Abnormal Urinalysis in Acute Appendicitis

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Abstract

Background: The correlation between urinalysis and appendicitis is still unclear. Urinalysis can be depended may aid diagnose and compare acute perforated and non-perforated appendicitis.

Objective: To determine the correlation between routine urinalysis and simple and perforated appendicitis.

Methods: The patients (210) analyzed prospectively with clinically suspected acute appendicitis that underwent urinalysis followed by appendectomy at Baquba Teaching Hospital, during the period from August 2013 to March 2014. Urine test strip analysis was used.

Results: Patients with acute appendicitis had a higher percentage of positive urine ketone bodies, higher specific gravity, and lower urine pH than patients with normal appendices. Such and other parameters and such data were much higher in patients with perforated appendix.

Conclusion: Routine urinalysis may show differences in findings between simple and perforated appendicitis. Clinically, we believe these urine parameters may aid clinicians in decision making for patients with suspected appendicitis.

Key words: Urinalysis, acute appendicitis, perforated appendicitis.

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Introduction

Acute appendicitis is the most common abdominal surgical emergency and its prognosis is dependent on accurate, early diagnosis [1-6]. The diagnosis of acute appendicitis relies heavily on history taking; reliable information includes migration of pain to right lower quadrant (RLQ) of the abdomen, anorexia, nausea and vomiting, and physical examination findings such as RLQ tenderness and rebound tenderness, pain on percussion, and muscle guarding. No single aspect of clinical presentation can accurately predict the presence of the disease but a combination of various signs and symptoms may support the diagnosis. Unfortunately, acute appendicitis is still difficult to diagnose and misdiagnosis is not uncommon in the emergency department [7]. In addition, unnecessary appendectomy can lead to postoperative complications, such as adhesion or infection. Furthermore, delay in accurate diagnosis may result in appendix perforation. Therefore, improving accuracy is desirable both for earlier and accurate diagnosis. Some imaging techniques, such as

ultrasonography, plain films of the abdomen, computed tomography and radionuclide scanning, may help primary clinicians identify acute appendicitis. However, these diagnostic approaches are not available in all primary healthcare settings, and some of them are expensive and user dependent.

Although preoperative laboratory tests such as white blood cell (WBC) count and C-reactive protein are fast, cheap and more available, the predictive value of these markers is still far from favorable. Therefore, many studies have been conducted to find out whether any other parameters can predict acute appendicitis.

In some studies, equivocal urinalysis results have been reported [8,9]. However, the correlation between urinalysis and appendicitis is still unclear.

Aim of the Study

The present study designed to determine the correlation between routine urinalysis to discriminate between acute appendicitis and perforated appendicitis.

Patients and Methods

Two hundred and ten patients with clinically suspected acute appendicitis, was analyzed statically who underwent urinalysis followed by appendectomy at Baquba Teaching Hospital, for the period from August 2013 till March 2014. Urine test strip analysis was used.

The diagnosis of these patients were primarily based on clinical signs and symptoms, such as abdominal pain, anorexia, nausea, vomiting, pyrexia, migration of pain and tenderness over the RLQ of the abdomen. Among them 22 patients with clinically suspected acute appendicitis who were treated non-operatively were excluded. In addition, 8 patients with UTI symptoms were excluded. Therefore, a total of 180 patients were studied. According to the intraoperative findings of excised appendices, the patients were divided into three groups consisting of a normal appendix group, a non-perforated (simple) appendicitis group and a third perforated appendicitis group.

In our hospital, clinically, acute appendicitis is often diagnosed based on correct history taking, physical examination and laboratory tests. A patient with clinical symptoms and signs, which include migration of pain, anorexia, nausea or emesis, tenderness in the RLQ of the abdomen, pyrexia, tenderness over the right iliac fossa, leukocytosis and polymorph nuclear neutrophilia is defined as suspected of having acute appendicitis.

In addition, patients who have typical clinical presentations with laboratory tests or have been confirmed by imaging studies, such as computed tomography or ultrasonography, will be diagnosed as highly suspected acute appendicitis and no further evaluation, such as urinalysis test, will be performed. Once diagnosis of acute appendicitis is made, emergency surgical approach is indicated.

Urinalysis: Urinalysis was performed for patients with clinically suspected acute appendicitis before surgical intervention. Routine urinalysis is composed of two examinations: chemical tests for abnormal chemical constituents and microscopic tests for abnormal insoluble constituents. Urine test strip analysis was performed. These test strips detect and measure specific gravity (SG), pH, leukocyte esterase, occult blood (OB) and ketones [10] Urine sedimentation may contain cells, casts and crystals, and is examined microscopically after centrifugation of a urine sample. The red blood cell (RBC) and WBC counts were performed manually, by counting and averaging the mean cells in 5 fields.

Statistical analysis

Chi square was used and the results from patients with simple appendicitis were

compared with those from patients with perforated appendicitis. A *p* value of less than 0.05 was considered statistically significant.

Results

The patient group comprised 83 males (46.11%) and 97 females (53.88%); the mean age was 36.4 years (range 5 to 94 years). Of these, 127 patients had grossly proven simple acute appendicitis, 23 had perforated and 30 had normal appendices (White worm).

The characteristics of urine parameters of patients with normal appendices and those with appendicitis are listed in table 1. Patients with acute appendicitis had a higher percentage of positive ketone bodies (p=0.019) than those with normal appendices. In addition, patients with appendicitis had significantly higher urine SG (p=0.004) and lower urine pH (p=0.005) than patients with normal appendices. Analysis revealed a higher specificity (0.788) and positive predictive value (0.897) but relatively lower sensitivity (0.327) of positive ketone bodies in patients with acute appendicitis (Table 1)

As shown in table (2) the characteristics of urine parameters of patients with simple appendicitis and those with perforated appendicitis. Patients with perforated appendicitis had a higher percentage of positive ketone bodies, positive OB, positive leukocyte esterase, positive urine WBC count (greater than 5/HPF), and showed greater SG and urine RBC counts than patients with simple appendicitis. In addition, patients with perforated appendicitis had lower pH than patients with simple appendicitis.

We found that the results indicated a higher specificity but lower sensitivity of positive ketone bodies, positive OB, positive leukocyte esterase and positive urine WBC count (greater than 5/HPF) in predicting perforated appendicitis.

Table (1): The characterstics of urine parameters of patients with appendicitis and those with normal appendices.

	Normal not inflamed appendix		Appendicitis	P value
		Percent	Percent	
Ketone	+	21.2	32.7	0.019
	_	78.8	67.3	
Occult blood	+	30.5	34.4	0.435
	_	69.5	65.6	
Leukocyte	+	18.3	19.4	0.784
	_	81.7	80.6	
WBC(HPF)	0-5	85.4	85.2	0.956
	>5	14.6	14.8	
Specific gravity	1.018 +_0.009		1.018+_0.009	0.004
PH	6.61+_0.88		6.35+_0.95	0.005
RBC(HPF)	5.58+_16.10		5.41+_15.47	0.015

WBC=White blood cells
RBCs=Red blood cells
HPF=High power field

Table (2): The characterstics of urine parameters of patients with simple appendicitis and those with perforated appendices**.**

	Simple appendicitis		Perforated appendicitis	P value
		Percent	Percent	
Ketone	+	30.1	45.8	0.003
	_	69.9	54.2	
Occult blood	+	32.5	44.3	0.024
	_	67.5	55.7	
Leukocyte	+	17.3	30.2	0.003
	_	82.7	69.8	
WBC(HPF)	0-5	86.8	77.3	0.016
	>5	13.2	22.7	
Specific gravity	1.020+_0.009		1.023+_0.009	0.003
PH	6.4+_0.97		6.11+_0.83	0.003
RBC(HPF)	4.95+_14.48		7.75+_19.65	0.002

Discussion

Appendicitis is often diagnosed based on correct history taking, physical examination and laboratory tests such as serum inflammatory markers. However, the aforementioned method is still unfavorable in diagnosing appendicitis. Many studies have been conducted to find out whether other predictive parameters could be used for diagnosing acute appendicitis. Some studies have reported abnormal urinalysis findings in patients with acute appendicitis [8, 9]. However, the correlation between urinalysis and appendicitis is unclear.

In the present study, we found significantly higher percentage of ketone bodies and SG in patients with appendicitis than in those with normal appendices. Ketonuria may be caused by starvation, insulinoma, diabetic ketoacidosis, persistent hypoglycemia, high fat/ low carbohydrate diets and glycogen storage disease [13, 14]. A higher percentage of ketone bodies in urine with appendicitis may be associated with starvation secondary to anorexia, which is one of the common symptoms of appendicitis. The urine SG ranges between 1.010 and 1.030 (higher numbers mean a higher concentration). The SG varies depending on the time in days, amount of food and liquids consumed, and the amount of recent exercise. We suggest that the higher SG may result from the decreased amount of food and liquids consumed due to discomfort secondary to the disease.

In addition, in our study, urine ketone values and SG were higher and pH was lower in patients with perforated appendicitis than in those with simple appendicitis. Moreover, we noticed that patients with perforated appendicitis had higher urine RBC counts than patients with simple appendicitis. Significant positive urine WBC findings (greater than 5/HPF) were also found in patients with perforated appendicitis.

Based on the above readings, positive ketone bodies, positive OB, positive leukocyte esterase and positive urine WBC

count (greater than 5/HPF) were statistically significant factors in diagnosing perforated appendicitis. In cases of acute appendicitis, irritation of the bladder or ureter by a ruptured appendix may result in the increase in urinary RBC and WBC counts [15].

Therefore, this may explain why we found abnormal RBC and WBC urinalysis findings in patients with appendicitis. In addition, the positive findings of OB and leukocyte esterase were also significant for perforated appendicitis. The OB test will react positively in the presence of RBCs, free hemoglobin or free myoglobin. A positive OB test indicates hematuria, hemoglobinuria or myoglobinuria. Most commonly, hematuria is the cause of the positive test result while myoglobinuria is rare [14]. A positive leukocyte esterase test results from the presence of WBCs, either as whole cells or as lysed cells. Thus, patients with perforated appendicitis have significantly positive OB and leukocyte esterase levels.
Clinically, acute appendicitis is often diagnosed based on correct history taking, physical examination and laboratory tests.

Routine urinalysis may aid clinicians in decision making to rule out acute appendicitis and so lower negative appendectomy rates. Urinalysis seemed more valuable in distinguishing perforated appendicitis from simple appendicitis than distinguishing between appendicitis and other acute abdominal diseases.

Therefore, accurate preoperative diagnosis of acute appendicitis and being able to differentiate perforated appendicitis from simple appendicitis are important.

In Conclusion routine urinalysis may reveal different findings between simple and perforated appendicitis. Clinically, according to the present results it can be suggested that urine parameters may aid primary emergency physicians in decision making for patients with suspected appendicitis.

Recommendation

The doctor also advised when examining a patient when the urine analysis gives readings indicate inflammation of the urinary tract that puts in his mind penitentiary medical examination of the possibility of appendicitis.

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