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A STUDY ON ROLE OF SERUM BILIRUBIN AS A PREDICTOR IN DIAGNOSIS OF GANGRENOUS OR PERFORATED APPENDIX

General Surgery

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ABSTRACT

AIM: To find the association of hyperbilirubinemia in perforated and gangrenous appendix
METHODS: In this prospective study, 50 patients with acute appendicitis were included. Patients were evaluated by detailed history, routine examination on initial contact with patients. Bilirubin and other blood parameters were evaluated.
RESULTS: In 50 patients, 30 were male and 20 were female patients. 23 patients (46%) were had Acute appendicitis and 27 patients (54%) had Perforated /gangrenous appendicitis. Bilirubin level in acute appendicitis was 1.0mg/dl and in perforated/gangrenous appendicitis was 1.4mg/dl.
CONCLUSION: Hyperbilirubinemia was significantly higher in gangrenous and perforated appendicitis than those patients with acute appendicitis. Serum Bilirubin is an important adjunct in diagnosing the presence of gangrenous and perforated appendicitis.

KEYWORDS

Perforated Appendicitis, Hyperbilirubinemia, Diagnostics Tool.

INTRODUCTION

Acute appendicitis is one of the most common causes of the acute abdomen, occurring at all ages. Inflammation of the appendiceal wall leads to ischemia, necrosis, and eventually perforation, which may result in a localized abscess or generalized peritonitis. The inciting event is obstruction of the appendix, which is commonly due to fecoliths or calculi. However, the cause of the appendiceal obstruction varies by age, with lymphoid hyperplasia being common in children and tumors occasionally found in adults. In areas where schistosomiasis is endemic, schistosome ova have beenidentified in the appendiceal wall in patients undergoing Appendicectomy. Regardless of the etiology, the clinical features of acute appendicitis are similar. The classic symptoms include pain that migrates from the periumbilical area to the right iliac fossa, fever, anorexia, and vomiting. The diagnosis may be more challenging in children and the elderly who present with less specific features.

Most causes of acute abdominal pain can mimic the acute appendicitis. Most commonly, acute gastroenteritis, inflammatory bowel disease, right-sided diverticulitis, irritable bowel syndrome, ectopic pregnancy, ischemic colitis, psoas abscess, and mesenteric artery ischemia as diverticulitis.

Currently, there is no specific laboratory test for acute appendicitis, but the finding of leukocytosis with a left shift and elevated C-reactive protein levels increase the likelihood of acute appendicitis by a factor of 5 when history and physical findings support that clinical diagnosis. Urinalysis may reveal mild pyuria that is thought to be caused by inflammation of the ureter secondary to the proximity of the inflamed appendix to the right ureter. Recent studies suggest that levels of urinary 5-hydroxyindoleacetic acid (5-HIAA) may be elevated in the early stages of acute appendicitis secondary to the inflammation of serotonin-containing cells within the appendix.

Several Scoring systems have been developed to aid in the diagnosis of acute appendicitis (Alvaredo, Lintula and RIPASA).The Alvarado score provides a consistent and reproducible tool to help diagnosis acute appendicitis. The score is based on the scoring of symptoms, and physical and laboratory findings. Other scoring systems designed to improve the accuracy of acute appendicitis have been proposed.

The diagnosis is made on clinical grounds in many countries, and Appendicectomy has remained the standard of care in the treatment of acute appendicitis for the last century. This is despite that approximately 15% of appendectomies yield a pathologically normal appendix and that Appendicectomy is not without morbidity and, rarely, mortality. The routine use of imaging, including ultrasound and computerized tomography as an adjunct to the clinical diagnosis of acute appendicitis, has decreased the number of "normal result" appendectomies to approximately 10%.

There have been some recent studies that suggest that bilirubin, a simple biochemical test, is a positive predictor for appendiceal perforation and may be more specific than C-reactive protein (CRP) and white cell count (WCC) in the diagnosis of acute appendicitis. Hyperbilirubinaemia is caused by increased production or reduced clearance of bilirubin. Bacterial infections, especially those caused by gram-negative pathogens, affect bile production and flow. Escherichia coli is the most common organism isolated from peritoneal fluid and through inflammation and subsequent ulceration of the appendix, bacteria can enter the portal circulation. Hyperbilirubinaemia in appendicitis is thought to occur through several underlying mechanisms including intravascular hemolysis and endotoxaemia.
This study was aimed to estimate the serum bilirubin levels in patients diagnosed to have appendicitis.

MATERIALS AND METHODS:

A Prospective study of 50 inpatients admitted with acute appendicitis in surgical ward, Sri venkateshwaraa Medical College Hospital and Research Centre. Period of Study was from November 2017 to October 2019. Based on clinical diagnosis, Investigation patients were opted for emergency surgery.

INCLUSION CRITERIA

Both Male and Female patients above 19 years and below 60 years of age who presented with acute appendicitis.

EXCLUSION CRITERIA

Age less than or equal to 18 yrs more than 60 yrs both male and female patients, hepatobiliary diseases associated with hyperbilirubinemia, hemolytic diseases, history of alcoholism, Acute and chronic liver disease,History of Gastrointestinal or hepatobilary malignancies, App endicular mass were excluded from the study.

Patients who satisfy the inclusion criteria are clinically evaluated by detailed history, routine examination on initial contact with patients followed by routine investigations with liver function test.

These investigations blood samples are drawn within half an hour of presentation in the emergency department and radiological investigations are done within 2 hours of admission.

Routine LFT results are compared with laboratory reference values. These cases are operated and clinical diagnosis is confirmed intra-

operatively, acute appendicitis and acute appendicitis with perforation and/or gangrene. Their clinical and investigative data are compiled and analyzed. Based on intra-operative findings, patients are categorized as negative (acute appendicitis without perforation or gangrene) and positive (acute appendicitis with perforation and/or gangrene).

STATISTICALANALYSIS

Statistical analysis will be performed using SPSS programme for windows, version 21.0. Continuous variables are presented as mean and standard deviation and categorical variables presented as absolute numbers and percentage. Normal distribution of the data was checked before analysis. Independent sample t test was used to compare between acute appendicitis and perforated/gangrenous appendicitis.

RESULTS

In this study 50 patients were included as per inclusion and exclusion criteria. 23 patients (46%) were had Acute appendicitis and 27 patients (54%) had Perforated /gangrenous appendicitis during intraoperative evaluation. Most of the patients in our study were found to be in young aged adults aged between 21 to 30 age group. 32 % of patients are from this age group. Mean age of presentation was 31.36 years. In our study, out of 50 cases 30 (60%) were males and 20 (40%) were females.Out of 50 cases, (76%) 38 patients had Nausea/Vomiting. Out of 50 cases, (56%) 28 patients had fever. In our study, 31 patients (62%) had bilirubin level more than 1.2mg/dl, 19 patients (38%) had bilirubin level less than 1.2mg/dl.Alvarado score of acute appendicitis patients was 6.5 and in perforated/gangrenous appendicitis was 8.6. There was a significant difference noted in Alvarado score between acute appendicitis and perforated/gangrenous appendicitis, p value <0.0001.The mean bilirubin level of acute appendicitis was 1.0mg/dl and in perforated/gangrenous appendicitis was 1.4mg/dl. There was a significant difference noted in bilirubin level between acute appendicitis and perforated/gangrenous appendicitis, p value <0.0001.

DISCUSSION

Diagnosis of acute appendicitis can be difficult, especially in women. A delay in the diagnosis and management can lead to appendix rupture and subsequent peritonitis. Despite advances in technology and imaging modalities, there is no blood marker for acute appendicitis, and therefore we cannot reliably make the diagnosis of acute appendicitis based on one test or sign but rather by a combination of clinical, laboratory, and radiologic examinations were indicated. Over the last decade, some attention has been drawn to the association between hyperbilirubinemia and appendicitis. Perhaps this could be explained by the over-ordering of "routine" blood tests in the emergency department. As a result, more studies are performed to test this hypothesis.

It would be ideal and facilitate the diagnosis of acute appendicitis if the appendix had a unique biochemical marker that would be highly diagnostic of acute appendicitis if positive. A meta-analysis proposed that an elevated bilirubin along with clinical signs of acute appendicitis should be considered for early Appendicectomy because there was a greater chance of appendiceal perforation.[1] In our study 50 patients were included with the diagnosis of appendicitis. A higher number of cases were found in age group of 21 to 30 years (32%) followed by 31 to 40 years (26%). In a study done by Ghnnam, W. higher number of young patients were admitted during the study (63%). [2]Sartelli M et al. in an international study POSAW done in 116 worldwide surgical departments from 44 countries over a 6-month period were found that the median age of the patients with acute appendicitis was 29 years with interquartile range of 21 to 44 years. This result demonstrates that the prevalence of this disease in young population.[3] In our study we found male patients are higher in number than female patients. This POSAW study reported 55% of patients were male in their worldwide study.[3] Addiss DG et al. reported male predominance in his epidemiological study and males are having overall lifetime risk of having acute appendicitis.[4]

The presentation of acute appendicitis generally follows a typical sequence of events: the sudden or gradual onset of vague periumbilical or epigastric pain followed by anorexia, nausea, and vomiting. In our study, 76% of patients had nausea and vomiting, 14% of patients had anorexia, 56% of patients had fever. POSAW study reported right lower quadrant pain and tenderness were the most frequently reported symptoms followed by vomiting, fever, and diffuse tenderness.[3] At times the initial pain may be felt all over the abdomen. Nausea and anorexia (with or without emesis) are the next symptoms to follow, a consequence of bowel wall distention. To date, a reliable specific marker of acute appendicitis has not yet been identified. Despite advances in technology and investigation modalities, the rate of negative appendicectomies remains between 15% and 50%.[5]

Hyperbilirubinemia, defined as an excessive amount of bilirubin in the blood, either because of increased bilirubin production or alteration of bilirubin clearance, has not been well recognized as a potential laboratory marker for aiding preoperative diagnosis of a perforated appendix. Both mechanisms, increased production, and alteration of bilirubin clearance lead to an accumulation of bilirubin and might play a role in the observed hyperbilirubinemia of patients with appendiceal perforation. In our study, hyperbilirubinemia was noted in 62% of appendicitis patients.

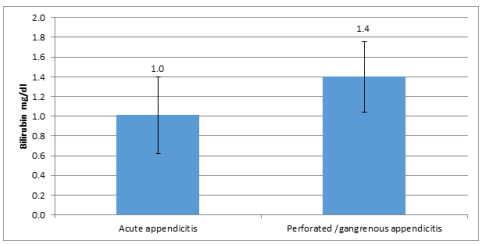
In the study done by Sand M et al.[6], 1.5 mg/dL for the patients with perforated appendicitis. Jaundice in the context of appendicitis has been well described in the literature over 60 years ago.[7] It is postulated that elevated serum bilirubin occurs as a result of portal sepsis or empyema, resulting in liver hepatocytes dysfunction or damage.[5] This is thought to be caused by bacterial endotoxins or cytokines. In a diagnostic meta-analysis study done by Giordano et al.,[8] in 5,000 patients concluded that hyperbilirubinemia alone is not a strong enough predictor of perforation. A study done by Khan[5] showed that 86% of patient with appendicitis and its complications had developed hyperbilirubinemia. Another study done by Emmanuel et al. in 2011[9] showed that hyperbilirubinemia is a significant marker for simple acute appendicitis and not only for appendiceal perforation.

This study shows that hyperbilirubinemia is an independent predictor of appendiceal perforation, with nearly a threefold risk of perforated appendicitis in patients with total bilirubin levels greater than 1 mg/dl. Some bacteria, including E. Coli have been associated with increased levels of total serum bilirubin levels.[10]Atahan et al.[11] concluded that the assessment of preoperative total bilirubin is useful for the differential diagnosis of perforated versus acute suppurative appendicitis, whereas a white blood cell (WBC) assessment is effective for diagnosing the presence versus absence of appendicitis. Symptom duration, WBCs, and total bilirubin should be used as independent parameters in the early diagnosis of appendix perforation. Most patients with perforated appendicitis have hyperbilirubinemia (54%), whereas, in patients with acute appendicitis, only 46% had elevated bilirubin. These findings were comparable to the study conducted by Kumar et al., which specified 63% versus 33%, respectively.[12] These findings suggested hyperbilirubinemia was more commonly associated with appendicular perforation than with non-suppurative appendicitis, that too with a significant elevation. In our study, the mean value of bilirubin in appendicular perforations is 1.4mg/dl, which was comparable to Kumar et al., who found that more than 1.5 mg/dl was predictive of appendicular perforation.[12] Motie et al. found that bilirubin >0.85 mg/dl was the cutoff value for the prediction of perforated appendicitis.[13] Mir et al. found that increased bilirubin levels (≥1.5 mg/dl) were found to have a high positive predictive value for detecting perforated appendicitis.[14]In our study, the mean value of bilirubin in acute appendicitis is 1mg/dl. This finding was comparable to studies by Cheekuri et al., who found that bilirubin of 1.125 was predictive of acute appendicitis.[15]

Table 1 Distribution of Bilirubin level with intraoperative diagnosis

Bilirubin	N	Mean	Std. Deviation	P value
Acute appendicitis	23	1.0	0.4	<0.0001
Perforated /gangrenous appendicitis	27	1.4	0.4	

Figure 1 Distribution of Bilirubin level with intraoperative diagnosis



CONCLUSION

To conclude, diagnosis of acute appendicitis, however, remains multifactorial and such tests simply help to guide the surgeon in the decision-making process. Hyperbilirubinemia was significantly higher in gangrenous and perforated appendicitis than those patients with acute appendicitis. Serum Bilirubin is an important adjunct in diagnosing the presence of gangrenous and perforated appendicitis. Patients presenting with elevated levels of serum bilirubin in the context of right iliac fossa pain warrant early surgical intervention.

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