

# Do intestinal parasitic infestations in patients with clinically acute appendicitis increase the rate of negative laparotomy? Analysis of 3863 cases from Turkey

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## Abstract

**Introduction:** Acute appendicitis is the most frequently observed disease requiring emergency surgery. The role of parasites in its pathogenesis has long been discussed. The signs of the parasitic infestations can mimic the signs of acute appendicitis. Therefore, it can cause a negative laparotomy.

**Aim:** To evaluate the parasitic infestations of the appendix vermiformis whether increases the rate of negative laparotomy.

**Material and methods:** The histopathology results of a total of 3863 patients who underwent appendectomy with clinically acute appendicitis were evaluated retrospectively. All appendectomy materials in which parasites were observed were evaluated with respect to the nature of the parasites and the findings of inflammation. Cases in which parasite tissue fragments and/or eggs as well as findings of inflammation were histopathologically observed in the appendix lumen were diagnosed with parasitic appendicitis.

**Results:** Evidence of parasites was observed in 19 (0.49%) of the evaluated appendectomy materials. In 9 (47.3%) of these specimens that had evidence for parasites, findings for acute appendicitis and localized peritonitis were identified. Findings of acute appendicitis had not been identified in the other ten (52.7%) of the specimens. *Enterobius vermicularis* was the most frequently identified parasite.

**Conclusions:** In parasitic acute appendicitis, appendectomy in itself is not sufficient for treatment. Pharmacological treatment should also be administered after surgery. Patients should be evaluated prior to surgery for parasites, and diagnosis of acute appendicitis should be considered more cautiously in order to avoid negative laparotomies.

## Introduction

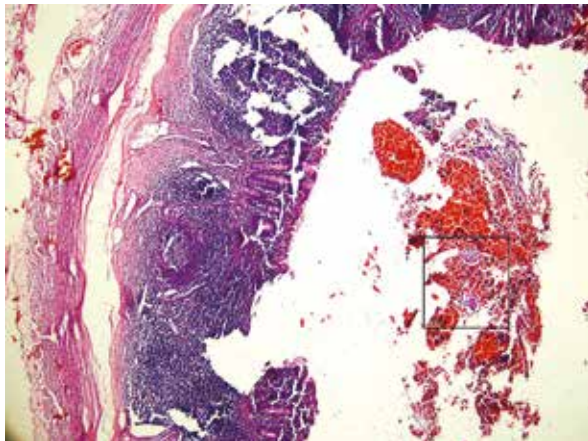
The aetiology of acute appendicitis includes fecaliths, lymphoid hyperplasia, fruit and vegetable seeds, barium enemas and tumours. Parasites are one of the more uncommon causes of acute appendicitis. *Enterobius vermicularis*, *Ascaris lumbricoides*, *Schistosoma* spp. and *Taenia* spp. are the parasites that can lead to a clinical picture of acute appendicitis. *Enterobius vermicularis* is the parasite that most frequently contributes to a clinical picture of acute appendicitis [1, 2].

## Material and methods

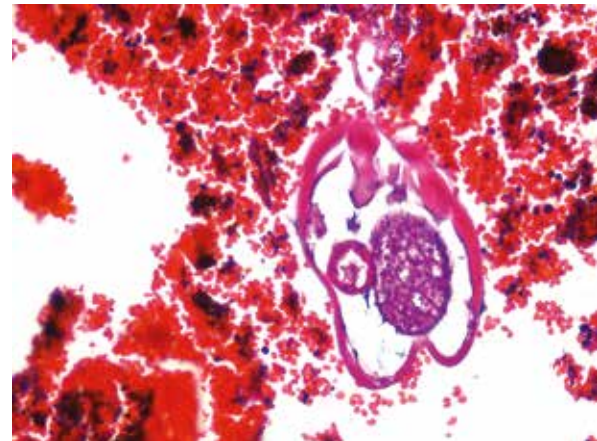
The files and electronic records of 3863 patients who underwent appendectomy at the Izmir Education

and Research Hospital General Surgery Clinic between 2003 and 2012 were evaluated retrospectively. All appendectomy materials in which parasites were observed were evaluated with respect to the nature of the parasites and the findings of inflammation.

The appendectomy materials were subject to fixation with 10% formaldehyde, tissue follow-up and paraffin block embedding. The 4-micron-thick sections obtained from the paraffin blocks were stained with haematoxylin and eosin, and examined under a white light microscope. Cases in which parasite tissue fragments and/or eggs as well as findings of inflammation were histopathologically observed in the appendix lumen were diagnosed with parasitic appendicitis (Figures 1 and 2).



**Figure 1.** Full thickness of appendiceal wall and two parasites located in black-lined box were seen in the lumina of the appendix (40× H + E)



**Figure 2.** Cut-section of the intestine of the parasite was seen in high-power magnification of the lumina of the appendix (400× H + E)

## Results

A total of 3863 patients underwent surgery with clinically acute appendicitis. Parasites had been observed in 19 (0.49%) of all evaluated appendectomy materials. Of the patients with parasites in their materials, 12 (63.2%) were female and 7 (36.8%) were male. Their average age was 30.6 years (range: 17–83 years). Of these parasites, 16 (84.2%) were identified as *E. vermicularis*, and 3 (15.8%) were identified as *Taenia saginata*. Acute appendicitis and localized peritonitis had been identified pathologically in 9 (47.3%) out of a total of 19 appendectomy materials. Findings of acute appendicitis had not been identified in the other ten (52.7%) materials (Table I). None of the patients had developed any significant morbidity or mortality. All patients had been postoperatively started on anti-parasite treatment and discharged from the hospital between their 1<sup>st</sup> and 3<sup>rd</sup> postoperative days.

## Discussion

Acute appendicitis is the most frequently observed disease requiring emergency surgery, and it affects nearly 7% of the population. It is observed more frequently in developed countries than in developing countries. The main cause of acute appendicitis is the obstruction of the appendix lumen. The underlying cause for its greater frequency in developed countries can hence be explained by hard stools, intracolonic pressure and fecalith formation, which are caused by diet. The obstruction of the appendix causes an increase in intraluminal pressure, leading to mucosal ischaemia. In conjunction with vascular congestion, the appendix mucosa becomes hypoxic and ulcers begin to form. This

**Table I.** Demographic parameters and histological findings of the patients

No. of case	Gender	Age	Species of parasite	Acute inflammation	Negative laparotomy
1	Female	29	<i>Enterobius vermicularis</i>	No	Yes
2	Female	40	<i>Enterobius vermicularis</i>	No	Yes
3	Female	18	<i>Enterobius vermicularis</i>	No	Yes
4	Female	33	<i>Enterobius vermicularis</i>	Yes	No
5	Female	25	<i>Enterobius vermicularis</i>	Yes	No
6	Female	19	<i>Enterobius vermicularis</i>	No	Yes
7	Male	33	<i>Enterobius vermicularis</i>	No	Yes
8	Male	17	<i>Enterobius vermicularis</i>	No	Yes
9	Female	29	<i>Enterobius vermicularis</i>	Yes	No
10	Male	30	<i>Enterobius vermicularis</i>	No	Yes
11	Female	33	<i>Enterobius vermicularis</i>	Yes	No
12	Female	24	<i>Enterobius</i>	No	Yes
13	Female	32	<i>Taenia saginata</i>	No	Yes
14	Female	27	<i>Taenia saginata</i>	Yes	No
15	Male	83	<i>Taenia saginata</i>	Yes	No
16	Female	23	<i>Enterobius vermicularis</i>	Yes	No
17	Male	27	<i>Enterobius vermicularis</i>	Yes	No
18	Male	19	<i>Enterobius vermicularis</i>	No	Yes
19	Female	41	<i>Enterobius vermicularis</i>	Yes	No

in turn leads to the invasion of the appendix wall by intraluminal bacteria [3, 4].

Parasitosis is a significant health problem in endemic countries. Although parasitic diseases are mainly observed in tropical countries, they have also started to become a significant health problem in developing countries due to increasing migration and travel [5].

*Enterobius vermicularis*, *Ascaris lumbricoides*, *Schistosoma* spp. and *Taenia* spp. are among the parasites that lead to a clinical picture of acute appendicitis. The gastrointestinal infections associated with *E. vermicularis* are the most frequently encountered helminthic infections worldwide [1, 6]. Although it can be observed in all ages and across all socioeconomic levels, it is seen more frequently among children and the young. The infections are generally asymptomatic in children, and the most commonly observed symptom is itching around the anus. Moreover, *E. vermicularis* infections may cause ileocolitis, enterocutaneous fistulas, urinary tract infections, mesenteric abscesses, salpingitis and appendicitis. The mature form of *E. vermicularis* is most frequently observed in the proximal section of the ascending colon, the cecum, the appendix and the terminal ileum [7, 8]. The relationship between *E. vermicularis* and acute appendicitis was first discovered towards the end of the 19<sup>th</sup> century [9, 10]. It has been observed that *E. vermicularis* can cause pathological changes to the appendix, ranging from lymphoid hyperplasia to acute phlegmonous appendicitis, gangrenous appendicitis and peritonitis [1]. Appendectomy is not sufficient in itself for treatment since it is not able to resolve the main cause of the disease. To obtain the best treatment results, antihelminthic treatment should be provided following surgery [11].

Teniasis, on the other hand, is a well-known tapeworm infection characterized by the presence of *Taenia saginata* or *Taenia solium* in the human intestines. Infection generally occurs as a result of consuming raw or undercooked meat [12]. Teniasis may sporadically lead to a clinical picture of acute or subacute appendicitis or cholangitis. A clinical picture of acute appendicitis occurring in association with *Taenia* is a very uncommon condition [13]. In the event that *Taenia* is the cause of acute appendicitis, albendazole treatment is provided to the patient following surgery [12].

The identification of intraluminal parasites in appendix material is usually an accidental finding. Such findings are generally observed concomitantly with an appendix that does not display any signs of inflammation. However, the parasitic invasion of the appendix may lead to the clinical symptoms of acute appendicitis, causing colic-like repetitive pain in the right lower quadrant. As a parasitic infection is actually present within the intestinal system, the clinical and laboratory findings will be suggestive of an infection. However, acute appendicitis will not be histologically present [5]. In our study, acute appendicitis and localized peritonitis were observed in 9 (47.3%) out of a total of 19 materials. The remaining ten (52.7%) materials did not demonstrate any findings of acute appendicitis, and the laparotomies that had been performed were hence considered as negative laparotomies.

In a study presented by Engin *et al.* in Turkey, parasites were observed in 9/1969 (0.45%) appendectomy materials [3]. In a study presented by Karatepe *et al.* in Turkey, parasites were observed in 24/5100 (0.5%) appendectomy materials, and the rate of no inflammation with appendix specimen was determined as 6/24 (25%) [4]. Similarly, Aydın 6/190 (3.15%) and 4/6 (66.6%) [5], Da Silva *et al.* 24/1600 (1.5%) and 12/24 (50%) [1], Sah and Bhadani 9/624 (1.62%) and 6/9 (66.6%) [14], Gialamas *et al.* 7/1085 (0.64%) and 6/7 (85.7%) [7], and Ramezani and Dehghani 144/5048 (2.9%) and 68/144 (47.2%) [15] reported the rates, respectively (Table II).

The identification of parasites in 19/3863 (0.49%) of the appendix materials of cases operated with a clinically acute appendicitis in our study was consistent with the literature.

As can be seen in the literature and in our study, the rate of absence of acute inflammation in patients operated with a clinically acute appendicitis and having parasites in their appendix lumen is very high. This is indicative of the high rate of negative laparotomy that has been performed on these patients.

**Table II.** Data obtained from countries included in this study

Author	Country	Total materials, n	Materials with parasites		
			Total, n (%)	Acute inflammation, n %	No acute inflammation, n (%)
Ramezani <i>et al.</i>	Iran	5048	144 (2.9)	76 (52.8)	68 (47.2)
Karatepe <i>et al.</i>	Turkey	5100	24 (0.5)	18 (75)	6 (25)
Aydın <i>et al.</i>	Turkey	190	6 (3.15)	2 (33.3)	4 (66.7)
De Silva <i>et al.</i>	Brazil	1600	24 (1.5)	12 (50)	12 (50)
Sah <i>et al.</i>	Nepal	624	9 (1.62)	3 (33.3)	6 (66.7)
Gialamas <i>et al.</i>	Greece	1085	7 (0.64)	1 (14.3)	6 (85.7)
Current study	Turkey	3863	19 (0.49)	9 (47.4)	10 (52.6)

In conclusion, *E. vermicularis* is the most frequently found parasite in the appendix lumen of patients operated with a clinically acute appendicitis. In cases where parasites are present in the appendix lumen, the rate of negative laparotomy becomes higher. In order to avoid the surgical side effects associated with negative laparotomy, patients applying for complaints of abdominal pain should be examined also for intestinal parasites. Patients whose medical history as well as clinical and laboratory findings are positive should be considered and evaluated more carefully. In addition to this, patients with acute appendicitis caused by parasites should receive anti-parasitic treatment following surgery.

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