

ORIGINAL ARTICLE

Histopathological Spectrum of Appendectomy Specimens with Emphasis on Unusual Findings

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ABSTRACT

INTRODUCTION: The present study was carried out to assess the value of routine histopathological examination of appendectomy specimens. An attempt is made to review the histopathological spectrum of appendectomy over a period of 2 years 3 months.

AIMS AND OBJECTIVES: To study the spectrum of histopathological lesions in appendectomy specimens and special emphasis is made to highlight the unusual lesions observed in surgically resected appendicectomies and appendix in medicolegal autopsies.

MATERIAL AND METHODS: The study was carried out on appendectomy specimens received in the department of pathology Mahadevappa Rampure Medical College during a period of 2 years 3 months from Jan 2019 to March 2021. Clinical data collected from records of corresponding appendectomy specimens were processed. Sections studied for various histopathological patterns with an emphasis on unusual findings.

RESULTS: A total of 500 specimens were analysed among which 298 were males and 202 were females with M:F 1.4:1. The histopathological examination showed Acute appendicitis (57.4%), Acute ulcerative appendicitis (0.8%), Recurrent/Eosinophilic appendicitis (0.3%), Acute necrotising appendicitis (1.6%), Acute appendicitis with periappendicitis (1.4%), Acute suppurative appendicitis (2.4%), Gangrenous appendicitis (0.8%), Healed appendicitis (2.2%), Chronic appendicitis (25.2%) and Chronic sclerosing appendicitis (1.0%). The unusual findings were observed in 22 cases (4.4%) which include Tubercular appendicitis (1.0%), Foreign body granuloma (0.8%), Xanthogranulomatous appendicitis (0.2%), Enterobiusvermicularis (0.8%), Round worm (0.2%), Retention mucocele (0.4%), Carcinoid tumor (0.4%), Mucinous adenocarcinoma (0.4%) and Metastatic adenocarcinoma (0.2%).

CONCLUSION: Though the present study revealed usual findings of appendicitis and variants in most of the cases, the observation of unusual findings like granulomas, parasites and neoplasms warrant a careful study of all appendectomy specimens received in pathology department with emphasis on relevant clinical and laboratory findings thus modulating the management and follow up.

KEYWORDS | APPENDECTOMY; UNUSUAL LESIONS; HISTOPATHOLOGY; APPENDICITIS.

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Received on: 10.06.2022

Accepted on: 11.10.2022



How to cite this article:

Sainath K Andola, Priyanka Patil, Rohit Patil, et al./Histopathological Spectrum of Appendectomy Specimens with Emphasis on Unusual Findings. *Indian J Forensic Med Pathol.* 2022;15(4):255-262.

INTRODUCTION

Appendicitis is the most common abdominal emergency and appendectomy is routinely performed surgery all over the world to manage appendicitis.¹ Incidence of appendicitis is increasing in India and other developing countries, mainly in urban cities due to increased acceptance towards western diet.² Appendicitis occurs commonly in children and young adults with a lifetime risk of 7%.³ In spite of all of advances in technology and imaging modalities, clinical diagnosis of acute appendicitis is accurate in only 60-80% of cases.⁴ Therefore, histopathological examination still remains the gold standard method of choice for confirmation of appendicitis.

Appendicitis can be obstructive/non-obstructive type. In acute appendicitis, luminal obstruction is the main factor and some of the common obstructive lesions are faecolith, lymphoid hyperplasia and foreign bodies. However some unusual factors such as parasitic infestations like enterobiasis, ascariasis, bacterial infections like tuberculosis or a tumor such as carcinoid, primary/secondary adenocarcinoma, lymphoma and gastrointestinal stromal tumor may cause obstruction.⁵

Hence an attempt is made to determine the various histopathological lesions of appendectomy specimens to find out unusual factors for appendicitis and compare with other studies.

AIMS AND OBJECTIVES

1. To study the spectrum of histopathological lesions in appendectomy specimens surgically removed and in medicolegal autopsies.
2. To analyse the various lesions according to age, sex and clinical presentation.
3. Special emphasis is made to highlight the unusual lesions.

MATERIALS AND METHODS

A study was carried out on all appendectomy specimen received in the department of

Pathology at Mahadevappa Rampure Medical College and Basweshwar teaching and general hospital. A total of 500 appendectomy specimens were received in the histopathology section during a period of 2 years 3 months from Jan 2019 to March 2021. All emergency appendectomies and interval appendectomies done for cases of clinically suspected appendicitis and incidental appendectomies done for other surgeries and medicolegal autopsies were included. The appendix resected along with other organs like hysterectomy and colectomy were also included. Relevant clinical data was retrieved. Gross findings were noted. Specimens fixed in 10% formalin, routine tissue processing and paraffin embedding was done and 5 micrometre thickness sections obtained and stained with H & E were studied. The gross and microscopic findings were analysed and various histopathological diagnoses of the appendectomy specimens were done and for every case, clinical findings were correlated with histopathological diagnosis.

RESULTS

Table 1: Age & sex distribution.

Age (years)	Males	Females	Total	Percentage (%)
0-9	23	20	43	8.6
10-19	80	60	140	28.0
20-29	122	64	186	37.0
30-39	50	39	89	17.8
40-49	10	10	20	4.0
50-59	09	05	14	2.8
60-69	04	04	08	1.6
Total	298	202	500	100.0

M:F ratio =1.4:1

Majority of the lesions were acute appendicitis (287 cases) which were transmural and few suppurative. Also noted were 15 cases of eosinophilic appendicitis which were not associated with any parasites. About 126 cases were diagnosed as chronic appendicitis.

In the present study the common parasites noted were enterobius vermicularis. However a single case of adult round worm was observed in the lumen of an appendix of a child who

Table 2: Spectrum of usual histopathological lesions.

Sl. No	Usual Histopathological findings	No.	Percentage (%)
1	Acute Appendicitis	287	57.4
2	Acute Ulcerative Appendicitis	04	0.8
3	Recurrent/Eosinophilic Appendicitis	15	3.0
4	Acute Necrotising Appendicitis	08	1.6
5	Acute Appendicitis With Periappendicitis	07	1.4
6	Acute Suppurative Appendicitis	12	2.4
7	Gangrenous Appendicitis	04	0.8
8	Healed appendicitis	11	2.2
9	Chronic Appendicitis	126	25.2
10	Chronic Sclerosing Appendicitis	04	0.8
-	Total	478	95.6

came with acute abdomen. There were 8 cases of granulomas among which 5 were having tuberculosis and 4 were foreign body type. Five cases of the neoplasms were observed

which included two each of carcinoid, adenocarcinoma and a single case of metastatic deposit.

Table 3: Spectrum of Unusual histopathological findings.

Sl. No	Unusual histopathological findings	No.	Percentage (%)
1	Tubercular appendicitis	05	1.0
2	Foreign Body Granuloma	04	0.8
3	Xanthogranulomatous appendicitis	01	0.2
4	Parasites	—	1.0
	i) Enterobius vermicularis	04	—
	ii) Round worm	01	—
5	Retention Mucocele	02	0.4
6	Carcinoid	02	0.4
7	Adenocarcinoma	02	0.4
8	Metastatic adenocarcinoma	01	0.2
	Total	22	4.4

Table 4: Comparative analysis of histopathology spectrum.

Histopathological findings	Divya R et al. (2016) N=308	Myageri A et al.(2019) N=472	Hasan A et al. (2020) N=700	Present study N=500
Inflammatory lesions (Usual finding)	300 (97.4%)	428 (90.6%)	634 (90.5%)	478 (95.6%)
Unusual findings	8 (2.5%)	44 (9.3%)	66 (9.4%)	22 (4.4%)

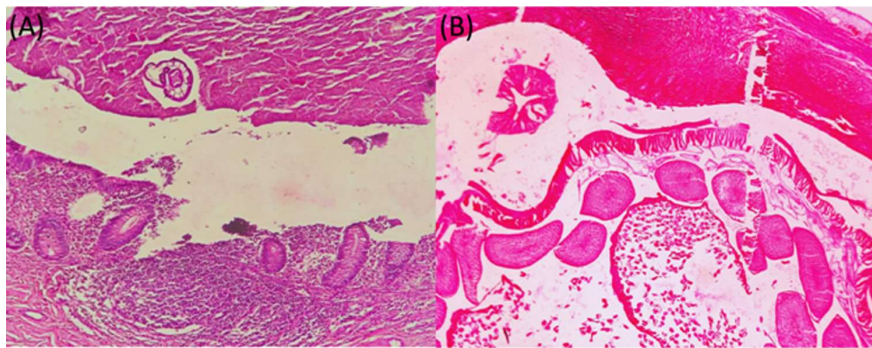


Fig. 1: (A) Enterobius Vermicularis: H & E shows Enterobius Vermicularis in the lumen of the appendix (10X). (B) Round Worm: H & E shows round worm in the lumen of the appendix (10X)

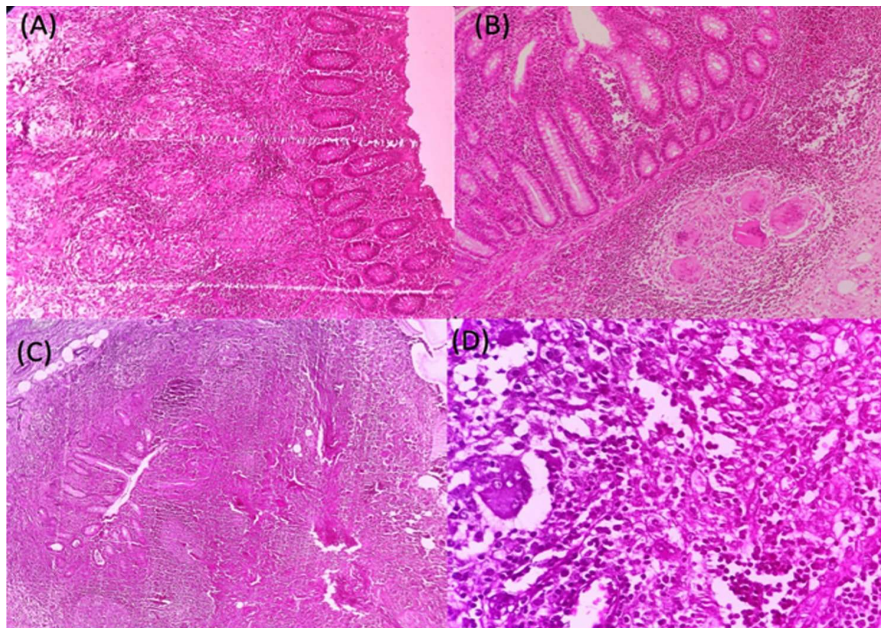


Fig. 2: (A) Tubercular Appendicitis: H & E Shows Appendicular Wall With Features Of Tubercular Granuloma (10X). (B) Foreign Body Granuloma: H & E shows granuloma consist of multinucleated foreign body type of giant cells (10x). (C) Xanthogranulomatous Appendicitis: H & E shows infiltrate composed of foam cells, scattered multinucleated histiocytes (4X), (D) H & E shows sheets of foamy histiocytes (40X)

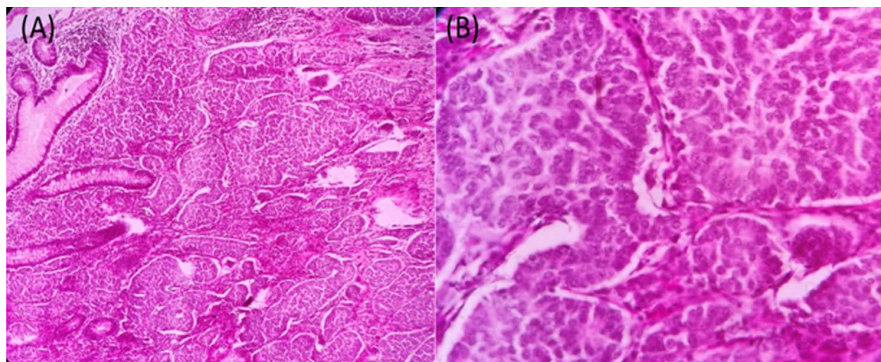


Fig. 3: Carcinoid Tumour: (A) H & E showing carcinoid tumor with monotonous cells arranged in insular pattern (10X). (B) Individual tumor cells showing salt and pepper chromatin (H & E, 40X)

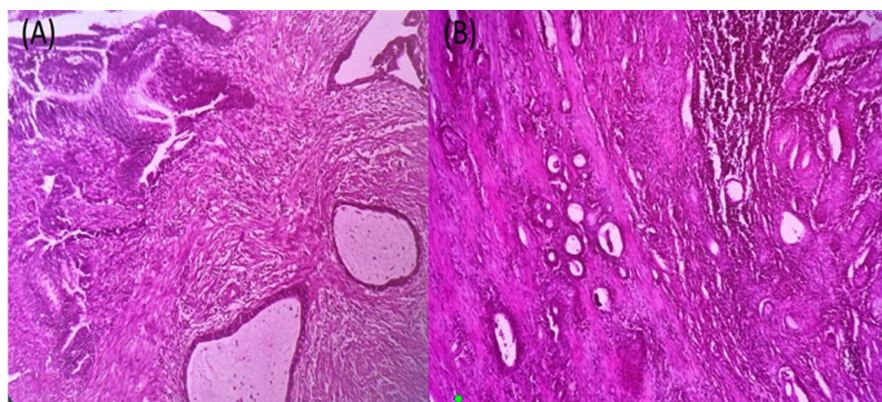


Fig. 4: (A) Mucinous Adenocarcinoma: (A) H & E Shows appendiceal mucosa is lined by neoplastic glands infiltrating muscularis (H & E 10x). (B) Metastatic Adenocarcinoma: H & E shows neoplastic glands infiltrating muscularis (H & E 10x)

DISCUSSION

Appendicitis is one of the most common cause of acute abdominal pain and it remains a clinical emergency despite diagnostic and therapeutic advancement in medical field. In the western world, acute appendicitis accounts for about 40% of all surgical emergencies. Due to adoption of western diet and lifestyle, recent studies showed a rise in the incidence of appendicitis in African countries. Incidence of appendicitis varies considerably by country, race, age, sex, geographic region, socio-economic status, dietary habits and hygiene.²

The vermiform appendix is considered by most to be a vestigial organ and its clinical importance lies in its propensity for inflammation which results in the clinical syndrome known as acute appendicitis. Acute appendicitis was recognized as a clinical entity first by Reginald Fitz. Soon afterwards, Charles Mc Burney described the clinical manifestation of acute appendicitis including the point of maximum tenderness in right iliac fossa, that's how it bears his name.⁵

Acute appendicitis is defined as an inflammation of the inner lining of the appendix which then spreads to other parts of the organ. Luminal obstructions such as fecolith, fibrosis, or stricture can lead to appendiceal gangrene and perforation. Lymphoid hyperplasia also narrow the lumen leading to luminal obstruction. Once the obstruction occurs, there will be continuous mucus secretion and

inflammatory exudation leading to increased intraluminal pressure resulting in obstruction of lymphatic drainage.³

Around 15-30% of cases diagnosed as acute appendicitis, it has been observed that there is discrepancy between the histopathological and clinical diagnosis. The histopathological study of appendix has the advantage that it confirms the diagnosis of acute appendicitis and it also reveals other important pathological findings that may not be obvious on gross examination intraoperatively but may affect patient's clinical management.⁶

In present study, emergency appendicectomy were the most common cases followed by interval appendicectomy. Maximum number of patients (37%) who underwent appendicectomy belonged to the age group of 20-29 years (Table 1), which correlated with the study done by Marudanayagam et al. which also showed that most of the appendicectomies (64.58%) were done in the second decade of life.¹ Number of appendicectomies performed were more in males (59.6%) as compared to females (40.4%) with male to female ratio 1.4:1, which were consistent with findings by Zulfikar et al., who studied 323 cases of appendicectomies retrospectively, in which 196(60.7%) were males and 127(39.3%) were females.⁷

Among 500 appendicectomy specimens, 496 (99.2%) were non-neoplastic lesions and only 04 (0.8%) cases were neoplastic lesions. In a retrospective study done by Blair et al. it

was reported that 80% of appendicectomy cases were non neoplastic lesions and 4% were neoplastic and remaining cases showed normal histology of appendix.

In present study, majority of patients presented with right iliac fossa pain followed by generalized abdominal pain. Edino et al. in their study also reported that abdominal pain was the most common presenting symptom in such patients.⁹ Most common unusual gross finding in present study was inflamed appendix followed by presence of faecolith in appendiceal lumen, which correlated with the study by Majid et al who studied 250 appendicectomy cases and found that mucosal congestion was the most common finding in 218 (87.2%) cases.¹⁰

In the present study, acute appendicitis accounted for the most common histopathological lesion for which appendicectomy was done and was seen in 57.4% (Table 2) of patients. Similar findings were observed in study done by Divya R et al. accounting for 58.7%¹¹. Chronic appendicitis constituted the second most common lesion, seen in 25.2% cases. Edino et al. in their study reported 17% cases of chronic appendicitis.⁹

In present study, clinically suspected appendicitis were histologically correlated in 478 (95.6%) cases (Table 2). This findings were concordant with those of Divya R et al.¹¹ (97.4%), Hasan A et al.¹² (90.5%) and Myageri A et al.¹³ (90.6%) (Table 4). These include spectrum of inflammatory lesions of appendix, of which majority includes acute appendicitis (57.4%) and chronic appendicitis (25.2%). Other lesions include acute ulcerative appendicitis, acute suppurative, necrotizing with periappendicitis, gangrenous and chronic sclerosing appendicitis (Table 2). Next common lesion was Healing appendicitis accounting for 2.2% of cases. The study done by Aravindan K. P. et al. found incidence of healing appendicitis was 6.25%.¹⁴

Present study included 15 cases (03%) of eosinophilic appendicitis. Eosinophilic appendicitis is characterized by lack of neutrophils, there is eosinophilic infiltration in muscle layer with oedema supporting muscle

fibres.¹⁵ It may be associated with helminth infection e.g. Schistosomiasis, strongyloides or enterobius. In many studies, they have revealed that Type I hypersensitivity may also trigger the condition.¹⁶ In the present study all 15 cases were not associated with any parasites, fecolith, foreign body and no associated hypersensitivity.

Unusual findings were found in 22 (4.4%) of cases in present study (Table 3). Divya R et al. found such unusual histological features in 2.5% of cases. In study done by Hasan A et al., unexpected histological features were found in 9.4% and 9.3% in Myageri A et al.¹³ (Table 4)

The presence of *Enterobius vermicularis* in appendix usually produces symptoms resembling acute appendicitis. In present study, we reported 04 cases (0.8%) of enterobius vermicularis presenting with features of acute appendicitis and it was an incidental finding in histopathological examination. The Worldwide, reported incidence of enterobius infection in patients with symptoms of appendicitis ranges from 0.2% to 41.817 (Fig. 1A). One of the case noted in the appendix removed for medicolegal case.

Ascariasis is one of the most common helminthic diseases which is caused by *Ascaris lumbricoides* and 99% of the worms are located in the jejunum and the proximal ileum. It is rarely found in the appendix, making the diagnosis of appendicitis debatable.¹⁸ In present study, we reported one case of round worm accounting for 0.2% of cases. (Fig 1B)

In present study, 05 cases of tubercular inflammation was observed as an incidental histopathological diagnosis. Its occurrence can either be primary or secondary, the former being very rare with a reported incidence of 0.1-0.6%.¹⁷ The presence of caseation necrosis, granulomas and Langhans giant cells was indicative of primary tubercular inflammation of the appendix with no other foci elsewhere in the body. (Fig 2A)

Foreign body granulomas were found in 04 cases in present study. This granulomatous reaction could be due to appendicitis itself or fecal matter (Fig 2B). Incidental observation noted in an autopsy case.

Xanthogranulomatous appendicitis is a rare form of chronic inflammation characterized by presence of high number of foamy histiocytes admixed with lymphocytes, plasma cells, abundant hemosiderin macrophages with touton type of giant cell and luminal obliteration with spared lymphoid follicles. In present study, we reported one case of this entity (0.2%). The study conducted by Myageri A et al.¹³ have also reported four cases of xanthogranulomatous appendicitis.¹³ (Fig. 2C). Mucocele is morphologic description of appendix where it appears dilated due to accumulation of mucin and in present study we found in 0.4% cases.

Other incidental findings diagnosed were two cases of carcinoid which accounted for 0.4%. Hof et al. in their study diagnosed carcinoid in 0.47% cases.¹⁹ Carcinoid tumors are the most common appendiceal tumors, characteristically small, firm, well circumscribed yellow brown lesions on gross examination.²⁰ Carcinoid tumor of appendix is found in 0.3%-2.27% of patients undergoing appendicectomy.²¹ Clinical presentation of these tumors mimic appendicitis because they lead to luminal obstruction and produce increased levels of serotonin, histamine and kinin which are all potent mediators of inflammation.²² (Fig. 3)

Adenocarcinomas of the appendix are rare entities, representing <0.5% of all gastrointestinal malignancies and 4-6% of appendix neoplasm.²³ Incidental diagnosis of Mucinous adenocarcinoma was noted in 02 cases which accounted for 0.4% (Fig. 4A) which

correlated with the study by Marudanayagam et al. who reported mucinous adenocarcinoma in 0.39% of cases.¹

In present study, there was a single case of metastatic adenocarcinoma (Fig. 4B) which is very rare and primary site of malignancy was not possible to detect as patient lost for follow-up. Pattanashetti Met al also reported one case of metastatic adenocarcinoma.²⁴

The incidence of appendicitis is peak in second and third decades of life. An accurate macroscopic assessment is not possible to make intraoperatively. Hence routine histopathological examination of appendix is

CONCLUSION

recommended not only to confirm the clinical diagnosis of acute appendicitis but also to rule out incidental findings leading to better clinical outcome. A combination of clinical features, laboratory parameters should be combined with ultrasonography to diagnose appendicitis. The observation of unusual findings warrant a careful study of all appendectomy specimens thus modulating the management. This study is highly beneficial for both pathologist and forensic pathologist who will be performing the autopsies regularly.

Conflict of Interest:

Nil

Source of Funding:

Nil

Acknowledgement:

Nil

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