**Enterobius vermicularis: A rare Cause of Appendicitis**

**Enterobius vermicularis: Apandisitin Nadir Bir Nedeni**

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**ABSTRACT**

**Objective:** Although appendicitis is one of the most common causes of emergency surgery, parasites are rarely found associated with inflammation of the appendix. The aim of this study is to establish the prevalence of *Enterobius vermicularis* in surgically removed appendices, as well as to determine its possible role in the pathogenesis of appendicitis.

**Methods:** A retrospective analysis of all the appendices removed during the last 20 years at a tertiary university hospital. Appendices removed during the course of another intra-abdominal procedure were excluded from the study.

**Results:** All 1085 surgical specimens removed from patients with clinical appendicitis were evaluated. *Enterobius vermicularis* was found in seven appendices (0.65%) with clinical symptoms of appendicitis. The parasite was most frequently identified in appendices without pathological changes (6/117). There was no case of chronic appendicitis presenting *E. vermicularis* infestation, while the parasite was rarely related to histological changes of acute appendicitis (1/901).

**Conclusion:** The results suggest that the presence of *E. vermicularis* in the appendix might cause appendiceal pain (colic), but can rarely be associated with pathologic findings of acute appendicitis. *(Turkiye Parazitol Derg 2012; 36: 37-40)*

**Key Words:** Appendicitis, *Enterobius vermicularis*, appendiceal oxyuriasis, worm appendicitis

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INTRODUCTION

Acute appendicitis (AA) is considered as the most common cause of emergency surgery (1, 2). The aetiology of AA rarely involves parasitic and protozoal infections of the gastrointestinal tract in the developed countries (3). Inversely, many parasitic infections frequently lead to the symptomatology of acute appendicitis.

It is exactly this ambiguous relation between parasitic infections and AA that still induces a controversy as to whether or not these parasites may cause appendicitis, despite the fact that many parasites have been found in the lumen of the appendix (4).

Human infestation with Enterobius vermicularis (pinworm, seatworm, threadworm, oxyuriasis) has been recognized for about 10,000 years, and the presence of the parasite in the appendix was first recognized by Fabrius in 1634 (5). The mature worm of E. vermicularis lives and reproduces in the proximal part of the ascending colon, caecum, appendix and the terminal ileum. After fertilization, the male worm dies while the female migrates to the anal canal where the laying of eggs takes place (6).

The aim of this study was to establish the prevalence of E. vermicularis in appendectomy specimens and to determine its possible role in the pathogenesis of appendicitis.

MATERIAL AND METHODS

This is a retrospective analysis of all the appendices that were removed between 1 January 1987 and 31 December 2008 by the surgeons of the 3rd department of surgery of AHEPA University Hospital of Thessaloniki. All 1085 surgical specimens removed at operation from patients with clinical appendicitis were evaluated. Appendices removed during the course of another intra-abdominal procedure were excluded from the study.

The appendices were fixed in 10% formalin. All blocks were stained with haematoxylin and eosin and examined for the presence of E. vermicularis and the type of inflammation.

RESULTS

A total of 1085 patients with appendicitis were examined. 584 among them were males (53.83%), while 501 were females (47.17%). The mean age of the patients was 27.62 years (SD 14.45 years), ranging from 8 to 96 years.

Histological examination revealed features of acute appendicitis in 83.04% (901), chronic appendicitis in 6.18% (67) and no inflammation in 10.78% (117) of appendices (Table 1). E. vermicularis was found in seven appendices, all of which were from patients with clinical symptoms of appendicitis. The prevalence of E. vermicularis was 0.65% in cases of clinical appendicitis. The ages of the patients with histologically proven E. vermicularis in appendices ranged from 15 to 33 years with a median age of 25 years. Of seven cases, four were women and three were men. In patients with clinical appendicitis, E. vermicularis was most frequently identified in appendices without pathological changes (6/117, 5.13%) while only one of the 901 cases of acute appendicitis (0.11%) showed evidence of infestation (Table 1). All seven cases showed characteristic features of E. vermicularis adult worms in the lumen of the appendix. In the case where acute appendicitis was present, the worm was found in the lumen of the appendix without any relation to the epithelium and with prominent signs of inflammation (Figure 1).

DISCUSSION

The various worms that have been reported to be associated with clinical appendicitis include: Ascaris lumbricoides (round worm), Trichuris trichuria (whip worm), Entamoeba histolytica and Enterobius vermicularis (6). Intraluminal parasites within resected appendix specimens are generally an incidental finding. Gastrointestinal infection due to Enterobius vermicularis occurs worldwide and is considered to be the most common helminthic infection. Although seen in all ages and socioeconomic levels, there is a distinct predilection for children and the young (7). Whilst most children are asymptomatic, the most common presenting symptom is pruritis ani, but infestation may present with ileocolitis, enterocutaneous fistula, urinary tract infection, mesenteric abscesses, salpingitis and appendicitis (8).

As previously mentioned, the mature worm of E. vermicularis lives in the proximal part of the ascending colon, caecum, appendix and the terminal ileum, and represents the most common parasite found in the appendix. The recent literature revealed the incidence of E. vermicularis in surgically removed appendices from patients with clinical appendicitis, varying from 2.7% to 4.1% (6). In our study, E. vermicularis was identified only in 0.65% of patients with clinical appendicitis and overall 0.60% for all appendices removed during the same period. This lower

Table 1. Demographic parameters and histological findings of patients

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Patients with clinical appendicitis (n=1085)</th>
<th>Patients with clinical appendicitis and E. vermicularis infection (n=7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>27.62 (SD 14.45)</td>
<td>25</td>
</tr>
<tr>
<td>Male</td>
<td>584</td>
<td>3</td>
</tr>
<tr>
<td>Female</td>
<td>501</td>
<td>4</td>
</tr>
<tr>
<td>Histological findings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute inflammation</td>
<td>901</td>
<td>1</td>
</tr>
<tr>
<td>Chronic inflammation</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>No inflammation</td>
<td>117</td>
<td>6</td>
</tr>
</tbody>
</table>
in association with acute inflammation, it may be that the worm *Enterobius vermicularis* is found. The situation in acute appendicitis is less clear. In the few cases where appendiceal lumen obstruction. The situation in acute appendicitis consists of chronic right lower quadrant and pelvic pain, intermittent in nature, and can be explained by the hypothesis of "appendiceal syndrome" even without eliciting acute inflammation. It is also surprising to note that male pinworms are more commonly seen than females in view of the greater size of the latter.

Despite the fact that the relationship of *E. vermicularis* to the pathogenesis of appendicitis has been investigated for many years, the influence of the parasite on the individual forms of inflammation is still unclear. Although *E. vermicularis* may have a causal role in appendiceal pain and chronic inflammation due to obstructive phenomena, the overwhelming majority of cases are not associated with acute inflammation. Interestingly, the presence of pinworms in the appendix may cause a clinical "appendiceal syndrome" even without eliciting acute inflammation. This "syndrome", also mentioned as appendiceal colic, consists of chronic right lower quadrant and pelvic pain, intermittent in nature, and can be explained by the hypothesis of appendiceal lumen obstruction. The situation in acute appendicitis is less clear. In the few cases where *E. vermicularis* is found in association with acute inflammation, it may be that the worm has been responsible for initiating the inflammatory reaction, although this and other studies suggest that its presence may be coincidental. In keeping with previously published reports, in our study there is only one of the 901 cases of acute appendicitis (0.11%) showing evidence of *E. vermicularis* infestation. It is important, however, to mention that all of our seven patients, diagnosed eventually with *E. vermicularis* infection, presented symptoms of clinical appendicitis, whether the latter was typical or not.

With regards to histopathology, *E. vermicularis* is rarely associated with the histological changes of acute appendicitis. Similarly, Wiebe et al. (11) recently revealed a highly significant difference in the incidence of *E. vermicularis* in normal appendices and in inflamed appendices. The present study strongly supports the previous bibliographic data. In other cases, *E. vermicularis* infestation of the appendix may cause a spectrum of pathologic changes in the appendix that range from lymphoid hyperplasia to life-threatening complications such as gangrenous appendicitis and perforation with peritonitis. Lymphoid hyperplasia in response to the presence of the parasite may be the first tissue reaction leading to clinical signs of appendiceal colic. On the other hand, the obstructive effect because of the prominent lymphoid tissue may be the initiating event for the inflammatory process. Concerning the sex incidence of *E. vermicularis* and its relation to inflammation, the results of the study of Williams and Dixon indicate that there is no relationship between the sex of appendiceal Enterobius and inflammation. It is also surprising to note that male pinworms are more commonly seen than females in view of the greater size of the latter.

The histological spectrum of appendicitis associated with *E. vermicularis* infection. a) Acute appendicitis: there is hemorrhagic ulceration of the mucosa. All coats of the wall of the appendix are markedly thickened by edema and an infiltrate of inflammatory cells. H&E, ×25. b) Acute appendicitis. H&E, ×40. c) *Enterobius vermicularis* in the lumen of the appendix (arrow). H&E, ×100. d) Cross-section of the worm (arrow). H&E, ×400.

prevalence could be justified by two factors. The first one is the geographic location and social circumstances, leading to prominent variations in the prevalence of the parasite. The other factor could possibly be the existence of minimal differentiations in the techniques followed by the pathologists. There is also evidence to suggest that a histologically normal appendix may show molecular evidence of inflammation if examined further.

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careful history may point to antecedent symptoms and a time course incompatible with typical appendicitis, but physical examination is generally not specific enough to differentiate between parasitic and ordinary appendiceal pain (7).

Patients should be clinically observed and re-evaluated before being subjected to an emergency appendectomy. However, the abdominal discomforts that they present and missing the diagnosis leads to inevitable surgical operation. Appendectomy, open or laparoscopic, should proceed with caution if the appendix is observed not to be acutely inflamed. The surgeon must bear in mind the possibility of resident worms in the vermiform appendix (7). The diagnosis of pinworm infestation can be generally reached only after the histopathologic observation of the resected appendices. In order to achieve the best therapeutic result, all patients should routinely receive antihelminthic treatment afterwards, because the appendectomy treats only the symptoms and not the primary cause of the disease. The treatment of E. vermicularis infection involves one dose of pyrantel pamoate 11 mg/kg, or mebendazole 100 mg orally with a second dose in 2 weeks to treat possible re-infection. It is also recommended that family members are treated in order to eliminate asymptomatic reservoirs and to ensure eradication (12).

Enterobius vermicularis is the most common parasite found in the appendix. Although its presence may play a causal role in appendiceal pain and chronic inflammation, it is rarely related to acute appendicitis. E. vermicularis infestation of the appendix usually produces an “appendiceal syndrome”, characterized by chronic intermittent pain in the right iliac fossa. The appendix may be histologically normal, but in many cases it shows various pathologic changes. Commonly, patients are subjected to an emergency appendectomy, but the final diagnosis can only be reached after pathologic examination of the appendix. All patients diagnosed with E. vermicularis infestation of the appendix should receive antihelminthic treatment in order to prevent possible re-infection.

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Conflict of Interest
No conflict of interest was declared by the authors.

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