Pinworms and Appendicitis

**Introduction**

Enterobius vermicularis (pinworm) is considered the most common helminth parasite worldwide and in the United States [4]. Patients with pinworm infestation are generally asymptomatic, but may present with pruritus ani [6]. Pinworm spread to the appendix may cause symptoms of appendicitis; however, pathology rarely reveals acute inflammation of the appendix [1,4]. We present a 12 year old male patient with appendicitis symptoms who was brought to the operating room for an appendectomy. The pathology was consistent with E. vermicularis and mild acute inflammation.

**Case Report**

A 12 year old male presents to the ER with his mother complaining of right lower quadrant abdominal pain. The pain started umbilical, approximately two hours prior while at school, then localized to the right lower quadrant, and has not improved since onset. Pain is crampy and occasionally sharp, rated as a 6/10. The patient reports one emesis but denies current anorexia, nausea, vomiting, diarrhea or constipation. The patient denies any abdominal symptoms prior to this morning. The patient has no significant medical, surgical or family history. He is taking no medications and has no known allergies. He lives at home with his mom, dad, younger sister and dog and is exposed to second hand smoke. Additional review of systems is negative.

On presentation the patient is supine in bed, he remains still but appears nontoxic, and he is in no significant distress. His heart and lung exam is normal. His abdomen is soft and bowel sounds are active in four quadrants. He is tender at McBurney’s point, has a positive Rovsing sign, but no guarding or rebound tenderness. The patient is afebrile and vitals are stable. His labs include an elevated white blood cell count at 17.3 x10^3/μL neutrophils at 13.7 x10^3/μL, monocytes at 1.6 x10^3/μL and eosinophils at 0.4 x10^3/μL. Additional labs are within normal limits. The appendix ultrasound is read as a questionably visible appendix which appears unremarkable.

Surgery was consulted for possible appendicitis due to the clinical presentation of right lower quadrant pain, McBurney’s point tenderness and positive Rovsing sign, as well as elevated white blood cell count. The patient was brought to the OR and prepared for laparoscopic appendectomy under general endotracheal anesthesia. The appendix was located without difficulty and did not appear to be significantly inflamed or perforated. When the appendix was cut, multiple mobile pinworms were noted moving around in the end of the appendix, with some falling into the intraabdominal cavity. See figure 1. The appendix was quickly removed in an Endo Catch bag and the intraabdominal cavity was carefully observed for loose pinworms. Three were found and removed. See figure 2. The rest of the procedure proceeded without complication.
The pathology report was consistent with mild acute appendicitis with numerous intraluminal Enterobius vermicularis (pinworms). The patient was admitted to the pediatric unit overnight and discharged the following day. The patient was placed on Pyrantel pamoate 500mg for 5 days, and then a single dose was repeated in 2 weeks. The family was educated that all members should be treated for pinworms and other close contacts should be informed.

**Discussion**

There may be up to 40 million people in the United States infected with *E. vermicularis*[^4]. Infection is more common in children, but is seen in all age groups and all socioeconomic classes. *E. vermicularis* is spread by fecal to oral route and is associated with close living, temperate and tropical climates, and poor hygiene [5, 6].

The life cycle of the pinworm begins as eggs are deposited on the rectum of the host. The eggs are infective within a few hours and can survive up to 20 days outside the body in climates with high humidity and moderate temperature [11]. Local irritation results in pruritus ani which allows spread via fecal to oral route. The eggs attach under fingernails and in clothing, pet fur, bed sheets, dust and other fomites. Humans are the only host of the pinworm; however, animals may act as vectors of the pinworm eggs [2,9]. Once ingested, the outer layer of the egg is digested, allowing release of the larvae into the duodenum. The larvae travel to the cecum and ascending colon, where the pinworm attaches to the lumen wall by its head and matures. The cycle takes approximately 6 weeks from ingestion to maturity [7, 11]. Retroinfection may also take place when the larvae hatch in perianal folds and migrate back into the rectum and large intestine [5, 7].

While most intraluminal infections are asymptomatic, patients may present with pruritus ani that is worse at night. In patients with a very high worm burden, abdominal pain, nausea, and vomiting may be present. Leo et al present a rare case of a patient that developed eosinophilic enterocolitis secondary to intraintestinal pinworm infection, who presented with severe abdominal pain, diarrhea, and melena [6].

Additional symptoms may develop if the pinworms migrate extraintestinally. Symptoms may develop due to direct inoculation of larvae in distant sites such as the external auditory meatus, conjunctiva, nasal mucosa, liver and lung [7, 11, 12]. In rare cases, patients may present with intraperitoneal pinworms due to retroinfection into the peritoneum via the fallopian tube or in patients with appendiceal or intestinal rupture. In patients with intraperitoneal pinworm contamination the immune system responds by producing granulomatous tissue around the pinworms. In addition to the granulation tissue, symptoms are present due to intestinal microorganisms the pinworms carry. Symptoms related to extraintestinal pinworm infection may include urinary tract infection, enterocutaneous fistula, mesenteric abscess formation, omentitis, salpingitis, fallopian tube infiltration, salpingo-oophoritis, and tubo-ovarian abscess. Granulomata of the vulva, vagina, uterus, fallopian tubes, ovaries and human embryo can also develop [8, 9, 11]. Tandan et al present a case of a 13 year old not sexually active female that presents with Pelvic inflammatory disease and granulomas on laparoscopy secondary to coagulase negative staphylococci infection carried into the peritoneal cavity by pinworm larvae [11].

It is debated whether pinworms can cause appendicitis or if they are an incidental finding. In the few cases reporting concurrent acute inflammation and intraluminal pinworm infestation it is unclear whether pinworms obstructing the lumen caused appendiceal inflammation, the pinworms induced a hypersensitivity reaction inducing appendicitis, or if the inflammation was from another cause [9]. In a retrospective study by Gialamas et al, of the 1085 appendectomies performed in a Greek hospital for clinical appendicitis, 7 were found to have *E. vermicularis* infection and only 1 case showed evidence of
concurrent appendiceal inflammation [4]. Another retrospective study by Ariyarathenam et al done in the UK, studied specifically laparoscopic appendectomies. In this study 13 of the 498 patients that underwent an appendectomy were diagnosed with E. vermicularis. Of those, 6 underwent laparoscopic appendectomies. The appendectomies were again done based on clinical appendicitis and of the 6 laparoscopic appendectomies, only 1 was noted to be inflamed. In two of the patients, peritoneal contamination with E. vermicularis was noted and the pinworms were quickly removed. All patients were treated with Mebendazole and no complications were noted at the 6wk follow up appointments [1]. The studies suggest the presence of pinworms may cause an appendicitis syndrome identical to acute appendicitis without acute inflammation [1, 4].

Causes of typical appendicitis include obstruction of the lumen by fecal material, a tumor, a bend or twist in the appendix, or enlarged lymphoid follicles within the appendiceal wall. In the event of obstruction, bacterial overgrowth can pursue resulting in inflammation, gangrene and eventually perforation [13]. A study in Venezuela by Dorfman et al reviewed parasite pathology from 830 cases of acute appendicitis. This study found in addition to pinworm, Ascaris lumbricoides (intestinal roundworm) and Trichuris trichiura (whipworm) in 62 of the cases. The study also found perforation and peritonitis less common in cases involving parasite infestation [3, 7].

A high index of suspicion of parasite involvement could reduce the rate of unnecessary appendectomies. Physical exam is generally not specific enough to differentiate appendiceal syndrome due to parasite infection from acute appendicitis. However if the time frame is not appropriate for appendicitis or there is a known recent exposure or recent diagnosis of pinworms without appropriate treatment a trial of an antihelmintic agent prior to an emergent appendectomy may reduce the need for surgery.

Understanding the role of E. vermicularis in appendicitis is important in preventing morbidity to the patient in the future. From the initial presentation to the ER it is important to ask past history questions such as pruritus ani, known exposure to pinworms or other symptoms suggestive of pinworms to alert the surgeon of possible pathology. Having a high index of suspicion of pinworm infection can allow the surgeon to make small adjustments to prevent peritoneal contamination. Ariyarathenam et al suggests in patients with an appendix not macroscopically inflamed or in patients with a high index of suspicion the surgeon should consider E vermicularis as a source of the symptoms and may consider using endostapeling which reduced the mucosal tissue exposed. The study also suggests keeping traction on the appendix to prevent pinworms from spilling into the peritoneum and having the Endo catch bag in place in preparation prior to dividing the appendix [1]. Careful preparation may help reduce morbidity such as granulomata formation due to peritoneal contamination.

Diagnosis of E. vermicularis infection will vary significantly based on the patient presentation and the extent of the infestation. It is most commonly diagnosed with the “scotch tape test” which involves pressing tape against the perianal skin early in the morning and examining under the microscope for eggs. Female adult worms may also be noted form the perianal skin. Examining the stool is limited because worms and eggs are not generally passed in the stool. However in patients with severe infection or a high worm load ovum or worms may be present in the stool [5]. Patients may also present with leukocytosis or eosinophilia [4]

The treatment of choice for Enterobius vermicularis is Mebendazole or pyrantel pamoate with Albendazole as an alternative treatment. Mebendazole is a synthetic benzimidazole which acts by inhibiting microtubule synthesis and has a low incidence of adverse effects. For pinworms the treatment is 100mg once, then repeated 2 weeks later. The drug must be repeated because it does not kill the eggs, therefore it must be repeated to increase efficacy. Pyrantel pamoate is a tetrahydropyrimidine derivative available over the counter and is poorly absorbed making it most effective against intraluminal
organisms. It is active against mature and immature worms; however it is not active against ova. The dose for pinworm infection is 11mg/kg up to 1g given once and repeated in 2 weeks. Pyrantel pamoate should be used with caution in patients with liver dysfunction. Albendazole is a benzimidazole carbamate, absorption is increased if taken with a fatty meal and it readily distributes in tissues, enters bile, CSF, and hydatid cysts. It acts by inhibiting microtubule synthesis and has larvicidal and ovicidal effects in certain helminth infections not including pinworm. The dosage is 400mg once repeated in 2 weeks for pinworm infection [10].

Conclusion

This patient presented with a possible appendiceal syndrome as described with right lower quadrant abdominal colic pain, McBurney’s point tenderness and a positive Rovsing sign. The ultrasound also presented with a possibly normal appearing appendix and on laparoscopy the appendix did not appear macroscopically inflamed. However these symptoms cannot be differentiated from acute appendicitis and additionally the significantly elevated WBC count and the pathology demonstrating mild acute appendicitis suggests a very rare presentation of pinworm infestation with acute appendicitis. The studies suggest the pinworms may have directly caused the inflammation by causing an inflammatory reaction or obstructing the appendix, or may be an incidental finding in a child with acute appendicitis. Further studies on this rare clinical pathology are necessary to conclude the relationship between pinworms and appendicitis.
Resources