

Original Research Article

Role of serum bilirubin in predicting the severity of acute appendicitis

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ABSTRACT

Background: The aim of the study was to establish the role of hyperbilirubinemia as a new diagnostic tool to predict gangrenous/perforated appendicitis.

Methods: A prospective study carried for 9 months (March 2018 to November 2018) at Rajarajeswari Medical College and Hospital. All patients admitted with clinical diagnosis of acute appendicitis and posted for surgery were included in the study. Serum total bilirubin results will be compared with Rajarajeswari Medical College and Hospitals laboratory reference values. These cases will be operated and clinical diagnosis will be confirmed pre-operatively and post-operatively by histopathological examination. Final histopathological examination will be considered as a gold standard for diagnosing and categorizing patients as having normal appendix, acute appendicitis and acute appendicitis with perforation and/or gangrene. Based on histopathological examination patients will be categorized as positive (acute appendicitis with perforation and/or gangrene) and negative (acute appendicitis without perforation or gangrene).

Results: Sensitivity of serum bilirubin in case of perforated/gangrenous appendicitis was found to be 90%. Specificity of serum bilirubin was found in case of perforated/gangrenous appendicitis was found to be 90.47%. Positive predictive value and negative predicting value of serum bilirubin in perforated/gangrenous appendicitis was found to be 81.8% and 95% respectively with p value of 0.003.

Conclusions: Serum total bilirubin is an easily available and cheap and can be estimated from the same blood sample withdrawn for routine investigations, if added to routine investigations, then diagnosis of complicated appendicitis can be made with fair degree of accuracy.

Keywords: Perforated appendicitis, Gangrenous appendicitis, Total bilirubin, Appendicectomy

INTRODUCTION

Acute appendicitis remains one of the most common acute abdomen and surgical emergency dealt every day in surgery department. It is estimated that as much as 6% to 7% of the general population will develop appendicitis during their lifetime.^{1,2} Delay in diagnosis and surgery for this condition may lead to various complications like perforation, abdominal abscess, urinary retention, small bowel obstruction and peritonitis causing an increase in morbidity and even mortality of the patients. Acute appendicitis is the most common intra-abdominal

infectious focus in a surgical patient and *Escherichia coli* and *Bacteroides fragilis* are the most frequent bacterial isolates in this condition.³ In appendicitis, compromised appendix wall integrity leads to translocation of bacteria and endotoxins from the appendix lumen into the portal system.⁵ It has been hypothesized that following appendicitis inflammatory agents like TNF alpha, IL-6 and cytokines usually migrate to the liver via portal vein causing inflammation, abscess or even liver dysfunction.³ Bacteremia is known to cause endotoxemia leading to impaired excretion of bilirubin from the bile canaliculi.^{3,5}

There are only a few reports in the literature that correlate hyperbilirubinemia with complicated appendicitis.

Need for the study

Total bilirubin levels upon admission can be used in conjunction with other diagnostic tests such as ultrasonography and routine investigations to help determine the presence of complicated appendicitis and aid in proper clinical management.

- To avoid unnecessary delay in surgery.
- Need for higher antibiotic coverage.
- Patient counseling.

Aim

The aim of the study was to establish the role of hyperbilirubinemia as a new diagnostic tool to predict gangrenous/perforated appendicitis.

METHODS

Study centre: The study was carried out in Rajarajeswari Medical College and Hospital.

Study duration: 9 months (March 2018 to November 2018)

Study design: Prospective observational study.

Study population: Patients who are admitted in the general surgery/casualty ward in Rajarajeswari Medical and hospitals with suspicion of acute appendicitis posted for appendicectomy.

Patients were clinically evaluated by detailed history, routine examination on initial contact with patients and the routine investigations as per surgery and anesthesia requirements with inclusion of serum total bilirubin.

Table 1: Reference values of serum bilirubin.

Test	Normal range
Total	1.2 mg/dl
Direct	0.2 mg/dl

Serum total bilirubin results will be compared with Rajarajeswari Medical College and Hospitals laboratory reference values given in Table 1. These cases will be operated and clinical diagnosis will be confirmed per-operatively and post-operatively by histopathological examination.

Final histopathological examination will be considered as a gold standard for diagnosing and categorizing patients as having normal appendix, acute appendicitis and acute appendicitis with perforation and/or gangrene.

Based on histopathological examination patients will be categorized as positive (acute appendicitis with perforation and/or gangrene) and negative (acute appendicitis without perforation or gangrene).

RESULTS

Total of 72 patients were admitted with diagnosis of acute appendicitis.

Out of 72 patients, 10 were managed conservatively (mass formation) and was called for interval appendectomy after 6 weeks.

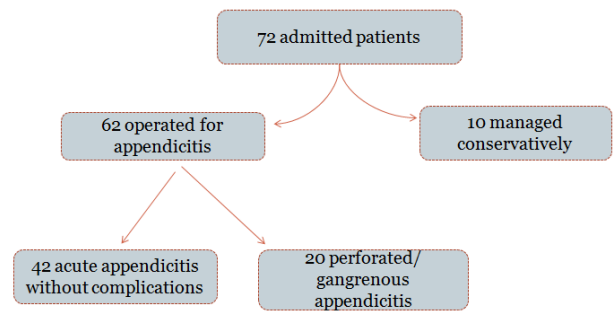


Figure 1: Showing the distribution of patients in the study.

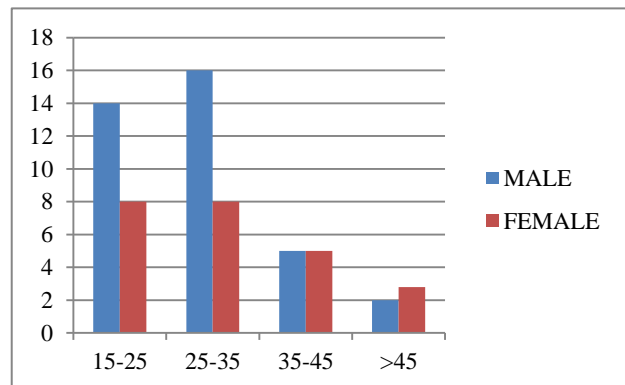


Figure 2: Age distribution.

Out of 72 patients of appendicitis there was an increase in incidence of acute appendicitis in age group of 15 to 35 with 46 patients as shown in Figure 2.

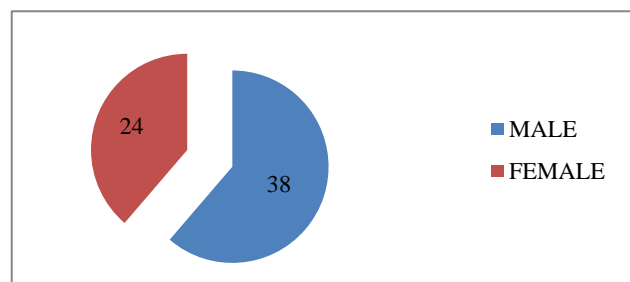


Figure 3: Gender distribution.

As shown in Figure 3 there is increased incidence in male population with male female ration of 1.5:1.

Table 2: Comparison of mean serum bilirubin levels in patients with, acute appendicitis and complicated appendicitis.

Bilirubin	Acute catarrhal appendicitis	Acute complicated appendicitis
Mean total bilirubin	0.9 mg/dl (0.4 to 1.3)	1.45 mg/dl (0.9 to 4.2 mg/dl)

The mean total bilirubin was found to be 0.9 mg/dl in acute catarrhal appendicitis and 1.45 mg/dl in acute complicated appendicitis respectively as shown in Table 2.

Table 3: Showing HPE correlation.

Histopathology	Total bilirubin <1.2 mg/dl	Total bilirubin >1.2 mg/dl	Total
Acute appendicitis	38	4	42
Gangrenous appendicitis	0	8	8
Perforated appendicitis	2	10	12
Normal appendix	0	0	0
Total	40	22	62

As shown in Table 3 out of 62 patients, 42 patients had acute catarrhal appendicitis, 8 patients had gangrenous appendicitis, 12 patients had perforated appendicitis, and we never encountered normal appendix either in intra op or post op.

In acute catarrhal appendicitis group 38 patients showed normal total bilirubin levels, whereas 4 patients showed increase in levels of total bilirubin.

In gangrenous appendicitis group all 8 patients showed elevated serum total bilirubin levels

In perforated appendicitis group consisted of 12, 10 patients showed elevated serum bilirubin levels and 2 patients showed normal total bilirubin levels.

Sensitivity of serum bilirubin in case of perforated/gangrenous appendicitis was found to be 90%.

Specificity of serum bilirubin was found in case of perforated or gangrenous appendicitis was found to be 90.47%.

Positive predictive value and negative predicting value of serum bilirubin in perforated/gangrenous appendicitis

was found to be 81.8% and 95% respectively with p value of 0.003.

DISCUSSION

Bilirubin is not commonly known to be a relevant marker in appendicitis.² Hepatic dysfunction as a result of bacterial infection or sepsis without direct invasion of the liver, has already been well described.³ In appendicitis, compromised appendix wall integrity leads to translocation of bacteria and endotoxins from the appendix lumen into the portal system.⁵ Bacteremia is known to cause endotoxemia leading to impaired excretion of bilirubin from the bile canaliculi.³ This study has shown there is a high sensitivity and specificity serum bilirubin 90% and 90.47% respectively with good positive predictive value of 81.8% and high negative predictive value of 95% with p value of 0.003 in case of complicated appendicitis, and should alert the surgeon regarding the possibility of this diagnosis.

Cheekuri et al in 2017 conducted a prospective study Hyperbilirubinemia as a predictor of the severity of acute appendicitis- an observational study with sample size of 110 showed results of sensitivity 94%, specificity 66%, PPV 88.5%, NPV 80%.¹

D'souza et al conducted a prospective study Bilirubin; a diagnostic marker for appendicitis with sample size of 143 showed results of sensitivity 70%, specificity 82%, PPV 47%, NPV 93%.³

S. Khan in 2008 conducted a prospective study of total bilirubin levels in appendicitis with sample size of 110 showed a results of sensitivity 87%, specificity 100%, PPV 100%, NPV 17.3%.⁷

Giordino et al conducted a meta-analysis Elevated serum bilirubin in assessing the likelihood of perforation in acute appendicitis: a diagnostic meta-analysis including 8 studies with sample size of 4974 showed sensitivity 49%, specificity 82%.⁵

In summary pre-operative serum total bilirubin can diagnose acute complicated appendicitis from catarrhal appendicitis with fair degree of accuracy.

CONCLUSION

Serum bilirubin is easily available test and cheap and can be estimated from the sample of blood drawn for routine blood investigations.

If serum bilirubin is added to existing lab investigations, then diagnosis of complicated appendicitis can be made with fair degree of accuracy which in turn helps in reducing the need for CECT, unnecessary delay in surgery can be avoided.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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