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ORIGINAL ARTICLE

Evaluation of the accuracy of physicians' diagnostic performances in patients with suspected acute appendicitis

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Abstract

Introduction: With a prevalence rate of 7-8 percent, acute appendicitis is one of the most common public surgical emergencies worldwide. Given the complications of this disease because of lack of medical diagnosis and not on-time arrival of patients, this study evaluated the diagnostic performance of physicians (general or specialist) in patients with suspected appendicitis admitted in Imam Reza Hospital of Birjand in 2015's second half.

Methods: In this cross-sectional study, diagnostic and treatment process from the onset of symptoms to hospitalization and surgery of 147 patients with a diagnosis of acute appendicitis undergoing surgery in the second half of 2015 in Imam Reza (AS) hospital in Birjand were evaluated using questionnaires and checklist. After examining the results of the histopathology, confirmed appendicitis cases were analyzed. The data were analyzed using statistical software SPSS 15 and statistical tests of chi-square, Fisher exact test, and Mann-Whitney U test.

Results: In the study, the mean age of the 147 patients was 24.45±13.32 years and all the patients were complaining of abdominal pain. The initial pain in 52% of the cases was in the periumbilical area. Moreover, 105 (71.42%) of the patients presented typical symptoms and 42 (28.57%) had untypical symptoms. Appendicitis in 74.8 percent of patients had led to no complications and 21.1% of them were admitted with generalized peritonitis in surgery. Distribution of the people in cases of complicated appendicitis evaluated by clinical examination (N=22) was significantly lower than uncomplicated cases (99 patients) (P<0.001). A statistically significant difference was found between the cases of complicated and uncomplicated appendicitis in terms of testing, imaging, first physician therapist, and clinical treatment (p= 0.033). Although both groups had direct reference in the first place, many cases of complicated appendicitis were discharged with prescription medication and without any advice or warnings.

Conclusions: Based on these results, it is necessary to raise awareness about quick lookup. It is also recommended to physicians to observe early signs and symptoms of appendicitis to accurately refer the patients to specialized diagnostic procedures in order to take quick actions and appropriate treatment.

Key Words: Diagnostic Techniques; Appendicitis; Appendectomy

Introduction

Acute appendicitis with a prevalence rate of 7-8 percent is one of the most common general surgical emergencies across the world (1). Accordingly, appendectomy has turned into a highly prevalent surgical procedure performed worldwide and represents a significant burden in modern health systems. Insufficient clinical research has impeded provision of a reliable clinical approach (2, 3). The

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annual incidence of appendicitis is 100 persons per 100,000 (4). The peak incidence is usually in the second or third decades of life and less on both ends of the age spectrum. Most studies indicate a slightly greater incidence in men (2, 3). One theory divides acute appendicitis into two distinct, inflammatory processes with different ends. The first is a simple inflamed appendicitis without perforation or necrosis that does not lead to perforation. The other is a significantly more severe inflammation that progresses quickly to necrosis or perforation, or both (5). Etiology and pathogenesis of appendicitis is not fully known. Lumen obstruction due to appendiceal fecaliths or hypertrophied lymphoid tissue is known as the primary etiology (6-8).

Abdominal pain is the first and most common symptom that reported in almost all cases of confirmed appendicitis (9, 10). Some patients report mild abdominal symptoms such as changes in bowel habits prior to abdominal pain. Other classic symptoms include loss of appetite, nausea, and vomiting that often occur a few hours after the pain onset. Initial presentations are atypical or non-specific in many patients and may include indigestion, bloating, intestinal disorder, diarrhea and general weakness. As the initial presentations of appendicitis are often mild, both the patient and the physician may fail to take it seriously (11). The symptoms found in physical abdominal examination include localized tenderness in the right lower quadrant of the abdomen, rebound tenderness, psoas sign, obturator sign, and voluntary or involuntary guarding when the patient is touched (12-15). These symptoms vary in terms of appendicitis site in the abdomen and its inflammatory stage, and the pain may be very mild in its initial onset (11).

Studies have shown that the accuracy of clinical findings in these patients is in a wide range (76 to 92%). At present, despite the advances achieved, accurate diagnosis of appendicitis before treatment tends to be difficult (16, 17). Delayed diagnosis of appendicitis is likely to occur for patients with atypical symptoms, people who have not undergone a complete physical examination, or those who have received muscle analgesia with opioids (18). Surgery is the preferred treatment for acute appendicitis and the closer the surgical intervention to the onset of symptoms, the fewer the complications. The correct diagnosis of appendicitis is important from two perspectives. On the one hand, suspected cases should be considered according to measures whereby positive cases would not be left unnoticed; on the other hand, negative surgical operations should be prevented. Statistics indicate that 17 to 30 percent cases of appendicitis may lead to intestine perforation due to delayed treatment (16). Moreover, cases of negative appendectomy have been reported between 10 to 30 percent. (16, 17).

Application of ultrasound, CT scan, barium enema and laparoscopy can contribute to a more accurate diagnosis of the disease. However, these diagnostic procedures are not easily available everywhere and can impose heavy costs on patients (17, 19). Therefore, this study aimed to evaluate the diagnostic performance of doctors (general or specialist) in patients with suspected appendicitis admitted in Imam Reza Hospital of Birjand in 2015's second half.

Methods

In this cross-sectional study, 147 patients who were hospitalized and operated for acute appendicitis in Imam Reza Hospital of Birjand were evaluated in terms of diagnostic and treatment processes from the onset of symptoms to hospitalization and surgery using a researcher-made questionnaire and checklist. The protocol of the study was approved by the Institutional Ethics Committee under the identifier IR.BUMS.REC.1394. 292. The data collection instrument covered 14 items about demographics, diagnostic process from the onset of symptoms to definitive diagnosis, the center and visited doctor at the onset of symptoms, time span between onset of symptoms and visiting the doctor, surgical practice, complications of appendicitis, treatment of physician with the patient on admission (i.e., monitoring in the office, referral to the emergency department, discharge with appropriate advice, immediate demand for paraclinical measures, medication prescription, discharge, etc.). The researcher-made instruments were approved by six experts and specialists in terms of validity. All patients hospitalized and operated with acute appendicitis in Imam Reza Hospital of Birjand from October to March 2015 were interviewed through which questionnaires were completed. For young children who were not able to respond, the questionnaires were completed by their companions and according to the information contained in patient records. After the histopathology results were determined, cases whose appendicitis diagnosis was not definitive were excluded leaving confirmed cases of appendicitis for final analysis. The data were analyzed using statistical software SPSS 15 and frequency distribution, chi-square, Fisher's exact

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test and Mann-Whitney U test. The significant level was considered at P <0.05.

Results

This study included 147 patients suffering from acute appendicitis with positive pathologies. Their mean age was 24.45 ± 13.32 years with the youngest age of 3. Ninety-two patients (62.6%) were male and 55 (37.4%) were female. The initial pain in 52% of the cases was in the peri-umbilical area, right upper quadrant 21.8% and right lower quadrant 71.4 % (Table 1). All patients were complaining of abdominal pain where loss of appetite, nausea and vomiting accounted for 41.5% of associated symptoms. Nausea and vomiting without loss of appetite (9.5%) and loss of appetite alone (8.8) were the next symptoms (Table 2). The first visit was made with the resident physician in hospital (50.3%) followed by emergency department (35.2%). The majority of the patients (60.5%) had already referred to two further physicians before they received surgical services.

The most frequently requested imaging procedure was sonography (89.1%). Among the patients, 83 percent underwent clinical examination in their first admission, and only 17 percent were not clinically examined in their first visit. In most cases (64.6%), the patient was referred by the visited physician to a higher level center after checking history and performing physical examination without any paraclinical demand; in 15 percent of the cases, the patient was referred to the higher center after paraclinical tests. In 15 percent of cases, the patient was discharged with medication prescription without any advice on readmission if no improvement or worsening symptoms occurred (Table 3).

Table 1: Frequency distribution of initial pain in patients with acute appendicitis

Site of initial pain	N (%)
Periumbilical	77 (52.4)
Right lower quadrant	32 (21.8)
Generalized	26 (17.7)
Epigastric	9 (6.1)
Other cases	3 (2.1)

Table 2: Frequency distribution of symptoms associated with abdominal pain in patients with acute appendicitis

Symptoms associated with abdominal pain	N (%)
Loss of appetite accompanied by nausea and vomiting	61 (41.5)
Nausea and vomiting	14 (9.5)
Loss of appetite	13 (8.8)
Loss of appetite and nausea	9 (6.1)
Loss of appetite, nausea, vomiting, and fever	9 (6.1)
Fever	20 (13.6)
Other cases	21 (14.2)

Table 3: Frequency distribution of physician's treatment with patients suffering from acute appendicitis

Clinical examination performed	N (%)
Medication prescription and discharge without advice or warning	22 (15)
Medication prescription and discharge with advice or warning in case of lack of improvement or deterioration of symptoms	5 (3.4)
Direct referral	95 (64.6)
Referral after paraclinical examination	23 (15.6)

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Table 4. Frequency distribution of clinical treatment of the first visited physician between appendicitis cases with and without complications

Variable	Group	Clinical treatment of the initial treating physician			Fisher's exact test
		Direct referral	Paraclinical demand followed by referral	Medication prescription and discharge without advice	P
Complication	Yes	75 (2.68%)	21 (1.19%)	11 (1.10%)	0.003
	No	20 (6.55%)	2 (6.5%)	11 (6.30%)	

Among the patients, 105 (71.42%) presented typical symptoms on admission and CBC and UA were requested for 91.2 percent of the patients. Appendicitis in 74.8 percent of patients had led to no complications. Males experienced greater complications although the difference between sexes in terms of complications was not significant.

In most cases (69.4%), the first visited physician was a general practitioner. There was a statistically significant difference between complicated and uncomplicated cases of appendicitis in terms of the number of treating physicians (P=0.001). Distribution of the people in cases of complicated appendicitis evaluated by clinical examination (N=22) was significantly lower than uncomplicated cases (P<0.001). There was a statistically significant difference between the cases of complicated and uncomplicated appendicitis in terms of testing (P=0.033) and imaging (P<0.001). There was a significant difference between complicated and uncomplicated appendicitis cases in terms of clinical treatment of the first visited physician. Although both groups had direct referral from the first place, many cases of complicated appendicitis were discharged with medication prescription and without any advice or warnings (Table 4).

The mean age of patients in complicated cases was significantly greater than uncomplicated cases (P<0.011). The mean time from onset of pain to admission was 10.8 ± 1.40 and to appendectomy 30.44 ± 2.16 hours. As for the mean time from onset of symptoms to seeing a doctor, there was no significant difference between complicated and uncomplicated cases. However, the time span from the onset of symptoms and appendectomy was significantly greater in complicated cases (P=0.028). No significant difference was found between uncomplicated and complicated cases of appendicitis in terms of clinical symptoms associated with abdominal pain where loss of appetite, nausea and vomiting were the most common associated symptoms in both groups. Ranking next were fever and loss of appetite in uncomplicated and complicated cases respectively, with no significant difference between the groups.

Discussion

This study was performed retrospectively on 147 patients with confirmed diagnosis of appendicitis based on histopathology. The mean age of patients was 24.45 ± 13.32 years (minimum age 3; maximum age 75) and the males were outnumbering females (62.6 vs. 37.4). Approximately close figures are reported in similar studies (16, 20).

Abdominal pain was the main presentation in all patients. The accompanying symptoms were loss of appetite together with nausea and vomiting (41.5%), nausea and vomiting without loss of appetite (9.5%), and loss of appetite alone (8.8%). In 71.4 percent of the patients, pain shifted to the right lower quadrant. In a study in Imam Khomeini Hospital of Tehran in 2005, the major manifestation included abdominal pain and associated symptoms were nausea (60%) and vomiting along with loss of appetite (51%). Moreover, in 50 percent of the cases, there was pain shift (20).

The mean time from onset of pain to admission was 10.8 ± 1.40 and to appendectomy 30.44 ± 2.16 hours. As for the mean time from onset of symptoms to seeing a doctor, there was not a significant difference between complicated and uncomplicated cases. However, the time span from the onset of symptoms and appendectomy was significantly greater in complicated cases (P=0.028). In a study in 2014 in the UK, a delayed appendectomy over 48 hours from onset of symptoms was associated with increased risks of complications (22). In another study in 2010 in Chicago, delayed appendectomy was not linked with increased 30-day incidence of complications (23).

The majority of patients (60.5%) had visited two further physicians prior to admission for surgery. The first visited physician was a general practitioner in most cases (69.4%) who either worked in a hospital (50.3%) or a community health center (19%). Nevertheless, there was no statistically significant difference between complicated and uncomplicated cases of appendicitis in terms of the first visiting center or the physician specialty. There was a significant difference in the number of visited physicians

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before admission for surgery between complicated and uncomplicated cases, where a greater number of physicians were visited in cases with complications. These findings suggest that poor diagnosis and incomplete examination on the first visit has led to patient confusion and recurrent visits to other physicians, leading to subsequently increased risk of complications.

The patients were hospitalized for surgery service with simple appendicitis and generalized peritonitis in 74.8 and 21.1 percent of cases, respectively. The mean age of patients with complication was significantly higher than uncomplicated cases; however, there was no significant difference as for sex, symptoms, and pain shift.

In most cases (64.6%), the patient was referred by the visited physician to a higher level center after checking history and performing physical examination without any paraclinical demand; in 15 percent of the cases, the patient was referred to the higher level center after paraclinical tests. In 15 percent of cases, the patient was discharged with medication prescription without any advice on readmission if no improvement or worsening symptoms occurred. There was a significant difference between complicated and uncomplicated appendicitis cases in terms of clinical treatment of the first visited physician. Although patients with and without complications had direct referrals in the first place, many cases of complicated appendicitis were discharged with medication prescription and without any advice or warnings. In another study, 22 percent of the patients were discharged with non-appendicitis diagnosis on their first visit of whom 71 and 29 percent were re-hospitalized for appendectomy, respectively, with complicated and uncomplicated appendicitis (16).

From among the patients, 83 percent were clinically examined in their first visit. The number of those who were clinically examined in complicated cases was significantly lower than that of uncomplicated cases, suggesting that clinical examination constitutes a major step in diagnosis of acute appendicitis.

CBC and UA were requested for 91.2 percent of the patients, and 89 percent of the patients underwent abdomen and pelvic sonography. No one was asked to perform abdomen and pelvis CT scan. There was a statistically significant difference between complicated and uncomplicated appendicitis cases in terms of the requested tests and imaging, implying that the use of paraclinical facilities significantly contribute to appropriate management of acute appendicitis.

Conclusions

Any patient with abdominal pain should be carefully checked for history and go thorough physical examination. In case of suspected acute appendicitis, the patient should be referred for surgical procedures to a higher level center and unnecessary medication should be avoided. In case laboratory facilities are available, blood and urine tests should be considered for all patients. Sonography also contributes to more accurate diagnosis. Proper clinical treatment on admission helps reduce complications and prevent from misleading the patient and spending extra time and money with several physicians. In the absence of surgical facilities, the suspected appendicitis patient should be referred to the appropriate center immediately in order to prevent complications and further expenses. In the elderly patients presenting with abdominal pain and suspected appendicitis, greater clinical caution should be considered.

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Conflict of interest

The authors declare no conflict of interest.

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