

ORIGINAL RESEARCH

Comparative Analysis of Alterations in Serum Bilirubin Levels Pre and Post Laparoscopic Cholecystectomy: An Institutional Based Study

¹Dinesh Kumar, ²Pankaj Mehrotra, ³Atul Tandon, ⁴Milan Sachan

^{1,2,3,4}Assistant Professor, Department of General Surgery, Rama Medical College Hospital & Research Centre, Kanpur, Uttar Pradesh, India

Corresponding Author

Dinesh Kumar

Assistant Professor, Department of General Surgery, Rama Medical College Hospital & Research Centre, Kanpur, Uttar Pradesh, India

Email: drdineshchauhan01@gmail.com

Received: 12 February, 2020

Accepted: 19 March, 2020

ABSTRACT

Background: Laparoscopic cholecystectomy (LC) has become the standard treatment of benign gallbladder diseases. The present study shows alterations in serum bilirubin levels pre and post laparoscopic cholecystectomy. **Materials & Methods:** A total of 100 patients scheduled to undergo LC were enrolled. Detailed demographic information for all patients was collected. Blood samples were taken to measure serum bilirubin levels before the surgery (baseline). The analysis was performed using SPSS software. **Results:** We measured the mean levels of total serum bilirubin at three different time points: preoperative, 24 hours postoperative, and 72 hours postoperative. The mean levels at these time points were found to be 0.80 mg/dL, 1.62 mg/dL, and 0.78 mg/dL, respectively. **Conclusion:** Serum bilirubin levels are significantly altered among patients undergoing Laparoscopic cholecystectomy.

Keywords: Laparoscopic Cholecystectomy, Serum Bilirubin.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

INTRODUCTION

Since the introduction of the laparoscopic cholecystectomy in 1987, knowledge about the difficulties associated with the procedure and awareness of the potential complications have grown. Modernization of technical skills to overcome the difficulties and early detection of the complications and their timely management are keys to the success of this procedure. Although open cholecystectomy has largely been replaced by the laparoscopic technique, the potential for iatrogenic duct injuries is higher in the latter procedure.¹ The frequency and type of biliary injuries during laparoscopic cholecystectomy vary, and timely diagnosis and management is critical for the well-being of the patient.² The introduction of laparoscopic surgery has profoundly changed the way for the management of patients with both gallbladder disease and common bile duct stone, and the laparoscopic cholecystectomy (LC) has become the "gold standard" in the treatment of benign gallbladder diseases such as gallbladder stone and cholecystitis.^{3,4}

Among other techniques for the assessment of biliary injuries, biochemical testing of liver enzymes is a common clinical practice. The sensitivity of LFTs in detecting obstructions in bile flow has been found to be greater than 90%.⁵ Any increase in their values is always a matter of concern for the clinician and warrants further investigation to determine the underlying pathology. AST and ALT are generally considered a measure of hepatocellular function. ALP levels are increased during obstruction of the biliary duct system; bilirubin levels can increase due to hemolysis or obstruction of the flow of bile. Very high levels of serum transaminases can also be suggestive of common bile duct (CBD) stones.⁶ Hence, the present study is conducted to evaluate alterations in serum bilirubin levels pre and post laparoscopic cholecystectomy.

MATERIALS & METHODS

A total of 100 patients scheduled to undergo LC in Department of General Surgery, Rama Medical

College Hospital & Research Centre, Kanpur, Uttar Pradesh (India) were enrolled. Detailed demographic information for all patients was collected. Blood samples were taken to measure serum bilirubin levels before the surgery (baseline). At 24 and 72 hours after the surgery, we re-evaluated the serum bilirubin levels. We compared the changes in bilirubin levels and recorded all the results. The analysis was performed using SPSS software.

RESULTS

In this study, we examined a group of 100 individuals, with 20 of them being younger than 40 years old and

the remaining 80 being older than 40 years old. We measured the mean levels of total serum bilirubin at three different time points: preoperative, 24 hours postoperative, and 72 hours postoperative. The mean levels at these time points were found to be 0.80 mg/dL, 1.62 mg/dL, and 0.78 mg/dL, respectively. Upon comparing these results, we observed a statistically significant difference. Similarly, we also measured the mean levels of serum direct bilirubin at the same time points, which were found to be 0.18 mg/dL, 0.55 mg/dL, and 0.30 mg/dL, respectively. Again, a statistically significant difference was observed upon comparing these results.

Table 1: Distribution of subjects according to age group

Age group (years)	Frequency	Percent
Less than 40	20	20
More than 40	80	80
Total	100	100.0

Table 2: Alterations in serum bilirubin levels

Bilirubin levels (mg/dL)	Mean	SD	p- value
Pre- op Total Bilirubin	0.80	0.15	0.001*
Post- op at 24 hr Total Bilirubin	1.62	0.45	
Post-op at 72 hr Total Bilirubin	0.78	0.06	
Pre-op Direct Bilirubin	0.18	0.08	0.01*
Post-op at 24 hr Direct Bilirubin	0.55	0.18	
Post-op at 72 hr Direct Bilirubin	0.30	0.04	

*: Significant

DISCUSSION

Laparoscopic cholecystectomy is considered the gold standard for the treatment of symptomatic gallstones. As with any surgical procedure, it is not 100% safe and free from complications. Retained stones and duct injuries are among the serious complications related to this procedure. Duct injuries are not easy to recognize during surgery and are usually detected postoperatively.⁷ Apart from the general assessment of liver function, LFTs are generally used postoperatively as an indicator of duct obstructions and iatrogenic injuries. The sensitivity of liver function tests in predicting biliary obstruction has been shown to be high. The predictive value of ALP has been accepted, and large values of this enzyme in particular raise the possibility of CBD stones.⁸ Hence, the present study is conducted to evaluate alterations in serum bilirubin levels pre and post laparoscopic cholecystectomy.

In the present study, a group of 100 individuals, with 20 of them being younger than 40 years old and the remaining 80 being older than 40 years old. We measured the mean levels of total serum bilirubin at three different time points: preoperative, 24 hours postoperative, and 72 hours postoperative. The mean levels at these time points were found to be 0.80 mg/dL, 1.62 mg/dL, and 0.78 mg/dL, respectively. A study by Singal R et al, a total number of 200 patients diagnosed with cholelithiasis were included in the study from May 2012 to May 2014. These cases were

randomly divided into two groups (A and B) consisting of 100 cases each. LC was performed in group A patients and OC was done in group B patients. Three blood samples were taken: (I) pre-operatively; (II) after 24 hours of surgery; and (III) after 72 hours of surgery for comparison of the enzyme level alterations. In LC patients, there was rise in the levels of serum bilirubin, AST and ALT after 24 hrs of surgery from the preoperative value and then again fall was noted (near to normal value) after 72 hrs of surgery except in that of ALP. ALP levels showed a slight fall after 24 hrs of surgery and then slight rise after 72 hrs which was within the normal limit. Whereas in OC patients, there were slight variations in the liver enzymes (which were within the normal range). Transient elevation of serum bilirubin, AST and ALT occurs after LC or after OC. The alteration in the liver enzymes can be attributed to CO₂ pneumoperitoneum, surgical manipulations, diathermy, patient position, and arterial injury may also be other factors. These changes return to normal in 3-4 days after procedure and they have no clinical consequences in patients with normal hepatic function, but they may still cause worry to the surgeon regarding the integrity of biliary tree.⁹

In the present study, upon comparing these results, we observed a statistically significant difference. Similarly, we also measured the mean levels of serum direct bilirubin at the same time points, which were

found to be 0.18 mg/dL, 0.55 mg/dL, and 0.30 mg/dL, respectively. Again, a statistically significant difference was observed upon comparing these results. Another study by Ahmad NZ et al, a total of 355 patients were retrospectively analyzed by examining the LFTs the day before, the day after, and 3 weeks after the surgery. The Wilcoxon signed-rank test and Student t test were performed to determine statistical significance. Alterations in the serum AST, ALT, and GGT were seen on the first postoperative day. Minor changes were seen in bilirubin and ALP. An overall disturbance in the LFTs was seen in more than two-thirds of the cases. Repeat LFTs performed after 3 weeks on follow-up were found to be within normal limits.¹⁰ Tan M et al, evaluated blood samples from 286 patients who underwent laparoscopic cholecystectomy (LC) and 40 patients who underwent open cholecystectomy (OC) were tested for liver function by measuring the level of serum alanine aminotransferase (ALT) and aspartate aminotransferase (AST) before and after the operations. The same tests were also applied to 18 laparoscopic colorectal cancer resection (LCR) patients and 23 open colorectal cancer resection (OCR) patients to determine whether CO₂ pneumoperitoneum could alter the serum liver enzymes. The level of serum ALT and AST increased significantly during the first 48 h post operations in both LC and LCR patients. However, no significant change of the serum liver enzymes was detected in both OC and OCR patients. As a result, there was statistically significant difference in change of both ALT and AST levels between LC and OC patients and LCR and OCR patients, respectively. By the 7th day post operation, the level of both enzymes returned to normal values in LC, OC and OCR patients except LCR patients whose enzymes remained at a higher level.¹¹ Sakorafas G et al, mortality was nil. Twenty-four hours after the procedure, ALT and AST increased statistically significantly in the LC group (ALTLC24: 87.1+/-24.2 U/L, P<0.001; ASTLC24:82.8+/-19.1 U/L, p<0.001)--whereas in the OC group, 24 hours after the procedure, the serum value of ALT and AST was above the upper normal limits in only in one patient. A further increase in serum ALT and AST value was observed in the LC group (ALTLC72: 99.3+/-19.5 U/L, p<0.001; ASTLC72H: 103.5+/-21.6 U/L, p<0.001) 72 hours after the operation. The mean value of ALT and AST in the OC group was within normal limits 72 hours after the procedure. Slow return to normality occurred 7-10 days after the procedure in the LC group.¹² Marakis et al. reported the mean duration of surgery in LC was 55 min (range, 40-70 min). In our design, the mean duration of surgery in LC group was 57.7 minutes and in OC group the mean duration of surgery was 61.8 minutes which is non-significant (P=0.109) and made both the groups comparable. In LC group we found that the patient with minimum duration of surgery (40 min) had less elevation in liver enzymes (serum bilirubin, AST and ALT) as

compared to the patient with maximum duration (90 min) of surgery.¹³ Mohamed et al. in his study observed elevation in the levels of serum ALT and AST within 24-48 hours following operations in LMUDT (laparoscopic maneuver for undescended testicle) patients compared with those in OMUDT (open maneuver for undescended testis) patients. The degree of change in ALT following LMUDT was greater than OMUDT and this difference was statistically significant (P<0.05). On the seventh day following the operations, both enzymes returned to normal value in LMUDT, and OMUDT patients. In his study, other liver function indices such as TBIL, direct bilirubin (DBIL), ALP, lactic dehydrogenase (LDH), total protein (TP) and gamma glutamyltransferase (GOT) also showed derangements. TBIL and DBIL showed slight increase within 24-48 hours following operation in some patients, but the changes were within normal range, and these values returned to preoperative levels.¹⁴

CONCLUSION

Serum bilirubin levels are significantly altered among patients undergoing Laparoscopic cholecystectomy.

REFERENCES

- Richardson MC, Bell G, Fullarton GM. Incidence and nature of bile duct injuries following laparoscopic cholecystectomy: an audit of 5913 cases. West of Scotland Laparoscopic Cholecystectomy Audit Group. *Br J Surg.* 1996;83(10):1356-1360.
- Khan MH, Howard TJ, Fogel EL, et al. Frequency of biliary complications after laparoscopic cholecystectomy detected by ERCP: experience at a large tertiary referral center. *GastrointestEndosc.* 2007;65(2):247-252.
- Cuschieri A. Laparoscopic cholecystectomy. *J R Coll Surg Edinb.* 1999;44:187-192.
- Himal HS. Minimally invasive (laparoscopic) surgery. *Surg Endosc.* 2002;16:1647-1652.
- 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.
- 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.
- Slater K, Strong RW, Wall DR, et al. Iatrogenic bile duct injury: the scourge of laparoscopic cholecystectomy. *Aust N Z J Surg.* 2002;72(2):83-88.
- Jarvinen H. Abnormal liver function tests in acute cholecystitis; the predicting of common duct stones. *Ann Clin Res.* 1978;10(6):323-327.
- Singal R, Singal RP, Sandhu K, Singh B, Bhatia G, Khatri A, Sharma BP. Evaluation and comparison of postoperative levels of serum bilirubin, serum transaminases and alkaline phosphatase in laparoscopic cholecystectomy versus open cholecystectomy. *J Gastrointest Oncol.* 2015 Oct;6(5):479-86.

10. Ahmad NZ. Routine testing of liver function before and after elective laparoscopic cholecystectomy: is it necessary? *JLSLS*. 2011 Jan-Mar;15(1):65-9.
11. 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 laparoscopic surgery. *World J Gastroenterol*. 2003 Feb;9(2):364-7.
12. Sakorafas G, Anagnostopoulos G, Stafyla V, Koletis T, Kotsifopoulos N, Tsiakos S, Kassaras G. Elevation of serum liver enzymes after laparoscopic cholecystectomy. *N Z Med J*. 2005 Feb 25;118(1210):U1317.
13. Marakis G, Pavlidis T, Ballas K, et al. Alterations in Liver Function Tests Following Laparoscopic Cholecystectomy. *The Internet J Surg* 2006;8:245-7.
14. EL-Leathy MM, Abo El-Enin MA, Abd El Aziz IM. Subclinical Hepatic Dysfunction after Laparoscopic Surgery in Pediatrics. *Annals of Pediatric Surgery* 2009;5:137-40.