



ALTERATIONS IN THE LIVER FUNCTION FOLLOWING LAPAROSCOPIC APPENDICECTOMY

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ABSTRACT

Acute Appendicitis is one of the common surgical emergencies managed by general surgeon. Introduction of laparoscopic surgery has revolutionised the surgical practice. Alterations in the liver enzymes following pneumoperitoneum have raised concerns regarding the safety of laparoscopic surgery. This study was done to evaluate the alterations in the liver function following laparoscopic appendicectomy in patients with Acute Appendicitis. Around hundred patients above the age of 14 years with Acute Appendicitis undergoing laparoscopic appendicectomy were included in the study. Liver function tests were done preoperatively and on postoperative day 1 and day 7. All patients had acute rise in serum bilirubin both conjugated and unconjugated and liver enzymes SGOT, SGPT, alkaline phosphatase on the first post-operative day, reaching to near preoperative values by postoperative day 7. These changes had no clinical implications in patients with normal liver function but an alternative to be thought of in patients with reduced liver reserve.

KEYWORDS : Acute Appendicitis, laparoscopic appendicectomy, liver function tests.

Introduction

Acute Appendicitis is one of the common surgical emergencies managed by general surgeon in surgical practice. It is commonly seen in young adults between the ages 10 – 20 years but no age is exempt^[1]. A male preponderance exists with male to female ratio of 1.4: 1 with an overall life time risk of 8.6% for males and 6.7% for females^[1]. The cause of Acute Appendicitis is unknown but is probably multifactorial; luminal obstruction, dietary and familial factors have been suggested^[2].

The diagnosis of Acute Appendicitis is mostly clinical and relies on thorough history and clinical examination. The diagnostic sequence of colicky central abdominal pain followed by vomiting with migration of pain to right iliac fossa was first described by Murphy^[3] for diagnosis of Acute Appendicitis but may be present in only 50% of cases.

Imaging techniques both ultrasound and CT scan are used to aid in the diagnosis of Acute Appendicitis with varied sensitivity and specificity; Ultrasound with 86% and 81% and CT scan with 94% and 95% respectively^[4].

Open Appendicectomy has been the standard surgical procedure for the treatment of Acute Appendicitis for over a century since it was first described by McBurney in 1894^[5]. Recent advances in the minimally invasive techniques had made Laparoscopic Appendicectomy a better alternative to open Appendicectomy with benefits of reduced post-operative pain, shorter length of hospital stay and superior cosmetic results. However, concerns arose regarding the effects of pneumoperitoneum on splanchnic circulation^[5], hepatic microcirculatory perfusion^[6,7] apart from cardiovascular and respiratory effects^[8]. There are studies which show alterations in the liver function tests after laparoscopic surgeries^[6,9,10] which is a matter of concern to the treating physician. The immediate and long-term effects of these alterations need to be analysed before embarking on laparoscopic surgeries in all patients.

MATERIALS AND METHODS

The study was done over a 2 year period in a single institution from September 2015 to October 2017. Hundred patients constituted the study population with the following inclusion and exclusion criteria

INCLUSION CRITERIA

- Patients with age more than 14 years.
- Patients with diagnosis of Acute Appendicitis.
- Patients fit for General Anaesthesia and with normal liver function.

EXCLUSION CRITERIA

- Patients with age less than 14 years
- Patients with altered liver function tests.
- Pregnant women
- Patients with known liver disease.
- Patients with appendicular mass.

A detailed history was taken and general physical examination was done. Routine investigations like CBP which includes Hb%, TLC, DLC, Platelet count; ESR, RBS, Serum creatinine, Blood Urea and other special investigations like ECG, Ultrasound Abdomen were done. Patients who were confirmed to have Acute Appendicitis and fit for General Anaesthesia were taken up for study after taking consent. Liver function tests which include Serum Bilirubin (conjugated & unconjugated), serum alanine aminotransferase (ALT/SGOT), serum aspartate aminotransferase (AST/SGPT), serum alkaline phosphatase were done preoperatively and on the post-operative day 1 and day 7 in all patients.

- All patients were given same General anaesthetic agent other than Halothane.
- Carbon dioxide pneumoperitoneum was created and a constant intraabdominal pressure of 14mm of Hg was maintained throughout the procedure.

The Quantitative data were expressed in mean +/- standard deviation. Student paired t – test was used to analyse the data and 'p' value less than 0.005 was considered statistically significant.

RESULTS

Out of the hundred patients who constituted the study population 49 were males and 51 were females. Around 39 patients were in the age group of 21-30 years followed by 26 in 31-40 years, 23 in 14-20 years, 8 in 41-50 years and 4 in > 50 years age group.

TABLE 1: Age distribution

Age in Years	Frequency	Percent
14 – 20	23	23
21 – 30	39	39
31 – 40	26	26
41 – 50	8	8
Above 50	4	4
Total	100	100

Changes in the parameters of liver function tests were analysed individually

TABLE 2: Unconjugated Bilirubin

	N	Mean	SD	ANOVAF	p
Pre-OP	100	0.311	0.138	102.516	< 0.001
POD1	100	0.491	0.165		HS
POD 7	100	0.270	0.111		

SD – Standard Deviation
 POD – Post Operative Day
 HS – Highly Significant

TABLE 3: Conjugated Bilirubin

	N	Mean	SD	ANOVAF	p
Pre-OP	100	0.267	0.155	163.998	< 0.001
POD1	100	0.474	0.167		HS
POD 7	100	0.297	0.142		

Graph 1: Comparison of Mean of Unconjugated Vs Conjugated Bilirubin at different time intervals.

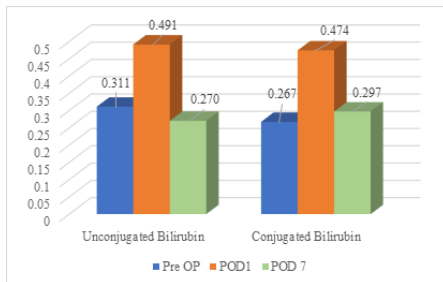


TABLE 4: Alkaline Phosphatase (ALP)

	N	Mean	SD	ANOVAF	p
Pre-OP	100	95.05	17.624	257.878	< 0.001
POD1	100	128.20	26.384		HS
POD 7	100	97.55	18.462		

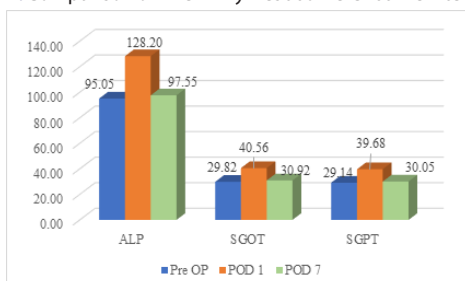
TABLE 5: SGOT

	N	Mean	SD	ANOVAF	p
Pre OP	100	29.820	8.075	311.714	< 0.001
POD1	100	40.560	9.218		HS
POD 7	100	30.920	7.875		

TABLE 6: SGPT

	N	Mean	SD	ANOVAF	p
Pre OP	100	29.140	7.811	434.567	< 0.001
POD1	100	39.680	8.563		HS
POD 7	100	30.050	7.712		

Graph 2: Comparison of Liver Enzymes at different time intervals



An acute rise in Bilirubin and liver enzymes is observed on post-operative day 1 reaching to near normal values by post-operative day 7

DISCUSSION

Acute Appendicitis is one of the common acute abdominal conditions requiring surgical intervention. Laparoscopic Appendicectomy, initially described by Semm in 1983^[11] has now become the standard of care for treating Acute Appendicitis, for its advantages. Laparoscopic approach requires creation of the pneumoperitoneum and carbon dioxide is used as a common insufflating agent. Carbon dioxide pneumoperitoneum has shown to produce certain pathophysiological changes involving systemic^[8] as well as splanchnic circulation^[5].

Studies^[6,9,12,13,14] have shown alteration in liver function tests in the post-operative period following laparoscopic surgeries. Such changes are not observed in patients undergoing open procedures or in whom gasless laparoscopy is done^[15,16] The cause is explained by sudden alteration in intraabdominal pressure causing undulation of the portal blood flow leading to ischemia – reperfusion injury to tissues and organs^[17]; and free radical generation^[18], though its role is small. An increase of 5mm, from 10 to 15 mm Hg of the intra-abdominal pressure resulted in decreased blood flow to all intra-abdominal organs with about 39% reduction to the liver^[19]. Also, splanchnic blood flow decreased with increase in the operative time despite constant intra-abdominal pressure^[19]. In this study, all patients were subjected to carbon-dioxide pneumoperitoneum with a constant intra-abdominal pressure of 14 mm of Hg. Liver function tests were done preoperatively and on the post-operative day 1 and 7. An acute rise in the serum Bilirubin and other liver enzymes (SGOT, SGPT, ALP) was observed on post-operative day 1 in all the patients which came to near baseline values by post-operative day 7. These changes were found to be statistically significant with p value < 0.001. Similar findings were seen in studies done by Tan M, et.al^[9]; Tauro LF, et.al^[10] Guven, et.al^[13]; Morino, et.al^[20]. In this study the mean pre-operative and immediate post-operative values of Serum Bilirubin (conjugated, unconjugated) were 0.267, 0.311 and 0.474, 0.491 respectively. The mean pre-operative and immediate post-operative values of SGOT, SGPT, ALP were 29.820, 29.140, 95.050 and 40.560, 39.680, 128.20 respectively. These elevations in the liver enzymes were consistent with the studies done by Tan M, et.al^[9]; Tauro LF, et.al^[10]; Guven, et.al^[13]; Morino, et.al^[20].

The studies^[12,13,14] done previously were mostly on laparoscopic cholecystectomy which might have required handling of liver along with local effect of diathermy to the liver surface with spread of heat to liver parenchyma, yet another possibility for elevated liver enzymes. This hypothesis was supported by other studies^[21,22,23]. But this study is done on patients with Acute Appendicitis undergoing laparoscopic Appendicectomy in which liver is not the organ of interest and was not handled at all.

Also, the changes in the liver function tests are not related to age or sex undergoing laparoscopic surgery. This shows that carbon dioxide pneumoperitoneum might be one of the major factors for altered liver function.

In this study the altered liver function tests did not produce any deleterious effects to the patients and reached to near baseline values by post-operative day 7. This shows these changes are only transient with no long-term effects. But caution should be taken in patients with poor liver function and chronic liver diseases, where an alternative like gasless laparoscopy can be considered.

This study has not considered the duration of the procedure and intra-operative pressure changes. Further studies need to be carried out by taking larger sample size, and to observe whether postoperative alterations in the liver function vary with operative time, any alternative gas other than carbon-dioxide and to different intra-abdominal pressures, as this could help patients with decreased hepatic reserve.

CONCLUSION

Transient elevation of liver enzymes and bilirubin is seen in patients undergoing laparoscopic procedures. These changes do not have any adverse effect in patients with normal liver function but care must be taken in patients with decreased hepatic reserve when planning for a laparoscopic surgery. As carbon-dioxide pneumoperitoneum is implicated as major causative factor, an alternative like gasless laparoscopy by laparolift or a low pressure pneumo-peritoneum should be thought of.

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