

SURVEILLANCE OF APPENDICECTOMY SPECIMEN WITH HISTOMORPHOLOGICAL EVALUATION

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ABSTRACT

Objective: Appendicectomy is the gold standard treatment in acute appendicitis, and in each case, a specimen should be evaluated thoroughly by a histopathologist to confirm the diagnosis and any unknown pathology. The present study aims to find out age and gender prevalence of appendicitis in a tertiary care hospital in Eastern India and various histological changes in the appendix in routine appendicectomy specimen undergoing surgery for appendicitis.

Methods: A total of 780 appendicectomy specimens were studied for acute appendicitis for 2 years. Gender prevalence and age-wise incidence of appendicitis were analyzed statistically. Sections were taken from different parts of formalin-fixed appendix specimen. A thorough histological examination was done to confirm acute appendicitis and to detect any incidental unusual histological changes.

Results: Of 780 cases, 343 (44%) were male and 437 (56%) were female. Females are more in number than males ($p < 0.001$). The incidence was more common in the age group of 21–30 years (50.7%). Histological findings revealed normal vermiform appendix in 60 (7.7%), lymphoid hyperplasia in 75 (9.6%) cases, acute appendicitis and periappendicitis in 471 (60%) and 110 (14%) cases, respectively. Gangrenous appendicitis was found in 56 (7%) cases. Unexpected findings were reported in 8 (1.02%) cases, of which *Enterobius vermicularis* 2 (0.25%) cases, endometriosis 2 (0.25%) cases, mucocele 1 (0.12%) case, and carcinoid in 3 (0.4%) cases.

Conclusions: Apart from intraoperative examination, a routine histological study of biopsy specimen reveals at times rare pathological changes which has some impact on clinical co-relation and patient management and might help to avoid any lethal complications.

Keywords: Appendicitis, Appendicectomy, Mucocele, Endometriosis.

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INTRODUCTION

The vermiform appendix is a tubular structure attached to the posteromedial wall of cecum at the confluence of all taenia coli about 2 cm below ileocecal valve [1]. The different anatomical positions depending on the direction of its tip are retrocecal (60%), pelvic (30%), paracecal, pre-ileal, post-ileal, and promonteric type [1]. This variable position may affect the clinical manifestations of appendicitis [2]. Histologically, it consists of innermost lining epithelium, lamina propria studded with lymphatic nodules extending to submucosa, muscularis externa, and serosa [3]. Appendicitis is the most common cause of acute abdomen. The exact etiopathogenesis of appendicitis is not established till now. It may be due to obstruction of lumen leading to distension and impaired circulation and if the cause obstruction remain untreated it leads to perforation of appendix and peritonitis. Appendicitis is more common in males than females with a ratio of 1.7:1. Early appendicectomy in suspected appendicitis leads to decreased morbidity, but histological evaluation shows no inflammation in 9–40% of cases [4,5]. In conventional practice, histopathology of appendicectomy specimens used to depend on surgeons view [6]. Many samples are not sent for histology unless any gross abnormality is detected by the surgeon [6]. However, many studies found incidental abnormal findings after histological evaluation in which patients need further treatment and follow-up [7-9]. <50% of appendicular tumors are identified intraoperatively, and the rest are diagnosed after biopsy evaluation incidentally [10]. It was also reported that normal looking appendicectomy specimens show inflammatory changes after histologic study suggesting some other hidden condition [11]. Therefore, the present study was carried out to find different pathological changes in

the routine appendicectomy specimen in suspected appendicitis cases for a proper diagnosis and management.

METHODS

This prospective study was carried out in a tertiary care hospital and it is approved by the Institutional Ethics committee. Appendix specimen was collected from 780 patients undergoing appendicectomy with a presumptive diagnosis of acute appendicitis from January 2014 to January 2016. Gender prevalence and age-wise incidence were analyzed. All specimens were formalin fixed, and macroscopic examination was done. Sections were taken from different parts of formalin-fixed specimens such as tip, body, and base and stained with hematoxylin and eosin stain and seen under the light microscope. Findings were recorded as acute appendicitis along with associated periappendicitis, recurrent appendicitis, gangrenous appendicitis, follicular hyperplasia, and unusual incidental findings. Statistical analysis was performed using the latest version of SPSS software when required.

RESULT

Of 780 patients, males were 343 (44%) and females were 437 (56%) in number. The number of females significantly outnumbered the males ($p < 0.001$). The mean age of the patients was 30 years varying from 10 years to 80 years (Table 1). The number of abnormal pathological findings of males and females was 5 and 3, respectively. It was revealed with χ^2 that there is no significant difference found with respect to gender in abnormal cases. After histologic evaluation, normal appendix was found in 60 cases (7.7%) without any pathological change in the wall. Features of acute appendicitis were found in 471 cases (60%)

(Fig. 1a). Lymphoid hyperplasia was reported in 75 (9.6%) cases (Fig. 1b). Associated findings along with acute appendicitis such as gangrenous appendicitis and peri-appendicitis (Fig. 1c) were found in 56 (7%) and 110 (14%) cases, respectively (Table 2). The incidental abnormal findings reported in 8 (1.02%) cases. They were mucocele (Fig. 2a) in one case, endometriosis (Fig. 2b) in two cases, *Enterobius vermicularis* (Fig. 2c) in two cases, and carcinoid (Fig. 2d) in three cases (Table 3). Maximum cases were in the age range of 21–30 years (50.7%) followed by 31–40 years (25.6%) (Table 4).

DISCUSSION

Appendicitis is the most common cause of acute abdomen in any age group. Diagnosis of appendicitis is usually based on periumbilical pain, pain, and rigidity in the right lower quadrant of abdomen along with fever and vomiting [11]. The main cause of appendicitis is the lumen obstruction by a fecalith that leads to increase mucus secretion and lymphoid hyperplasia. This causes further obstruction and if left untreated leads to perforation, gangrene, and abscess formation. Appendicitis is very rare at two extremes of age, i.e. in infants due to wider lumen and at old age due to the obliteration of the lumen [12]. The maximum incidence of appendicitis occurs in the second decade; thereafter, the disease incidence declines with age [13,14]. However, in the present study, the mean age of presentation is 30 years and maximum is in the age range of 21 years–30 years [50.7%], followed by 31 years–40 years [25.6%]. This may be due to changing food habit and intake of unhealthy food in this group. In our study, females were significantly more in number than males which coincide with a study by Naveen *et al.* on South Indian population [15]. A study by Noudeh *et al.* in Taiwan population reported more cases of males than females [16]. A similar study by Al-Omran *et al.* showed that males are affected more in number than females and in the age range of 10–19 years in Canada [17]. This may reflect the regional variation of incidence of appendicitis. Histological examination of appendicectomy specimen carried out for two purposes, first to confirm the diagnosis of appendicitis and second to exclude any unusual findings. Both the things affect further management. In the present study, normal appendix was found in 60 cases (7.7%). Lymphoid hyperplasia is another cause obstruction and acute inflammation. We found only lymphoid hyperplasia in 75 (9.6%) cases. After histologic examination, some

unusual findings were reported. *Enterobius vermicularis* was found in 0.25% of cases. Previous studies show *E. vermicularis* in 0.18–4.1% of cases and rarely present with features of acute appendicitis [18]. Mucocele is a very rare condition of appendix. There are four histologic types of appendiceal mucocele: Retention cyst, mucosal hyperplasia, mucinous cystadenoma, and mucinous cystadenocarcinoma [19]. Appendectomy is the standard of care for mucinous cystadenoma, whereas a cystadenocarcinoma requires a right hemicolectomy. In the present study, cystadenocarcinoma found in one case (0.125%). This incidence is very less in comparison to a study by Jones *et al.* where they reported 0.25% of cases [20]. Due to the high association of mucinous neoplasm with colon and ovarian malignancy, follow-up computed tomography (CT), US, and colonoscopy examinations must be performed during the post-operative period. Carcinoid is another clinical condition that most commonly affects appendix and could not be diagnosed intraoperatively. We found three cases (0.4%) of carcinoid which was very less than the study by Jones *et al.* in the UK. However, a review by Arife Polat Duzgun showed only 0.1% of

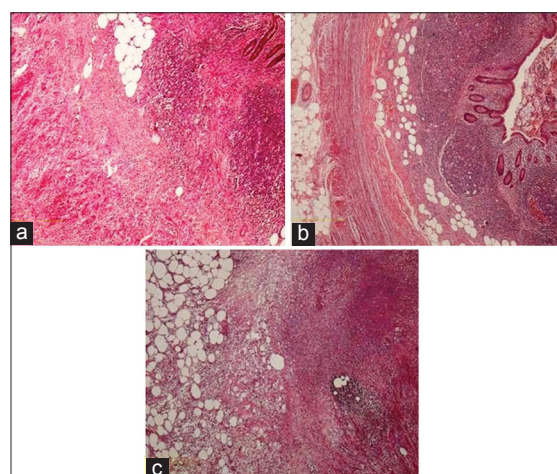


Fig. 1: (a) Acute appendicitis - appendix with edematous wall and dense infiltration by inflammatory cells. (b) Follicular hyperplasia - Markedly hyperplastic lymphoid follicle, (c) Gangrenous appendicitis - Gangrenous wall with a large area of necrosis and periappendicitis

Table 1: Number of patients of appendicitis with respect to gender

Gender	Total number of patients (%)	Abnormal finding
Males	343 (44)	5
Females	437 (56)	3
Total	780 (100)	8

Table 2: Histological findings of appendicitis patients

Histological findings	n (%)
Normal	60 (7.7)
Acute appendicitis	471 (60)
Periappendicitis	110 (14)
Lymphoid hyperplasia	75 (9.6)
Gangrenous appendicitis	56 (7)
Abnormal findings	8 (1.7)
Total	780 (100)

Table 3: Details of abnormal findings from histological evaluation (n=780)

<i>E. vermicularis</i>	2	0.25%
Endometriosis	2	0.25%
Mucocele	1	0.125%
Carcinoid	3	0.4%

E. vermicularis: *Enterobius vermicularis*

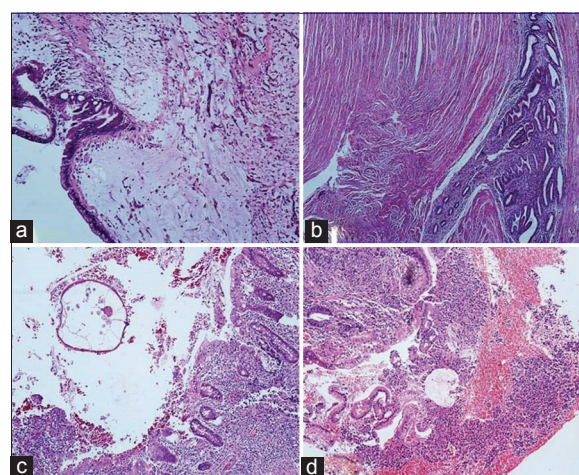


Fig. 2: (a) Mucinous carcinoma appendix - Pool of mucin with occasional floating tumor cells in the lamina propria and muscle layer. (b) Endometriosis in appendix - Endometrial gland and stroma in the muscularis propria. (c) *Enterobius vermicularis* - Lumen showing cross-sectional parasite. (d) Appendicular carcinoid - Seeds of neuroendocrine tumor cells having uniform nuclei and eosinophilic cytoplasm

Table 4: Abnormal findings from histological evaluation with respect to age

Age group (years)	Findings consistent with appendicitis (%)	<i>E. vermicularis</i>	Endometriosis	Mucocele	Carcinoid
10-20	55 (7.05)	0	0	0	0
21-30	396 (50.7)	1	1	0	0
31-40	200 (25.6)	0	1	1	2
41-50	62 (7.9)	0	0	0	1
51-60	39 (5)	1	0	0	0
61-70	18 (2.3)	0	0	0	0
71-80	10 (1.3)	0	0	0	0

E. vermicularis: *Enterobius vermicularis*

cases of carcinoid in appendectomy specimen for appendicitis [7]. Carcinoids are the most common benign tumor of appendix, and it may be associated with carcinoid of other sites of the intestine. Carcinoid of appendix usually affects the tip, so meticulous sampling during biopsy is required. Appendiceal endometriosis is another incidental finding that is detected after histological evaluation. According to Akbulut *et al.*, intestinal endometriosis occurs in only about 10% of women with endometriosis and most common sites are rectum and sigmoid colon but rarely in appendix [19]. Appendiceal endometriosis is 2.8% of endometriosis affecting females [21]. It can occur on women of both fertility age group and postmenopausal age group [22]. We found two cases of endometriosis (0.25%) among our study population in the women of fertile age group. Appendiceal endometriosis is usually asymptomatic but sometimes presents as appendicitis, perforation, and intussusception [19,23,24]. In the present study, both of them manifest as acute appendicitis and after histopathology study advised for hormone therapy.

CONCLUSION

Appendectomy is the gold standard of therapy in all types of appendicitis cases. The present study on eastern India population highlighted the sex prevalence and age distribution of the cases. It was important to find post-operative histopathological examination and requires awareness and understanding of different usual and rare entities of the organ which affects further management.

AUTHOR'S CONTRIBUTION

All the authors contributed equally.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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