ARTICLE

Clinical Significance of Serum Bilirubin in the Diagnosis of Atypical Acute Appendicitis

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ABSTRACT

Objective: To investigate the significance of serum bilirubin in the diagnosis of atypical acute appendicitis. Methods: perform a retrospective analysis of 120 patients with atypical acute appendicitis diagnosed in our hospital from July 2012 to July 2016. All patients underwent routine liver function tests before surgery. Results: 83 patients were confirmed by surgery as acute appendicitis, of which 68 patients had elevated serum total bilirubin and direct bilirubin, and 15 patients were normal; 37 patients were confirmed by surgery as non-acute appendicitis, of which 7 patients had elevated serum total bilirubin and direct bilirubin, and 30 patients were normal. Conclusion: The increase of serum bilirubin level has certain clinical significance for the diagnosis of atypical acute appendicitis.

1. Introduction

Acute appendicitis is the most common acute abdomen in surgery. Typical acute appendicitis, through its typical clinical manifestations, combined with the necessary auxiliary examinations, is often easier to obtain a definitive diagnosis. However, the clinical manifestations of some acute appendicitis are not typical, which brings certain difficulties to the diagnosis. And under the current medical conditions, there is no effective auxiliary examination method to directly diagnose acute appendicitis, which leads to the misdiagnosis of atypical acute appendicitis, which seriously threatens the life safety of patients. This paper retrospectively analyzed the changes of serum bilirubin levels in 120 patients with atypical acute appendicitis diagnosed in our hospital from July 2012 to July 2016, thereby explore the diagnostic significance of serum bilirubin levels in atypical acute appendicitis.

2. Materials and Methods

2.1 General Information

From July 2012 to July 2016, 120 patients who were diagnosed with acute appendicitis in our hospital were included in the study. None of the patients had typical symptoms of metastatic right lower abdominal pain. There were 71 males and 49 females; the age ranged from 9 to 79 years, with an average of 32.6 years; the shortest time from onset to treatment was 4 hours, and the longest was 1 week.
All patients included in the study were urgently diagnosed with blood routine, urine routine, coagulation function, liver function, electrocardiogram, chest radiograph and other routine examinations. Some patients underwent abdominal color Doppler ultrasound or abdominal CT examination. All patients were given anti-infective treatment, and the signs and symptoms of abdominal symptoms were not improved. All patients were diagnosed with acute appendicitis before operation. The patients underwent surgical exploration under continuous epidural anesthesia. All patients included in the study had no history of liver dysfunction or liver disease.

2.2 Methods

Determination of bilirubin levels: All patients received 5 ml of preoperative venous blood for hospital examination to check liver function; record serum total bilirubin, direct bilirubin levels, and calculates indirect bilirubin levels. Patient evaluation: Patients were divided into appendicitis group and non-appendicitis group according to the results of intraoperative and postoperative results.

2.3 Statistical Analysis

The data were analyzed by SPSS13.0 statistical software. The data were expressed as mean ± standard deviation (x ± s). The results were analyzed by t-test of two sets of independent sample measurement data and four-square table chi-square test of group count data, P < 0.05 indicates that the difference was statistically significant.

3. Results

3.1 Operation Results

83 patients were confirmed to have acute appendicitis after surgery and postoperative examination, and 37 patients were confirmed to have non-acute appendicitis.

3.2 Bilirubin Levels

68 of 83 patients with acute appendicitis had elevated serum total bilirubin and direct bilirubin, and 15 were normal; of the 37 patients with non-acute appendicitis, 7 had elevated serum total bilirubin and direct bilirubin, and 30 had normal. That is, in patients with acute appendicitis, 81.9% (68/83) of serum total bilirubin increased, 18.9% (7/37) of patients with non-acute appendicitis increased serum total bilirubin, the difference was statistically significant (x² = 43.350, P = 0.000), see Table 1.

### Table 1. Comparison of the increased situation of serum total bilirubin in patients

| Group          | Serum Total Bilirubin | Total | x²  | P     |
|----------------|-----------------------|-------|-----|-------|
| Appendicitis   | 68                    | 15    | 83  | 43.350| 0.000 |
| Non-appendicitis| 7                     | 30    | 37  |       |       |
| Total          | 75                    | 45    | 120 |       |       |

The mean serum total bilirubin level in 83 patients with acute appendicitis was (35.12±9.61) umol/L, which was higher than the average bilirubin level in the non-appendicitis group (18.60±6.55) umol/L. The difference was statistically significant; the mean serum bilirubin level in patients with acute appendicitis was (23.75±8.57) umol/L, which was higher than the average bilirubin level in the non-appendicitis group (9.81±6.06) umol/L. The difference was statistically significant, see Table 2 and Table 3.

### Table 2. Comparison of the increased level of serum total bilirubin in patients

| Group          | Number of Cases | (x ± s) umol/L | t    | p      |
|----------------|-----------------|----------------|------|--------|
| Appendicitis   | 83              | 35.12±9.61     | 9.498| 0.000  |
| Non-appendicitis| 37              | 18.60±6.55     |      |        |

### Table 3. Comparison of the increased level of direct bilirubin in patients

| Group          | Number of Cases | (x ± s) umol/L | t    | p      |
|----------------|-----------------|----------------|------|--------|
| Appendicitis   | 83              | 23.75±8.57     | 9.929| 0.000  |
| Non-appendicitis| 37              | 9.81±6.06      |      |        |

4. Discussion

Acute appendicitis is the most common acute abdomen in general surgery. It is acutely ill and progresses rapidly. If the diagnosis or treatment is delayed, there may be serious complications such as portal venous inflammation, liver abscess, and perforation of the appendix, acute diffuse peritonitis, abdominal abscess and even septic shock.

Typical acute appendicitis can be clearly diagnosed by symptoms and signs. But for atypical acute appendicitis, sometimes the diagnosis is quite difficult. In particular, there is no specific detection method at this stage that can clearly diagnose acute appendicitis. Therefore, combined with the necessary auxiliary examination, it is particularly important in the diagnosis of difficult cases.

The detection of serum bilirubin is a routine item in clinical liver function tests, and its significance in the diagnosis of acute appendicitis is easily overlooked. The correlation between serum bilirubin and acute appendicitis has also been popular in recent years. However, most studies are limited to the value of hyperbilirubinemia in the diagnosis of acute appendicitis gangrene perforation,
and this study will explore the clinical significance of hyperbilirubinemia in the diagnosis of atypical acute appendicitis.

Most of serum bilirubin is produced by aging red blood cells through the liver. When liver function is abnormal, serum bilirubin levels are often elevated. Severe intra-abdominal inflammation can cause impaired liver function, resulting in elevated serum bilirubin levels. The cause of elevated bilirubin associated with inflammation is; liver cell damage caused directly or indirectly by bacterial infection; inflammation causes biliary epithelial cells to detach, proliferate, or liver fibrosis causes the bile duct to distort and occlude, causing cholestasis to accumulate in the capillary bile duct, forming a bile plug, increasing the internal pressure of the bile duct, and returning blood to the bile, which causes an increase in direct bilirubin in the blood. The most common bacterial species cultured in peritoneal effusions in patients with acute appendicitis is Escherichia coli. The bacteria can invade the muscle layer of the appendix, enter the liver through the portal system, interfere with the microcirculation of the liver cells, hinder the production and drainage of bile, and cause hyperbilirubinemia.

Our study found that in cases of surgically confirmed acute appendicitis, total bilirubin and direct bilirubin were significantly elevated, accounting for 81.9%, while in non-acute appendicitis cases, the bilirubin index was only 18.9%. Chunrong Sun, et al. studies found that patients with acute appendicitis confirmed by surgery and pathology accounted for 68.7% of the total bilirubin. Another study showed that the specificity of serum total bilirubin in acute appendicitis was 99.4%, and the sensitivity was 73.2%. Bilirubin had a certain auxiliary effect on the diagnosis of acute appendicitis, especially in patients with atypical symptoms. In this study, the proportion of serum bilirubin in patients with acute appendicitis was significantly higher than that in patients with non-acute appendicitis, indicating that there was some mechanism leading to impaired liver function after acute appendicitis, followed by laboratory results of elevated serum bilirubin. Conversely, in cases of undiagnosed abdominal pain, if the patient's serum bilirubin level is increased, combined with the symptoms and signs of acute appendicitis, can help us determine the diagnosis of acute appendicitis. In this study, the proportion of bilirubin increased in patients with acute appendicitis was higher than other studies. The probable cause is that the patient's preoperative diagnosis is not clear, the onset to surgery is relatively long, and the appendix inflammation is heavier, resulting in a higher proportion of serum bilirubin levels than other studies.

Therefore, we believe that serum bilirubin detection is a specific marker for the diagnosis of acute appendicitis, and it has good sensitivity, especially for patients with acute appendicitis with atypical symptoms. Moreover, serum bilirubin is used as a routine item of liver function, and the detection is simple and suitable for popularization.

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