

# Unusual findings in appendectomy specimens: Evaluation of 2458 cases and review of the literature

Arife Polat Duzgun, Münevver Moran, Selçuk Uzun, Mahir M. Ozmen, Vasfi M. Ozer, Selda Seckin\*, Faruk Coskun

Department of Surgery and \*Department of Pathology, Ankara Numune Teaching and Research Hospital, Ankara-Turkey.

## ABSTRACT

**Background:** Acute appendicitis is the most common acute surgical condition of the abdomen. Obstruction of the lumen is the dominant factor for acute appendicitis. Although fecaliths are the usual cause of obstruction, some unusual factors could be the reason.

**Aim:** Our aim was to document the unusual findings in appendectomy specimens.

**Methods and Material:** The hospital records of 2458 patients (834 F) who were diagnosed as acute appendicitis and underwent open appendectomy during last six years were retrospective according to age, sex, histopathological diagnosis, coexisting pathologies and unusual findings on histology.

**Statistical Analyses:** All data were stored using SPSS 9.05 for Windows. Frequency and distribution of data were analysed.

**Results:** Unusual findings were determined in 19 (0.7%) cases by histology. Parasites were found in six (0.3%) (*Enterobius Vermicularis*, *Balantidium Coli*, *Schistosoma Haematobium*), mucocoele in 5 (0.2%), carcinoid tumour in three (0.1%), B cell malignant lymphoma in one (0.05%), leiomyoma in one (0.05%), primary appendiceal adenocarcinoma in one (0.05%), acute appendicitis with dysplastic changes in one (0.05%) and inflammatory bowel polyp was reported in remaining one case (0.05%).

**Conclusion:** Although unusual or coexisting pathologies can be seen rarely during appendectomy, this should be kept in mind and meticulous exploration and evaluation should be performed in each cases.

## KEY WORDS

Histology, unusual findings, acute appendicitis, appendectomy, surgery.

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## INTRODUCTION

Acute appendicitis is the most common acute surgical condition of the abdomen. The incidence of acute appendicitis roughly parallels to that of lymphoid development, with the peak incidence in late teens and twenties. The sex ratio in acute appendicitis is about 1:1 prior to puberty. At puberty, male to female ratio becomes 2:1. Obstruction of the lumen is the dominant factor for acute appendicitis. Although fecoliths are the usual cause of obstruction, some unusual factors could also be the reason. This may be due to lymphoid hyperplasia, intestinal worms, malignant or benign

tumors, or other conditions.<sup>1</sup> Eventhough, there are many case reports in the English written medical literature, reports with meticulous analyses of all cases with appendicitis are small in number.<sup>2-6</sup> Therefore, this retrospective study was planned to document the unusual findings in appendectomy specimens.

## MATERIALS AND METHODS

Hospital records of 2458 patients (834 females), mean (range) age of 27 (4-85), years who were diagnosed as acute appendicitis and underwent open appendectomy during last six years (January 1998

**Address for correspondence:** M. Mahir Ozmen, Turan Günes Bulvari 43.Sokak 9/22, 06450 Oran, E-mail:mmahir@mynet.com

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and April 2004) at Emergency Surgical Unit of Ankara Numune Hospital, were studied retrospectively with special reference to age, sex, operative and histology reports. Operative records were analyzed to determine primary or coexisting operative findings and other primary pathologies. Histology reports were also analyzed according to the diagnosis and unusual findings were noted. The study protocol was approved by the local hospital ethics committee.

All data were stored using SPSS 9.05 for Windows. Frequency and distrubution of data were analysed.

RESULTS

There were 834 (34%) female and 1624 (66%) male patients. Mean (range) age was 27 (4-85) years. All patients were clinically diagnosed as having acute appendicitis based on the physical and laboratory examination. After the pathological evaluation, in 624 cases (26%) acute necrotizing appendicitis, in 830 cases (33%) acute phlegmonose appendicitis, in 470 cases (19%) acute appendicitis, in 56 cases (2%) obliterated appendix vermiformis were reported. In 348 cases (14%) lymphoid hyperplasia were determined. The patients with lymphoid hyperplasia were divided into two groups according to age based on the common knowledge that hyperplasia of the lymphoid tissue is a common normal feature in those younger than 20 years (6). Hence, appendix of 132 cases (5.3%) younger than 20 years were accepted as normal. Whereas there were 216 cases (9%) older than 20 years who had lymphoid hyperplasia as an initial finding of inflammation based on the theory that obstruction by lymphoid hyperplasia is important in the pathogenesis of acute appendicitis (6) (Table 1).

Of the 210 specimens (8.5%) who were evaluated negative for acute appendicitis, 56 (2.2%) were normal appendix vermiformis, 13 (0.5%) were found to be fat necrosis only, 9 (0.3%) were periappendicitis and remaining 132 (5.3%) had lymphoid hyperplasia.

Coexisting pathologies were found in 33 (1.3%) patients who were all negative for acute appendicitis. Hemorrhagic corpus luteums were seen in 13 (0.6%), salpingitis in 5 (0.2%), acute cholecystitis in 4 (0.16%), diverticulitis in 5 (0.2%), Meckel diverticulitis in 1 (0.05%), ruptured ovarian cyst in 3 (0.12%), tubal grosses in 1 (0.05%) and ovarian Brenner tumor in one (0.05%) patient (Table 2).

Unusual findings were determined in 19 (0.7%) cases

Table 1: Patient characteristics and histopathologic diagnosis

Patients	n=2458
Male	1624 (66%)
Female	834 (34%)
Mean age (range)	27 (4-85)
Histopathological diagnosis	
Negative for acute appendicitis	210 (8.5 %)
Normal appendix vermiformis	56 (2.2%)
Lymphoid hyperplasia (0-20 years)	132 (5,3%)
Fat necrosis only	13 (0.5%)
Periappendicitis	9 (0.3%)
Positive for acute appendicitis	2248 (90.5%)
Acute phlegmonose appendicitis	830 (33%)
Acute appendicitis	470 (19%)
Acute gangrenous appendicitis	624 (26%)
Obliterated appendix vermiformis	56 (2%)
Lymphoid hyperplasia (age>20 years)	216 (9%)
Coexisting Pathologies	33 (1,3%)
Unusual findings	19 (0,7%)

Table 2: Coexisting pathologies according to frequency

Coexisting pathologies	Patient No.	%
Hemorrhagic corpus luteum	13	(40%)
Salpingitis	5	(15%)
Acute cholecystitis	4	(12%)
Diverticulitis	5	(15%)
Ruptured ovarian cyts	3	(9%)
Meckel diverticulitis	1	(3%)
Tubal grosses	1	(3%)
Ovarian Brenner tumor	1	(3%)
Total	33	(100%)

by histology and the mean (range) age of them were 41 (21-65) years. Parasites were found in 6 (0.3%) (*Enterobius vermicularis*, *Balantidium coli*, *Schistosoma heamatobium*) (Figure 1), simple mucocoele in 5 (0.2%), carcinoid tumor in 3 (0.1%) (Figure 2), B cell malignant

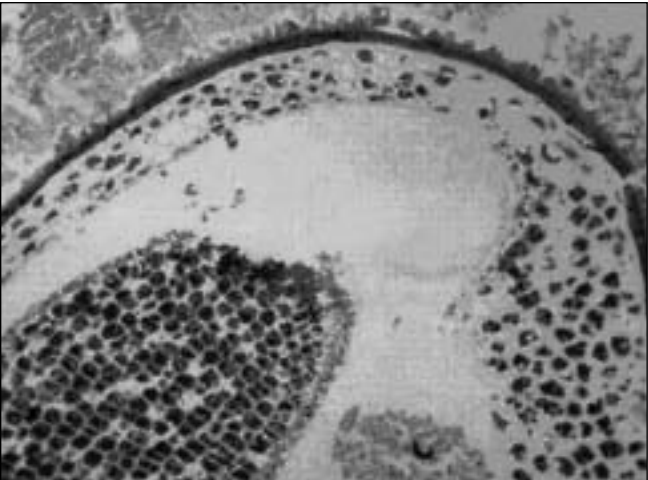


Figure 1: Balantidium Coli in appendix

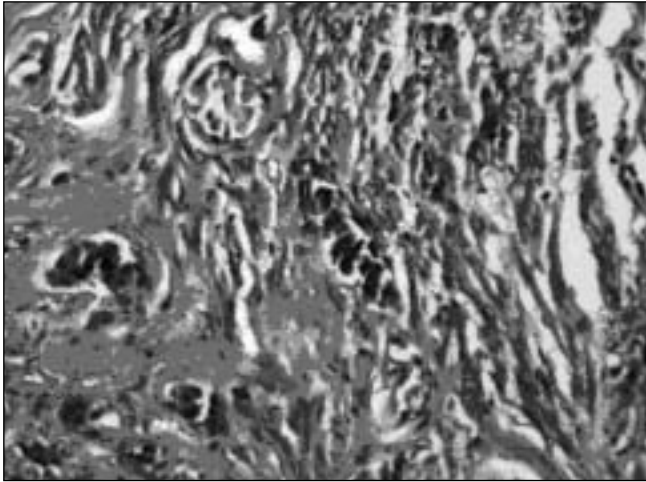


Figure 2: Carcinoid in appendix

lymphoma in 1 (0.05%), leiomyoma of the appendix in 1 (0.05%), primary adenocarcinoma of the appendix in 1 (0.05%), dysplastic changes in 1 (0.05%) and in remaining 1 case (0.05%) inflammatory bowel polyp were reported (Table 3).

## DISCUSSION

Acute appendicitis is the most common acute surgical infection seen in emergency department. Obstruction of the appendiceal lumen seems to be essential for development of appendiceal infection, gangrene and perforation. Yet, in many cases of early appendicitis the appendix lumen is patent despite the presence of mucosal inflammation and lymphoid hyperplasia. Once obstruction occurs, continued mucus secretion and inflammatory exudation increase intraluminal pressure, which obstructs lymphatic drainage and oedema and mucosal ulceration develop, further distension of the appendix may cause venous obstruction and finally ischaemic necrosis of the appendix wall produces gangrenous appendicitis.<sup>7</sup>

Table 3: Unusual findings on histology.

Findings	Patients No.	(%)
Parasites		
( <i>Enterobius vermicularis</i> , <i>Balantidium coli</i> , <i>Schistosoma haematobium</i> )	6	(32%)
Mucocele	5	(27%)
Carcinoid tumor	3	(16%)
B cell malignant lymphoma	1	(5%)
Leiomyoma of the appendix	1	(5%)
Primary appendiceal adenocarcinoma	1	(5%)
Dysplastic changes	1	(5%)
Inflammatory bowel polyp	1	(5%)
Total	19	(100%)

Although fecaliths and lymphoid hyperplasia are the usual cause of obstruction, some unusual factors could also be the reason. The more common unusual findings in appendectomy specimens are intestinal worms and malignant or benign tumors.<sup>1</sup> In this retrospective study operative records of appendectomies were analyzed to determine primary or coexisting pathologies and histology reports were also analyzed according to the diagnosis and any unusual findings were collected. As shown in table 4, unusual findings on histology were mainly reported as case-reports and there were total number of 126 papers in English written medical literature based on Pubmed-Medline. Therefore, only reports with more than one cases selected and listed in table 4.<sup>2,4,8-34</sup> Apart from study by Collins in 1963, there is no study covering as many cases as the present study does.<sup>35</sup>

Although some usual aetiological factors are known to be fecoliths and lymphoid hyperplasia, appendicitis may be due to some parasitic infestation as well.

*E. Vermicularis* was identified in ranges from 0.18 to 4.1% of patients with clinical appendicitis and was most commonly seen in appendix with either chronic inflammation or where the appendix was normal on histology.<sup>13,36-38</sup> *Enterobius vermicularis* was rarely associated with histological changes of acute appendicitis.<sup>36</sup>

*Enterobius vermicularis* was found in 4 (0.4%) cases in the present study and none of them had acute appendicitis on histology which is in correlation with the literature.<sup>4</sup>

Schistosomiasis is a trematod infestation, and one of the most common parasitic diseases in the world. *Scistosomia haematobium* was implicated as the causative agent of a granulomatous inflammatory reaction with eosinophilia and fibrosis.<sup>39</sup> Although, Schistosomiasis of the appendix was first described by Turner in 1909, the actual role of schistosomal infestation as a contributory factor in appendicitis is still open to debate but the diagnosis must be entertained in patients in the tropics with the feature of acute appendicitis or recurrent abdominal pain.<sup>40</sup> Although the actual rate of incidence in acute appendicitis is unknown it was found in one (0.05%) case in the present study.

We failed to find any report in English written medical literature regarding, *Balantidium coli* in the

**Table 4: Selected references with unusual finding from the literature review (1975-2004).**

Author	Year of Pub.	Type of report	Number of case	Findings
Didolkar MS <sup>8</sup>	1977	RS	11	Adenocarcinoid
Edmonds P <sup>9</sup>	1984	RS	10	Adenocarcinoid
Henrik-Nielsen R <sup>10</sup>	1985	RS	13	Spirochetosis
Nielsen M <sup>11</sup>	1987	RS	22	Endometriosis
Burgess P <sup>12</sup>	1989	RS	11	Adenocarcinoma
Blair NP <sup>4</sup>	1993	RS	10/21	Malignant/Benign
Dahlstrom JE <sup>13</sup>	1994	RS	63	Enterobius vermicularis
Fernandez Blanco CM <sup>14</sup>	2002	RS	6	Villous adenoma
Prommegger R <sup>15</sup>	2002	RS	36	Carcinoid
Uohara JK <sup>16</sup>	1975	R	12	Endometriosis
Delikaris P <sup>17</sup>	1983	R	10	Diverticulitis
Kakande I <sup>18</sup>	1990	R	1	Acute Diverticulitis
			1	amoebic schistosomal
Ojo OS <sup>2</sup>	1991	R	14	Lymphoma
Lenriot JP <sup>19</sup>	1988	R	32	Adenocarcinoma
Zhang Z <sup>20</sup>	1996	R	15	Tuberculous
Pelizzo G <sup>21</sup>	2001	R	10	Carcinoid
Betancourt C <sup>22</sup>	1990	RRC	2	Carcinoid tumor
Mittal VK <sup>23</sup>	1975	CR	2	Tuberculous
Bippus PH <sup>24</sup>	1977	CR	2	Focal mucosal hyperplasia
Singh MK <sup>25</sup>	1987	CR	17	Tuberculous
Duinslaeger M <sup>26</sup>	1985	CR	2	Endometriosis
Ticmeanu F <sup>27</sup>	1996	CR	2	Carcinoid tumor
Celi D <sup>28</sup>	1999	CR	6	Carcinoid tumor
Miettinen M <sup>29</sup>	2001	CR	4	GI stromal tumor a
Kelm C <sup>30</sup>	2001	CR	5	Adenocarcinoma
Higgins MJ <sup>31</sup>	2002	CR	2	Granulomatous ppendicitis
Aizawa M <sup>32</sup>	2003	CR	2	Adenocarcinoid
Agarwal P <sup>33</sup>	2004	RS	26	Tuberculo us
Casadio G <sup>34</sup>	2003	CR	1	Fishbone

RRC: review of reported cases, RS: Retrospective study, CR: Case report, R: review.

appendicectomy specimens. *Balantidium coli* was found in one case in our series so that it is difficult to make any comment on its causative role in the pathogenesis of appendicitis (Figure 2).

Tuberculous appendicitis (TBA) is a rare condition and commonly occurs in the young. Results of all pre-operative investigations are non-specific and the diagnosis is made only after histopathology.<sup>20,23,25,33</sup>

Neoplasms of the appendix are very uncommon and usually diagnosed at operation or autopsy. In his classical study of 71000 appendicectomy specimens, Collins found 958 malignant and 3271 benign tumors with an overall incidence of 4.6% for benign tumors and 1.35% for the malignant tumors.<sup>35</sup> Benign tumors of the appendix consist of leiomyomas, neuromas and lipomas. Malignant tumors of the appendix include carcinoids, mucocoeles and adenocarcinomas. In our series 7 (0.2%) cases with neoplasm in appendix were identified.

The more common mucinous epithelial neoplasm of

the appendix will form mucocoeles that reveal obvious cystic dilatation of the lumen with or without mural calcification. The underlying pathology may be a hyperplastic polyp, a benign neoplasm, such as cyst adenoma, or a malignant tumor such as cystadenocarcinoma. The diagnosis of appendiceal mucocoele is almost never made preoperatively.<sup>41</sup> In some cases mucocoele is well seen by either tomography or ultrasound, although other cystic lesions of the peritoneal cavity, such as ovarian cyst, mesenteric and omental cysts may have a similar radiologic appearances. These lesions are almost always found during appendicectomy and complicate about 0.3% of all appendicectomies.<sup>42</sup> A female to male ratio was found to be 4 to 1, with a mean age of presentation being 55 years.<sup>41</sup> We found 5 (0.2%) mucocoeles. All of them were female with a mean age of 34 years revealing that it might also be found in an earlier period of life.

Carcinoids are the commonest tumor of the appendix and are typically small, firm, circumscribed, yellow-brown lesions. It is more frequently diagnosed

incidentally after an operation for acute appendicitis and occasionally during other procedures. In the series by Collins, carcinoid made up 51% of the malignant tumors of the appendix.<sup>35</sup> The reported incidence of appendiceal carcinoids in several studies ranges from 0.02 to 1.5% of surgically removed appendices.<sup>43</sup> In Collins's study, carcinoids were found in 0.7% of all appendectomy specimens.<sup>35</sup> It was 0.1% in our study and seen in three patients. All patients in our study had signs and symptoms of acute appendicitis. Flushing, diarrhea, cushing syndrome or carcinoid syndrome were not observed. Diagnosis was made after appendicectomy and histologic examination. A large female preponderance is reported in all series (2-3:1).<sup>21,41</sup> All the patients in our study were also female. In most series, tumor size are reported to be less than 1 cm, in 70-95% of the cases and mostly (in 82%) located at the tip of the appendix.<sup>44</sup> Such findings were in correlation with ours as the tumors were located at the tip of the appendix and both were under 1 cm in size so that no additional procedure was performed.

Leiomyomas of the small intestine are benign tumors arising from smooth muscle in the intestinal wall. Leiomyomas occur with equal frequency in the jejunum and ileum and less commonly seen in duodenum and colon. There is no sexual preponderance. Most leiomyomas are symptomatic. Forty to fifty percent of the patients experience bleeding or obstruction. Characteristically, these lesions undergo central necrosis and hemorrhage into the necrotic area being very common. Treatment consists of segmental resection. Although the actual rate of incidence of leiomyoma in acute appendicitis is unknown, it was found in 1 (0.05%) case in the present study and patient underwent appendicectomy only.

Gastrointestinal tract is the most frequently involved extranodal site in Hodgkin's lymphoma. Gastrointestinal tract diseases accounts for 4-20% of all non-hodgkin lymphoma (NHL) and 30-45% of extranodal cases. Median age for the involvement of gastrointestinal tract is 55 years and its more common in men.<sup>46</sup> According to all reported cases, most of the appendiceal lymphomas arise in the Non-Hodgkin type (especially B cell in origine). Primary lymphomas of the appendix were reported in 11 of 71000 appendectomies by Collins.<sup>35</sup> Lewin et al. reported it in only one of the seventy-nine cases of gastrointestinal lymphomas.<sup>47</sup> d'Amore et al. reported 8 appendiceal primary lymphomas in 306 gastrointestinal lymphoma cases.<sup>48</sup> Although it is rare, the characteristic CT

appearance could lead to a preoperative diagnosis.<sup>45</sup> We found B cell lymphoma in 1 (0.05%) of the specimens. The rate of 0.05% in our study is also in correlation with previous reports, though the real involvement incidence in NHL patients is out of the scope of this paper.

Primary adenocarcinoma of the appendix is an extraordinarily rare tumor, with fewer than 300 of these lesions described in the world literature. The incidence of adenocarcinoma is 0.08% (57 of 71000 appendectomies) in Collins's reports.<sup>35</sup> This tumor is most common in person aged between 50-55 years. Adenocarcinomas behave aggressively and in a fashion similar to that of colonic adenocarcinomas, so they must also be treated with the same aggressive approach.<sup>41</sup> In our study one (0.05%) female patient with an age of 55 years was found. Initially, she was treated by appendicectomy but after the histology report arrived she underwent right hemicolectomy. The patient is still alive five years after the operation with no recurrences and is still being followed up.

## CONCLUSION

Obstruction of the lumen is the dominant factor for acute appendicitis. Some usual aetiologic factors are fecoliths and lymphoid hyperplasia. Although the symptomatology of some intestinal parasites, appendiceal neoplasms and some coexisting pathologies imitates an attack of acute appendicitis, the true nature of disease is diagnosed only through histological examination.

We conclude that unusual or coexisting pathologies can be seen rarely during appendicectomy, that should be kept in mind and meticulous exploration and evaluation should be performed in each cases. As final diagnosis may affect the requirements for further surgery, same principals should be applied to histologic evaluation.

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