

Enterobius vermicularis: The great pretender. Misdiagnosis of acute appendicitis leads to increased morbidity

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Summary

The role of *Enterobius vermicularis* in the pathogenesis of acute appendicitis remains controversial, as it may be associated with appendiceal colic in the absence of actual histological inflammation. A retrospective study was conducted in two hospitals in Spain between June 2016 and January 2021, including six patients with histologically confirmed *E. vermicularis* infection. 1 two males and four females with a median age of 20 years. All patients presented with right iliac fossa pain and underwent laparoscopic appendectomy. In all cases, the appendix appeared hyperemic without macroscopic signs of acute inflammation, and histological examination confirmed the absence of acute appendicitis. All patients received postoperative mebendazole. No postoperative complications occurred.

Enterobius vermicularis may mimic acute appendicitis by causing appendiceal colic, but it is rarely associated with true inflammatory appendicitis. Appendectomy should therefore be performed with caution when the appendix appears non-inflamed, given the possibility of *E. vermicularis* infection and the associated risk of intra-abdominal contamination.

Key words: Appendiceal oxyuriasis, appendicitis, *Enterobius vermicularis*



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Introduction

Acute appendicitis (AA) is the leading surgical emergency worldwide. The lifetime risk of undergoing appendectomy is approximately 12% for men and 25% for women. In developed countries, the etiology rarely involves parasitic or protozoal infections. *Enterobius vermicularis* (pinworm) infestation can present with symptoms resembling acute appendicitis, such as right iliac fossa pain and appendiceal colic, even in the absence of acute inflammatory changes in blood tests. It is therefore considered a possible cause of false appendicitis. This parasitic infestation is often an unexpected finding in postoperative appendectomy specimens, and the vast majority of cases occur in pediatric patients. The reported prevalence of the infestation varies worldwide, ranging from 0.2% to 41.8% (Arca et al. 2004). Though commonly regarded as a benign condition due to its low pathogenicity, its incidence is increasing, and it may lead to higher morbidity, such as colitis, perianal abscesses or granulomas,

ectopic infections, chronic pelvic pain, and pelvic inflammatory disease, as well as increased mortality in cases of appendectomy performed for suspected AA.

The diagnosis of AA is usually based on clinical suspicion, physical examination findings, and abnormal blood test results. Additional diagnostic investigations are generally not required. Consequently, in most reported cases, the parasite is only detected after surgery. Helminthic infestations in humans have been studied for more than 10,000 years and are estimated to affect up to 209 million people worldwide (Panidis et al. 2011). Fabricius was the first to recognize and report the presence of this parasite in the appendix in 1634. (Fry and Moore 1969). Infestation is acquired through ingesting embryonated eggs. In the intestine, larvae released from the eggs migrate to the colon and attach to the mucosa. Adult *E. vermicularis* worms live and reproduce primarily in the proximal ascending colon, cecum, appendix, and terminal ileum. After copulation, the male worm expires shortly thereafter, while the fertilized female worm travels to the anus and perianal region, to deposit her egg (Sah and Bhadani 2006). Further hand contamination may lead to autoinfection and perpetuate the parasite's life cycle.

Material and methods

A retrospective analysis was performed in two hospitals in Spain—a General Tertiary Referral Hospital and a District Hospital—over a 4-year and 7-month period, from June 2016 to January 2021. We reviewed records of surgical procedures, medical treatments, and pathology reports and identified 6 patients with histologically confirmed *E. vermicularis*. The patients and their clinical and histologic findings are shown in Table 1.

Table 1. Patients. Clinical and histologic findings.

Patient	Age	Gender	Leukocytosis	Plasmatic eosinophilia	US results	Acute inflammation	Parasite spilling
1	12	M	Present	Present	Appendicitis	No	No-
2	14	F	Absent	Present	Negative	No	Present
3	48	F	Absent	Absent	Negative	No	No
4	22	F	Absent	Present	Appendicitis	No	No
5	32	M	Absent	Absent	Negative	No	No
6	18	F	Present	Absent	Negative	No	No

All patients underwent laparoscopic appendectomy under general anaesthesia. A standard three-port technique was applied. The mesoappendix was dissected and divided using electrocautery with various laparoscopic instruments, including a monopolar hook, curved dissectors, or blunt-tip dissectors. Once the appendiceal base was dissected and clearly identified, we applied two Endoloops. The appendix was divided between the loops, and the specimen was extracted using a retrieval bag (Endo Catch®, Endobag®) through an 11-mm working trocar.

The cohort included two males and four females, with a median age of 20 years. Most patients reported a history of central abdominal pain migrating to the right iliac fossa. The Alvarado score is not routinely used in the diagnostic work-up of patients in either institution. Ultrasonography favored a diagnosis of acute appendicitis in three of the six cases. In one case, pinworms were released into the abdominal cavity during surgery and were promptly fulgurated using a hook and bipolar diathermy dissector (Fig. 1).



Figure 1. Operative specimen: presence of parasites in the lumen of the appendix compatible with *E. vermicularis*.

In all six cases, the appendix appeared hyperemic without signs of acute inflammation. Subsequent histological examination showed no evidence of acute appendicitis, but inflammatory changes were described (Figs 2, 3).

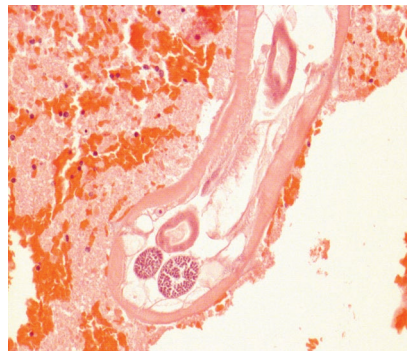


Figure 2. Histologic specimen. Oblique cut of *Enterobius vermicularis* located in the ileocecal appendiceal light. Appendicular wall with presence of helminths and reactive lymphoid hyperplasia (Hematoxylin-eosin 20×).

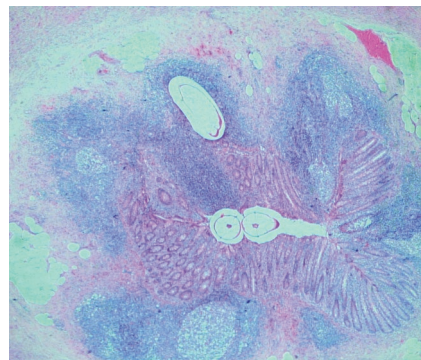


Figure 3. Hematoxylin-eosin ×10 appendicular wall with presence of helminths and reactive lymphoid hyperplasia.

In one patient, a 14-year-old female with three hospital admissions over 15 days for right lower abdominal pain, physical examination during the last hospitalization revealed a good general condition, right lower quadrant tenderness with rebound, localized muscular guarding, and fever of up to 38 °C. Right lower quadrant tenderness and rigidity were noted on abdominal examination during each admission. Laboratory tests were within the normal range. However, during

the third hospitalization, the white blood cell (WBC) count increased to 12×10^9 cells/L, while C-reactive protein levels remained normal (< 1). Ultrasonography performed during the first admission and a computed tomography (CT) scan during the second admission revealed a normal appendix with no signs of appendicitis (Fig. 4). Due to persistent right iliac fossa pain, tenderness, rigidity, fever, and leucocytosis, the decision for surgery was made (Stoyanov et al. 2016).



Figure 4. CT scan.

All patients were treated with 100 mg of oral mebendazole, with a repeat dose 2–3 weeks later. Close family contacts were advised to take the Graham test and/or prophylactic treatment. In all cases, the infestation of kids and family (positive Graham test) was demonstrated, and they were successfully treated. Symptoms resolved completely after anti-helminthic treatment, and no adverse events were recorded during the one-year follow-up.

Ethical responsibility

All authors have confirmed their responsibility to maintain confidentiality and respect patients' rights in the authorship responsibility document, publication agreement, and copyright assignment submitted to the Journal of Biomedical and Clinical Research. Informed consent for publication of medical information was obtained from the patients in accordance with the journal's patient consent policy.

Discussion

Although the relationship between *E. vermicularis* and the pathogenesis of appendicitis has been extensively investigated, the parasite's influence on the various forms of inflammation remains unclear. It is more frequently found in females, with a peak incidence in 12-year-old girls (Dahlstrom and Macarthur 1993). Despite the predominance in pediatric patients, cases of appendiceal pinworm infestation in elderly patients have also been described in the literature, sometimes presenting with unusual locations and complications, such as distal ileal necrosis (Rizwan et al. 2021; Domingues and Mineiro 2025). Many authors have inferred that the presence of helminths in the appendix is not directly responsible for the development of acute appendiceal pathology, although there is general agreement that pinworms may induce tissue inflammation. The presence of pinworms has been reported in appendices without pathological changes, as well as in those exhibiting various forms of inflammation. However, intraluminal parasites identified in resected appendiceal specimens

are generally considered incidental findings. Although surgical treatment is indicated in the presence of appendiceal pain, there is a potential risk of releasing pinworms into the peritoneal cavity during appendectomy.

The terms appendiceal syndrome or appendiceal colic describe right lower quadrant and pelvic pain and may be explained by the hypothesis of luminal obstruction. Conversely, obstruction secondary to lymphoid tissue proliferation may represent the initiating event of the inflammatory process. An accurate diagnosis can be achieved through a comprehensive assessment of the patient's medical history: physical assessment, blood tests, and imaging studies. In cases of clinical ambiguity, patients may benefit from an overnight perianal cellophane tape test.

According to Aschoff, parasites were identified in less than 1% of appendectomy specimens, suggesting that such infections may cause clinical manifestations of appendiceal colic rather than true inflammatory appendicitis (Aschoff 1913). Nevertheless, Sterba and Vlcek demonstrated that the number of granulomas in infested appendices far exceeded that observed in a control group. In a retrospective analysis of histological examinations of biopsy material, 21,916 appendices collected between 1965 and 1974, parasites were found exclusively within the lumen, without evidence of an associated acute appendiceal tissue reaction. However, further histological investigation revealed a highly statistically significant difference, with a 16-fold higher incidence of granulomas and eosinophilic infiltration in the infested group (Sterba and Vlcek 1984). Goldburt found a high proportion of granulomas in these parasitic infestations, thus obtaining results in accordance with the above-presented studies. Özen and Celep reported that lymphoid hyperplasia was the most common histopathological finding in patients who underwent appendectomy for pinworm infestation (Özen and Celep 2023). In our patient cohort, lymphoid hyperplasia of the appendiceal wall was observed in 5 of 6 patients.

Mogensen et al. described inflammatory reactions caused by invasion or active penetration of the appendiceal wall, leading to lymphoid hyperplasia and phlegmonous inflammation (Mogensen et al. 1985). Pathologists have demonstrated the expression of tumor necrosis factor alpha and interleukin-2 (IL-2) messenger RNA in the germinal centers, submucosa, and lamina propria of a subset of histologically classified normal appendices (Wax and Cooper 1941). The intestinal mucosa is a first protective barrier against luminal microbial and chemical insults (Brandtzaeg et al. 1989; Jawabreh et al. 2024; Tata et al. 2024). Because appendectomy results in symptom relief in most patients, an underlying pathological process is likely present. Therefore, appendectomy may be justified, provided that meticulous precautions are taken to prevent helminthic spillage into the abdominal cavity. Both inflammatory and neuroimmunological mechanisms have been proposed as contributors to the symptomatology in this patient population (Kamali et al. 2022).

A retrospective study by Gialamas et al. reviewing 1,085 appendectomies performed in Greece identified 8 patients with pinworm infestation. *Enterobius vermicularis* infestation was identified in 7 patients without appendicitis, whereas only one patient demonstrated concomitant signs of acute appendicitis (Gialamas et al. 2012). In a study conducted by Pogorelić et al. that included 6,359 pediatric appendectomies, only 61 patients (0.96%) were diagnosed with *Enterobius vermicularis* on histological examination. Acute appendicitis was observed in 34% of appendiceal specimens with pinworm infestation. The median age of the patients was 11 years, with females predominating (60.7%) (Pogorelić et al. 2024).

In the infrequent cases in which *E. vermicularis* is associated with acute appendicitis, the pinworm may have initiated the inflammatory process, most likely through luminal obstruction and/or reduced blood supply, leading to ischemic mucosal damage (Sousa et al. 2022). In our series, one patient presented with appendiceal luminal obstruction caused by an appendicolith. No signs of acute appendiceal inflammation were recorded.

During the laparoscopic procedure and in the presence of a macroscopically normal appendix, there is agreement in the literature that the appendix should be removed, provided no other pathology is found. As for the surgical technique, the standard method with 2–3 endoloops is secure enough. However, other authors have advocated an endostapling technique, as it minimizes exposure of the appendiceal mucosa and reduces the risk of parasitic spillage (Saxena et al. 2001). The use of a specimen retrieval bag is strongly recommended. Thermal desiccation or suction may be used to remove the worms safely.

Appendectomy should proceed with caution if the appendix is observed uninfamed and there is a possibility of pinworm infection and risk of abdominal contamination. A.V. Ariyathenam et al. recommend that a bag be placed inside the abdomen near the specimen, prior to cutting the appendix, to ensure an easy transfer of the specimen into the bag (Ariyathenam et al. 2010). Either GIA or two PDS endoloops are recommended for the de-appendiceal section to prevent contamination. In our group of patients, two PDS or Vicryl endoloops were routinely used. In only one patient, a single endoloop was applied, resulting in pinworm spillage. Therefore, we strongly recommend using two endoloops or a GIA stapler cartridge when appendiceal pinworm infestation is suspected.

Following surgery, *pinworm* infection is treated with mebendazole or pyrantel pamoate, with albendazole used as a second-line option (Akbulut et al. 2011; Chai et al. 2021). In our study, all patients received 100 mg of oral mebendazole, with the dose repeated after 2–3 weeks. Close family contacts were advised to undergo the Graham test and/or receive prophylactic treatment.

The present study strongly supports previously published data, demonstrating the increasing importance of appendiceal parasitic infestation even in developed countries, particularly among pediatric populations, likely related to hand-to-mouth contamination.

Conclusions

1. Although acute appendicitis remains the most frequent emergent surgical pathology, it continues to present a diagnostic challenge. It is recognized that a considerable number of removed appendices demonstrate no histological evidence of acute inflammation.
2. Parasites may be associated with the development of classic appendicitis. Our results indicate that *E. vermicularis* within the appendix may produce appendiceal colic. However, it is rarely associated with pathological changes of acute appendicitis.
3. Although appendectomy may be clinically justified in these cases, the appendix often appears histologically normal. Nevertheless, it is of utmost importance to maintain a high index of suspicion and obtain a detailed symptom history. Patients must be carefully monitored and reassessed before a decision for urgent surgical intervention.

4. Appendectomy should be performed with caution when the appendix appears non-inflamed, given the possibility of *E. vermicularis* infection and the associated risk of intra-abdominal soiling.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statements

The authors declared that no clinical trials were used in the present study.

The authors declared that no experiments on humans or human tissues were performed for the present study.

Informed consent from the humans, donors or donors' representatives: Consorcio Hospital General Universitario de Valencia. Valencia. Spain. Hospital General de Villarobledo. Provincia de Albacete. Spain

The authors declared that no experiments on animals were performed for the present study.

The authors declared that no commercially available immortalised human and animal cell lines were used in the present study.

Use of AI

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Author contributions

C.N.M.: Original draft preparation, Conceptualization, Investigation Writing, Data Curation, Visualisation, Supervision. A.M.A.: Original draft preparation. Conceptualization, Data Curation, Visualisation, Investigation Writing, T.I.S.: Conceptualization, Data Curation, Visualisation, Investigation Writing, Reviewing, and Editing. All authors have read and agreed to the published version of the manuscript.

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Data availability

All of the data that support the findings of this study are available in the main text.

References

- Akbulut S, Tas M, Sogutcu N, Arikanoglu Z, Basbug M, Ulku A, Semur H, Yagmur Y (2011) Unusual histopathological findings in appendectomy specimens: A retrospective analysis and literature review. *World Journal of Gastroenterology* 17: 1961–1970. <https://doi.org/10.3748/wjg.v17.i15.1961>

- Arca MJ, Gates RL, Groner JI, Hammond S, Caniano DA (2004) Clinical manifestations of appendiceal pinworms in children: An institutional experience and a review of the literature. *Pediatric Surgery International* 20: 372–375. <https://doi.org/10.1007/s00383-004-1151-5>
- Ariyathenam AV, Nachimuthu S, Tang TY, Courtney ED, Harris SA, Harris AM (2010) *Enterobius vermicularis* infestation of the appendix and management at the time of laparoscopic appendectomy: Case series and literature review. *International Journal of Surgery* 8: 466–469. <https://doi.org/10.1016/j.ijssu.2010.06.007>
- Aschoff L (1913) Appendicopathia oxyurica (pseudoappendicitis ex oxyure). *Medizinische Klinik* 91: 249–251.
- Brandtzaeg P, Halstensen TS, Kett K, Krajči P, Kvale D, Rognum TO, Scott H, Sollid LM (1989) Immunobiology and immunopathology of human gut mucosa: Humoral immunity and intraepithelial lymphocytes. *Gastroenterology* 97: 1562–1584. [https://doi.org/10.1016/0016-5085\(89\)90406-X](https://doi.org/10.1016/0016-5085(89)90406-X)
- Chai JY, Jung BK, Hong SJ (2021) Albendazole and mebendazole as anti-parasitic and anti-cancer agents: An update. *Korean Journal of Parasitology* 59: 189–225. <https://doi.org/10.3347/kjp.2021.59.3.189>
- Dahlstrom J, Macarthur E (1993) *Enterobius vermicularis*: a possible cause of symptoms resembling appendicitis. *Pathology* 25: 5. [https://doi.org/10.1016/S0031-3025\(16\)35730-0](https://doi.org/10.1016/S0031-3025(16)35730-0)
- Domingues JC, Mineiro JF (2025) Acute appendicitis related to *Enterobius vermicularis* infestation in a geriatric patient: a case report and literature review. *International Surgery Journal* 12: 2178–2181. <https://doi.org/10.18203/2349-2902.isj20253849>
- Fry GF, Moore JG (1969) *Enterobius vermicularis*: 10,000-Year-old human infection. *Science* 166: 1620. <https://doi.org/10.1126/science.166.3913.1620>
- Gialamas E, Papavramidis T, Michalopoulos N, Karayannopoulou G, Cheva A, Vasilaki O, Kesisoglou I, Papavramidis S (2012) *Enterobius vermicularis*: a rare cause of appendicitis. *Türkiye parazitolojii dergisi* 36: 37–40. <https://doi.org/10.5152/tpd.2012.09>
- Jawabreh I, Amro A, Azmi K, Batran H, Abdeen Z, Hamarsheh O (2024) *Enterobius vermicularis* (pinworm) infestation mimicking acute appendicitis in two children from Palestine: a case report. *Journal of Medical Case Reports* 18: 445. <https://doi.org/10.1186/s13256-024-04785-9>
- Kamali GH, Ulusoy C, Eğin S, Kamalı S, Nikolovski A (2022) Uncommon causes of acute appendicitis: Retrospective analysis of 6785 histopathological findings in a tertiary center. *Ulusal travma ve acil cerrahi dergisi* 28: 1708–1715. <https://doi.org/10.14744/tjtes.2022.84937>
- Mogensen K, Pahle E, Kowalski K (1985) *Enterobius vermicularis* and acute appendicitis. *Acta chirurgica Scandinavica* 151: 705–707. [PMID: 4096177]
- Özen FZ, Celep G (2023) Clinicopathological assessment in patients with *Enterobius vermicularis* infection. *Türkiye parazitoloji dergisi* 47: 93–99. <https://doi.org/10.4274/tpd.galenos.2023.02418>
- Panidis S, Paramythiotis D, Panagiotou D, Batsis G, Salonikidis S, Kaloutsis V, Michalopoulos A (2011) Acute appendicitis secondary to *Enterobius vermicularis* infection in a middle-aged man: A case report. *Journal of Medical Case Reports* 5: 559. <https://doi.org/10.1186/1752-1947-5-559>
- Pogorelić Z, Babić V, Bašković M, Ercegović V, Mrklić I (2024) Management and incidence of *Enterobius vermicularis* infestation in appendectomy specimens: A cross-sectional study of 6359 appendectomies. *Journal of Clinical Medicine* 13: 3198. <https://doi.org/10.3390/jcm13113198>

- Rizwan M, Raju M, George R (2021) *Enterobius vermicularis* infestation causing terminal ileal gangrene. International Surgery Journal 8: 2477. <https://doi.org/10.18203/2349-2902.isj20213150>
- Sah SP, Bhadani PP (2006) *Enterobius vermicularis* causing symptoms of appendicitis in Nepal. Tropical Doctor 36: 160–162. <https://doi.org/10.1258/004947506777978361>
- Saxena AK, Springer A, Tsokas J, Willital GH (2001) Laparoscopic appendectomy in children with *Enterobius vermicularis*. Surgical Laparoscopy, Endoscopy & Percutaneous Techniques 11: 284–286. <https://doi.org/10.1097/00129689-200108000-00012>
- Sousa J, Hawkins R, Shenoy A, Petroze R, Mustafa M, Taylor J, Larson S, Islam S (2022) *Enterobius vermicularis*-associated appendicitis: A 22-year case series and comprehensive review of the literature. Journal of Pediatric Surgery 57: 1494–1498. <https://doi.org/10.1016/j.jpedsurg.2021.09.038>
- Sterba J, Vlcek M (1984) Appendiceal enterobius - its incidence and relationships to appendicitis. Folia Parasitologica 31: 311–318. [PMID: 6510834]
- Stoyanov TI, Corral-Fernandez E, Melero-Abellan A, Sarduy-Fernandez P, Casado-Santamaria P, Garcia-Grimaldo E, Corellano JV, Ivanov KT, Kolev NH, Tonchev PT (2016) Appendiceal recurrent colic due to *Enterobius vermicularis* infection in a 14-year-old female patient. Journal of Biomedical and Clinical Research 9: 159–162. <https://doi.org/10.1515/jbcr-2016-0025>
- Tata RC, Abdelreheem M, Mercant Osuna A, Mangam S (2024) Acute appendicitis due to *Enterobius vermicularis* infestation: A case report. Cureus 16: e76535. <https://doi.org/10.7759/cureus.76535>
- Wax WV, Cooper NS (1941) *Oxyuris vermicularis* appendicitis. The incidence of oxyuris vermicularis in a series of 1,016 cases of appendicitis. The American Journal of Surgery 52: 89–91. [https://doi.org/10.1016/S0002-9610\(41\)90492-0](https://doi.org/10.1016/S0002-9610(41)90492-0)