to anesthetic drugs and Carbon dioxide narcosis have contributed to the increased hepatic dysfunction. However, in expert hands laparoscopic surgeries have now become safer and less time consuming thus tremendously reducing the above complications. Follow-up observations and feedback from patients undergoing laparoscopic surgeries show no apparent clinical implication due to the transient elevation of hepatic enzymes. However, this knowledge throws light to the fact that in patients with poor liver function, laparoscopic surgery might not be the optimal choice. However, the post-operative changes in the liver enzymes resolve back to normal over a period than one week. Most of the studies comparing the changes to the liver functions were conducted in other populations. Against this background, we conducted this study to compare the biochemical and clinical changes in hepatic function in laparoscopic cholecystectomy compared to open cholecystectomy

Materials and methods

We have conducted this study in the department of surgery medical college Trivandrum, a Tertiary care teaching Institute catering to the southern districts of Kerala and Kanyakumaridistrict of Tamil Nadu. The study period was from February 2013 to December 2013.We had obtained institutional research committee clearance and ethics committee clearance before recruiting the patients into the study. Informed consents were taken from all patients willing to take part in our study.We have selected 30 consecutive patients undergoing laparoscopic cholecystectomy and 16 consecutive patients posted for open cholecystectomy for this study. Patients with preoperative liver failure, portal hypertension and cirrhosis were not includedin the study. Patients with any previous history of intra abdominal operations in the upper abdomen were excluded from the study. Only patients between 13-60 years were considered in the study. Only patients with normal liver function tests in the preoperative period were included in the study. Prior sample size calculation was done to adequately power the study. Patients who developed complications such as bile duct injury, obstruction,infection, bile leakage, and high grade fever in the post operative period were excluded from the study. Patients who underwent endoscopic procedures within one week prior to operation were also excluded from the study.

Laparoscopic cholecystectomy was done following standardized steps as followed in our institution with four ports. Open cholecystectomies were done using the classical approach. Anesthetic

protocol is similar in both types of operation in our institution.We have collected data and studied basic demographic variables, post operative stay, type of procedure, time, liver function test on the preoperative day, first post operative day and on the seventh post operative day. The changes in the first postoperative day from the preoperative day before the liver function tests and the changes at one week were the outcome variables we studied.All measurements were taken in standard units using well calibrated instruments.Data were collected by the resident and principal investigator using standardized and pretested data collection forms. Data were subsequently entered into an excel database. Adequate precautions were taken to safeguard against data entry errors. All data were kept confidential with no patient's identifiers included at any phase of the study.

All data analysis was implemented in R statistical environment. Demographic variables were summarized with median and interquartile range and comparison of means were tested with Mann-Whitney test.

Results

The number of patients included in the study was 46 with more females compared to males(female:male=35:11). The median age was 49 with IQR 38.2 to 57. The Medan post operative stay was 4 days(4-5). There were 30(65.2%) laparoscopic cholecystectomies with 16(34.8%) open cholecystectomies performed. The median time taken for the operation was 1.5 hours(1-1.94). Preoperative SGOT was 27.5(22-37.8) with levels increasing to 51.5(34-36) on the first post operative day and reaching back to 30(26-35) at the end of one week. The median SGPT value on the preoperative day was 27(19-35) with 48(35-69.8) on the first post operative day and 28.5(22.2-69.8) at the end of first week. At the same time, the mean bilirubin levels at the preoperative day was 0.77(0.29) with median bilirubin on the first post operative day 0.80(0.60-1.08) dropping to 0.75(0.26). The alkaline phosphatase level was 70.5 (53-88.8) on the preoperative day with 65(50-88.8) on the first post operative day which regressed back to 58.5(46.2-74.2) on the seventh day.

There were 30 patients in the laparoscopic cholecystectomy group and 16 patients in the open cholecystectomy group. No preoperative derangement in the liver function tests was present in both groups. The baseline comparison of both groups is given in table 1.

Table 1: Baseline characteristics of patients in the two groups

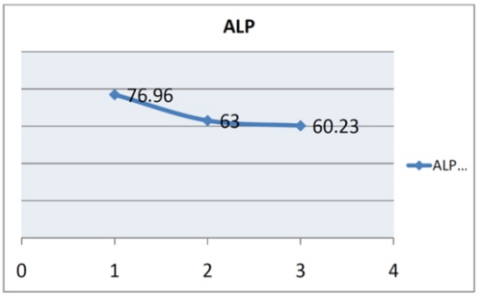
Variable	[ALL] N=46	Lap cholecystectomy N=30	Open cholecystectomy N=16	p.value
AGE	49.0 [38.2;57.0]	50.0 [40.0;57.0]	46.0 [34.8;55.8]	0.466
GENDER:				0.068
Female	35 (76.1%)	20 (66.7%)	15 (93.8%)	
Male	11 (23.9%)	10 (33.3%)	1 (6.25%)	
POST.OP.S	4.00 [4.00;5.00]	4.00 [4.00;5.00]	4.00 [4.00;6.00]	1.000
TIME	1.50 [1.00;1.94]	1.50 [1.00;2.00]	1.50 [1.00;1.50]	0.422
SGOT.0	27.5 [22.0;37.8]	28.5 [22.0;37.8]	26.5 [21.8;37.2]	0.729
SGOT.1	51.5 [34.8;74.8]	70.0 [51.2;84.8]	33.5 [29.8;40.5]	<0.001
SGOT.7	30.0 [26.0;36.0]	30.0 [24.5;31.8]	34.0 [26.8;37.0]	0.398
SGPT.0	27.0 [19.0;35.0]	28.5 [21.0;35.0]	21.0 [18.8;33.2]	0.338
SGPT.1	48.0 [35.0;69.8]	62.5 [48.0;84.8]	28.0 [23.8;36.2]	<0.001
SGPT.7	28.5 [22.2;35.8]	29.5 [24.0;39.0]	27.5 [22.0;34.2]	0.412
S..BILI.0	0.77 (0.29)	0.79 (0.31)	0.72 (0.26)	0.435
S.BILI.1	0.80 [0.60;1.08]	0.80 [0.70;1.20]	0.75 [0.57;0.82]	0.046
S.BILI.7	0.75 (0.26)	0.78 (0.28)	0.70 (0.24)	0.292
S.BILI.7.1	0.60 [0.50;0.90]	0.60 [0.50;0.98]	0.65 [0.50;0.90]	0.852
ALP.0	70.5 [53.0;88.8]	75.0 [54.2;88.8]	66.5 [52.8;93.2]	0.747
ALP.1	65.0 [50.0;73.2]	68.5 [50.2;70.8]	60.0 [46.5;83.2]	0.661
ALP.7	58.5 [46.2;74.2]	62.5 [42.5;72.0]	51.5 [46.8;85.2]	0.908

In our study, there was a statistically significant difference in the changes in liver functions in the laparoscopic group as compared to the open cholecystectomy on the first post an operative day(table 2).

Table 2: Changes in the liver function tests in laparoscopic and open groups over the first week

Change in the variable	[ALL] N=46	Lap cholecystectomy N=30	Open cholecystectomy N=16	p.overall
SGOT on the fist day	27.5 [6.25;46.2]	38.0 [28.0;56.8]	5.50 [4.00;7.00]	<0.001
SGOT on the seventh day	1.30 (4.97)	0.47 (4.34)	2.88 (5.81)	0.158
SGPT on the fist day	10.0 [5.00;39.2]	30.0 [9.50;51.8]	4.50 [2.75;7.25]	<0.001
SGPT on the seventh day	3.00 [-2.00;6.00]	2.00 [-3.50;5.00]	3.50 [-2.00;7.25]	0.439
Bilirubin on the first day	0.10 [0.00;0.20]	0.15 [0.00;0.30]	0.05 [-0.10;0.10]	0.008
Bilirubin on the seventh day	0.00 [-0.10;0.10]	0.00 [-0.10;0.10]	0.00 [-0.12;0.10]	1.000
Alkaline phosphatase on the seventh day	-10.00 [-20.00;-4.25]	-11.50 [-22.50;-3.25]	-9.00 [-16.25;-5.75]	0.703

Moreover, there were no statistically significant changes in the liver function test at the end of first week from the preoperative value in the laparoscopic group compared to open cholecystectomy group. On the first post operative day, the median SGOT was 38(28;56.8) 56.8 in the laparoscopic group where as it was 5.5(4;7) in the open group. The difference was statistically significant. The details about the changes in the other liver functions across both groups are given in table 2. In this study,there was a significant correlation with the time and changes in the liver function(figure1)



Discussion

The objective of this study was to determine whether there are any changes in the liver function tests in laparoscopic cholecystectomy compared to the open cholecystectomy. In laparoscopic surgery, there is a short term elevation in the liver function test in patients in our study in the immediate post operative period which recover to preoperative values as compared to the open cholecystectomy group. This elevation in the liver function test could be due to the effect of the peritoneum in the absence of the prior disease in these groups of patients who underwent laparoscopic procedures. This has been attributed to reduced blood flow to the liver due to pressure effects produced by the pneumoperitoneum(10-12). In addition to , the hepatic derangement caused by the decreased vascular flow, another explanation put forward was anesthetic complications causing these changes. Any changes in the liver functions tests are of concern to the operating surgeon as it poses a diagnostic challenge in presence of a potential bile duct injury.

In our study, the preoperative values were normal. Those patients with history of liver diseases or with clinical or serological or sociological evidence of hepatic dysfunction were excluded from the study. Anesthetic drugs could produce a transient increase in the liver function tests due to affect on hepatic vascular flow. However, the differential change for both groups cannot be explained by these. Moreover, in our institution, for both laparoscopic and open procedures, the same anesthetic protocol is being followed.

Our results are in agreement with other studies(11-13). Our result has shown that as there is a correlation between the duration of the

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procedure with extent of the changes in the liver function tests. The study by Tan et all demonstrated the same results and trends. In a study by Hasukic et all, there is doubling of liver function tests from the preoperative values, where as in our study, it is more than 2.5 times higher the preoperative level. This difference could be explained to the pressure setting and the comparative fewer obese patients in our set up. These effects could be due to increased intraperitoneal pressure and possibly compression of liver by retraction of gallbladder. Other potential causes could be effects of anesthesia and application of surgical diathermy to the liver bed. However, as the anesthetic protocol was similar in both laparoscopic and open group, the differential changes in laparoscopic procedure alone cannot be explained as caused by effects of anesthetic drugs. The main reason may be the pneumoperitoneum caused by carbon dioxide gas. Study by Jakimowicz et all using Doppler technique has established that pneumoperitoneum reduces portal blood flow by more than 50 percent(15). However,Giraudo et all demonstrated that liver function test did not alter with gas fewer laparoscopies(16). Moreover, the study by Barczynski et all revealed an increasing trend in the liver function abnormality in high pressure laparoscopic compared to low pressure laparoscopy (17).

One of the limitations of our is the observational nature of the study. Moreover, the sample size was low so that we may have missed other significant results. Another limitation was the comparative low number of recruits in the open procedure. This is due to increasing trend in our institution to do most of the cholecystectomy laparoscopically. This could have introduced a selecting low risk cases to the laparoscopic group and high-risk patients to the open group. In addition, we did not take into account the potential effects of obesity in our study. However, this study being the single study carried out in our population. In future, studies within an interventional design need to be planned to address the limitations in our study.

Conclusion

Our study has shown that laparoscopic cholecystectomy produces significant changes in the liver function test in the immediate post operative period. However, these changes spontaneously reverted back to preoperative levels over a week resulting in no apparent clinical implications. Nevertheless, knowledge about these transient changes is important to in the immediate post operative period whenever a differential diagnosis in entertained in view of any untoward biliary complications that occur in the perioperative period. Another implication is giving extra care to the selection of patients with deranged preoperative liver function tests for the laparoscopic cholecystectomy.

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