



Medicine and Medical Sciences (LRJMSS) ISSN: 2354-323X Vol. 3 issue 4 pp. 029-033, April, 2016
Available online <http://www.landmarkresearchjournals.org/lrjmms/index.php>
INDEXING: ISI Impact Factor (IF)=1.264; Scopus; Index Copernicus.
Copyright © 2016 Landmark Research Journals

Full Length Research Paper

The value of C - reactive protein (CRP), White blood cells count (WBCS) and neutrophils on acute appendicitis diagnosis

Elsharif Ahmed Bazie^{1*}, Mohammed Eltoum Hamed Azoz¹, Abazar Mahmoud Ismail²

^{1*} Assistant professor –Pediatrics department-Elimam Elmahdi University-Sudan

¹ Assistant professor –department of surgery-Elimam ELmahdi university-Sudan

² Lecturer-clinical laboratory departments- Elimam ELmahdi university-Sudan

Accepted 04 April, 2016

Acute appendicitis is one of the most common causes of the acute abdomen. Leukocytosis is present in most of cases of acute appendicitis. We studied 94 patients, males were 64.9% and females were 35.1%. Their age range was 8-75 years. Patients with neutrophilia were 80 patients (85.1%) and only 14 patients (14.9%) were with normal TWBCS. Strong positive CRP at presentation was found in (93.6%), and positive CRP was (4.3%) and two patients present with normal CRP. Final diagnosis of acute appendicitis in 79 patients (84%), perforated appendix found in 10 patients (10.6%) and appendicular mass in 5 patients (5.3%). Clinical symptoms and signs of acute appendicitis can be confirmed by WBCS and CRP tests before doing unnecessary operations.

Keywords: Acute Appendicitis, TWBCS, CRP.

INTRODUCTION

Appendicitis, an inflammation of the vestigial vermiform appendix, is one of the most common causes of the acute abdomen and one of the most frequent indications for an emergent abdominal surgical procedure worldwide (Williams, 1983; Fitz, 1886).

The vermiform appendix is located at the base of the cecum, near the ileocecal valve where the taenia coli converge on the cecum (Jaffe and Berger, 2005; Buschard and Kjaeldgaard 1973). The appendix is a true diverticulum of the cecum. In contrast to acquired diverticular disease, which consists of a protuberance of a subset of the enteric wall layers, the appendiceal wall

contains all of the layers of the colonic wall: mucosa, submucosa, muscularis (longitudinal and circular), and the serosal covering (Mulholland, Lillemoe and Doherty 2005). The appendiceal orifice opens into the cecum. Its blood supply, the appendiceal artery, is a terminal branch of the ileocolic artery, which traverses the length of the mesoappendix and terminates at the tip of the organ (Buschard and Kjaeldgaard 1973).

The attachment of the appendix to the base of the cecum is constant. However, the tip may migrate to the retrocecal, subcecal, preileal, postileal, and pelvic positions. These normal anatomic variations can complicate the diagnosis as the site of pain and findings on the clinical examination will reflect the anatomic position of the appendix.

The presence of B and T lymphoid cells in the mucosa

Table 1 Age distribution

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid less than 18 years	42	44.7	44.7	44.7
18 to less than 40 years old	47	50.0	50.0	94.7
More than 40 years	5	5.3	5.3	100.0
Total	94	100.0	100.0	

Table 2 Sex distribution

	Frequency	Percent	Valid percent	Cumulative Percent
Valid Male	61	64.9	64.9	64.9
Female	33	35.1	35.1	100
Total	94	100	100	

and submucosa of the lamina propria make the appendix histological distinct from the cecum (Mulholland, Lillemoe and Doherty 2005). These cells create a lymphoid pulp that aids immunologic function by increasing lymphoid products such as IgA and operating as part of the gut-associated lymphoid tissue system (Jaffe and Berger, 2005). Lymphoid hyperplasia can cause obstruction of the appendix and lead to appendicitis. The lymphoid tissue undergoes atrophy with age (Kumar, Abbas and Fausto 2007). Appendicitis occurs most frequently in the second and third decades of life. The incidence is approximately 233/100,000 population and is highest in the 10 to 19 year-old age group (Addis's, Shaffer, Fowler and Tauxe 1990). It is also higher among men (male to female ratio of 1.4:1), who have a lifetime incidence of 8.6 percent compared to 6.7 percent for women (Addiss, Shaffer, Fowler and Tauxe 1990).

A mild leukocytosis (white blood cell count >10,000 cells/microL) is present in most patients with acute appendicitis (Silen 1996). Approximately 80 percent of patients have a leukocytosis and a left shift (increase in total WBC count, bands [immature neutrophils], and neutrophils) in the differential (Coleman C, Thompson, Bennion and Schmit 1998). The sensitivity and specificity of an elevated WBC in acute appendicitis is 80 percent and 55 percent respectively.

METHODS

A prospective study of 94 consecutive patients, aged between 8-75-years, suspected of having acute appendicitis who attended the Surgical Department Kosti Teaching Hospital-White Nile State-Sudan, in the period during May 2007 through to May 2008. Careful history and physical signs were recorded and evaluated with an active in hospital observation, decisions were made to operate or to observe on clinical backgrounds. Blood tests for a total WBC count; neutrophil percentage and CRP were requested and immediately sent to the laboratory. For patients who are assigned for appendectomy the samples were taken while the patients

were prepared to the theater. The estimation of the CRP was by the rapid method. The cut off value for positive tests was (8 ug/ml) and strong positive tests were (15ug/ml) or more. The upper limit for normal WBC count and neutrophil percentage were (11,000/ microL), 75%. The histopathological results were graded as normal, simple inflamed, gangrenous and perforated appendix. Data was analyzed by SPSS program.

The aim of this study is to investigate the role of Creactive protein (CRP) and its value in combination with the total white blood cells (WBC) count and neutrophil percentage in identifying a group of patients with suspected acute appendicitis in which surgery can be deferred, hoping to improve the diagnostic accuracy and reduces the incidence of perforation and negative laparotomy.

RESULT

Table 1 showed that those who were 18 years old and less than 40years old were 47 patients (50%), those less than 18 years old were 42patients (44.7%), and 5 patients (5.3%)were more than 40 years old, their age range was 8-75 years.

In table 2 males were 61 patients (64.9%) and females were 33 patients (35.1%). Male to female ratio was 1.84:1.

In table 3 patients with neutrophilia were 80 patients (85.1%) and only 14 patients(14.9%) were with normal TWBCS.

In table 4 those present with stronge positive CRP at presentation were 88 patients (93.6%), with only positive CRP were 4 patients (4.3%) and two patients present with normal CRP.

Table 5 showed the final diagnosis as acute appendicitis in 79 patient (84%), perforated appendix found in 10 patients (10.6%) and appendicular mass in 5 patients (5.3%).

In table 6: those with acute appendicitis and between 18 and less than 40 years old were 40 patients (42.6%), 35 patients (37.2%) less than 18 years old and had acute

Table 3 TWBS count

		Frequency	Percent	Valid percent	Cumulative Percent
Valid	Normal	14	14.9	14.9	14.9
	Neutrophilia	80	85.1	85.1	100
	Total	94			

Table 4 CRP measures

		Frequency	Percent	Valid percent	Cumulative Percent
Valid	Normal	2	2.1	2.1	2.1
	Positive	4	4.3	4.3	6.4
	Strong Positive	88	93.6	93.6	100
	Total	94	100	100	

Table 5 final diagnosis

		Frequency	Percent	Valid percent	Cumulative Percent
Valid	acute appendicitis	79	84.0	84.0	84.0
	Appendicular mass	5	5.3	5.3	89.4
	Perforated	10	10.6	10.6	100
	Total	94	100	100	

Table 6 Age and final diagnosis Cross tabulation

	diagnosis			Total
	Acute appendicitis	Appendicular mass	Perforated appendices	
Less than 18 years old count	35	1	6	42
% of total	37.2%	1.1%	6.4%	44.7%
18 less than 40 years old count	40	4	3	47
% of total	42.6%	4.3%	3.2%	50.0%
More than 40 years old count	4	0	1	5
% of total	4.3%	.0%	1.1%	5.3%
Total count	79	5	10	94
% of total	80.0%	5.3%	10.6%	100.0%

appendicitis, and 4 patients (4.3%) were more the 40 years old and had acute appendicitis .those who had perforated appendices and less than 18 years old were 6 patients(6.4%), 3 patients were between 18 and less than 40 year old present with perforated appendices and one patient was more than 40 years old and presented with perforated appendices. Appendicular mass was found in 4 patients (4.3%) and their age was between 18 and less than 40 year old and only one patients (1.1%) was diagnosed as appendicular mass and his age was more than 40 years old. The correlation was insignificants= >0.05 .

Table 7 showed that those with acute appendicitis and had neutrophilia were 66 patients (70.2%), appendicular mass and had neutrophila were 5 patients (5.3%)

and 9 patients (10%) presented with perforated appendices and found to have perforated appendices. Those who found to have normal WBCS and presented with acute appendicits were 13 patients (13.8%) and only one patient (1.1%)was found to have normal WBCS

count but presented with perforated appendices. The correlation was insignificants= >0.05 .

Table 8 showed stronger positive CRP was found in 75 patients (79.8%), 9 patients (9.6%)and 4 patient (4.3%) who were diagnosed as acute appendicitis, perforated appendices and appendicular mass respectively. positive CRP was found in 3 patients (3.2%) and 1 patients (1.1%) who were diagnosed as acute appendicitis and appendicular mass respectively. Normal CRP was found in two patients one patient was diagnosed as acute appendicitis and the other was diagnosed as perforated appendices. The correlation was insignificants= >0.05 .

Table 9 showed that those with neutrophilia and stronger positive CRP were 77 patients (81.9%) and 3 patients (3.2%) with positive CRP and neutrophilia. Normal CRP and normal WBCS count was found in 2 patients (2.1%). Eleven patients (11.7%) were found to have stronger positive CRP and normal WBCS count. One patient (1.1%) had positive CRP and normal WBCS count. Significant correlation p.Value was 0.000.

Table 8 CRP result and final diagnosis Cross tabulation

	diagnosis			Total
	Acute appendicitis	Appendicular mass	Perforated appendices	
CRP Normal Count	1	0	1	2
% of total	1.1%	.0%	1.1%	2.1%
Positive count	3	1	0	4
% of total	3.2%	1.1%	.0%	4.3%
Strong Positive count	75	4	9	88
% of total	79.8%	4.3%	9.6%	93.6%
Total count	79	5	10	94
% of total	84.0%	5.3%	10.6%	100.0%

Table 9 TWBCS and CRP Cross tabulation

		CRP			
		Normal	Positive	Strong Positive	
TWBS Normal	Count	12	1	11	14
% of total		2.1%	1.1%	11.7%	14.9%
Neutrophilia	Count	0	3	77	80
% of total		.0%	3.2%	81.9%	85.1%
Total	Count	2	4	88	94
% of total		2.1%	4.3%	93.6%	100.0%

DISCUSSION

The diagnosis of acute appendicitis is primarily a clinical matter, also the diagnostic accuracy of which is a bit low in the pediatric age group. (Anderson, Hugander and Thuhir 1992). Many authors advocated pre-operative measurement of CRP to improve the accuracy of diagnosis of acute appendicitis. Blood inflammatory markers, such as WBCs and CRP, cannot be relied upon to make a specific diagnosis. However, these inflammatory markers have contributory values and can aid clinical judgments. In this setting, elevated levels of inflammatory markers have been reported to increase the probability of acute appendicitis by some investigators (Kipper SL, Rypins, Evans, Thakur, Smith and Rhodes 2000). Whereas others have concluded that patients with right lower quadrant pain with a normal WBC count and CRP level are unlikely to have acute appendicitis (Jaye and Waites 1997).

In our study males were (64.9%) and females were (35.1%). Male to female ratio was 1.84:1. Our study group age range between 8 and 75 years old. In study done by Shefki Xharra et al (Shefki 2012). 52% were male and 48% were female, with the age ranging from 5 to 59 with a median of 19.7 these results were near to our study although our age range was wide.

We found acute appendicitis in (84%), perforated appendix found in (10.6%) and appendicular mass in (5.3%). Where in study done by Paajanen. H. et al (Paajanen 2002). Acute appendicitis was found in 34%, gangrenous in 40% and perforated acute appendicitis in

5% of the patients these variations because we studied all ages group and they only studied pediatrics.

In our study those with acute appendicitis and neutrophilia were (70.2%), appendicular mass with neutrophilia were (5.3%) and (10%) presented with acute appendices and found to have perforated appendices. Those who found to have normal WBCS and presented with acute appendicitis were (13.8%) and only (1.1%) was found to have normal WBCS count but presented with perforated appendices. Strong positive CRP was found in (79.8%). In study done by Paltola et al (Paltola, Ahlqvist, Rapola, Rasanen, Louhimos and Saarinen 1986). They found that leukocytosis (WBC greater than 15 000/mm³) was found in 58%, CRP alone was capable of identifying 83% of cases with gangrenous appendices, while 76% had leukocytosis and 60% elevated ESR. When perforation had occurred there was greatly increased CRP and invariably leukocytosis, but elevated ESR in only 60%. With the combination CRP and WBC count (using rise in one or both), 88% of all appendicitis cases could be identified, and at least 96% of those with gangrene or perforation. So their result is near to our findings. Therefore, the diagnostic accuracy of WBC count can be improved if the neutrophil percentage is taken in consideration. (Lau WY, Ho and Yeung 1989).

Marcelo A. Beltrán et al (Marcelo and Beltrán 2007). They studied Predictive value of white blood cell count and C-reactive protein in children with appendicitis they found that WBCS and CRP individually and together had a high sensitivity to differentiate patients with and without appendicitis, also after observation the inflammatory

response was increasing among patients with appendicitis and decreasing among patients without appendicitis. Shefki Xharra et al (Shefki 2012). in their study they found that combination of WBCS , CRP and Neutrophil count tests significantly increases the accuracy of acute appendicitis diagnosis and that elevated serum CRP levels support the surgeon's clinical diagnosis.

CONCLUSION

Evaluation of the clinical symptoms of acute appendicitis and signs combined with the TWBCS count and CRP tests can improve the diagnostic accuracy and significantly reduce the incidence of perforation and the rate of unnecessary operations.

REFERENCE

- Addiss DG, Shaffer N, Fowler BS, Tauxe RV (1990). The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol*; 132:910.
- Anderson BE, Hugander A, Thahir AJ (1992). Diagnostic accuracy and perforation rate in appendicitis , association with age and sex of the patient and with appendectomy rate. *Eur J Surg*; 158: 37-41.
- Buschard K, Kjaeldgaard A (1973). Investigation and analysis of the position, fixation, length and embryology of the vermiform appendix. *Acta Chir Scand*; 139:293.
- Coleman C, Thompson JE Jr, Bennion RS, Schmit PJ (1998). White blood cell count is a poor predictor of severity of disease in the diagnosis of appendicitis. *Am Surg*; 64:983.
- Fitz RH (1886). Perforating inflammation of the vermiform appendix with special reference to its early diagnosis and treatment. *Am J Med Sci*; 92:321.
- Jaffe BM, Berger DH (2005). The Appendix. In: Schwartz Principles of Surgery, 8th ed, Schwartz, SI, Brunickardi, CF (Ed), McGraw-Hill Health Pub. Division, New York.
- Jaye DL, Waites KB (1997). Clinical application of C-reactive protein in pediatrics. *Pediatr Infect Dis J*; 16: 735-746.
- Kipper SL, Rypins EB, Evans DG, Thakur ML, Smith TD, Rhodes B (2000). Neutrophil specific 99mTc labeled anti CD15 monoclonal antibodies imaging for diagnosis of equivocal appendicitis. *J Nucl Med*; 41: 449-455.
- Kumar V, Abbas AK, Fausto N (2007). Robbins and Cotran: Pathologic Basis of Disease, 7th end, Saunders Elsevier, Philadelphia, PA.
- Lau WY, Ho YC, Yeung C (1989). Leucocytes count and neutrophil percentage in appendectomy for suspected appendicitis. *Aust N Z J Surg*; 59: 395-398.
- Marcelo A, Beltrán (2007). Predictive value of white blood cell count and C-reactive protein in children with appendicitis, *Journal of pediatrics surgery* ,July.Vol. 42(7):1208–1214.
- Mulholland MW, Lillemoe KD, Doherty GM (2005). Greenfield's Surgery, 4th ed, Lippincott Williams & Wilkins, Philadelphia, PA. Paajanen H (2012). Novel serum inflammatory markers in acute appendicitis *Scandinavian J. of Clinical and Laboratory Investigation* Vol. 62:8.
- Paltola H, Ahlqvist J, Rapola J, Rasanen J, Louhimos I, Saarinen M (1986). C-reactive protein compared with white cell count and ESR in the diagnosis of acute appendicitis in children. *Acta Chir Scand*; 152: 55-58.
- Shefki X (2012). Correlation of serum C-reactive protein, white blood count and neutrophil percentage with histopathology findings in acute appendicitis *World Journal of Emergency Surgery*, 7:27 doi:10.1186/1749-7922-7-27.
- Silen W (1996). Cope's Early Diagnosis of the Acute Abdomen, 19th edition, Oxford University Press. p.70.
- Williams GR (1983). Presidential Address: a history of appendicitis. With anecdotes illustrating its importance. *Ann Surg*; 197:495.