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Remote general practice: diagnosis of appendicitis

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Objective: To determine the diagnostic value of an elevated white blood cell (WBC) count in the diagnosis of acute appendicitis.

Design: A retrospective descriptive study.

Setting: Al-Ain Hospital and Tawam Hospital in Al-Ain Medical Health District, Abu Dhabi.

Subjects: All patients over the age of 15 years who were referred by Primary Health Care Clinics (PHCC) and admitted to the surgical wards of Al-Ain and Tawam Hospitals, between Jan. 1 and Dec. 31, 1995, with a provisional diagnosis of acute appendicitis. The study is based on 445 patients referred by PHCC to Tawam and Al-Ain Hospitals.

Results: Surgery was performed in 268 cases. Of those subjected to surgery, 16 were found to have a normal appendix and the remaining 252 were found to have various degrees of acutely inflamed or perforated appendices. The WBC count was greater than 12 000 in all of the 252 cases where the diagnosis of acute appendicitis was confirmed at operation. Equally in those patients who were not operated upon but who were provisionally diagnosed with appendicitis and had non-specific abdominal pain, the WBC count was less than 12 000. WBC count, nausea, rebound, and rigidity were the only significant predictors of acute appendicitis.

Conclusion: The results suggest that determining the patient's WBC count, a simple test, could be of value to general practitioners in deciding when a patient should be referred urgently for a surgical opinion. This applies particularly for physicians who practise in a remote area at a distance from a hospital.

Objectif : Établir la validité diagnostique d'une leucocytose élevée pour diagnostiquer l'appendicite aiguë.

Conception : Étude descriptive rétrospective.

Contexte : L'hôpital d'Al-Ain et l'hôpital Tawam du district de santé d'Al-Ain (Abu Dhabi).

Sujets : Tous les patients de plus de 15 ans chez qui un diagnostic provisoire d'appendicite aiguë avait été posé à une clinique de santé primaire, et qu'on avait référés au service de chirurgie de l'hôpital d'Al-Ain ou de l'hôpital Tawam, où ils ont été admis entre le 1er janvier et le 31 décembre 1995. L'étude porte sur 445 patients référés par des cliniques de santé primaires vers l'hôpital Tawam et l'hôpital d'Al Ain.

Résultats : On a pratiqué une chirurgie dans 268 cas. On a constaté que chez 16 des patients ayant subi une chirurgie, l'appendice était normal, tandis que dans les 252 autres cas, on a observé divers degrés de perforation ou d'inflammation aiguë de l'appendice. La leucocytose était supérieure à 12 000 chez les 252 cas dont le diagnostic d'appendicite aiguë a été confirmé lors de la chirurgie. De plus, chez les patients qui n'ont pas subi de chirurgie mais qui avaient reçu un diagnostic provisoire d'appendicite et souffraient de douleurs abdominales non spécifiques, la leucocytose était inférieure à 12 000. La leucocytose, la nausée, la douleur après palpation et la rigidité étaient les seuls prédicteurs importants de l'appendicite aiguë.

Conclusion : Les résultats indiquent que la détermination de la leucocytose du patient, examen facile, pourrait servir aux omnipraticiens lorsqu'ils doivent décider si on référer de toute urgence un patient pour une consultation en chirurgie. Cette conclusion intéressera particulièrement les médecins qui pratiquent en région périphérique, loin d'un hôpital.

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Introduction

Acute appendicitis is a common surgical condition, and the diagnosis is made primarily on the basis of the history and the physical findings, with additional assistance from laboratory examinations.[1] Although most patients with acute appendicitis can easily be diagnosed, for many of them the signs and symptoms are variable and a firm diagnosis can be difficult. This is particularly true when the appendix is in the retrocecal or the retroileal position. The percentage of appendectomies performed where the appendix is subsequently found to be normal varies between 15% and 50%,[2] and postoperative complications can occur in up to 50% of these patients.[3] However, at the other end of the spectrum, nowhere are general practitioners more seriously criticized than when they fail to recognize appendicitis and the patient subsequently presents to hospital with generalized peritonitis. Moderate leucocytosis, ranging from about 12 000 to 18 000 per cubic millimetre, is the rule in acute appendicitis, and it seemed reasonable to examine this finding in greater detail to determine how pathognomonic leucocytosis is for the diagnosis. Several studies have shown a total leucocyte count in suspected acute appendicitis to give valuable information to guide the surgeon.[4–10] Overall, a white blood cell (WBC) count as a diagnostic tool is claimed to be reliable by some[7,11,12] and unreliable by others[13–15] in patients with suspected appendicitis.

The aim of this retrospective study was to determine the diagnostic value of an elevated WBC count in the diagnosis of acute appendicitis.

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Materials and methods

Study design

During the 12-month period from January to December 1995, all patients over the age of 15 who were admitted to the surgical wards at Al-Ain and Tawam hospitals with a diagnosis of suspected appendicitis were included in this study. These 2 hospitals serve the Al-Ain district, which is part of the Abu Dhabi Emirate, United Arab Emirates (UAE). This district has a population of approximately 300 000. A total of 445 patients presented with suspected appendicitis during the study period. All patients were examined by a surgeon, who recorded the clinical signs and symptoms. In all cases the surgeons ordered a complete blood count at presentation and the decision regarding surgical intervention was made on the basis of clinical and laboratory findings. All removed appendices were subjected to histological examination. The medical records were used to extract data relating to the age, sex and nationality of the patients. A data collection sheet was designed to collect the required clinical information, which included the WBC count.[4,9,10,16] Operative findings relating to the appendices were recorded as normal or acutely inflamed. Pathology findings were recorded as normal or acutely inflamed. The general surgeons working in both hospitals gave their opinion regarding the diagnostic value of WBC count in acute appendicitis. Before commencement of the study, ethical approval was sought and granted by the Ministry of Health/UAE University Ethical Committee.

Statistical methods and analysis

The data were analyzed using the Statistical Packages for Social Sciences (SPSS). A logistic regression model was constructed that included the acute appendicitis status (0 for normal, 1 for acute appendicitis) as the dependent variable and a series of covariants: age, sex, duration of pain, location of initial pain, nausea, vomiting, rigidity, guarding, rebound tenderness, body temperature and WBC count. These covariants were then entered into a multiple logistic model and allowed to compete in a stepwise fashion. The level $p < 0.05$ was considered as the cut-off value for significance.

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As shown in Figure 1, 445 patients with a provisional diagnosis of acute

appendicitis were admitted during the study period. Surgery was performed in 268 cases. Of those patients subjected to surgery, 16 were found to have a normal appendix and the remaining 252 were found to have various degrees of acutely inflamed or perforated appendices. The WBC count was greater than 12 000 in all cases in which the diagnosis of acute appendicitis was confirmed at operation. Equally, in those patients not operated upon, the WBC count was less than 12 000. In the 16 patients operated upon and where the appendix was found not to be inflamed, the WBC count was greater than 12 000 in 9 and less than 12 000 in 7.

The gender distribution showed a considerable preponderance of males; 75% of all admitted patients were male. Of the patients with confirmed acute appendicitis, 59.4% of the males had a high WBC count, whereas only 45.5% of the females had a high WBC count.

The WBC count was > 12 000 in all of the age groups where the diagnosis of acute appendicits was confirmed at operation. The age range was much as would be expected in a series of patients with appendicitis. The most females were in the younger age group (14–25 years), while most males were in the younger and middle age group (14–25 and 26–35 years).

Table 1 shows all diagnostic variables in appendicitis that showed significant differences. As can be seen from this table, a diagnostic screening test was performed for sensitivity (%) and specificity (%) for variables used to try to establish the diagnosis of acute appendicitis in the prospective study of 445 patients.

Table 2 shows that WBC count, nausea, rebound and rigidity are the only significant predictors of acute appendicitis after adjusting for age and sex. The most significant predictor was WBC count with a relative risk of 6.22, a 95% confidence interval of 3.48–11.11 and a p value of 0.0001.

In answer to the question "On a scale of 1 (not important) to 5 (very important) how would you rate the importance of the WBC count in reaching a diagnosis in suspected appendicitis?" 7 surgeons chose the number 5, 5 surgeons chose the number 4 and 5 surgeons chose number 3. In answer to the question "If the results of your clinical examination strongly suggest a diagnosis of appendicitis but the WBC count is normal or low, what action would you take?" 12 surgeons said they would operate immediately and 5 said they would observe

further. Seventeen of the 20 surgeons responded to the survey.

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There is no sure laboratory test that confirms or excludes the diagnosis of acute appendicitis. Nevertheless, it is worth noting that all patients proven to have acute appendicitis in this study had a leucocytosis while those rejected for surgery did not. Of the patients who were operated on but had a normal appendix, about half had a leucocytosis. Thus, only 3% of those patients subjected to surgery following the diagnosis of acute appendicitis had a leucocytosis when the appendix was normal. This suggests that a leucocytosis is an important feature in the diagnosis of appendicitis, although it cannot be regarded as a positive finding in the absence of clinical signs.

In this study the association between leucocytosis and appendicitis was particularly strong. The distribution of age of these patients was normal; however, the population pyramid in the UAE shows a large preponderance of males in the 20–40 age range due to the influx of expatriate workers, and this is reflected in the gender ratio of appendicitis cases.[17] Appendicitis is easier to diagnose in males than in females, but it is uncertain whether the preponderance of males in the study population influenced the findings in the study. Also, the Al-Ain hospitals serve a wide rural district, therefore patients may be more advanced on presentation to hospital because of the long distances some have to travel to get to a hospital.

The responses to the questions put to the surgeons suggest that although they always estimate the WBC count, they place most faith on their clinical judgement. The finding of a high WBC count is consistent with previous reported studies,[7,11,12,16,18] but this study has shown how consistent the WBC count can be, both in patients proven to have appendicitis and those who do not have appendicitis. While this is unlikely to influence the practices of surgeons, it has relevance for remote practitioners because obtaining a WBC count is a simple procedure that can easily be carried out in a rural doctor's office. This test could be of great value when attempting to diagnose appendicitis because patients with this condition can deteriorate very quickly and the journey to

hospital in many cases can take considerable time.

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