SHORT COMMUNICATION

Co-infection with *Enterobius vermicularis* and *Taenia saginata* mimicking acute appendicitis

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Verminous appendicitis; *Enterobius vermicularis*; *Taenia saginata*

**Summary** In this report, we describe an unusual case of verminous appendicitis due to *Enterobius vermicularis* and *Taenia saginata* in a 29-year-old woman from Iran. The histopathological examinations and parasitological descriptions of both worms found in the appendix lumen are discussed. The removed appendix exhibited the macroscopic and microscopic features of acute appendicitis. Antihelminthic therapy was initiated with single doses of praziquantel for the taeniasis and mebendazole for the enterobiasis, and the patient was discharged.

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**Introduction**

In tropical countries in which intestinal parasitic infections are quite common, such as Iran, verminous appendicitis remains common [1]. Several parasitic infections involving the appendix have been reported as the etiologies of appendicitis in humans. Among these infections, helminthes (verminous) infections caused by *Enterobius vermicularis*, *Taenia* sp., *Ascaris* sp., *Schistosoma* sp., and *Trichuris trichiura* are most frequently reported [2–8].

Human enterobiasis caused by *Enterobius vermicularis* (*E. vermicularis*) infection is usually

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asymptomatic. The most common symptom is pruritus in the perianal region, but infestation may also present with ileocolitis, urinary tract infection, vulvovaginitis and appendicitis [9]. The presence of pinworms in the appendix has been demonstrated to mimicking appendicitis and/or appendiceal colic [10], but there is frequently no histological evidence of acute inflammation [9,11–13]. However, E. vermicularis is the most common worm found in the appendix, particularly in children and/or adolescents. Moreover, in our previous study in the Mazandaran Province of northern Iran, verminous appendicitis was found to be more prevalent in the age group below 10 years old [14]. Additionally, the mean prevalence of E. vermicularis infection in the province has been reported to be approximately 4% [15]. Human taeniasis (due to Taenia saginata and Taenia solium) is a zoonotic tapeworm infection that is characterized by the presence of the adult form of the helminth in the human small intestine. Infection frequently occurs in individuals who eat poorly cooked and or unfrozen beef or pork containing the cysticerci.

Case report

In July 2012, a 29-year-old woman from the Mazandaran Province (53°6′E, 36°23′N), which is south of the Caspian Sea in northern Iran and has subtropical climate conditions, was referred to our emergency department due to acute abdominal pain in her right lower quadrant (RLQ) with a one-day history of colic pain, anorexia, vomiting and nausea. A physical examination revealed right iliac fossa tenderness and a mild fever. A laboratory examination revealed an elevated white blood cell (WBC) count of 10,600/μL with marked neutrophilia (67% neutrophils). No marked eosinophilia was observed (2% eosinophils). The removed appendix exhibited the macroscopic and microscopic features of acute appendicitis. Microscopic slides revealed mucosal ulceration and luminal exudates accompanied by an elongated and flattened segment of the helminth. A large number of round eggs with remarkable embryophores (an appearance of thick radial striations) were within the parasite uteri (known as gravid proglottids) and also freely floating in the lumina (Fig. 1). These characteristics confirmed that the helminth belonged to the genus Taenia sp. However, the eggs of both Taenia spp. are morphologically identical, but based on the history of the patient, which included no consumption of pork, the species was putatively identified as T. saginata. The patient was from the Mazandaran Province in which taeniasis caused by T. saginata is endemic, and the prevalence of the taeniasis in this province is estimated to be approximately 1–2% [16]. In contrast, because Iran is a Muslim country, no pork is eaten; accordingly, all human taeniasis occurs following the consumption of undercooked beef. Human infections with T. saginata have been observed in various regions of the country, particularly the Mazandaran Province in northern Iran where our patient lived.

Moreover, many transverse cross-section of E. vermicularis pinworms displaying the characteristic cuticular ridge (known as an alae) on both sides were identified (Fig. 2). Antihelmintic therapy was initiated with single doses of praziquantel for the taeniasis and mebendazole for the enterobiasis, and the patient was discharged.

Discussion

There is only one report of taeniasis/enterobiasis co-infection, which occurred in a 12-year-old boy

Figure 1  (A) Cross-section of Taenia saginata in the appendiceal lumen showing proglottid segment containing the numerous eggs; the mucosa shows an acute inflammation. (B) Note the characteristic embryophore (radial striaion) of Taenia eggs inside the proglottid. Hematoxylin and eosin stain (100× and 400× magnification for A and B, respectively).
from Iran [17]. To the best of our knowledge, this is the second report of the co-existence of taeniasis and enterobiasis from Iran. Therefore, it seems that this unusual condition is extremely rare. Tapeworm infections due to *T. saginata* are prevalent worldwide, and *T. solium* is more frequent in non-Muslim countries. Because pork is believed to be a non-Halal meat in Islam, Muslims do not eat pork. Generally, eating undercooked pork is the primary risk factor for acquiring taeniasis due to *T. solium*. The main clinical symptoms of this infection are abdominal pain that occasionally occurs with mild eosinophilia and fever. The occurrence of the co-existence of enterobiasis and taeniasis in the appendix is extremely unusual. However, recently in Turkey, Çalli et al. [4] presented a case of appendicitis in which *E. vermicularis* was only the worm detected in the appendectomy material, but *T. saginata* eggs were detected, and the adult worm was detected in the stool of the patient. However, the association of taeniasis and acute appendicitis is uncommon.

In conclusion, the association between parasitic infections of the appendix and acute appendicitis has been widely investigated. However, the role of the helminthes in appendicitis remains controversial. In general, helminthes in appendicitis remains controversial. We believe that in our patient, a luminal obstruction of the appendix due to adult *Taenia* worms may have caused the acute appendicitis. Radiological and laboratory findings do not help in the diagnosis of acute appendicitis. In histopathological examinations of the appendix, the finding of acute inflammation of the appendix may not be defined. For patients with normal pathological examinations, screening for parasites should be performed, and anti-parasitic treatment should be initiated after appendectomy.

Conflicts of interest

The authors declare that they have no conflicts of interest.

References