

# Impact of Histopathological Examination of Appendix on Clinical Management of Patients

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## ABSTRACT

### INTRODUCTION

Acute appendicitis is one of the common conditions requiring emergency surgery. In routine practice appendix is sent for histopathological examination only when operative findings are inconclusive. In view of this trend in clinical practice this study was carried out to assess the value of routine histopathological examination of surgically resected appendices.

### OBJECTIVES:

To study spectrum of histopathological lesions.

To analyse the proportion of various lesions, age & sex distribution

To find out proportion of unusual findings in appendicectomy specimens

### METHODS:

A retrospective study was done including appendicectomy specimens received at histopathology section of Dept of pathology at our institute from February 2023 till July 2024.

### RESULTS:

A total of 210 cases were reviewed. Out of those, clinically suspected appendicitis was found in 193(91.9%) cases including spectrum of appendicitis [acute, recurrent, chronic, suppurative, acute on chronic, acute with periappendicitis, gangrenous acute with perforation]. Unusual findings were found in 11(5.23%) cases [tuberculosis, amoebiasis, fecolith, xanthogranulomatous inflammation, retention mucocele and neoplastic lesions including carcinoid, Low grade appendiceal mucinous neoplasm, adenocarcinoma].

### CONCLUSION:

Though majority of cases had the usual features, 11 of these 210 spectrum(5.23%) had an impact on patient management & outcome. They were not suspected on macroscopic examination at the time of surgery and would have been missed had the specimens not been examined microscopically. Intra-operative diagnosis of surgeon is therefore unreliable in detecting abnormalities of appendix. The study supports the sending of all appendicectomy specimens for routine histopathological examination.

## INTRODUCTION

Appendicitis is a frequently diagnosed pathology and an indication of appendicectomy. It is one of the most common surgical emergencies presenting with acute abdominal pain. Acute appendicitis is usually diagnosed clinically. Many surgeons don't want the appendicectomy specimens to undergo histopathological assessment, which can result in missed diagnosis and incorrect management.

Post operative histopathology conducted on specimens retrieved during surgery, is pivotal for the final diagnosis. It helps to confirm whether or not the clinical diagnosis made on the basis of signs and symptoms was correct and if suspected lesion has been successfully resected.

This aids the clinician in deciding what further management the patient needs. It is fundamental surgical practice to always send the specimen for histopathology [unless clinically indicated other wise] and not to rely on clinical assessment alone.

The histopathology findings directly influence the patient's post operative management and determine the need for any further treatment. Different findings upon histopathology include acute gangrenous appendicitis, neoplasia, diverticulitis, parasites, endometriosis and various granulomatous diseases.<sup>2</sup>

One can imagine the sinister impact of missing such diagnosis on Materials and Methods

A retrospective study was done including appendicectomy specimens received at histopathology section of Department of Pathology at our institute during 18 months period from February 2023 till July 2024.

Total of 210 appendicectomy specimens were included.

Inclusion criteria: All emergency appendicectomies and interval appendicectomies performed on clinically suspected appendicitis were included.

Exclusion Criteria: Incidental appendicectomies which were Negative Appendicectomy was defined as one which is performed for a clinical diagnosis of acute appendicitis but in which the appendix is found to be normal on histopathological examination. The analysis focused on the confirmation of acute appendicitis, Results

A total of 210 specimens of appendix were received in the histopathology department during the period of 18 months from February 2023 to July 2024. There were 150 [71.42%] males and 60 [28.57%] females among 210 cases of appendicitis with male : female ratio of 2.4:1. Overall, a greater number of appendicectomies (71.42%) were performed in males than in females(28.57%).

The peak age incidence of appendicitis was found in the age

Table 1: Histologic findings of appendicectomy specimens

Diagnosis	Number of Cases	% of cases
Acute appendicitis	50	23.8%
Recurrent appendicitis	25	11.9%
Acute necrotizing appendicitis	06	2.8%
Acute appendicitis with peri appendicitis	14	6.7%
Acute suppurative appendicitis	10	4.8%
Acute on chronic appendicitis	64	30.5%
Gangrenous appendicitis with perforation	7	3.4%
Chronic appendicitis	17	8%
Negative appendicectomy (NAD)	6	2.8%
UNUSUAL FINDINGS	11	5.2%

Table 2: Unusual findings in appendicular specimens

Unusual findings	No. of cases	% of cases
Tuberculosis	01	0.47%
Amoebiasis	02	0.95%

the life of the patient. On the other hand, histopathology may reveal a normal appendix, which necessitates further investigations to look for other pathologies. These diverse findings emphasize the importance of histopathology in the assessment of appendicectomy specimens.

This study is undertaken to reveal the importance of routine histopathology examination of the appendicectomy specimens with recording of the occurrence of a distribution of unusual pathologic finding with spot lighting on the clinical benefits of detecting such a lesion.

performed during other abdominal or pelvic surgeries were excluded. Relevant clinical data, intra- operative findings and gross findings were noted. Appendicectomy specimens are prepared according to a hospital- defined protocol, involving immediate fixing in formalin prior to transport to pathology laboratory.

Specimens are sectioned at the tip, body and base ,processed , slides stained with hematoxylin & Eosin and were examined by a consultant or senior pathologist.

incidental unexpected findings other than inflammation, whether these abnormalities were suspected on gross examination at the time of surgery and the effect on patient management and prognosis.

group of 21-30 years. More than 80% cases of appendicitis occurred below the age group of 40 years. The youngest patient was 6 years old and the oldest was 90 years of age.

Many patients presented with multiple and overlapping clinical symptoms. The most common symptoms was pain in abdomen seen in 206 [98.2%] followed by fever in 119 [57.1%] and vomiting in 63[30.1%] patients. Patients presenting with intestinal obstruction were 2[0.8%] patients and perforation were 5 [2.5%].

Fecolith	01	0.47%
Retention mucocele	01	0.47%
Xanthogranulomatous inflammation	02	0.95%
NEOPLASTIC	04	1.9%
Carcinoid tumor	01	
Adenocarcinoma	01	
Mucinous Cystadenoma [ Low grade appendiceal mucinous neoplasms]	02	

Table3: Comparison of histopathological findings

Histopathological findings	Present study	Patel MM [4]	Divya R et al [5]	Hanish Chavda[8]	Alen Jones [9]
Inflammatory lesions	193[91.9%]	365[91.3%]	300[92.3%]	94.6%	77%
Unusual findings	11[5.23%]	20[5%]	8[2.5%]	4.6%	3.75%

As shown in table 1 , out of 210 cases reviewed , clinically suspected appendicitis was proven histologically in 193 [91.9%] cases including spectrum of appendicitis (acute, ulcerative, suppurative , necrotizing , gangrenous ,recurrent acute with peri appendicitis, acute on chronic).Unusual unexpected findings were found in 11 (5.23%) cases [ Tuberculosis, Amoebiasis, retention mucocele, xanthogranulomatous inflammation fecolith & neoplastic lesions including carcinoid, Adenocarcinoma, mucinous Cystadenoma [Low grade appendiceal mucinous neoplasm].

As shown in table 2, total 11 (5.23%) cases out of 210 were found to have unusual findings. These include 1 case of tuberculosis, 2

cases showed trophozoite forms of amoebiasis.Fecolith was found in 1 case, mucocele was seen in 1 case . Total 4 [1.9%] out of 210 turned out to be neoplastic which include 2 cases of mucinous cystadenoma [Low grade appendiceal mucinous neoplasm], 1 case of carcinoid tumor and 1 case of adenocarcinoma .

Negative appendicectomy was defined as one which is performed for a clinical diagnosis of acute appendicitis but in which the appendix is found to be normal on histopathological examination .Six cases out of 210 in our study accounted for negative appendicectomy.This implies that appendicitis was not cause of acute abdomen.

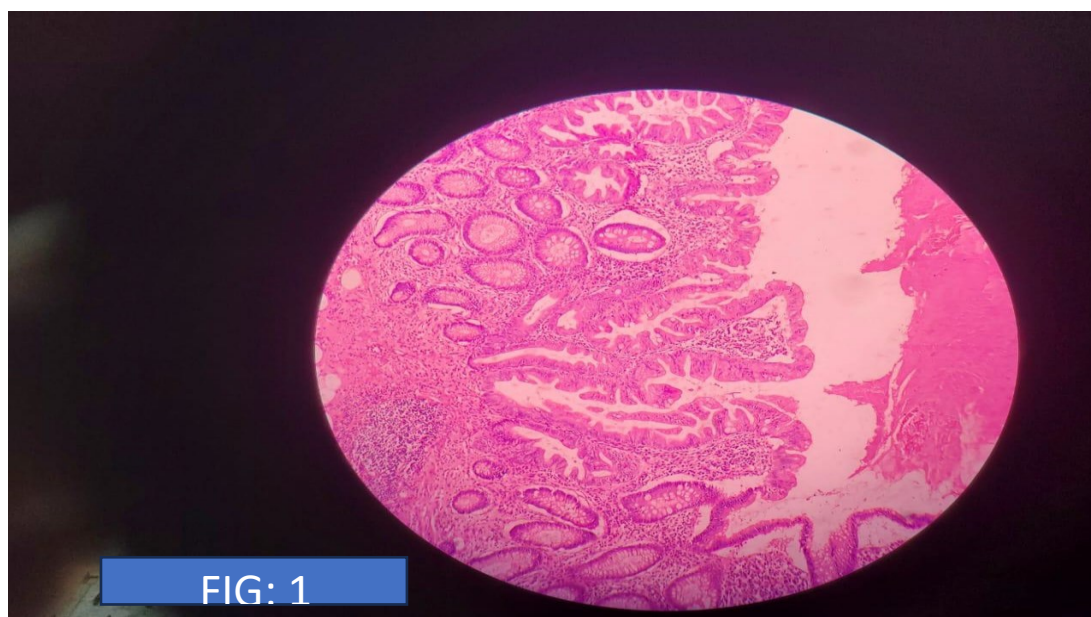


Fig1: Low grade mucinous Cystadenoma of appendix H&E 100X & 400X.



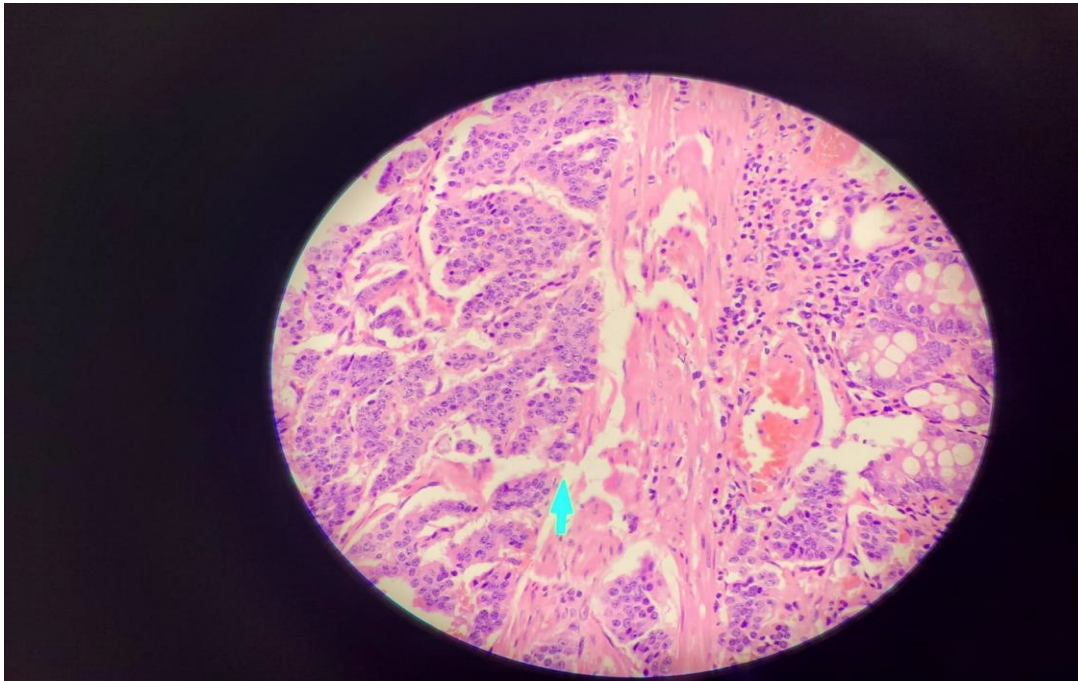


FIG: 2

Fig 2: Carcinoid tumor of Appendix. H&E 400X

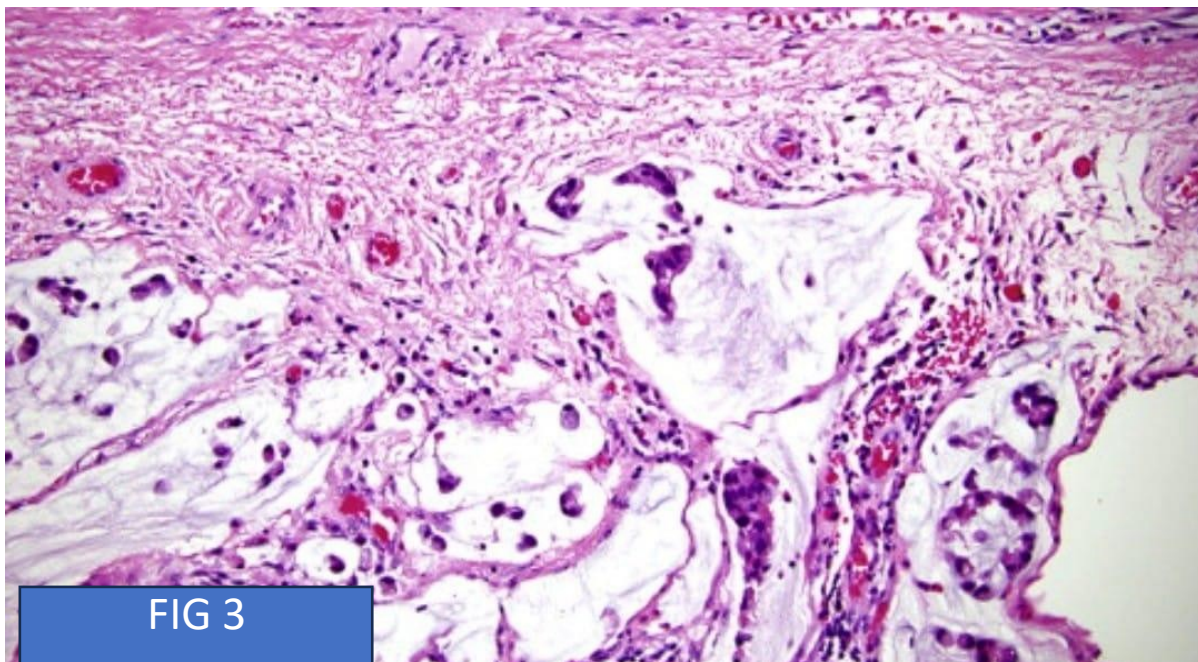


FIG 3

FIG 5: Mucin secreting adenocarcinoma of appendix. H&E 400X

## DISCUSSION

The current study is one and half year retrospective study and presents the data on histopathological analyses of 210 appendectomy specimens received in the department of pathology at tertiary care center.

The histopathological examination of appendix serves two purposes. First it allows the diagnosis of acute appendicitis to be confirmed, second histopathological examination may disclose

additional pathologies that may not be evident intraoperatively which may impact patient management.

In our study, age incidence of appendicitis was higher in 21-30 yrs age group. Similar results were seen in study by Patel MM[4],

Divya Rabindranath[5], Shrestha R et al [6]. & by Mohsin -ul-Rasool[7].

In our study maximum number of patients presenting with

complaints of suspected acute appendicitis were males [71.42%].

Similar findings were observed in study done by Patel MM<sup>[4]</sup>, Negative appendicectomy was defined as one which is performed for a clinical diagnosis of acute appendicitis but in which the appendix is found to be normal on histopathological examination. In our study rate of negative appendicectomy was (2.8%). In study done by Mohsin- ul-Rasool (7) reported rate of negative appendicectomy was 5.7% and 10.8% in study done by Shrestha R This findings were concordant with those of Patel MM<sup>[4]</sup>, Divya

R et al<sup>[5]</sup>, Harish Chavda<sup>[8]</sup> & Mohsin-ul-Rasool<sup>[7]</sup> (Table 3). These include spectrum of inflammatory lesions of appendix of which acute appendicitis (23.8%) and acute on chronic appendicitis (30.5%) constitute majority of cases. Other in the spectrum constitutes the minority of proportion including acute suppurative necrotizing with peri-appendicitis, gangrenous, recurrent, chronic appendicitis, Xanthogranulomatous appendicitis.

As shown in table 3, in our study unusual findings were found in Incidence of this rare condition has been reported as 0.14% to 0.3% in western countries and as 1.3 to 2.3% in underdeveloped countries. (4). It can be caused by various infectious and non-infectious factors.

Systemic conditions such as Crohn's disease and Sarcoidosis may be associated with granulomatous inflammation of the appendix. However infectious causes like Mycobacterium Tuberculosis, The reported incidence of appendicular tuberculosis varies from 0.1 to 3.0% among all appendicectomies performed.

An accurate diagnosis is usually established only after histopathological examination of a specimen. Some studies report that no further treatment after appendicectomy is In our study there were two cases of Xanthogranulomatous appendicitis was reported. It is not seen in other studies.

Acute appendicitis may be mode of presentation of appendix neoplasms particularly adenocarcinomas(4), as was also seen in our study. One case that was suspected to be acute appendicitis was finally revealed to have adenocarcinoma on histopathological examination. Patient with adenocarcinoma should undergo subsequent right hemicolectomy.

as these are all potent mediators of inflammation.<sup>[4]</sup>

Carcinoid tumors are smaller than 1 cm in 70-95% of cases (10), including ours. Such small tumors are easily missed on gross examination intra- operatively. The calculated risk of metastasis from tumors 1 cm or smaller are reported to be nearly zero and therefore may be managed with a simple appendicectomy. An increase in the metastasis risk of upto 85% occurs with the tumor double the size or larger. An appendiceal carcinoid tumor larger than 2 cm should be managed with a formal right hemicolectomy [10]. Since our case was about 1 cm in size, no further management was needed.

clinically from features of acute appendicitis. Confirmative diagnosis of mucocoele and its cause is possible only after histopathology.

Appendicectomy is the treatment of choice for mucinous cystadenoma, whereas cystadenoma carcinoma requires a right hemicolectomy. Because of the high association of mucinous cystadenomas with colon and ovarian malignancy, follow- up computed tomography, ultrasonography & colonoscopy examinations must be performed during the post- operative period [10].

Hence our study demonstrated that histopathological examination led to incidental diagnosis of many important xanthogranulomatous appendicitis (due to proteus organisms), amoebiasis, cancers like carcinoid and adenocarcinoma. Thus such incidental detection can lead to early treatment of these conditions.

It becomes obvious from the above discussion that it is highly beneficial to send all appendicectomy specimens for

## CONCLUSION

Despite the advances in technology and imaging modalities there is dilemma in the clinical diagnoses of acute appendicitis. Histopathological examination still remains the gold standard method for the confirmation of the appendicitis.

Divya Rabindranath<sup>[5]</sup>, Mohsin-ul-Rasool<sup>[7]</sup> & by Hanish Chavda<sup>[8]</sup>.

et al. Negative appendicectomy implies that appendicitis was not cause of acute abdomen and other investigations need to be performed if symptoms persist.

In our study, clinically suspected appendicitis were histologically correlated in 193 (91.9%) cases as shown in table 3.

11 (5.23%) of cases.

Patel MM (4) also found such unusual histological features in 5% of cases.

Divya R et al (5) found unusual findings in 2.5% of cases, Hanish Chavda (8) found them in 4.6% of cases & Alen Jones (9) found unusual findings in 3.75% of cases. Our results are concordant with these studies. Another important incidental diagnoses in our study was granulomatous appendicitis which was reported as Tuberculosis due to confirmation on Ziehl- Neelson staining.

Yersinia species, campylobacter species and histoplasma Capsulatum form a much more important cause in our country [4].

Since tuberculosis is endemic in our country, our case was also suspected to suffer from intestinal tuberculosis. Patient was subsequently investigated for the same and our suspicions were found to be correct by positive Ziehl-Neelsen staining.

necessary for primary appendicular disease. In contrast, Jones et al described a case of appendicular tuberculosis in their study who subsequently underwent right hemicolectomy for treatment. Hence, no consensus has been reached yet about the treatment of appendicular tuberculosis.[4,9].

Carcinoids are the most common tumors of appendix and are typically small, firm, circumscribed yellow brown lesions.

An appendiceal carcinoid tumor is found in 0.3% to 2.27% of patients undergoing an appendicectomy [10]. In our study, we had one case of carcinoid. It has been suggested that carcinoid tumours may present as appendicitis because of luminal obstruction or elevated levels of 5 hydroxy Tryptamine, histamine, and kinin as

Our study also included one case of mucocoele. A mucocoele of the appendix denotes an obstructive dilation of the appendiceal lumen due to abnormal accumulation of mucous, which may be caused either by a retention cysts, endometriosis, mucosal hyperplasia, cystadenoma or a cystadenocarcinoma. The incidence of mucocoele has been reported to range from 0.2% to 0.3% of all appendicectomy specimen. Mucocoeles are often asymptomatic and discovered only as incidental findings at appendicectomy or during laparotomy for another indication or at histopathological examination of an operative specimen. However they may also be diagnosed

lesions that would have been otherwise missed by a surgeon. These diagnosis lead to significant effect on patient management. Those included conditions like low grade appendiceal mucinous neoplasm [mucinous cystadenoma] and mucinous cystadenocarcinoma which have a high risk of association with other neoplasms. Hence their diagnosis is imperative for adequate patient management. Also few

conditions can be<sup>st</sup> diagnosed in appendix only like granulomatous appendicitis (due to tuberculosis or Crohn's disease),

histopathological examination. When we weigh the cost of the procedure against the possible benefits, it becomes clear that the benefit far outweighs the cost in this situation. Early diagnosis and treatment of lesion would prevent the added costs the patient would have to bear if the diagnosis was late and the disease had spread to other organs.

The histopathological examination of appendix serves two purposes. First it allows the diagnosis of acute appendicitis to be confirmed, especially where this is not evident intra-operatively. Second histopathological examination may disclose additional pathologies that may not be evident on gross examination intra-

operatively but may affect subsequent clinical management of Implication of Research

Aberrant /unusual findings discovered at histopatholgy analysis were not suspected on macroscopic examination at the time of surgery and had an impact on patient management and outcome. These would have been missed had the specimens not been examined microscopically.

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the patient.

The intra-operative diagnosis of the surgeon is therefore unreliable in detecting abnormalities of the appendix. This study supports the sending of all appendectomy specimen for routine histopathological examination and meticulous examination of all of those.

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