

## **A Study of Histopathology of Appendicitis with Clinical Correlation**

Supriya Dutta<sup>1</sup>, Ishita Ghatak<sup>2</sup>, Mir Hasan<sup>3</sup>, Pranamita Ray<sup>4</sup>

### **Abstract**

#### **Introduction :**

Acute appendicitis is a common surgical emergency all over the world. The incidence in developing countries is increasing due to change in life style and behaviour. Histopathological examination (HPE) remains the gold standard for diagnosis of acute appendicitis. The article describes a study conducted in a teaching hospital in Kolkata . The aim of this study was to look for the correlation between clinical and histopathological diagnoses of acute appendicitis, if any, and to evaluate the utility of HPE of the resected specimensof appendixes.

#### **Method :**

75 appendixes received in Department of Pathology from February 2021 to July 2022 were included and clinical details and data obtained from HPE were recorded. Data analysis was performedwith SPSS 21 software.

#### **Result :**

There was a significant association between the clinical and histopathological diagnoses of acute appendicitis. Ten cases from the appendixes not showing acute appendicitis on HPE showed unusual pathologieslike carcinoid, appendiceal neuroma, low grade mucinous neoplasm, parasite, etc. So the results re-established the utility of gold standard HPE.

#### **Key words :**

Appendicitis, Carcinoid, Mucocele, Low grade mucinous neoplasm, Enterobius vermicularis

#### **Introduction :**

Appendicitis accounts for the most common abdominal emergency and appendectomy is a routinely performed surgery all over the world.<sup>[1]</sup> The incidence of appendicitis is increasing in India and other developing countries, mainly in urban cities due to increased acceptance towards western diet.<sup>[2]</sup> Appendicitis occurs commonly in children and young adults with a lifetime risk of 7%.<sup>[3]</sup> In spite of all the recent advancements, clinical diagnosis of acute appendicitis is accurate in only 60-80% of cases.<sup>[4]</sup> Therefore, histopathological examination stays the gold standard for confirmation of appendicitis.

The aim of present study was to evaluate the correlation between clinical and histopathological diagnoses of acute appendicitis and the utility of histopathological examination.

#### **Materials and Methods :**

This study was carried out in the Department of Pathology of a tertiary care Teaching Hospital in Kolkata. A total of 75 appendectomy specimens were received in the histopathology section, Department of Pathology, over the period of 18 months from February 2021 to July 2022. All emergency appendectomies and interval appendectomies done for cases of clinically suspected appendicitis were included. Appendices resected as a part of intestine in surgeries other than appendectomy for clinically diagnosed appendicitis, were excluded. The relevant clinical data was retrieved and gross findings were noted. Specimens were fixed in 10% formalin, routine

---

<sup>1,2</sup>Junior Resident, <sup>3,4</sup>Associate Professor, Department of Pathology, RKMS, VIMS

tissue processing and paraffin embedding was done and 5 micrometre thickness sections obtained, Haematoxylin and Eosin stain was used for microscopic examination of the sections.

Histopathological diagnoses were reviewed by senior pathologists.

The data compilation was done in Microsoft Office Excel. Analysis was done with IBM SPSS 21.

### Results :

In total 75 appendixes were evaluated during the study period.

Clinical diagnosis of acute appendicitis	Histopathological diagnosis of acute inflammation of appendix		Total
	Present	Absent	
Present	29	16	45
Not present	2	28	30
Total	31	44	75

The sensitivity and specificity of clinical diagnosis of acute appendicitis were 93.55 % and 63.64 % respectively. The positive likelihood ratio was 2.57 and negative likelihood ratio was 0.1. Positive predictive value was 64.44 % and negative predictive value was 93.33 %. Positive likelihood ratio was 2.57. Negative likelihood ratio was 0.1.

Chi sq 22.45

df-1

P value was 0.0000021.

So clinical diagnosis of acute appendicitis was significantly associated with a histopathological diagnosis of acute appendicitis.

As shown in the Table, 31 cases were diagnosed as acute appendicitis by histopathological examination (HPE). Of those 2 cases were not diagnosed as acute appendicitis clinically. HPE showed mild acute inflammation in the form of few polymorphs in the muscle layer. The absence of clinical features of acute appendicitis were

probably explained by the mild inflammation in those 2 cases.

On the other hand, 44 cases did not show acute appendicitis on HPE. Of those 2 showed fibrous obliteration of appendix or appendiceal neuroma. One showed carcinoid-neuroendocrine tumour grade 1. Two cases showed noncaseating granuloma, one case showed *Enterobius vermicularis* infection. One case showed long standing chronic inflammation and haemorrhage. Another case showed ill-formed foreign body granuloma. 1 case showed mucocele and another case showed low grade mucinous neoplasm of appendix.

The remaining 34 cases showed reactive lymphoid follicular hyperplasia without significant acute inflammation. These were diagnosed as recurrent appendicitis.

Of the total 44 cases 16 had positive clinical features of acute appendicitis and clinically were diagnosed as acute appendicitis. These cases on HPE showed reactive lymphoid follicular

hyperplasia and were diagnosed as recurrent appendicitis. The luminal obstruction caused by lymphoid hyperplasia probably caused the symptoms clinically mimicking acute appendicitis.

#### **Discussion :**

A study conducted by Oguntola et al shows out of the 238 resected appendix, 211 (88.7%) had histopathology findings consistent with appendicitis which was variously reported as acute suppurative appendicitis, transmural inflammation of the appendix with or without fecolith and gangrenous perforated appendix. Four cases of fibrous obliteration of the lumen of the specimen without evidence of inflammation were reported. Approximately 1.7% of the 238 specimens were unusual pathologies other than inflammation of the appendix and two mucinous lesions were reported. One of the findings suggestive of mucinous cystadenoma was reported as "specimen is covered with fibrous exudate. A nodule of 10 mm in maximum dimension is seen. Focally dilated appendiceal lumen is lined with mildly atypical epithelium which is thrown into convoluted folds. Mucin extravasation with a single gland within tissue is seen all suggestive of cystadenoma with low grade dysplasia associated with acute appendicitis. One case of carcinoid tumour at the tip of the appendix which was synaptophysin and chromogranin positive was reported. The negative appendectomy rate (NAR) was 11.3%. The female sex accounted for 59.3% of the negative appendectomies. Adults (>16 years) represented 77.8% of the negative appendectomies.

Appendicitis can be of the obstructive or non-obstructive type. Luminal obstruction is the main factor in acute appendicitis and some of the

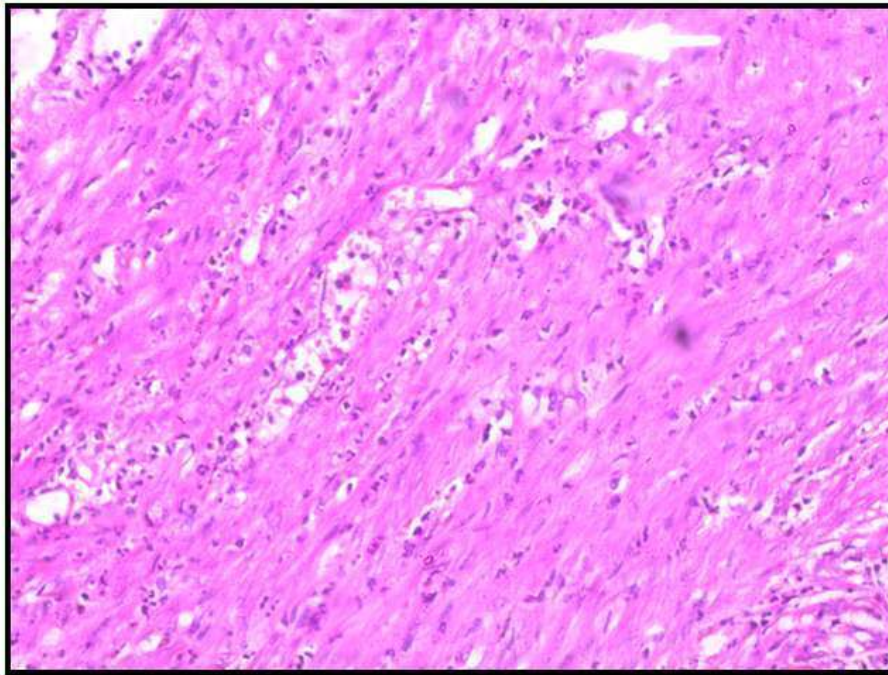
common classical obstructive lesions are fecolith, lymphoid hyperplasia and foreign bodies. Some unusual factors include parasitic infestations like enterobiasis, ascariasis, bacterial infections like tuberculosis or a tumour as carcinoid, primary/secondary adenocarcinoma, lymphoma, gastrointestinal stromal tumour.<sup>[5]</sup>

Clinical features are abdominal discomfort, pain and anorexia. Pain usually starts in periumbilical or epigastric region and then localizes to right lower quadrant subsequently. Nausea, vomiting may occur but usually are self-limited. Most commonly McBurney's point tenderness is present or may be different according to different anatomical location. The temperature is usually normal or mildly raised-99° to 100.5°F. A temperature > 101° F is suggestive of perforation. Tachycardia develops with rising temperature. Rigidity and tenderness are marked as perforation develops and perforation is unusual before 24 hours of onset of symptoms but is very frequent after 48 hours.

The appendix is an organ of gut associated lympho-epithelial tissue.<sup>[6]</sup> It consists of a large number of repeating units - an apical dome, a large basal lymphoid follicle with a germinal centre and laterally extending thymus dependent areas. The dome epithelium consists mainly of columnar absorptive cells and of specialized follicle associated epithelial (FAE) cells or M cells. The dome epithelium normally has large number of lymphocytes, smaller numbers of histiocytes and plasma cells. Macrophages and M cells are involved in processing and presenting antigens to lymphocytes. The mucosal glands are much less closely packed than colon.<sup>[7]</sup> Normal function of appendix probably helps suppress potentially destructive humoral antibody responses while promoting local immunity.<sup>[6]</sup>

On microscopy, in acute appendicitis, proliferation of neutrophils in the muscularis propria is seen establishing the diagnosis (Figure1). The degree and extent of inflammation are directly proportionate to the severity and

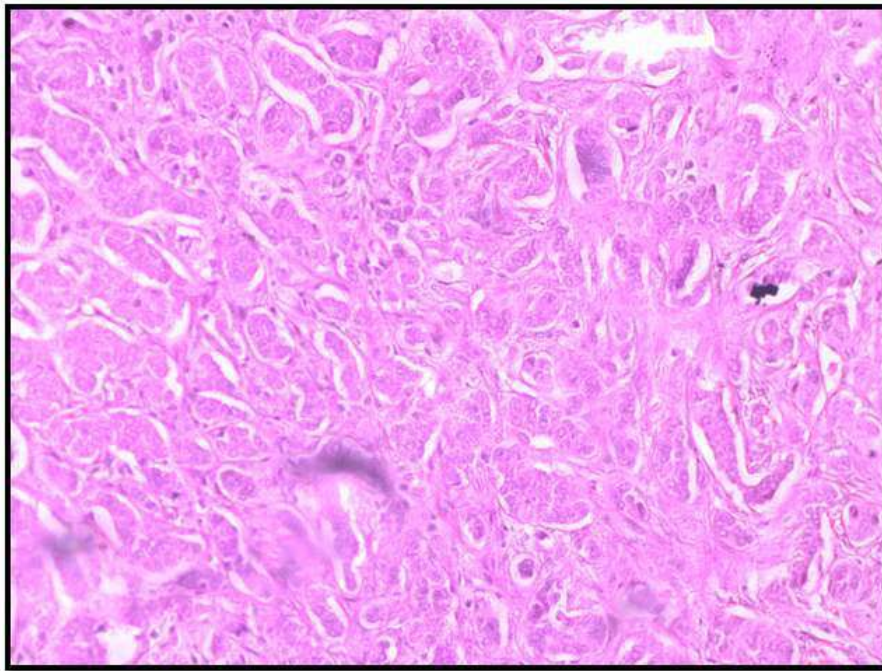
duration of the disease. As this condition progresses, extra appendiceal fat and surrounding tissues become involved in the inflammatory process.<sup>[7]</sup>



**Figure 1 : Neutrophils in muscularis propria (H&E 40x )**

In this study, 75 appendices were examined histopathologically. Histopathology showed acute appendicitis in 31 cases. The remaining 44 cases showed no evidence of acute inflammation. Thirty seven patients were male and 38 patients were female. Fifty cases were adult. The remaining 25 cases were in the age group of = 18 years. Of the 31 cases with acute appendicitis, 29 cases showed clinical symptoms of acute appendicitis. The remaining 2 cases were not having clinical symptoms of acute appendicitis. Of the 44 cases without acute inflammation, 16 cases were diagnosed as acute appendicitis clinically. The remaining 28 cases were clinically

negative for acute inflammation. 16 cases were interpreted as acute inflammation most likely due to symptoms caused by luminal obstruction due to reactive lymphoid follicular hyperplasia. Ten cases showed unusual pathologies on HPE, including 2 appendiceal neuroma, 2 granulomatous inflammation, 1 carcinoid extending through muscle layer, 1 mucocele and 1 low grade mucinous neoplasm of appendix. Another case showed chronic long-standing inflammation and haemorrhage and another one showed heavy chronic inflammation with ill formed foreign body granuloma. The other case showed *E.vermicularis* infection.



**Figure 2 : Carcinoid - (H&E 100x)**

In this study, sensitivity and specificity of clinical diagnosis were 93.55 % and 63.64 % respectively. The positive likelihood ratio was 2.57 and negative likelihood ratio was 0.1. Positive predictive value was 64.44 % and negative predictive value was 93.33 %. P value was 0.0000021. Hence clinical diagnosis of acute appendicitis was significantly associated with histopathological diagnosis of the same.

**Conclusion :**

This study was done in a tertiary care teaching hospital in Kolkata from February 2021 to July 2022. Only 31 of the population of 75 patients had acute inflammation on histopathology. 10 cases had pathologies which were unusual, including *E. vermicularis* infection, mucinous neoplasm, carcinoid, granuloma, etc. Those

cases were in the group without acute appendicitis on histopathology (44 cases). Remaining 34 cases showed lymphoid follicular hyperplasia without significant acute inflammatory features. These cases probably had luminal obstruction and in turn clinically resembled acute appendicitis.

The clinical diagnosis of acute appendicitis was significantly associated with gold standard-histopathologic diagnosis of the same. HPE of appendixes revealed unusual pathologies in 10 cases out of total 75. These findings reestablished the utility of gold standard HPE.

**Acknowledgement :**

We sincerely express our gratitude to Prof. R. Raychowdhury for his valuable suggestions and opinion in making this article of original research.

#### References :

1. Marudanayagam R, Williams GT, Rees BI. Review of the pathological results of 2660 appendicectomy specimens. *J Gastroenterol.* 2006 Aug;41(8):745-9. doi: 10.1007/s00535-006-1855-5. PMID: 16988762.
2. Oguntola AS, Adeoti ML, Oyemolade TA. Appendicitis: Trends in incidence, age, sex, and seasonal variations in South-Western Nigeria. *Ann Afr Med.* 2010 Oct-Dec;9(4):213-7. doi: 10.4103/1596-3519.70956. PMID: 20935419.
3. Turner JR. The Gastrointestinal tract. Kumar V, Abbas K, Fausto, Aster J(eds). *Robbins and Cotran. Pathologic basis of disease.* 8th ed. (2010) Saunders: Philadelphia. 870-1.
4. Fergusson JA, Hitos K, Simpson E. Utility of white cell count and ultrasound in the diagnosis of acute appendicitis. *ANZ J Surg.* 2002 Nov;72(11):781-5. doi: 10.1046/j.1445-2197.2002.02548.x. PMID: 12437687.
5. O'Connell PR. The vermiform appendix. In: Russell RC, Williams NS, Bulstrode CJ. editors. *Bailey and Love's Short Practice of Surgery.* 26th ed London: Arnold Hodder; 2010. p.1203-18.
6. Bockman DE. Functional histology of appendix. *Arch Histol Jpn.* 1983 Jun;46(3):271-92. doi: 10.1679/aohc.46.271. PMID: 6357136.
7. Barbara Young, Geraldine O'Dowd, Phillip Woodford. *Wheater's Functional Histology. A Text and Colour Atlas.* 6th Edition. Churchill Livingstone. 2014, Philadelphia.