The THAI Journal of SURGERY 2003; 24:81-84.
Official Publication of the Royal College of Surgeons of Thailand

Acute Appendicitis : A 5-year Review of Histopathology and Clinical Presentation

Nampet Ngodngamthaweesuk, MD
Anucha Tunthangtham, MD
Dusadee Sakonya, MD
Division of Pathology, Faculty of Medicine, Thammasat University, Patumthani 12121, Thailand.

Abstract

Background: **Appendicitis is one of the most common causes of acute abdominal pain. Study of diagnostic accuracy and pathological correlation aiming to reduce not only late complications but also the rate of negative appendectomy had been studied worldwide.**

Patients and Methods: **The diagnostic accuracy and important clinical presentations of acute appendicitis in 449 patients who underwent appendectomy in a 5-year period from 1996 to 2001 were retrospectively studied. The pathological reports were reviewed and grouped into Group I, acute appendicitis with or without perforation and Group II, no acute inflammation of appendix. Clinical information of age, sex, body temperature, and laboratory findings were analyzed by Chi-square test and $p<0.05$ was considered statistically significant.**

Results: **There were 396 cases in Group I (88.2%) and 53 cases in Group II (11.8%). Male and children less than 10 years old were the significant factors related to acute appendicitis ($p<0.05$). Increased neutrophilic ratio (neutrophil >75%) was significantly associated with acute appendicitis ($p<0.05$) especially in the range of 80-85%. There were no significant association between acute appendicitis and body temperature, WBC count, Hct, and urinary WBC.**

Acute appendicitis is one of the most frequent reasons for acute abdominal operation.[1,2] To obtain accurate preoperative diagnosis may be difficult in many cases.[3] Delay in treatment can cause certain complications. On the other hand, prompt diagnosis and emergency operation can result in a number of negative appendectomies. The diagnostic accuracy of acute appendicitis and acceptable rate of negative appendectomy had been reported in several studies.[4-7] The clinical data of age, sex, white blood cell count (WBC) and urine examination were generally analyzed in order to find possible diagnostic clue.[8-10] The objective of this study is to determine factors that help to increase diagnostic accuracy as well as to reduce negative appendectomy.

Patients and Methods

Medical and pathological records of 449 patients who underwent surgery for suspected acute appendicitis at Thammasat Chalermprakiat Hospital in a 5-year period between 1996 and 2001 were reviewed. Pathological reports of all appendiceal specimens were collected from the surgical pathological unit and divided into two groups; Group I, pathological confirmation of acute appendicitis or perforated acute appendicitis and Group II, no acute inflammation of the appendix. Cases of incidental appendectomy, chronic appendicitis and periappendicitis were excluded. Preoperative clinical information regarding age, sex, body temperature at emergency room,

hematocrit, WBC, neutrophils, and urinary WBC were analyzed.

Chi-square test was used for statistic analysis of categorical data. P<0.05 was considered statistically significant.

Results

There were 396 patients (88.2%) in Group I and 53 patients (11.8%) in Group II (Table 1). Two hundred and forty patients were female and 209 patients were male with a female to male ratio of 1.15:1. Forty two cases were children less than 10 years old.

Table 2 showed significant difference in histological confirm-ation of acute appendicitis in 194 males (92.82%) compared to 202 females (84.17%). Male patients and children less than 10 years old were significant factors related to acute appendicitis (p <0.05). Increased neutrophilic ratio (neutrophil >75%) was significantly associated with acute appendicitis (p <0.05) especially neutrophil in the range of 80-85 per cent. There were no significant association between acute appendicitis and body temperature, WBC count, Hct, and urinary WBC.

Table 1 Pathological diagnosis

	No. of cases	% of cases
Group 1 : Acute appendicitis with or without perforation	396	88.2
Group 2 : Histology showed no acute inflammation including	53	11.8
- Normal, unremarkable		
- Lymphoid hyperplasia		
- Fecalith		
- Fibrosis		
- Congestive serosa		
- mucocele		
Total	**449**	**100.0**

Table 2

Patients	Group I	Group II	Odds Ratio	95% CI	P-value
Sex Female	202 (84.17%)	38 (15.83%)	2.433	1.217-4.565	< 0.05**
Male	194 (92.82%)	15 (7.18%)			
Age group					
Children (1-10 years.)	42	0			< 0.05**
Adolescent (11-20 years.)	102	14			> 0.05
Adult (21-50 years.)	209	32			> 0.05
Elderly (51-70 years.)	43	7			> 0.05
Body Temperature 38°C	109	10			> 0.05
Blood Examination					
52 % < Hct < 36 %	62	12			> 0.05
WBC count >10,000 cells/cumm	349	38			> 0.05
Neutrophill >75 %	329	31	3.485	1.901-6.390	< 0.05**
(Neutrophils 80-85%)		4	4.029	1.418-11.448	< 0.05**
Urine					
Presence of WBC	208	35			> 0.05

***P<0.05 was considered statistically significant*

Discussion

The diagnosis of acute appendicitis remains mostly on the basis of clinical manifestation. The problem in making a clinical diagnosis of appendicitis is that in addition to appendicitis, there are other possible surgical and nonsurgical causes of lower abdominal pain. The signs and symptoms associated with appendicitis have been found to have sensitivity between 16 and 100 percent and specificity between 36 and 95 percent.[11] Therefore, other diagnostic modalities such as plain abdominal radiographs,[12,13] barium enema,[14] and ultrasonography[15] have been clinically employed to aid in clinical evaluation, but none has demonstrated a clear advantage over a careful clinical examination.

In this study, the diagnostic accuracy (88.2%) was in the same range generally reported in the literatures.[3,11-15,19-22] Male patients operated upon for lower abdominal pain had histological feature of acute appendicitis significantly more than females. Appendectomies without histological feature of acute appendicitis were found more in female in most reports.[8-10,18,23-25] However laparoscopy may prove to be a useful tool when the diagnosis of appendicitis is not clear, especially in female who may have other causes of lower abdominal pain such as ovarian cysts, pelvic inflammatory disease, and ectopic pregnancy.[16-18]

In addition to patient gender, age was the other important clinical feature in appendicitis. In this study, young children (<10 years old) were statistically significant in having acute appendicitis when presented with lower abdominal pain (Table 2). Early diagnosis in this group should be considered seriously to avoid complications.

The characteristic abdominal pain in acute appendicitis correlated with histologically infiltration of neutrophils within the appendiceal wall. White blood cell count has been considered to be a useful finding in the diagnosis of acute appendicitis. Leukocytosis characterized by neutrophilia had been reported as a good parameter for diagnosis.[9] In this study, although the overall increased total WBC count was not significantly associated with acute appendicitis, increased neutrophilic ratio (neutrophil >75%) especially in range of 80-85 percent was significant. Hence, the finding of neutrophilia in patient with lower abdominal pain is more useful than leukocytosis alone in the diagnosis of acute appendicitis.

No any single symptom or sign permits definite diagnosis of acute appendicitis. The use of scoring systems to enhance accuracy in the diagnosis of appendicitis, such as Alvarado score,[26] is gaining popularity because it can be used in hospitals lacking of certain diagnostic facilities. The score points are derived from the following findings: migratory right iliac fossa pain, anorexia, nausea and vomiting, RLQ rebound tenderness, elevated body temperature, leukocytosis with or without increased neutrophil.

Is pathological report of normal appendix in patients with clinical diagnosis suspicious of acute appendicitis actually normal? There had been report that approximately 25 per cent of histologically normal appendices removed from patients with preoperative diagnosis of acute appendicitis showed presence of TNF-α and IL-2 in the mucosa similar to those of acute appendicitis.[27] However, whether these inflammatory cytokines are responsible for the clinical symptoms remains unknown and is a subject of further study.

Analysis of pathological diagnosis of appendicitis showed marked variation in terminology and classification especially in groups of normal appendix. To avoid the different groups of diagnosis, a same standard diagnostic criteria and tissue coding system is helpful and should be generally used in describing the pathological reports. According to this variation, a careful review of diagnosis of these alternate groups is the first necessary step in the studying of diagnostic accuracy and normal appendectomy rates.

REFERENCES

1. Gough IR. A study of diagnostic accuracy in suspected acute appendicitis. Aust N Z J Surg 1988; 58: 555-9.
2. Van Way CW(III), Murphy JR, Dunn EL, Elerding SC. A feasibility study of computer aided diagnosis in appendicitis. Surg Gynecol Obstet 1982; 155: 685-8.
3. Anderson RE, Hugander A, Thulin AJ. Diagnostic accuracy and perforation rate in appendicitis : Association with age and sex of the patient with appendectomy rate. Eur J Surg 1992; 158: 37-41.
4. Schrock TR. Acute appendicitis. In: Sleisinger MH, Fordtran JS, editors. Gastrointestinal disease: pathophysiology, diagnosis, management. 3rd ed. Philadelphia: WB Saunders; 1983. p. 1268-75.

5. Condon RE. Appendicitis. In: Sabiston DB Jr, editor. Textbook of surgery. The biological basis of modern surgical practice. Philadelphia: WB Saunders; 1985. p. 967-82.
6. Lewis FR, Holcroft JW, Boey J, Dunphy JE. Appendicitis. A critical review of diagnosis and treatment in 1000 cases. Arch Surg 1975; 110: 677-83.
7. Hobson T, Rosenman LD. Acute appendicitis: when is it right or to be wrong? Am J Surg 1964; 108: 306-12.
8. Korner H, Sondenaa K, Soreide JA, Anderson E, Nysted A, Lende TH. Structured data collection improves the diagnosis of acute appendicitis. Br J Surg 1998; 85: 341-4.
9. Ng KC, Lai SW. Clinical analysis of the related factors in acute appendicitis. Yale J Biol Med 2002; 75: 41-5.
10. Anderson R, Hugander A, Thulin A, Nystrom PO, Olaison G. Indications for operation in suspected appendicitis and incidence of perforation. Br Med J 1994; 308: 107-10.
11. Wagner MJ, McKinney PW, Carpenter LJ. Does this patient have appendicitis? JAMA Nov 20, 1996; 276: 1589-94.
12. Campbell JPM, Gunn AA. Plain abdominal radiographs and acute abdominal pain. Br J Surg 1988; 75: 554-6.
13. Velanovich V. Plain abdominal radiographs and acute abdominal pain. (letter) Br J Surg 1988; 75: 1147.
14. Brazaitis MP, Darchrnan AH. The radiographic evaluation of acute abdominal pain of intestinal origin. Med Clin North Am 1993; 77: 939-72.
15. Wade DS, Morrow SE, Balsara ZN, et al. Accuracy of ultrasound in the diagnosis of acute appendicitis compare with the surgeon's clinical impression. Arch Surg 1993; 128: 1039-46.
16. Bouillet JL, Salah S, Fernandez F, et al. Laparoscopic procedure for suspected appendicitis: a prospective study in 283 consecutive patients. Surg Endosc 1995; 9: 957-60.
17. Zaninotto G, Rossi M, Anselmino M, et al. Laparoscopic versus conventional surgery for suspected appendicitis in women. Surg Endosc 1995; 9: 337-40.
18. Korner H, Sondenaa K, Soreide JA, Anderson E, Nysted A, Lende TH, Kjellevold KH. Incidence of acute nonperforated appendicitis : age-specific and sex-specific analysis. World J Surg 1997; 21: 313-7.
19. Blair PN, Bugis PS, Turner JL, Macleod MM. Review of the pathologic diagnoses of 2,216 appendectomy specimens Am J Surg 1993; 165: 618-20.
20. Blind J, Dahlgren S. The continuing challenge of the negative appendix. Acta Chir Scand 1986; 152: 623-7.
21. White JJ, Santillana M, Haller JA Jr. Intensive in hospital observation: A safe way to decrease unnecessary appendectomy. Am Surg 1975; 41: 794-8.
22. Whitworth CM, Withworth PW, Sanfillipo J, Polk HC Jr. Value of diagnostic laparoscopy in young women with possible appendicitis. Surg Gynecol Obstet 1988; 167: 187-90.
23. Chang AR. Ananalysis of the pathology of 3003 appendices. Aust N Z J Surg 1981; 51: 169-78.
24. Agafonoff S, Hawke I, Khadra M, Munings V, Notaras L, Wadhwa S, Burton R. The influence of age and gender on normal appendicectomy rates. Aust N Z J Surg 198757: 843-6.
25. Ricci AM, Trevisani FM, Beck CW. Acute appendicitis: A 5-year review. Am Surg 1991; 57: 301-5.
26. Calder JDF, Gajraj H. Recent advance in the diagnosis and treatment of acute appendicitis. Br J Hosp Med 1995; 54: 129-33
27. Wang Y, Reen DJ, Puri P. Is a histologically normal appendix following emergency appendectomy always normal? Lancet 1996; 347: 1076-9.