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Original Research Article

The Value of Hyperbilirubinemia in the Diagnosis of Acute Appendicitis

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Abstract

Background: Appendix inflammation is referred to as appendicitis. It's a medical emergency that almost always necessitates appendix removal surgery as soon as feasible. There is currently no reliably specific marker for acute appendicitis. Although C-reactive protein (CRP) is frequently utilized in the assessment of suspected appendicitis, its specificity varies significantly among studies and can only be dramatically elevated if appendiceal perforation occurs.

Material and Method: A general of two hundred sufferers had pressing appendicectomies completed for the duration of the observe length and 172 have been protected withinside the observe. Patients have been divided into 4 agencies in line with their histology findings.

Result: Mean bilirubin levels were higher in patients with simple acute appendicitis than in those with an uninflamed appendix (18.7 vs. 14.5 mol/l, $p<0.001$), and they also had noticeably more patients with hyperbilirubinemia at the time of admission (30% vs. 12%, $p<0.001$). Patients with hyperbilirubinemia are more than three times as likely to experience simple acute appendicitis as those without it (odds ratio [OR]: 3.25). With a 91% positive predictive value, hyperbilirubinaemia exhibited an 88% specificity for simple acute appendicitis.

Conclusion: A precise diagnostic for acute appendicitis with a high positive predictive value is bilirubin. It is also a useful sign of those who are more prone to have gangrene or an appendiceal perforation. When evaluating individuals with suspected acute appendicitis, bilirubin should be utilised in conjunction with clinical examination and other laboratory findings.

Keywords: Acute appendicitis, Hyperbilirubinaemia, Diagnostic, white cell count and CRP

Background

Appendix inflammation is referred to as appendicitis. It's a medical emergency that almost always necessitates appendix removal surgery as soon as feasible. A increased white mobile count (WCC) is not specific for appendicitis [1]. Appendicitis and jaundice have been linked, and studies have shown that hyperbilirubinemia is a useful indicator of appendiceal perforation. Those studies no longer take into account bilirubin as a specific marker for acute appendicitis, though [2,3].

The best way to treat appendicitis is still being debated, however many studies point to the possibility of non-operative management using antibiotics. In many hospitals, the diagnosis of acute appendicitis is made on the basis of medical evidence, and patients in whom the diagnosis is uncertain or who no longer exhibit peritonism symptoms are typically managed with a course of observation to avoid needless surgery [4]. In determining which patients are likely to have appendicitis and should be considered for surgery, a straightforward, inexpensive biochemical examination that is tailored for acute appendicitis can be helpful. The goal of this investigation was to assess the value of hyperbilirubinemia as a sign of acute appendicitis [5,6].

Materials and Methods

We completed a retrospective evaluate of all appendicectomies completed in hospital. Patients have been recognized the usage of a present database (Lothian surgical audit system) and taken into consideration for inclusion withinside the observe if that they'd an pressing ppendicectomy completed through any approach for the duration of the observe length Patients have been excluded from the observe in the event that they did now no longer have LFTs completed on admission, in the event that they had a record of showed hepatitis or liver disorder or in the event that they have been acknowledged to have consistently deranged LFTs.

A general of two hundred sufferers had pressing appendicectomies completed for the duration of the observe length and 172 have been protected withinside the observe. According to histology results, patients were classified into 4 agencies. Patients in group 1 had an uninfected appendix, patients in group 2 had acute appendicitis, patients in group 3 had appendicitis with an inflammatory infiltrate extending through the entire thickness of the appendix wall up to the serosa, and patients in group 4 had perforated or gangrenous appendages.

A bilirubin level of more than 20.5 mol/l, an elevated WCC of more than 10 x 109/l for patients over 12 years of age and more than 13 x 109/l for those under 12, and an elevated CRP of more than 10 mg/l are all considered hyperbilirubinaemia. These numbers matched the upper bounds of the standard reference tiers used by each institution's laboratory offerings.

Results

Of the 172 sufferers blanketed withinside the study, eighty-one sufferers (47.09%) had been male. Table 1 indicates the distribution of sufferers via way of means of histology group. Thirty- two (18.61%) had a noninflamed appendix.

Table 1: Groupings according to histology are described, and patients are assigned to groups.

Group	Description	No. of patients (% 0f total)	No. of patients with hyperbilirubinaemia (%)
1	No acute inflammation	32 (18.61%)	8 (25%)
2	Acute appendicitis	95 (55.23%)	43 (45%)
3	Acute appendicitis with inflammatory infiltrate extending through full thickness of appendiceal wall	24 (13.95%)	13 (54%)
4	Perforated or gangrenous appendix	21 (12.21%)	14 (67%)
Total		172 (100%)	78

Mean bilirubin levels were higher in patients with simple acute appendicitis than in those with an uninflamed appendix (18.7 vs. 14.5 μmol/l, p<0.001), and they also had noticeably more patients with hyperbilirubinemia at the time of admission (30% vs. 12%, p<0.001). Patients with hyperbilirubinemia are more than three times as likely to experience simple acute appendicitis as those without it (odds ratio [OR]: 3.25). For simple acute appendicitis, hyperbilirubinemia exhibited an 88% specificity and a 91% positive predictive value (Table 2).

Table 2: Raised bilirubin, White cell count (WCC), and C-reactive Protein (CRP) values are used to distinguish between non-inflamed appendices and uncomplicated acute appendicitis.

Parameters	Sensitivity	Specifivity	Positive predictive value	Negative predictive value	Likelihood ratio positive (95% Cl)	Likelihood ratio Negative (95% Cl)
Bilirubin	30%	88%	91%	24%	2.57 (1.40-4.70)	0.79 (0.71-0.88)
WCC	82%	60%	90%	42%	2.05 (1.57-2.67)	0.30 (0.23-0.40)
CRP	64%	71%	93%	23%	2.16 (1.02-4.58)	0.52 (0.35-0.76)

Patients with gangrenous or perforated appendices had mean bilirubin levels that were higher (23.1 μmol/l vs. 18.7 μmol/l, p=0.01) than those with simple acute appendicitis. The odds of a patient having a perforated or gangrenous appendix were over three times greater in those with hyperbilirubinaemia (60% vs 30%, p<0.001) and significantly more patients with a perforated or gangrenous appendix than those with uncomplicated acute appendicitis (OR: 3.47). Seventy percent of people with hyperbilirubinemia had perforated or gangrenous appendices (Table 3).

Table 3: Values of elevated bilirubin, WCC, and CRP for distinguishing between simple acute appendicitis and perforated or gangrenous appendicitis

Parameters	Sensitivity	Specifivity	Positive predictive value	Negative predictive value	Likelihood ratio positive (95% Cl)	Likelihood ratio Negative (95% Cl)
Bilirubin	60%	70%	21%	92%	1.99 (1.49-2.65)	0.57 (0.40-0.83)
WCC	93%	19%	13%	96%	1.16 (1.05-1.27)	0.34 (0.11-1.05)
CRP	91%	36%	13%	98%	1.43 (1.13-1.81)	0.25 (0.04-1.65)

In simple acute appendicitis, the specificity of WCC increased to 60%; for appendiceal perforation or gangrene, it increased to 19%. CRP levels were tested on admission in only a small number of patients. Mean CRP levels were significantly higher in patients with perforated or gangrenous appendix than in patients with simple acute appendicitis (130.0 mg/L vs. 55.6 mg/L, p=0.02). However, only 36% of patients had elevated appendix-specific CRP. perforation or gangrene.

Neither mean bilirubin levels (p=0.15) nor the percentage of patients with hyperbilirubinemia (p=0.21) were significantly different between patients with appendicitis and patients without full-thickness inflammatory infiltrate (group 2).

Patients with simple acute appendicitis and those with non-infected appendices, as well as those with a ruptured or gangrenous appendix and those with simple acute appendicitis, showed no appreciable difference in any of the various LFTs' diagnostic phases.

Swabs of intraperitoneal fluid were obtained intraoperatively from a total of 61 patients for bacterial culture, and 37 (60.7%) of those samples produced a positive result. Escherichia coli and mixed anaerobes were the most frequently grown organisms, showing up in 46% and 36% of good cultures, respectively. Blood cultures were obtained from 47 patients upon admission, however none of them produced any notable positive cultures.

The most accurate threshold bilirubin level with the optimum combination of sensitivity and specificity was determined by the ROC curve for bilirubin levels in patients with simple acute appendicitis to be 15 μmol/l. At this stage, the sensitivity and specificity of hyperbilirubinaemia may be 57% and 72%, respectively, approaching levels similar to CRP in our investigation. The specificity of the laboratory diagnostic threshold for hyperbilirubinaemia, however, is much greater at 88%.

According to a logit regression study, WCC (p0.001) and hyperbilirubinaemia (p=0.01, OR: 2.63, 95% confidence interval [CI]: 1.27-5.47) were significantly linked with simple acute appendicitis. Acute appendicitis was not shown to be substantially correlated with age or any of the other LFTs. A ruptured or gangrenous appendix was likewise linked with hyperbilirubinaemia in appendicitis (p0.001), although WBC was not (p=0.12).

Discussion

The progression of jaundice in sepsis is well known and has been linked to a wide variety of causing microorganisms, with gram-bad microorganisms being most frequently blamed. Numerous factors that contribute to hyperbilirubinemia in systemic infections have been identified [7]. Escherichia coli and other microorganisms have been linked to hemolysis, which causes an increased bilirubin load [8,9]. Bacterial endotoxin causes a cytokine-mediated blockage of the systems that transport bile salts, which leads to cholestasis [10,11]. Escherichia coli is the most prevalent bacteria grown from intraperitonealfluid in appendicitis, as was the case in this investigation.12,13 It is associated to the endotoxin lipopolysaccharide. Due to bacteraemia or endotoxaemia, which can occur in both uncomplicated and perforated or gangrenous appendicitis but more frequently in the latter, hyperbilirubinaemia most likely develops in appendicitis [14,15].

However, no study discusses the value of hyperbilirubinemia as a factor in predicting simple acute appendicitis. According to our findings, hyperbilirubinemia is a more significant indicator of uncomplicated acute appendicitis than simply perforation of the appendix. Patients with hyperbilirubinemia were much more likely than patients with normal bilirubin to experience simple acute appendicitis. Compared with other studies, the specificity of hyperbilirubinemia for appendiceal perforation or gangrene was reduced to 70%. However, we found that in simple acute appendicitis, hyperbilirubinemia had an excellent predictive value of 91% and a high specificity of 88%. Although only a small percentage of patients had their CRP levels checked upon admission, hyperbilirubinemia had a greater specificity for simple acute appendicitis than CRP, which was only 71% [12,16].

Acute appendicitis cannot be accurately diagnosed or predicted by a single clinical or

laboratory test. To make the diagnosis and choose the best course of action, a combination of the history, clinical examination, laboratory, and radiographic tests is used. Although abdominal computed tomography is effective at identifying acute appendicitis, studies have shown that widespread use of the technique does not increase diagnostic precision or decrease the number of unsuccessful appendicectomies [17]. Additionally, it could lead to longer stays in the emergency room and hospitals, higher costs, and longer wait times for definitive treatment with greater postoperative problems. Additionally, not all hospitals always have it readily available for such use at any time [18,19].

The diagnostic accuracy in a patient with an average history of migrating pain and correct lower quadrant soreness may be high enough to perform an appendicectomy immediately. The "watch-and-wait" approach, used by many practitioners, is appropriate for patients who exhibit non-traditional signs and symptoms or symptoms and symptoms [20]. However, this method ought to bring about unnecessarily prolonging sufferers' health center remains and delaying their definitive treatment. Therefore, it may be wise to consider early appendectomy in patients who present with probable appendicitis and have hyperbilirubinemia [21].

Due to the retrospective nature of this study's design, not all patients had complete data available, and all patients with pre-existing hepatic or hemolytic illnesses were not subjected to thorough histories or examinations. Gilbert's syndrome patients could not be consistently identified, despite the fact that the tiny number of these patients would have been evenly divided among the histological groups. Additionally, the study only included individuals who underwent appendicectomy, which would have led to increased specificities for the various inflammatory markers [22].

Conclusions

A precise diagnostic for acute appendicitis with a high positive predictive value is bilirubin. It is also a useful sign of those who are more prone to have gangrene or an appendiceal perforation. When evaluating individuals with suspected acute appendicitis, bilirubin should be utilised in conjunction with clinical examination and other laboratory findings.

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