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Clinicopathological Correlation In Cases Of Acute Appendicitis

Tushar[1], Sanjeev Sharma[2], Bal chander[3], Rajesh Sharma[4]
Junior Resident, Department of Surgery, Dr RPGMC Tanda, Kangra, HP, India
Professor, Department of Surgery, Dr RPGMC Tanda, Kangra, HP, India
Professor, Department of Pathology, Dr RPGMC Tanda, Kangra, HP, India
Assistant Professor, Department of Surgery, Dr RPGMC Tanda, Kangra, HP, India

ABSTRACT
Introduction: *Appendix is hollow tubular structure with a blind ending which communicates with the caecum. Acute appendicitis is one of the most common problems encountered by a general surgeon, accounting for approximately 1% of all surgical operations. The accurate pre-operative diagnosis of acute appendicitis remains an enigmatic challenge despite clinical examination, laboratory investigations and diagnostic imaging. In view of diagnostic dilemma this study was done to evaluate the clinicopathological correlation in cases of acute appendicitis.*
Material and methods: *The study was done in patients admitted in Department of Surgery at our institution presenting with symptoms of Acute Appendicitis for a period of 1 year from January to December 2021. All the patients were evaluated with detailed history, clinical examination, relevant hematological, biochemical and radiological examination. Operative findings included normal appearing appendix, catarrhal appendicitis, gangrenous appendicitis and presence of either pus or abscess. After surgery, appendix specimen was subjected to histopathological examination.*
Results: *A total of 40 patients were included in the study. Out of these patients 25(62.5%) were male and 15(37.5%) were female. Most common symptom in these patients was pain abdomen in right iliac fossa which was present in all the patients. Perforated appendix was found in 9(22%) of cases. Absence of acute inflammation or neutrophils in the mucosa noted in 19 out of 40 patients, which is nearly 50%.*
Conclusion: *Histopathological examination of the appendix appears to be essential as it sheds light on rate of negative appendix specimens which are clinically diagnosed as acute appendicitis. Approximately half of the specimens did not show any evidence of acute inflammation (neutrophils) on histopathological examination and therefore were not diagnosed as acute appendicitis.*
Keywords: *Appendicitis, fecolith, histopathological, neutrophils, eosinophils*

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I. INTRODUCTION

Appendix is hollow tubular structure with a blind ending which communicates with the caecum. Its length ranges from 6 to 10 centimeters and it may show variations in its position [1]. It can be retrocaecal, paracaecal, preileal, postileal, pelvic and subcaecal. It is invested with mesentery and like small and large intestine; it is composed of these layers: mucosa, submucosa, muscularis propria and serosa.

Acute appendicitis is one of the most common problems encountered by a general surgeon, accounting for approximately 1% of all surgical operations [2]. It occurs most commonly between the ages of 10 to 20 years with a lifetime risk of 8.6% and 6.7% for males and females respectively [3].

The classic teaching is that luminal obstruction, secondary to fecolith, lymphoid hyperplasia or malignancy is the main initiator of this process. The proposed pathway is that obstruction of the lumen leads to accumulation of the mucous in the appendix, thus creating increased intraluminal pressure. The lack of luminal drainage leads to bacterial overgrowth while the increased pressure leads to mucosal ischemia with impaired venous and lymphatic drainage. This combination of factors then leads to bacterial invasion of the appendiceal wall and development of acute appendicitis, which if left unchecked, can lead to gangrenous and perforated appendicitis.

Irrespective of the etiology, the symptomatic progression of appendicitis often follows a typical course. The initial stages of appendiceal inflammation correspond with the development of periumbilical, visceral type pain. This is accompanied by anorexia (92%), nausea (78%) and vomiting (67%). Differences in presentation of abdominal pain can be secondary to abnormal appendiceal location, with retroceacal appendices leading to diffuse right flank pain, or pelvic location of the appendix causing poorly localized hypogastric discomfort, or

tenesmus. When vomiting does occur, it is rarely persistent and most commonly occurs after the onset of pain. Combined with the patient's history, physical examination can be sufficient to make a diagnosis of acute appendicitis, especially in men where the differential diagnosis is not very extensive as in women. This is true for typical and uncomplicated cases but diagnostic dilemma still exists in diagnosing atypical cases due to various positions of appendix and many differential diagnoses that mimics acute appendicitis.

In order to improve diagnostic accuracy, a number of diagnostic modalities have been used to diagnose acute appendicitis including Alvarado scoring system, Ultrasonography (USG), Computerized Tomography (CT) scan, Magnetic Resonance Imaging (MRI) and diagnostic laparoscopy. CT scan and USG are the preferred imaging modalities for diagnosis of abdominal pain and appendicitis. Studies comparing the two modalities for appendicitis reveal increased accuracy with CT over USG [4], equivocal cases have demonstrated CT to be more accurate [5]. For most adult patients with abdominal pain and suspected appendicitis, the abdominal CT has become the main diagnostic imaging study with an accuracy of greater than 94% [6, 7]. The accurate pre-operative diagnosis of acute appendicitis remains an enigmatic challenge, despite clinical examination, laboratory investigations and diagnostic imaging studies due to wide range of diseases mimicking acute appendicitis which can lead to increased negative appendicectomy rates.

In view of diagnostic dilemma in diagnosing cases of acute appendicitis due to various clinical challenges, limited use of advanced radiological investigations due to its high cost and significant rate of negative appendicectomy, this study was done to evaluate the clinicopathological correlation in cases of acute appendicitis.

II. MATERIAL AND METHODS

This study was done in patients admitted in the Department of Surgery at our institution presenting with symptoms of Acute Appendicitis for a period of 1 year from January to December 2021. It was a descriptive study with patient's age ranging from 5 to 70 years. All the patients were evaluated with detailed history, clinical examination, relevant hematological, biochemical and radiological examinations. Operative findings included normal appearing appendix, catarrhal appendicitis, gangrenous appendicitis and presence of either pus or abscess. After surgery, appendix specimen was subjected to histopathological examination by Hematoxylin and Eosin staining for final diagnosis of acute appendicitis and was correlated with the clinical findings. Statistical analysis was performed using Microsoft excel and SPSS version 22. All the continuous variables were expressed as means and standard deviation in table form.

III. RESULTS

A total of 40 patients were included in the study. Out of these patients 25(62.5%) were male and 15(37.5%) were female. Average age of male patients was 36.1 years with range of 13 to 70 years while in female patients, average age was 28.6 years with a range of 5 to 65 years.

Most common symptom in these patients was pain abdomen in right iliac fossa, which was present in all the patients. It was followed by fever in 8(20%) patients, vomiting in 20 (50%) patients and anorexia in 24(60%) patients. A total of 7 (17.5%) patients were febrile. All the participants were treated with Ceftriaxone and Metronidazole.

The average total leukocyte count was found to be 11,406 per cubic millimeters (cumm) with a maximum count of 22000/ cumm and minimum count 4800/ cumm.

During intra-operative period, the colour of the appendix was found to be red in 31(77.5%) cases, brown in 7(17.5%) and black in 2(5%) cases. Most common position of the appendix in these patients was retroceacal, found in 45% of cases and the least common position was subcaecal. Perforated appendix was found in 9(22%) patients.

Regarding histopathological analysis, neutrophils, eosinophils, lymphocytes and plasma cells were counted in 40X (objective lenses) magnification. The counting was carried out in fields with maximum number of cells.

The degree of ulceration was assigned values from 0 to 3

0: No ulceration
1: Focal ulceration not exceeding one
2: Focal ulceration exceeding one but less than three high power fields (HPF)
3: Ulceration in more than three HPF

The degree of acute inflammation in the mucosa was assigned values from 0 to 3

0: Absence of neutrophil
1: Neutrophil count less than 50/ HPF
2: Neutrophil count between 50 and 400/HPF
3: Neutrophil count more than 400/HPF

The same criterion was used to assign degree of acute inflammation in submucosa. The number of lymphoid follicles was counted in the entire section, which was divided in primary and secondary follicles.
The degree of chronic inflammation in the mucosa was assigned values from 0 to 3.
0: Absence of lymphocytes
1: Lymphocyte count less than 50/ HPF
2: Lymphocyte count between 50 to 300/ HPF
3: Lymphocyte count more than 300/ HPF
The same criteria was used to assign degree of acute inflammation in submucosa
The degree of adipocytes in the submucosa was assigned values from 0 to 3.
0: Absence of adipocytes
1: Adipocytes count less than 20/HPF
2: Adipocytes count between 20 and 60/ HPF
3: Adipocytes count more than 60/ HPF

Parameters	Minimum	Maximum	Mean	SD
Mucosal Neutrophils/ HPF	0	500	54.3	101.7
Mucosal eosinophils/ HPF	0	30	7	7.3
Mucosal lymphocytes/ HPF	0	500	273.2	192.6
Mucosal plasma cells/ HPF	0	300	56.1	69.6
Mucosal plasma lymphoid follicles	0	7	2.1	1.8
Mucosal serosal lymphoid follicles	0	10	2.5	2.7
Total follicles	0	17	4.7	4.2

Table 1: Histopathological parameters

Parameters	Grade 0	Grade 1	Grade 2	Grade 3
Mucosal acute inflammation	19(47.5%)	10(25%)	6(15%)	5(12.5%)
Sub mucosal acute inflammation	23(57.5%)	7(17.5%)	3(7.5%)	7(17.5%)
Muscularis acute inflammation	21(52.5%)	5(12.5%)	5(12.5%)	9(22.5%)
Serosal acute inflammation	24(60%)	7(17.5%)	5(12.5%)	4(10%)
Peri appendiceal acute inflammation	28(70%)	4(10%)	3(7.5%)	5(12.5%)
Mucosal chronic inflammation	2(5%)	38(95%)	0	0
Sub mucosal chronic inflammation	1(2.5%)	18(45%)	10(25%)	11(27.5%)
Muscularis chronic inflammation	5(12.5%)	14(35%)	1742.5%)	4(10%)
Serosal chronic inflammation	2(5%)	24(60%)	10(25%)	4(10%)
Peri appendiceal chronic inflammation	22(55%)	12(30%)	3(7.5%)	3(7.5%)
Adipose tissue	1(2.5%)	11(27.5%)	11(27.5%)	17(42.5%)

Table 2: Detailed Histopathological parameters

IV. DISCUSSION

Acute appendicitis in most cases is a clinical diagnosis [8]. Commonly affected age group is 10 to 20 years even though it can be seen in older age. Vast majority of patients are expected to be less than 40 years of age [3]. In some studies most commonly affected age groups has been found to be in 2nd and 3rd decade [9]. Males have slight preponderance compared to females. Male to female ratio, in different studies ranges from 1:1 to 2.9:1 [9].

Acute appendicitis is defined as inflammation of mucosa which is the innermost layer of appendix [10]. The inflammation if left untreated can spread to surrounding anatomical structures and even distant organs such as liver. There are many factors which are considered to be responsible for initiation of inflammation in appendix. According to some, luminal obstruction is one of such critical factor. Obstruction leads to increased intra luminal pressure, which in turn leads to venous obstruction resulting in blood outflow obstruction and eventual ischemia. Ischemic injury to the lining epithelium facilitates invasion by resident luminal bacteria [10].

Many conditions have been demonstrated to result in luminal obstruction. The wide spectrum of such conditions includes infections such as tuberculosis, amoebiasis, actinomycosis, adenovirus infection and granulomatous disease along with taeniasis. Other lesions such as eosinophilic granuloma, foreign body melanosis and diverticulitis have also been implicated. Although appendix is not one of the organs predisposed to malignancies, rare tumors such as carcinoids, gastrointestinal stromal tumors, hyperplastic polyp, tubular adenoma, villous adenoma, mucocele, mucinous cystadenoma, adenocarcinoma, mucinous cystadenocarcinoma,

neurofibroma, endometriosis, lymphoma and leukemia, all have been shown to result in luminal obstruction resulting in acute appendicitis. The diagnosis in such tumor cases rests on eventual histopathological examination.

Studies have indicated an association between acute appendicitis and the manifestation of colorectal cancer. In fact 2.9% of patients who suffered from acute appendicitis, were found to have colorectal cancer. In patients who are 55 years and older, acute appendicitis was found to be associated with right sided neoplasm. The overall diagnosis of appendicitis, whether resected or treated conservatively, was associated with an overall increase in colorectal cancer rate. Hence, patients who are 55years and older suffering from acute appendicitis should follow up to receive colorectal cancer screening [3].

As per a study by Saleh Al- Mulhim et al [11], 61.2% patients were male and 38.8% were female, with a ratio of 1.6:1. In another study by Shrestha R et al [12], there was slight female preponderance with female to male ratio being 1.1:1. In a series from South Africa, appendicitis occurred most commonly during second decade, accounting for 43.1% of patients [13]. In our study male to female ratio was 1.7:1 and most of the cases were confined to 3rd and 4th decade. The youngest patient was 5 year old and the oldest was aged 70 years.

The most common symptom in a study from South Africa, was abdominal pain (100%), vomiting (57.4%) and anorexia (49%) [13].In the same study, diarrhea was present in 18.2% of patients and 11.1% patients had pelvic abscess. In another study, out of 146 patients, male to female ratio was 1.6:1 and the presenting symptoms were right iliac fossa pain (95%), nausea (80%) and vomiting (73%). Fever was present in 15% of cases [14]. In our study, all the patients had abdominal pain which is similar to published literature, 20% had fever, 60% had anorexia and 57.5% had vomiting.

In a study by Tran et al [15], an average of 23.5% cases showed presence of fecoliths in patients with acute appendicitis. In perforated appendix, the fecoliths were slightly higher (24.9%). Remarkably, fecoliths were reported in 20.3% of normal appendix. In our study, material constituting probable or possible fecolith was seen in 2 cases which come out to be 5% of all cases. Therefore, it can be argued that fecolith while important in the pathogenesis of acute appendicitis, is not enough on its own, given the fact that acute appendicitis cases also occur without any fecolith. In the present study, acute appendicitis without fecoliths constituted 95% of cases.

In a study by Jat et al [9], 97% of the clinically diagnosed acute appendicitis cases were proven to be so on histological examination. This rate of histological proven acute appendicitis is one of the highest published in the literature. In another study by Jones et al [16], only 77% cases were histological proven to be acute appendicitis with quite high rate of negative appendicectomies. In the present study, absence of acute inflammation or neutrophils in the mucosa was noted in 19 out of 40 patients, which is nearly 50%. Out of these 19 patients, it is interesting to note that one case showed presence of neutrophils in submucosa, four showed scattered neutrophils in muscularis propria and one in the serosa. Absence of neutrophils in the mucosa but presence in the submucosa or muscularis or even serosa can be explained by the fact that the distribution of the inflammatory cells is not uniform along the length and therefore a single section may not show expected presence of neutrophils in all the layers.

All of these cases did not show any evidence of ulceration of mucosa which fits in quite well with absence of neutrophils. On the other hand, all cases showing ulceration showed presence of neutrophils in the mucosa. A single case showed presence of neutrophils in the mucosa without accompanying ulceration. In addition out of above mentioned 19 cases; most had eosinophils in the mucosa except 4 cases. Eosinophils are generally indicative of either allergic reaction or presence of some parasite. It should be noted that one of these cases showed the presence of parasites in the lumen.

It should be mentioned here that in all these cases diagnosis was made on clinical examination and confirmed on USG and laboratory findings, yet almost 50% cases did not show presence of inflammation on histopathological examination. This can be explained by the fact that routinely only 2 sections from whole of the specimen are examined and these sections may or may not show acute inflammation particularly when it has a focal distribution.

The salient question that needs to be answered is whether mild focal inflammation in the appendix can lead to the clinical manifestations indistinguishable from moderate inflammation. Similarly, whether eosinophils without other accompanying infiltrate in the appendix can result in clinical manifestations very similar to that of only neutrophils.

Moreover, there appears to be no valid ground for using radiological investigations such as USG, CECT and MRI, for diagnosing acute appendicitis because of only mild or focal inflammation.

Studies have shown that eosinophils are present in normal appendix specimens. However, the numbers are less as compared to histologically proved cases of acute appendicitis. Therefore, strictly speaking, in our study the number of cases with no eosinophils or neutrophils in the appendix; in other words negative appendicectomies turn out to be in 4 (10%) patients.

Association between amount of dietary fibre and acute appendicitis has also been shown in the literature. Generally more fibre appears to provide some protection against acute inflammation owing to altered luminal flora [17].

We failed to find any significant correlation between degree of inflammation with age, sex or total leukocyte counts in peripheral blood.

V. CONCLUSION

Histopathological examination of the appendix appears to be essential as it sheds light on rate of negative appendicectomy specimens which are clinically diagnosed as acute appendicitis. Approximately, half of the specimens did not show any evidence of acute inflammation (neutrophils) on histopathological examination and therefore were not diagnosed as acute appendicitis. It is possible that the "negative" specimens are negative owing to limitations imposed by nature of histological examination. There appears to be strong case for diagnosing specimen with eosinophilic infiltrate as acute appendicitis.

Strengths of the study: This study is first of its type in this region, as in this study we tried to quantify the different types of inflammatory cells like neutrophils, eosinophils, lymphocytes and plasma cells in all the specimens of appendix and tried to correlate them with the clinical parameters.
Limitations of the study: It was a single centre study and the sample size is also small.
Conflict of interests: None declared

REFERENCES

[1]. Stringer MD. Acute appendicitis. J Paediatr Child Health. 2017 Nov;53(11)1071-76.
[2]. Lewis FR, Holcroft JW, Boey J, Dunphy E. Appendicitis- a critical review of diagnosis and treatment in 1,000 cases. Arch Surg 1975;110(5):677-84.
[3]. Krzyzak M, Mulrooney SM. Acute appendicitis review: background, epidemiology, diagnosis and treatment. Cureus. 2020 Jun 11;12(6):e8562.
[4]. Terasawa T, Blackmore CC, Bent S, Kohlwas RJ. Systematic review: computed tomography and ultrasonography to detect acute appendicitis in adults and adolescents. Ann Intern Med. 2004;141(7):537-46.
[5]. Pieper R, Kager L, Nasman P. Acute appendicitis: a clinical study of 1018 cases of emergency appendicectomy. Acta chir Scand. 1982;148(1)51-62.
[6]. Fuchs JR, Schlamberg JS, Shortsleeve MJ, Schuler JG. Impact of abdominal CT imaging on the management of appendicitis: an update. J Surg Res 2002;106(1):131-36.
[7]. Holloway JA, Westerbuhr LM, Chain J et al. Is appendiceal computed tomography in a community hospital useful? AM J Surg 2003;186(6)682-84.
[8]. Dey S, Mohanta PK, Baruah AK, Kharga B, Bhutia KL, Singh VK. Alvarado scoring in acute appendicitis- a clinicopathological correlation. Indian J Surg 2010;72(4):290-93.
[9]. Jat MA, Al- Swailmi FK, Mehmood Y, Alrowaili M, Alanazi S. Histopathological examination of appendicectomy specimens at a district hospital of Saudi Arabia. Pak J Med Sci. 2015 Jul Aug;31(4):891-94.
[10]. Emre A, Akbulut S, Bozdag Z, Yilmaz M, Knalioz M, Emre R, Sahin N. Routine histopathological examination of appendectomy specimens: retrospective analysis of 1255 patients. Int Surg 2013 Oct Dec 98(4):354-62.
[11]. Saleh Al Mulhim AR. Unusual findings in appendicectomy specimens; local experience in Al-Ahsa region of Saudi Arabia. JCPFM 2011;2(1):40-41.
[12]. Shrestha R, Ranabhat SR, Tiwari M. Histopathological analysis of appendectomy specimens. J Pathol Nepal 2012;2(3):215-19.
[13]. Chamisa I. Clinicopathological review of 324 appendices removed for acute appendicitis in Durban, South Africa: a retrospective analysis. Ann R Coll Surg Engl.2009 Nov;91(8):688-92.
[14]. Nshuti R, Kruger D, Luvhengo TE. Clinical presentation of acute appendicitis in adults at the Chris Hani Baragwanath academic hospital. Int J Emerg Med 2014 Feb 17;7(1):12.
[15]. Tran N, Emuakhagbon VS, Baker BT, Huerta S. Reassessing the role of fecolith in acute appendicitis in adults: case report, case series and literature review. J Surg Case Report 2021 Jan 29.
[16]. Jones AE, Philips AW, Jarvis JR, Sargen K. The value of routine histopathological examination of appendicectomy specimens. BMC Surg 2007 Aug 10;7:17.
[17]. Barker DJ, Morris J, Nelson M. Vegetable consumption and acute appendicitis in 59 areas in England and Wales. Bri Med J 1986 April 5;292:927-30.