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Evaluation of liver function tests in pathological appendix

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Abstract
Introduction: Acute appendicitis (AA) is the most common surgical disease with life time risk of 7-8% and appendectomy is the treatment of choice in majority of cases. Although acute appendicitis is the most common surgically correctable cause of abdominal pain, the diagnosis is highly challenging. Recent research literatures have hyperbilirubinemia is a diagnostic gangrenous/perforation of appendix. In some literature it has mentioned that hyperbilirubinemia is a predictor of severity of acute appendicitis.
Materials and Methods: 82 consecutive cases of acute appendicitis admitted to surgery unit, irrespective of age and sex were recruited for the study. We have included clinically diagnosed (Alvarado score ≥7) and USG confirmed subjects of acute appendicitis and its complications. The patients with the cases of acute appendicitis and its complications with liver disease due to any cause, history of alcohol intake and AST/ALT >2, history of jaundice and history of hepatotoxic drug intake were excluded. After taking informed consents, all patients included in the study were subjected to abdominal ultrasound and blood sample taken for routine blood examination, LFT and after appendicectomy histopathology examination report were collected.
Results: Out of 82 subjects, 51 were males and 31 were females. On histopathological and intraoperative examination, 11% had normal appendix, 13% had perforated appendix, 27% had gangrenous appendix and 49% had inflamed appendix respectively. Liver function tests were evaluated in these subjects, we found that in subjects with inflamed appendix 8/40, 6/40, 2/40 had elevated levels of total bilirubin, AST, ALT respectively and none had elevated ALP. Similarly, in subjects with perforated/gangrenous appendix 28/33, 18/33, 8/33 and 7/33 had elevated total bilirubin, AST, ALT and ALP levels respectively.
Conclusion: LFT can be added as adjunctive test to the investigation of acute appendicitis and its complications and earlier diagnosis of the complications of acute appendicitis and timelier management.

Keywords: appendicitis, AST, ALT, ALP, inflamed appendix, perforated appendix

Introduction

Acute appendicitis (AA) is the most common surgical disease with life time risk of 7-8% and appendectomy is the treatment of choice in majority of cases. Although acute appendicitis is the most common surgically correctable cause of abdominal pain, the diagnosis is highly challenging. It requires a high index of suspicion on the part of treating surgeon to avoid substantial morbidity and mortality due to its complications like gangrene of appendix or perforation of appendix [1-4].

There may not be classical symptoms and signs of appendicitis always. An accurate diagnosis can be aided by additional testing and radiological evaluation and expectant management. These might delay laparotomy and lead to complications of appendicitis and increase the morbidity. So, a safe alternative is appendicectomy, but this strategy increases negative appendicectomies. Mortality rate after appendectomy is very low and may range from 0.07 to 0.7% rising to 0.5 to 2.4% in patients with and without perforation. The therapy of acute appendicitis is aimed to early diagnosis and prompts operative intervention. However, this aim is not always easily accomplished since many patients do not seek medical attention in a timely manner and the diagnosis of appendicitis can be difficult due to negative laparotomy rate about 25% is common in many reports [5-8].

Improving the diagnostic pathway is the cornerstone for decreasing the negative appendectomy rate and the risk of wrong diagnosis. Despite the introduction of modern diagnostic imaging, such as CT, ultrasonography, population-based rates of negative appendectomy remain unchanged over time. The clinical diagnosis may be difficult to make without a classic presentation of periumbilical pain migrating to the right lower quadrant or patient populations such as women of child bearing age whose gynecologic pathologies may present similarly. However, the use of high resolution ultrasound scan and CT scan has improved the diagnostic yield of acute appendicitis in some studies. The use of leukocyte count and determination of the neutrophil fraction has been suggested as means to aid diagnostic accuracy.

Recent research literatures have hyperbilirubinemia is a diagnostic gangrenous/perforation of appendix. In some literature it has mentioned that hyperbilirubinemia is a predictor of severity of acute appendicitis [4, 9, 10]. Liver function test is one of the biochemical parameters being assessed as a marker of acute appendicitis and may also predict the severity of the inflammation. However, the available literature is limited and views are conflicting. Hence we have taken up this study to evaluate the liver function tests and access the validity of using liver function test to predict the appendicitis and its severity.

Objectives of the study

The objectives of our study include,

1. To evaluate liver function tests in subjects with acute

appendicitis and its associated complications
2. To study the percentage of elevated liver function tests parameters between normal and pathological appendix

Materials and Methods

Source of data and Study design

This cross-sectional study was conducted at Dept. of Surgery, World College of Medical Sciences and Research, from January 2019 to November 2019, Jhajjar, Haryana. 82 consecutive cases of acute appendicitis admitted to surgery unit, irrespective of age and sex were recruited for the study. We have included clinically diagnosed (Alvarado score ≥7) and USG confirmed subjects of acute appendicitis and its complications. The patients with the cases of acute appendicitis and its complications with liver disease due to any cause, history of alcohol intake and AST/ALT >2, history of jaundice and history of hepatotoxic drug intake were excluded.

Biochemical, Radiological and Histopathological Evaluation

After taking informed consents, all patients included in the study were subjected to abdominal ultrasound and blood sample taken for routine blood examination, LFT and after appendicectomy histopathology examination report were collected. A master chat prepared entering the patients name, age, sex, USG findings, LFT parameters values, histopathology examination report of excised appendicular mass.

Results

A total of 82 subjects were enrolled in the study who had been operated for Appendicitis and its complications. Out of 82 subjects, 51 were males and 31 were females. The age group commonly involved was 10-20 years followed by 21-30 years (table 1). On histopathological and intraoperative examination, 11% had normal appendix, 13% had perforated appendix, 27% had gangrenous appendix and 49% had inflamed appendix respectively (table 2). Liver function tests were evaluated in these subjects, we found that in subjects with inflamed appendix 8/40, 6/40, 2/40 had elevated levels of total bilirubin, AST, ALT respectively and none had elevated ALP. Similarly, in subjects with perforated/gangrenous appendix 28/33, 18/33, 8/33 and 7/33 had elevated total bilirubin, AST, ALT and ALP levels respectively. It is quite evident that the deranged liver function tests are more associated with Appendix Complications (table 3 and 4).

Table 1: Shows Age and Gender wise distribution of the subjects Acute Appendictis and its complications

Age Groups (years)	Number of Subjects	Males	Females
<10	6	4	2
10-20	33	21	12
21-30	28	16	12
31-40	9	7	2
41-50	4	2	2
>50	2	1	1

Table 2: Distribution of Normal and Pathological Appendix

Normal/Pathological Appendix	Number of Cases (%)
Normal Appendix	11%
Perforated Appendix	13%
Gangrenous Appendix	27%
Inflamed Appendix	49%

Table 3: Liver Function Tests Status in Normal and Pathological Appendix

	Normal Appendix	Inflamed Appendix	Gangrenous/Perforated Appendix
Total Bilirubin			
Elevated	0	8	28
Normal	9	32	5
AST/SGOT			
Elevated	4	6	18
Normal	5	34	15
ALT/SGPT			
Elevated	2	2	8
Normal	7	38	25
ALP			
Elevated	0	0	7
Normal	9	40	26

Table 4: Liver Function Tests Status in Pathological Appendix

	Inflamed Appendix	Gangrenous/Perforated Appendix	Total
Total Bilirubin			
Elevated	8	28	36
Normal	32	5	37
Total	40	33	73
AST/SGOT			
Elevated	6	18	24
Normal	34	15	49
Total	40	33	73
ALT/SGPT			
Elevated	2	8	10
Normal	38	25	63
Total	40	33	73
ALP			
Elevated	0	7	7
Normal	40	26	66
Total	40	33	73

Discussion

In the present study, out of 82 subjects, 51 were males and 31 were females. The Present study has shown male preponderance with 62.1% case of Acute Appendicitis. Similar observation of male preponderance was also seen in one of the hospital based study done in Nepal [11]. Normal appendix was seen in Histopathological findings of 9 cases (11%) out of 82 cases. This finding was similar to the observations of M. Sand *et al*. who reported 12.45% (67 out of 538) of normal appendix. Dhakal *et al*. reported 22.7% of case of negative appendectomy. But more than that of reported by Subedi *et al*. 1.4% (5 case) of normal appendix in histopathological finding out of 345 case [12-14].

Liver function tests were evaluated in these subjects, we found that in subjects with inflamed appendix 8/40, 6/40,

2/40 had elevated levels of total bilirubin, AST, ALT respectively and none had elevated ALP. Similarly, in subjects with perforated/gangrenous appendix 28/33, 18/33, 8/33 and 7/33 had elevated total bilirubin, AST, ALT and ALP levels respectively. It is quite evident that the deranged liver function tests are more associated with Appendix Complications. Similarly, Khan (2008) [15] showed AST elevated in 38.77% of case, ALT elevated in 26.54% of case and ALP elevated in 48.97% of case And Sand et.al showed an average level of AST 21.5 U/L, ranged 5-26U/L and S.D 19.2. and average level of ALT 21.8 U/L, ranged 7- 133U/L and S.D 11.1 [12, 15]. Sisson *et al*, describes the pathogenesis of the appendicitis and its complications. He demonstrated that in appendicitis there is mucosal ulceration and it facilitates the invasion of the bacteria into muscularis propria, that leading to acute suppurative appendicitis. Consequently, it leads to oedema, venous engorgement, rising of intra luminal pressure than ischemic necrosis and lastly gangrene and perforation. Translocation of pathological organisms from the inflamed appendix or gangrenous/perforated appendix to liver occurs through the portal vein. In liver, these organisms are phagocytosed by the Kupffer cells. If the bacterial load is high it overcomes the capacity of the phagocytic cells and that leads to local multiplication of the organisms and release of the cytokines like TNF, IL-6 etc. It leads to damage of liver parenchyma and alteration of the liver function test.

Estrada *et al*, found patients with complicated appendicitis have high peritoneal culture for gastrointestinal tract. According to the studies of Chaudhary *et al*, Yadav *et al*, Vineed S *et al*, Cheekuri SK *et al*, it was found that hyperbillirubinemia can be used as an indicator of complicated appendix like gangrenous or perforated appendix [16-18].

Conclusion

Liver function test should be used together with clinical examination and other laboratory investigations in the assessment of patients with suspected acute Appendicitis. LFT parameters are deranged in pathological appendix and more specifically the total bilirubin level. So LFT can be added as adjunctive test to the investigation of acute appendicitis and its complications and earlier diagnosis of the complications of acute appendicitis and timelier management.

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