EVALUATION OF HYPERBILIRUBINAEMIA AS A NEW DIAGNOSTIC MARKER FOR ACUTE APPENDICITIS AND ITS ROLE IN THE PREDICTION OF APPENDICULAR PERFORATION

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ABSTRACT

BACKGROUND

There are various investigations recommended to diagnose acute appendicitis; however, till date there is no confirmatory laboratory marker to diagnose preoperatively acute appendicitis & appendicular perforation. The purpose of study is to evaluate hyperbilirubinaemia as a new diagnostic marker for acute appendicitis and its role in the prediction of appendicular perforation. Preoperative assessment of serum bilirubin appears to be a promising new laboratory marker for diagnosing acute appendicitis & have a predictive potential for the diagnosis of appendicular perforation.

METHODS

A prospective analytical study of 100 cases comprising of a non-randomised cohort.

RESULTS

Hyperbilirubinaemia was found in most of the patients diagnosed with acute appendicitis (68.23%) or appendicular perforation (73.33%). The mean total bilirubin level in patients diagnosed with acute appendicitis was 1.34 mg% while in patients diagnosed with appendicular perforation was 2.12 mg%.

CONCLUSIONS

Preoperative assessment of serum bilirubin should be routinely performed in cases of acute appendicitis as it can help in diagnosis of acute appendicitis as well as also serve as an important maker of acute gangrenous appendicitis.

KEYWORDS

Appendicitis, App. Perforation, Preop. Assessment, Hyperbilirubinaemia.

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INTRODUCTION: Appendectomy is one of the most commonly performed abdominal surgeries in an emergency setting. 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. On the other hand, too aggressive surgical approach may lead to an increased rate of negative appendectomies. The incidence of perforated appendicitis in adults has been reported from 13–37% or higher.[1,2] Appendicitis has been shown to have a strong association with hyperbilirubinaemia. It has been hypothesised that following appendicitis inflammatory agents like TNF alpha, IL-6 and cytokines usually migrate to the liver via the superior mesenteric vein producing inflammation, abscess or dysfunction of the liver function. These inflammatory agents may also alter the hepatic blood flow and normal physiological flow of the bile causing hyperbilirubinaemia.[3-8] Few other studies have compared various inflammatory agents with total bilirubin as a predictive marker of perforation of appendix. Though various imaging modalities like computed tomography (CT) scan, magnetic resonance imaging (MRI) and ultrasonography may help in early diagnosis of perforated appendix, they may not be readily available in many health centres of the third world and developing countries.[9-14] In such condition, clinical and laboratory investigations may be the only cheaper and readily available options for diagnosis. In the present study, we have tried to compare the difference in the level of serum bilirubin between patients with gangrenous and non-gangrenous appendicitis. The present study was undertaken to assess the relationship between hyperbilirubinaemia and acute appendicitis, to evaluate its credibility as a marker for diagnosing acute appendicitis and to assess the predictive potential for diagnosis of appendicular perforation.

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AIMS & OBJECTIVES- 1. To study the relationship between hyperbilirubinaemia & appendicitis. 2. To evaluate its credibility as a diagnostic marker for appendicitis. 3. To evaluate whether hyperbilirubinaemia has a predictive potential for diagnosis of appendicular perforation.

METHODS: A prospective analytical study was carried out comprising of a non-randomised cohort which was followed up from admission to the hospital till discharge in Dr. S. N. Medical College, Jodhpur, Rajasthan. The sample comprised of 100 patients operated for appendicitis and confirmed by HPE in between January 2014-December 2015.

Patients undergoing interval appendectomies, appendectomies for other indications and patients with negative appendectomies confirmed on histological report were excluded from the study. Other exclusion criteria were patients with risk factors for hepatic disease such as alcoholism, a history of viral hepatitis, acquired or congenital biliary disorders, and other documented biliary, haemolytic or liver diseases associated with hyperbilirubinaemia.

RESULTS & OBSERVATIONS:

	Number	Percent
Acute appendicitis	69	69
Appendicular perforation	11	11
Normal	100	100

Table 1: Ultrasonographic Findings

Total bilirubin level (mg/dL)	Number	Percent
>1.0	69	69
≤1.0	31	31
Total	**100**	**100**

Table 2: Total Bilirubin Levels (n=100)

31 patients (31%) of all 100 patients were found to have normal bilirubin level (≤1.0 mg/dL), while 69 patients (69%) had raised bilirubin levels (>1.0 mg/dL).

Serum bilirubin levels (mg/dL)	Mean	SD
Total bilirubin	1.46	0.699
Direct bilirubin	0.85	0.511
Indirect bilirubin	0.61	0.293

Table 3: Mean and SD value of Serum bilirubin Levels

The mean total bilirubin of all 100 patients was 1.46±0.699 (mg/dL) while the direct bilirubin was 0.85±0.511 (mg/dL) and indirect bilirubin was 0.61±0.293 (mg/dL).

Final diagnosis	Number (n=100)	Percent
Acute appendicitis	85	85
Appendicular perforation	15	15
Total	**100**	**100**

Table 4: Final (Postop) Diagnosis

Serum bilirubin (mg/dL)	Final diagnosis (n=100)			
	Number	Percent	Number	Percent
≤1	27	31.77	4	26.67
>1	58	68.23	11	73.33
Total	**85**	**100**	**15**	**100**

Table 5: Correlation of s. bilirubin in Appendicitis & app. Perforation

58 patients (68.23%) of the total patients diagnosed with acute appendicitis (n=85) were found to have elevated bilirubin levels (>1/0 mg/dL), while 27 patients (31.77%) had normal bilirubin levels (≤1.0 mg/dL). Similarly, 11 patients (73.33%) diagnosed with appendicular perforation (n=15) were found to have elevated bilirubin levels (>1.0 mg/dL) while 04 patients (26.67%) had normal bilirubin levels (<1.0 mg/dL).

Serum bilirubin (mg/dL)	Acute appendicitis			Appendicular perforation			P value
	Number	Mean	SD	Number	Mean	SD	
Total bilirubin	85	1.34	0.54	15	2.12	1.17	0.0001
Direct bilirubin	85	0.74	0.35	15	1.35	0.88	<0.0001
Indirect bilirubin	85	0.58	0.26	15	0.77	0.38	0.017

Table 6: Comparison of mean S. Bilirubin with Ac. Appendicitis and App. Perforation

The mean bilirubin levels in patients diagnosed as acute appendicitis was 1.34±0.50 mg/dL while in patients diagnosed as appendicular perforation was 2.12±1.17 mg/dL. The direct and indirect bilirubin in patients diagnosed as acute appendicitis were 0.76±0.35 mg/dL and 0.58±0.26 mg/dL respectively. The direct and indirect bilirubin in patients diagnosed as appendicular perforation were 1.35±0.88 mg/dL and 0.77±0.38 mg/dL respectively.

Intraoperative findings	Number (n=100)	Percent
Inflamed appendix	85	85
Perforated appendix	15	15
Total	**100**	**100**

Table 7: Intraoperative Findings

Intraoperatively, 85 patients were confirmed as appendicitis & 15 - perforated appendix.

Diagnosis	Number (n=100)	Percent
Acute appendicitis	85	85
Appendicular perforation	15	15
Total	**100**	**100**

Table 8: Histopathological Diagnosis

Histopathologically, 85 patients were confirmed as appendicitis & 15 - App. perforation.

The mean bilirubin levels in patients diagnosed as acute appendicitis was 1.34±0.50 mg/dL while in patients diagnosed as appendicular perforation was 2.12±1.17 mg/dL. The direct and indirect bilirubin in patients diagnosed as acute appendicitis were 0.76±0.35 mg/dL and 0.58±0.26 mg/dL respectively. The direct and indirect bilirubin in patients diagnosed as appendicular perforation were 1.35±0.88 mg/dL and 0.77±0.38 mg/dL respectively.

Total bilirubin level (mg/dL)	Histopathological diagnosis (n=100)		Total
	Acute appendicitis	Appendicular perforation	
>1	58 (a)	11(b)	31
<1	27 (b)	4 (d)	69

Table 9: Relation of Bilirubin Level with histopath. diagnosis

DISCUSSION: Appendicitis is the most common surgery performed for acute abdominal pain. Delay in surgery in these cases due to any reasons; delayed presentation or mistaken judgment, leads to dreaded complications like gangrenous changes and perforation. The rate of morbidity and mortality for patients operated for perforated or gangrenous appendicitis is much higher than those operated for non-gangrenous appendicitis. Diagnosis of appendicitis and even perforated appendicitis is entirely based on clinical assessment and judgment of the treating surgeon. Various radiological investigations like USG and multidetector CT scans can detect appendicitis with high precision but they are very unspecific; the diagnosis of perforation can be made only when there is abscess or extraluminal gas present in the peritoneal cavity. Recently, few studies have investigated the role of serum bilirubin in diagnosis of perforated appendicitis. Study conducted by Estrada JJ et al (2007) has found hyperbilirubinaemia to be an important predictive marker for perforated and necrotizing appendicitis. In this series of 157 patients, the odds of gangrenous and perforated appendicitis was found to be 3 times higher for patients having hyperbilirubinaemia than those with normal bilirubin level.[15] Similarly, another study conducted by Sand M et al(2009) investigated 538 patients to determine the value of serum bilirubin in diagnosing acute suppurative or necrotising appendicitis and found that the specificity of serum bilirubin was higher (86%) than other markers like WBC (55%) and C-reactive protein (CRP) (35%) in diagnosing gangrenous and perforated appendicitis[16]. A retrospective analysis conducted by Atahan K et al (2011) including 351 cases of acute appendicitis investigated preoperative markers for perforated appendicitis; found that symptom duration (p=0.002), total bilirubin (p=0.000) and elevated leucocyte counts (p=0.011) were significant independent variables for identifying acute perforated appendicitis against the suppurative ones.[17]

A retrospective cohort study performed in two centres by Käser SA et al (2010) involving 155 cases of perforated appendicitis and 570 cases of non-perforated appendicitis were compared for hyperbilirubinaemia, CRP, leucocyte count and age as a marker of perforated appendicitis. They came to the conclusion that hyperbilirubinaemia is a statistically significant marker of perforated appendicitis, but they also found CRP to be a superior marker of perforation than hyperbilirubinaemia.[18]

In our study of 100 patients, 85 patients were diagnosed as acute appendicitis while 15 patients were diagnosed with appendicular perforation. Among the patients diagnosed with acute appendicitis (n=85), 58 patients (68.23%) were found to have elevated bilirubin (>1.0 mg%) while only 27 patients (31.77%) had normal bilirubin level (<1.0 mg%). In patients diagnosed as appendicular perforation (n=15), 11 patients (73.33%) had bilirubin elevated (>1.0 mg%), while only 4 patients (26.67%) had normal level of bilirubin (<1.0 mg%). Thus, hyperbilirubinaemia was found in most of the patients diagnosed with acute appendicitis (68.23%) or appendicular perforation (73.33%). The mean total bilirubin level in patients diagnosed with acute appendicitis was 1.34 mg% while in patients diagnosed with appendicular perforation was 2.12 mg%.

Hence, we see that patients with appendicular perforation had higher levels of bilirubin as compared to that of acute appendicitis. So we infer that patients with features suggestive of acute appendicitis with higher value of bilirubin are more susceptible of having appendicular perforation. This is in concordance with the study conducted by Sand et al (2009).[16]

CONCLUSION: Serum bilirubin level appears to be a promising new laboratory marker for diagnosing acute appendicitis; however, diagnosis of acute appendicitis remains essentially still clinical. The level of serum bilirubin comes out to be a credible aid in diagnosis of acute appendicitis and would be a helpful investigation in decision making. So, preoperative assessment of serum bilirubin should be routinely performed in cases of acute appendicitis as it can help in diagnosis of acute appendicitis as well as also serve as an important maker of acute gangrenous appendicitis.

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