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SUMMARY

Hookworm infection and peptic ulcer disease are common in subtropical and tropical countries. While hookworm infection is endemic where sanitary conditions are poor, peptic ulcer disease is associated with a high prevalence of *Helicobacter pylori* infection. Dyspepsia and epigastric pain are common presenting symptoms of patients with either hookworm infection or peptic ulcer disease. Consequently it is common practice at our healthcare facility to examine stool for ova or parasites before considering empirical gastric acid suppressive therapy or *Helicobacter pylori* eradication therapy. We describe a patient who presented with dyspepsia and epigastric pain whose stool examination showed no ova or parasites. The patient's symptoms did not improve with proton pump inhibitor therapy. Endoscopy revealed hookworms in the first part of the duodenum. We review published reports of hookworms at this location. In hookworm endemic areas, when empirical treatment for dyspepsia and upper abdominal pain with acid suppressive agents does not offer remedy, antihelminthic agents should be considered even when stool for ova or parasites is negative.

INTRODUCTION

The diagnosis of hookworm infection by oesophagoduodenoscopy (EGD) has rarely been reported and we are aware of no reports where hookworms have been visualised by EGD in the first part of the duodenum. Hookworm infection is common in Tanzania (1-3) and epigastric pain is a common presenting symptom to gastroenterology services in sub-Saharan Africa. Increasingly, patients with epigastric pain in Tanzania are treated empirically for peptic ulcer disease with drugs that increase gastric pH. If the patient does not improve clinically and has access to one of the few centres

that offers endoscopy services, they may receive EGD to investigate their symptoms further. In this article, we report the case of a patient with epigastric pain who was subsequently diagnosed with laboratory-confirmed hookworm infection ascertained at EGD. Symptoms resolved after treatment with mebendazole. We review the literature on hookworm diagnosis by EGD, discuss the association of hookworm infection with the syndrome of epigastric pain in the tropics, and suggest that deworming should be a consideration for patients with epigastric pain unresponsive to acid suppression therapy and living in endemic areas for hookworm infection.

CASE REPORT

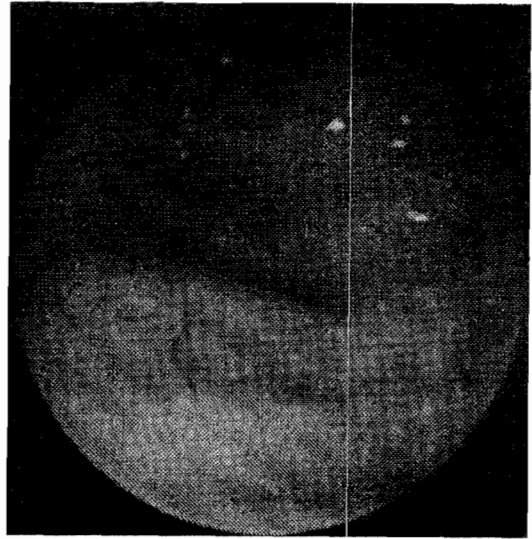
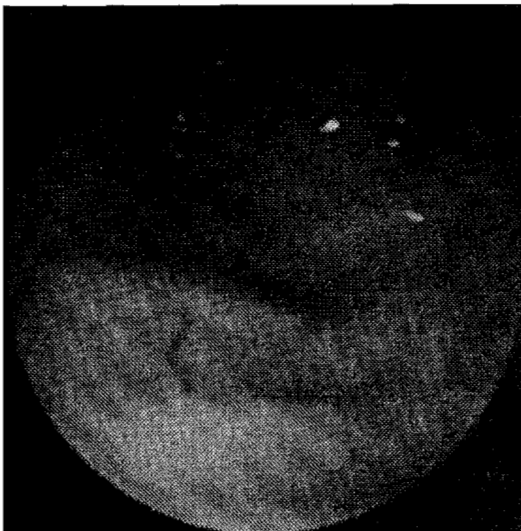
A 72-year-old male patient was referred for investigation of intermittent epigastric pain of two years duration, worsening over the previous one month. He had been treated for suspected peptic ulcer disease with magnesium trisilicate, cimetidine, and later with omeprazole without improvement. During periods of exacerbation, the pain was constant, radiating to the back and was associated with insomnia. There was no clear relationship between the pain and meals. The patient experienced one episode of vomiting two days before the investigation. The vomitus consisted of food with no visible blood.

Physical examination was normal except for mild epigastric tenderness. No epigastric mass was palpable. Microscopic stool analysis for ova and parasites was negative, erythrocyte sedimentation rate was 50mm/hr and haemoglobin concentration was 126g/L (normal reference range: 100-140 g/l) with normal red blood cell indices. The total white blood cell count and differential counts were normal. There was no eosinophilia.

EGD revealed inflammation of the gastric antrum. Several nematodes of approximately one centimetre in length were visible in the first part of the duodenum (Figure 1). Nematodes were aspirated and were transported to the clinical microbiology laboratory in normal saline for identification.

Figure 1

Adult hook worm in the duodenal bulb during oesophagogastroduodenoscopy



Morphologic examination of the nematodes confirmed them to be adult hookworms. The patient was treated with oral mebendazole 100mg twice daily for three days. At a follow-up visit three weeks later, he reported complete resolution of epigastric pain.

DISCUSSION

To identify previous reports of hookworms in the upper duodenum at EGD we electronically searched the multilingual scientific literature published between 1966 and 2005 using the Medline Database. We found five case reports (Table 1). The ages of the patients ranged from young adults to middle age. The absence of reports of this presentation of hookworm infection in children may reflect that endoscopic examinations of the alimentary canal are less common in children compared to adults. Also that in the least developed and most hookworm-endemic countries, paediatric endoscopes are rarely available. Patients in this series originated from both least and highly developed countries. This is likely to reflect the greater frequency of EGD examinations in developed countries, versus the higher prevalence of hookworm infection in developing countries (4). The use of acid suppressive therapy was reported in only one other case prior to final endoscopic diagnosis. As with our patient, in three (60%) of the five reported patients stool examination was not helpful to elucidate the cause of the symptoms. Four (80%) patients presented with epigastric pain as the main symptom. In all but this report, worms were noted to be distal to the first part of the duodenum. The majority of the patients were treated with mebendazole and symptoms resolved.

Table 1

Summary of reports of hookworm diagnoses by oesophagogastroduodenoscopy

Presentation	Clinical findings	Prior therapy	EGD localisation	Stool findings	Treatment	Outcome
72-year-old male Tanzania (this report)	Epigastric pain, vomiting	Magnesium trisilicate Cimetidine Proton-pump inhibitor	1 st part duodenum	No ova or larvae found	Mebendazole	Symptom resolution (this report)
52-year-old female, Bangladesh	Epigastric pain	Proton-pump inhibitor	2 nd part of duodenum	Not described	Mebendazole	Symptom resolution ⁵
31-year-old male Japan	Epigastric discomfort, fatigue, anaemia	Not described	2 nd portion of duodenum	Ova	Duodenal flushing with Damaso de Rivas-Kihara modified method and pyrantel pamoate	Not described ¹⁴
29-year-old woman, Zaire	Epigastric pain, post-prandial vomiting	Not described	Antrum of stomach	Larvae	Mebendazole	Not described ¹⁵
48-year-old woman, India	Dyspepsia, severe anaemia, melena	Not described	2 nd and 3 rd parts of duodenum	Not described	Mebendazole	Symptom resolution ¹⁶
51-year-old male United States	Fatigue and anaemia	Not described	2 nd part of duodenum	None found	Mebendazole	Anaemia improved ⁴

Visualisation of hookworms in the duodenum has rarely been reported and, to our knowledge, this is the first report of localisation of adult hookworms in the first part of the duodenum (the duodenal bulb) during EGD examination.

Hookworm is an endemic infection in many tropical and subtropical countries (3). It is possible that hookworm infection of the upper part of the duodenum is more common than we appreciate, but that it is rarely reported is because of the limited endoscopy services currently available in many hookworm-endemic regions. Of case reports in the literature, four (67%) of six are from countries that are hookworm endemic but for which endoscopy services are likely to be limited.

Infection with hookworm is well known to be associated with iron-deficiency anaemia, hypoproteinaemia, and sometimes a malabsorption syndrome. Symptoms may include exertional dyspnea, fatigue, and poor concentration due to progressive iron deficiency anaemia. Gastrointestinal symptoms, such as abdominal pain,

nausea, and anorexia are thought to occur primarily when human hookworms attach and invade intestinal mucosa; more pronounced gastrointestinal symptoms may be seen with infection by the dog hookworm *Ancylostoma caninum*, a cause of eosinophilic enteritis. Dyspepsia and epigastric pain, which may be relieved by food, occur in hookworm infection and is often mistaken for peptic ulcer disease (5-8). Therefore in regions where hookworm is endemic, dyspepsia is also a common complaint. While hookworm infection is associated with poor sanitation and inadequate preventive efforts, peptic ulcer disease is associated with the high prevalence of *Helicobacter pylori* infection in developing countries (7-11). The increasing use of non-steroidal anti-inflammatory drugs in developing countries may also play a role. Because hookworm infection is known to be a cause epigastric pain in endemic patients (3,6,7,12), regions presenting with epigastric pain and dyspepsia may erroneously be treated for peptic ulcer disease. Clinicians in hookworm endemic areas should screen patients presenting

with epigastric pain for stool ova and parasites before proceeding to endoscopy. Where an endoscopy service is not available to evaluate patients with persisting dyspeptic symptoms and epigastric pain despite the use of acid suppressive therapy, empirical single-dose anthelmintic agents should be considered even when stool is negative for ova or parasites. It is notable that the patient reported here had worms consistent with adult hookworm morphology visible in the duodenum at EGD, although neither larvae nor ova been identified from stool. Endoscopists should be vigilant for the presence of hookworm larvae in the duodenum even when the stool examination is negative; this includes thorough endoscopic examination of the distal duodenum and microscopic analysis of duodenal fluids when the cause of the symptoms is not found. One study found that duodenal fluid yielded the detection of more parasites than stool (13). Transmigration of hookworm across the gastroduodenal sphincter may cause inflammation of the gastric antrum. Although hookworms were not seen in the stomach of our patient, inflammation of the gastric antrum was noted. Such inflammation may lead to the development of an ulcer. Ulcers due to ancylostomiasis have been found in the duodenum (8). While such mucosal inflammation does not usually respond to acid suppressive therapy, it will improve with deworming (8).

Among patients living in or traveling to the tropics and subtropics, the differential diagnosis of epigastric pain should include hookworm infection. Unfortunately in resource poor countries, diagnostic facilities are fewer and limit the ability to reach aetiological diagnosis in many of the cases. Multiple empirical treatments, therefore, are frequently employed to eventually treat the causative agent. If endoscopy is not readily available, an empiric treatment with a benzimidazole should be considered in such cases.

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