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Original Research Article

INCIDENTAL HISTOPATHOLOGICAL FINDINGS IN APPENDECTOMY SPECIMENS: A RETROSPECTIVE CASE SERIES FROM A RURAL TERTIARY CARE CENTER IN CENTRAL INDIA

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ABSTRACT

Background: Acute appendicitis is among the most common surgical emergencies globally. Most appendectomy specimens confirm the diagnosis of inflammation. However, incidental histopathological findings such as appendiceal neuroma, low-grade appendiceal mucinous neoplasms (LAMNs), and schwannomas are occasionally identified. These lesions are traditionally considered rare, but our two-year experience suggests a higher-than-expected frequency, warranting a re-evaluation of their perceived rarity.

Materials and Methods: We retrospectively reviewed appendectomy specimens of patients operated on for suspected acute appendicitis at a rural tertiary care hospital in central India over a 2-year period (January 2023 to December 2024). Only those specimens that revealed incidental non-inflammatory lesions on histopathology were included. Clinical, radiological, intraoperative, and histological data were analyzed.

Results: Of the 20 cases with incidental histopathological findings, 15 were included for detailed evaluation (complete data available). There were 7 cases of appendiceal neuroma, 7 of LAMN, and 1 of appendiceal schwannoma. Most patients presented with right iliac fossa pain clinically indistinguishable from acute appendicitis. Radiological findings were nonspecific. Intraoperative appearance ranged from inflamed to mildly thickened appendix. All patients underwent laparoscopic or open appendectomy. Postoperative recovery was uneventful in all cases.

Conclusion: High frequency of appendiceal neuroma and LAMN in this study challenges the presumed rarity of these pathologies in cases undergoing appendectomy. This study underlines the importance of routine histopathological examination of appendectomy specimens.

Keywords: Appendicitis, Appendectomy, low-grade appendiceal mucinous neoplasms, Neuroma.

INTRODUCTION

Appendectomy is one of the commonly performed emergency surgical procedures globally. It is primarily indicated for acute appendicitis.[1] Histopathological examination of resected appendices remains the gold standard for confirming the clinical diagnosis. While the principal aim of histological assessment is to validate the presence and type of appendicitis incidental or unexpected histopathological findings are also common. These findings may have significant diagnostic, prognostic as well as therapeutic implications. Such incidental discoveries range from benign conditions such as parasitic infestations and mucoceles to malignant neoplasms like carcinoid tumors and

adenocarcinomas. If incidentally found in appendectomy specimens these conditions may necessitate further intervention or surveillance.[2]

The incidence of incidental findings in appendectomy specimens varies widely. In different studies It is reported to be ranging from 0.2% to 15%. This variability may be due to differences in population demographics as well as the quality of histopathological examination.[3] Some institutions routinely submit all appendectomy specimens for microscopic evaluation whereas many rely on gross inspection to determine the need for histological analysis. The debate surrounding the necessity of routine histopathological evaluation is ongoing. Given this context, an understanding of the spectrum and frequency of incidental findings is important for guiding clinical practice and policy development.[4]

Previous studies have emphasized the importance of such histopathological findings. Incidental findings of pathologies discovered by histopathological examination of appendectomy specimen (such as Neuroendocrine tumors) may warrant further surgical resection based on size and invasion depth. Similarly Mucinous neoplasms raise concerns for pseudomyxoma peritonei, a condition with grave long-term outcomes if not adequately managed. Detection of endometriosis or granulomatous inflammation in the appendix may provide clues to underlying systemic diseases. These findings may serve as the first indication of broader pathological processes and thus merit careful consideration.[5]

In this context retrospective analysis of appendectomy specimens offers a valuable opportunity to find out characterize incidental histopathological findings.[6] Such studies may provide insight into the real-world prevalence of histopathological findings and may add to the existing knowledge about necessity of routine histopathological evaluation.[7] The present study aims to examine the incidence and nature of incidental histopathological findings in appendectomy specimens over a defined retrospective period. Through this case series, we intend to highlight the diagnostic value and potential impact of what may initially appear to be routine surgical specimens.

MATERIALS AND METHODS

This retrospective case series was conducted in the department of surgery of a tertiary care medical institute. Because this relied solely upon previously collected clinical and histopathological data ethical clearance was waived. We reviewed the records of all patients who underwent appendectomy for suspected acute appendicitis between 1 January 2023 and 31 December 2024 at our institute. During this interval we followed a standardized protocol for clinical assessment and specimen handling thus minimizing variability in data capture. Preoperative diagnosis was based on clinical evaluation supported by either ultrasound (USG) or computed tomography (CT) imaging. All operative notes and histopathology reports were maintained in a digital archive which allowed for a complete uninterrupted audit of every appendectomy performed within the study period.

Patient demographic and clinical data was extracted from the hospital's electronic health record system. For each case meeting inclusion criteria, age, sex, body mass index (BMI), and preoperative imaging findings and any incidental radiological abnormalities were collected. Intraoperative details such as whether the procedure was open or laparoscopic operative findings and any deviations from a standard appendectomy were noted. We also recorded any intraoperative suspicion of unexpected pathology.

All appendectomy specimens had been fixed in 10% formalin and processed using standard protocols. A senior pathologist reviewed all slides. proximal and distal margins were evaluated microscopically, along with any grossly abnormal areas.

Data were entered into a Microsoft Excel spreadsheet (Microsoft Corp., Redmond, WA, USA) using predefined drop-down menus to reduce transcription errors. After de-identification, data were imported into IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA) for analysis. Continuous variables were assessed for normality and are presented as mean ± standard deviation or median (interquartile range) as appropriate. Categorical variables (such as sex and type of incidental finding) are reported as frequencies and percentages.

Inclusion Criteria

- All patients (any age or sex) who underwent appendectomy with a provisional clinical or radiological diagnosis of acute appendicitis during the study period
- Specimens in which histopathology revealed incidental, non-inflammatory lesions or unexpected findings (e.g., neoplasms, parasitic infestations, granulomatous changes)

Exclusion Criteria

- Patients who underwent incidental appendectomy during another intra-abdominal procedure (e.g., colorectal or gynecological surgery)
- Appendectomy specimens showing only acute inflammatory changes consistent with uncomplicated or complicated appendicitis (no incidental/non-inflammatory pathology)
- Records lacking complete clinical or histopathological data

RESULTS

The analysis of the gender distribution of the studied cases showed that out of 15 cases there were 9 (60%) and 6 (40%) males. There was a female preponderance in cases of patients undergoing appendectomy with a M:F ratio of 1:1.5 [Figure 1].

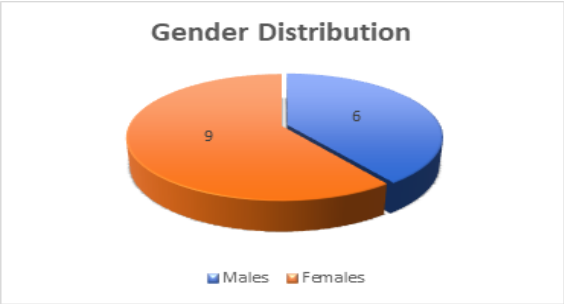

Figure 1: Gender Distribution of studied cases.

The analysis of the age distribution of the studied cases showed that the most common age group was 41–50 years (40%) followed by the age groups below 30 years, 30–40 years, and above 50 years each having with 3 cases (20%). The mean age of the participants was 41.6 years with a standard deviation of ±11.7 years [Table 1].

The analysis of the histopathology findings of the studied cases showed that neuroma was the most frequently observed condition (60%) followed by low-grade appendiceal mucinous neoplasm (33.3%). Schwannoma was the least common pathology and was reported in only 1 case (6.7%). Neuroma was the predominant histopathological diagnosis among the studied group [Figure 2, Figure 3].

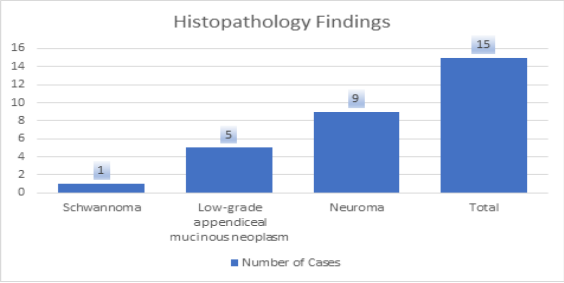

Figure 2: Histopathological findings in cases undergoing appendectomy.

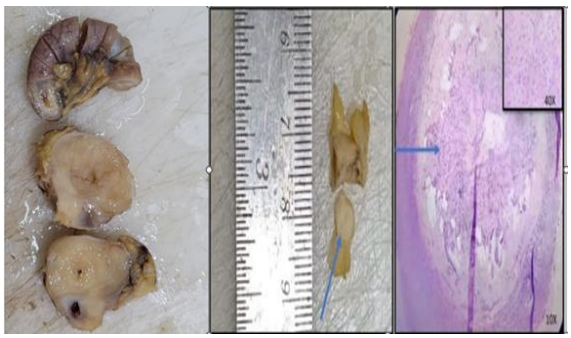

Figure 3: Gross and histopathological features of an obliterative appendiceal lesion. (Left) Three cut surfaces of formalin-fixed appendectomy specimens demonstrating pale, firm tissue and loss of a patent lumen. (Middle) Close-up gross view highlighting complete obliteration of the appendiceal lumen (blue arrow) with residual fibrous and neural tissue. (Right) Hematoxylin & eosin–stained section at low magnification with inset at high magnification showing the lumen replaced by spindle cell proliferation and hypertrophied nerve bundles; mucosa and lymphoid follicles are absent.

Pathologies diagnosed on histopathological examination of appendectomy cases included neuroma, low-grade appendiceal mucinous neoplasm (LAMN) and schwannoma. Neuroma was the most common histopathological diagnosis, seen in 9 cases (60%), followed by LAMN in 5 cases (33.3%) and schwannoma (6.7%). The majority of surgeries were performed laparoscopically (13 cases), with only one open surgery and one combined laparoscopic-assisted vaginal hysterectomy with appendectomy. Key histological features included spindle cells, fibrosis, mucin, and nerve bundles, among others. The post-operative day (POD) of discharge ranged from 2 to 10 days, with most patients discharged by post operative day 4 or 5 [Table 2].

Table 1: Age distribution of cases undergoing appendectomy.

Age Group	Number of Cases	Percentage
Below 30	3	20%
30–40	3	20%
41–50	6	40%
Above 50	3	20%
Total	15	100%
Mean age ± SD (years) = 41.6 +/- 11.7		

Table 2: Summary of the findings in cases of appendectomy.

Case	Age/Sex	Diagnosis	Histopathology	Radiology	Surgery	POD	Key Findings
1	17/M	Appendicitis	Schwannoma	Mucocele; solid lesion	Laparoscopic	5	Verocay bodies, spindle cells
2	50/F	Appendicitis	LAMN	14 mm appendix	Laparoscopic	4	Mucin, villous epithelium
3	47/F	Appendicitis	Neuroma	9 mm thick appendix	LAVH + Appendectomy	10	Spindle cells, fibrosis
4	47/M	Appendicitis	LAMN	12 mm, no appendicolith	Open	5	Crypt loss, mucin
5	52/F	Appendicitis	Neuroma	Pre-ileal appendix	Laparoscopic	5	Chronic inflammation
6	28/M	Appendicitis	LAMN	10 mm diameter	Laparoscopic	4	Mucin up to serosa
7	47/F	Appendicitis	LAMN	9 mm with mural thickening	Laparoscopic	5	Effaced mucosa
8	38/M	Appendicitis	Neuroma	8 mm appendix	Laparoscopic	4	Spindle cells

9	47/M	Appendicitis	Neuroma	Suggestive of appendicitis	Laparoscopic	4	No mucosa, fibrosis
10	36/F	Appendicitis	LAMN	9.2 mm tubular appendix	Laparoscopic	5	Mucinous epithelium
11	40/F	Appendicitis	Neuroma	6-7 mm inflamed appendix	Laparoscopic	4	Collagen, nerve bundles
12	54/F	Appendicitis	Neuroma	7 mm, fecolith	Laparoscopic	6	Adipocytes, spindle cells
13	20/F	Appendicitis	Neuroma	4.5 mm, retrocecal	Laparoscopic	2	Obliterated lumen
14	49/F	Appendicitis	Neuroma	7.4 mm, mild thickening	Laparoscopic	3	No mucosa
15	52/M	Appendicitis	Neuroma	8.2 mm	Laparoscopic	10	Nerve bundles, fibrosis

DISCUSSION

Appendiceal neuromas, involving spindle cells, nerve bundles, and fibrous tissue, are considered benign and often asymptomatic. However in this study many of these pathologies presented with clinical features mimicking appendicitis. This suggests they might play an active role in causing symptoms rather than being incidental findings. Stanley MW et al conducted a light-microscopic, immunohistochemical and electron-microscopic study to investigate the existence and neural origin of appendiceal neuromas.[8] For this purpose the authors undertook a study comprising of 20 appendiceal specimens previously diagnosed as fibrous obliteration. The study found that appendiceal neuromas appeared as loose proliferations of spindle cells in a myxoid background, often with entrapped fat and connective tissue and eosinophilic infiltration. Seventeen lesions were central without nodules and one showed nodularity. Two were mucosal On the basis of these findings the authors concluded that appendiceal neuroma is a relatively common lesion and that many cases labeled as fibrous obliteration actually represent neuromas. Similar prevalence of appendiceal neuromas was also reported by the authors such as Al-Janabi MH et al and Molina GA et al.[9,10]

LAMNs, although seen in less than 1% of appendectomy specimens in literature, constituted nearly half of our cases. These mucin-producing epithelial tumors carry a risk of pseudomyxoma peritonei, emphasizing the need for surgical vigilance and routine pathological review. In our cases, LAMNs were not suspected preoperatively, highlighting the limitations of radiology in identifying early-stage neoplasms. Köhler F et al conducted a retrospective study to analyze the clinical profile and outcomes of low-grade appendiceal mucinous neoplasms (LAMN).[11] For this purpose the authors undertook a study comprising of 612 anonymized cases collected from a national cancer registry database over a seven-year period. The study found that 63.07% of patients were female, with a mean age at diagnosis of 62.03 years. Tumor staging data was available in only 24.86% of cases, with nearly half of these being T4-stage. Surgery was recorded in 269 cases, while chemotherapy was rarely used. The overall 5-year survival rate was 79.52%, with better survival in patients under 55 years (85.77%) compared to those over 55 years (73.27%). On the basis of these findings the authors concluded that LAMN is likely underreported, and the lack of comprehensive staging and treatment data calls for a dedicated registry to improve management and follow-up guidelines. Similar findings about LAMN in cases of appendectomies were also reported by the authors such as Wang AS et al,[12] and Guner M et al.[13]

The single case of appendiceal schwannoma in a 17-year-old male shows why its necessary to do histolopathological examination in appendectomy specimens. In this particular case this benign nerve sheath tumor mimicked acute appendicitis and was only confirmed through microscopic features such as Verocay bodies and nuclear palisading. Similar cases of appendicular schwannomas have also been reported by the authors such as Intagliata E et al,[14] and Kamp MC et al.[15]

The high incidence of incidental lesions over a short duration from a single center suggests these pathologies may be significantly underreported. This reinforces the argument for sending all appendectomy specimens for histopathological analysis irrespective of intraoperative findings.

CONCLUSION

Our findings contest the presumed rarity of appendiceal neuroma and LAMN. Their high frequency in this case series underlines the critical importance of routine histopathological examination of appendectomy specimens. Greater awareness and standardized reporting can aid early detection and appropriate postoperative management, especially for lesions with malignant potential like LAMNs.

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