Case 23-2012: A 59-Year-Old Man with Abdominal Pain and Weight Loss
Ramnik J. Xavier, M.D., Manish K. Gala, M.D., Brian K. Bronzo, M.D., and Paul J. Kelly, M.B., B.Ch., F.R.C.Path.

PRESENTATION OF CASE

Dr. Katie R. Famous (Medicine): A 59-year-old man was admitted to this hospital because of abdominal pain, nausea, vomiting, and weight loss.

The patient had been in his usual state of health until 9 months before admission, when weakness and anorexia developed. Evaluation at another hospital disclosed normal blood levels of thyrotropin and vitamin B₁₂; other laboratory-test results are shown in Table 1. Six stool specimens showed no occult blood. Esophagogastroduodenoscopy reportedly revealed a normal esophagus and stomach; biopsy specimens of abnormalities in the distal duodenum were obtained. Colonoscopy revealed erythema in the right colon and transverse colon, without ulceration. Pathological examination of the duodenal-biopsy specimen reportedly revealed villous blunting, active inflammation, and intraepithelial lymphocytes, findings that were considered consistent with celiac disease. The colonic lamina propria showed marked chronic inflammatory changes, without granulomas. The patient did not recall being told of a diagnosis of celiac disease at that time.

Three months before admission, episodes of abdominal discomfort recurred, with anorexia and a 10-kg weight loss. Three weeks before admission, the patient had diffuse, crampy abdominal pain, nausea that worsened after eating, and increased frequency of formed stools. He returned to the other hospital. Levels of amylase and lipase and tests of liver function were normal, and testing for Helicobacter pylori, IgA antibody to endomysial antigen, and IgA and IgG antibodies to tissue transglutaminase was negative; other test results are shown in Table 1. Computed tomography (CT) of the chest and abdomen reportedly showed atherosclerotic disease in the distal aorta and iliac vessels and no bowel-wall thickening or obstruction. The diagnosis of celiac disease was communicated to the patient, and he began a gluten-free diet, eating only soup. One week before admission, intermittent bilious nonbloody emesis developed. The evening before admission, nausea and abdominal pain worsened, vomiting recurred, and he stopped eating. The next morning, he was brought to the emergency department at this hospital.

The patient reported leg swelling of 3 weeks’ duration, chronic constipation, with a recent increase in stool frequency without overt diarrhea, and confusion about the
gluten-free diet. He did not have hematochezia, melena, hematemesis, night sweats, urinary symptoms, or rash.

Fourteen years earlier, the patient had sustained multiple fractures in an accident; recovery was complicated by nonunion of the left iliac wing and a persistent intestinal hernia in the region of the nonunion. Four years earlier, a neurofibroma

<table>
<thead>
<tr>
<th>Table 1. Laboratory Data.*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Hematocrit (%)</td>
</tr>
<tr>
<td>Hemoglobin (g/dl)</td>
</tr>
<tr>
<td>White-cell count (per mm³)</td>
</tr>
<tr>
<td>Differential count (%)</td>
</tr>
<tr>
<td>Neutrophils</td>
</tr>
<tr>
<td>Band forms</td>
</tr>
<tr>
<td>Lymphocytes</td>
</tr>
<tr>
<td>Monocytes</td>
</tr>
<tr>
<td>Eosinophils</td>
</tr>
<tr>
<td>Basophils</td>
</tr>
<tr>
<td>Platelet count (per mm³)</td>
</tr>
<tr>
<td>Mean corpuscular volume (μm³)</td>
</tr>
<tr>
<td>Folate (ng/ml)</td>
</tr>
<tr>
<td>Iron (μg/dl)</td>
</tr>
<tr>
<td>Iron-binding capacity (μg/dl)</td>
</tr>
<tr>
<td>Ferritin (ng/ml)</td>
</tr>
<tr>
<td>Transferrin (mg/dl)</td>
</tr>
<tr>
<td>Sodium (mmol/liter)</td>
</tr>
<tr>
<td>Potassium (mmol/liter)</td>
</tr>
<tr>
<td>Chloride (mmol/liter)</td>
</tr>
<tr>
<td>Carbon dioxide (mmol/liter)</td>
</tr>
<tr>
<td>Protein (g/dl)</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Albumin</td>
</tr>
<tr>
<td>Calcium (mg/dl)</td>
</tr>
<tr>
<td>25-Hydroxycholecalciferol (ng/ml)</td>
</tr>
<tr>
<td>IgM (mg/dl)</td>
</tr>
<tr>
<td>Prealbumin (mg/dl)</td>
</tr>
<tr>
<td>Thyrotropin (μU/ml)</td>
</tr>
</tbody>
</table>

* Ref denotes reference range at the other hospital. To convert the values for folate to nanomoles per liter, multiply by 2.266. To convert the values for iron and iron-binding capacity to micromoles per liter, multiply by 0.1791. To convert the values for calcium to millimoles per liter, multiply by 0.250. To convert the values for 25-hydroxycholecalciferol to nanomoles per liter, multiply by 2.496.

† Reference values are affected by many variables, including the patient population and the laboratory methods used. The ranges used at Massachusetts General Hospital are for adults who are not pregnant and do not have medical conditions that could affect the results. They may therefore not be appropriate for all patients.
of the jejunum had been resected after the patient presented with small-bowel obstruction; helminths consistent with *Strongyloides stercoralis* were noted in the resected bowel. Ivermectin, 12 mg (0.2 mg per kilogram of body weight) orally, was administered in the hospital and was to be repeated 7 days later; it was not clear whether the patient had taken the second dose. He also had hypertension and hyperlipidemia. Medications included lisinopril, atorvastatin, acetaminophen, and doxycaine sodium. He had no known allergies. He was born in a Caribbean country, immigrated to the United States 25 years earlier, and spoke only Spanish.

In the past 10 years, he had returned to his native country only once, 1 month earlier. He did not consume undercooked meat or fish or unpasteurized dairy products, and he had no known exposures to tuberculosis. He was divorced, lived alone, had three children, and was unable to work because of a pelvic fracture. He did not smoke, drink alcohol, or use illicit drugs. There was no family history of bowel disease.

On examination, the patient was thin. The blood pressure was 116/71 mm Hg, the pulse 74 beats per minute, the temperature 36.7°C, the respiratory rate 16 breaths per minute, and the oxygen saturation 100% while he was breathing ambient air. There were coarse inspiratory breath sounds, more marked on the right side than on the left side; a distended tympanic abdomen, without tenderness or hernias; hypoactive bowel sounds; blanching erythematous macules, 1 to 2 mm in diameter, on the torso; and 1+ pitting edema on the legs. The stool was brown and guaiac-positive. The prothrombin time and blood levels of glucose, globulin, lipase, creatine, electrolytes, and his usual medications. Testing for IgA antibodies to tissue transglutaminase was negative. Other test results are shown in Table 1. Urinalysis was positive for nitrites and ketones and was otherwise normal. CT of the abdomen to the emergency department because of recurrent abdominal pain. The examination was unchanged. Levels of glucose, globulin, lipase, creatine, electrolytes, and his usual medications. Testing for IgA antibodies to tissue transglutaminase was negative; other test results are shown in Table 1. Urinalysis was positive for nitrites, 3 to 5 white cells per high-power field, and bacteria. Trimethoprim–sulfamethoxazole was administered for a presumptive urinary tract infection.

Nine days later, the patient’s temperature reportedly rose to 38°C; anorexia, postprandial nausea, and occasional vomiting recurred. He returned to this hospital. On examination, he appeared cachectic. The height was 167.6 cm, the weight 53.1 kg, and the body-mass index (the weight in kilograms divided by the square of the height in meters) 18.9; other vital signs were normal. The bowel sounds were faint, and the abdomen was diffusely tender; the remainder of the examination was unchanged. The stool was positive for occult blood. A chest radiograph revealed increased linear opacities in the lungs. CT of the abdomen and pelvis after the intravenous and oral administration of contrast material was unchanged from the previous study. Fluids were administered intravenously, and oral intake was withheld. Blood levels of glucose, phosphorus, magnesium, IgG, and IgA were normal, as were serum protein electrophoresis and tests of renal and liver function; testing for IgA antibodies to tissue transglutaminase was negative. Other test results are shown in Table 1. The patient was readmitted to this hospital. Analysis of the stool revealed 25% fat (reference value, <20%).

Diagnostic procedures were performed.
Differential Diagnosis

Dr. Ramnik J. Xavier: May we review the imaging studies?

Dr. Brian K. Bronzo: CT of the abdomen and pelvis performed during the first admission to this hospital reveals diffusely dilated loops of fluid-filled small and large bowel with mucosal hyperemia and bowel-wall thickening (Fig. 1A, 1B, and 1C). No transition point is identified to suggest mechanical bowel obstruction. There is marked atherosclerotic calcification of the abdominal aorta, but the superior and inferior mesenteric arteries are patent throughout their visualized courses and the distribution of abnormal bowel does not conform to a vascular territory. There is no free air or ascites. There is a chronic non-united left pelvic fracture through which a loop of large bowel had herniated, without evidence of strangulation. The findings on CT performed during the patient’s second admission are unchanged (Fig. 1D).

Dr. Xavier: This 59-year-old man presented with months of recurrent nausea, vomiting, and abdominal pain. Duodenal-biopsy specimens reportedly showed active inflammation with villous blunting, crypt hyperplasia, and increased intraepithelial lymphocytes. Colonic-biopsy specimens showed an inflammatory infiltrate. Results of laboratory tests showed evidence of malabsorption, with folate and iron deficiency, mild anemia, and hypoalbuminemia; the patient had profound weight loss and malnutrition. Imaging scans and biopsy specimens showed no abdominal tumor.

Celiac Disease

Does this patient have celiac disease? Celiac disease is also known as celiac sprue or gluten-sensitive enteropathy. Patients with celiac disease are usually younger than this one; however, an initial diagnosis after 60 years of age is not uncommon. Celiac disease is strongly associated with certain HLA types (HLA-DQ2 and HLA-DQ8) and is most common in persons of northern European descent. This patient’s ethnic background is not specifically indicated in the case history, but northern European ancestry seems unlikely in view of his country of origin.

Classic gastrointestinal symptoms of celiac disease include those of malabsorption, such as steatorrhea, flatulence, and abdominal discomfort. This patient had abdominal pain without diarrhea, but results of his laboratory tests are indicative of malabsorption. Symptoms of celiac disease may range from fatigue and no gastrointestinal symptoms to profuse diarrhea with metabolic disturbances. Dermatologic manifestations include eczema and dermatitis herpetiformis, neither of which fits the description of this patient’s skin lesions.

Serologic testing is important in the diagnosis of celiac disease. The sensitivity and specificity of IgA antibodies to tissue transglutaminase are greater than 94% in the absence of IgA deficiency; IgA deficiency can occur in up to 2% of persons with celiac disease. In this case, serologic testing for celiac disease is negative, and the patient is not IgA-deficient. These negative results do not rule out a diagnosis of celiac disease, but they do reduce its likelihood. HLA testing could be considered if clinical suspicion for celiac disease is high despite negative serologic testing.

A biopsy specimen of the small bowel is a cornerstone of the diagnosis of celiac disease and typically reveals villous atrophy, crypt hyperplasia, increased intraepithelial lymphocytes, or a combination of these. There may also be an increase in intraepithelial lymphocytes in the colon. Although some features of this patient’s small bowel—biopsy specimen resemble those of celiac disease, the findings are not specific for the diagnosis and may occur in cases of enteritis from other causes.

Adherence to a gluten-free diet should alleviate symptoms and signs of celiac disease. We do not know how well or for how long this patient adhered to a gluten-free diet, but his symptoms appear to have worsened rather than improved. In view of the patient’s age, negative serologic testing, and probable ethnic background, celiac disease seems unlikely and we must pursue alternative diagnoses.

Common Variable Immunodeficiency

A sprue-like illness may occur in patients with common variable immunodeficiency (CVID). Patients with CVID have reductions in serum levels of IgG, IgA, IgM, or a combination of these. They also have poor responses to immunizations and often have recurrent infections, including sinusopulmonary bacterial infections, opportunistic fungal infections, or protozoal infections. They may have seemingly paradoxical autoimmune manifesta-
tions, such as autoimmune cytopenias. Of patients with CVID, 20% have gastrointestinal manifestations (e.g., chronic giardiasis, sprue-like illnesses, inflammatory bowel disease, protein-losing enteropathy, nonspecific malabsorption-like syndromes, or gastrointestinal lymphomas).6,7 Biopsy specimens of the small and large bowel may show pathological features that are indistinguishable from those of celiac disease.8 The diagnosis of CVID is usually made before the patient is 30 years of age.

This patient has normal serum immunoglobulin levels, has no history of chronic bacterial or other infections, and is well beyond the age at which the diagnosis is typically made. These factors make the diagnosis of CVID unlikely.

**TROPICAL SPRUE**

This patient was raised in a Caribbean country and had recently visited there. Tropical sprue, initially described by William Hillary in 1759, is

---

**Figure 1. CT Scans of the Abdomen and Pelvis.**

An axial CT image of the abdomen (Panel A) obtained on the first admission, after the oral administration of contrast material, shows mucosal hyperemia, thickening of the wall of the small intestine (arrow), and atherosclerotic calcification of the aorta (arrowhead). An axial image through the pelvis from the same study (Panel B) shows mucosal hyperemia and thickening of the colonic wall (arrow). Panels C and D show coronal reformation of the CT scans obtained on the first admission and the second admission, respectively (the scan in Panel D was obtained after the oral and intravenous administration of contrast material); no significant changes are apparent in the dilated fluid-filled loops of bowel (arrows), mucosal hyperemia, and bowel-wall thickening (arrowheads).
endemic in many tropical regions, including the Caribbean. Characterized by chronic diarrhea, malabsorption, and nutritional deficiencies of folate and vitamin B₁₂, tropical sprue should be suspected in anyone who has lived for more than a month in a region where the disease is endemic. Symptoms may develop up to several years after emigration. On examination of biopsy specimens, tropical sprue mimics celiac disease. The cause is presumed to be infectious, and treatment with broad-spectrum antibiotics is usually curative. Patients with tropical sprue usually present with voluminous diarrhea, which our patient does not have. Although I cannot rule out tropical sprue in this case, I believe there is a more specific diagnosis that will fit this case better.

**Crohn’s Disease**

Crohn’s disease must be considered in this patient. This disorder affects the small bowel in 80% of afflicted patents, and the terminal ileum is the most commonly involved site. However, symptoms can occur anywhere from the mouth to the anus. Histopathological examination of mucosal-biopsy specimens may reveal a spectrum of severity, from increased intraepithelial lymphocytes to frank ulceration and inflammation, with architectural distortion and noncaseating granulomas. The disease is currently thought to be due to an abnormal immune response to resident gut bacteria in patients with genetic susceptibilities.

Although the patient’s symptoms are compatible with a diagnosis of Crohn’s disease, epidemiologic factors make this diagnosis unlikely. In the United States, the prevalence of Crohn’s disease in the Hispanic population is one tenth that in the white population. The incidence of inflammatory bowel disease is increasing in the developing world; however, in the United States, persons who have lived in latitudes closer to the equator before the age of 30 years have a lower risk of the development of inflammatory bowel disease than those who have lived in more northern latitudes. Finally, this patient’s dermatologic manifestations do not resemble the extraintestinal manifestations of inflammatory bowel disease (i.e., pyoderma gangrenosum and erythema nodosum).

**Strongyloidiasis**

An important clue that emerges from the patient’s clinical history is the incidental finding of *S. stercoralis* in the jejunum 4 years earlier. *S. stercoralis* is endemic in the tropics and subtropics; in the United States, it is often diagnosed in recent immigrants or U.S. military personnel who have recently returned to the United States. The life cycle starts in the soil, where rhabditiform larvae develop into infectious filariform larvae that penetrate the skin, enter the systemic circulation, penetrate the alveolar spaces, are coughed up and swallowed, and enter the gastrointestinal tract. In the small intestine, the organism matures and releases eggs that develop into rhabditiform larvae, which are typically excreted in the stool. Autoinfection may occur, usually in immunocompromised persons, in which rhabditiform larvae mature into filariform larvae in the gut and penetrate through the wall of the large intestine or the perianal skin into the systemic circulation.

Most cases of strongyloidiasis are asymptomatic or cause only mild symptoms. An acute manifestation is duodenitis, which causes abdominal pain, nausea, vomiting, diarrhea, or a combination of these. Ground itch is a severely pruritic cutaneous manifestation of the disease. Chronic autoinfection may result in enteroocolitis and malabsorption, with diffuse involvement of the upper gastrointestinal tract and the proximal large bowel. Dermal migration of the larvae may result in urticaria, a feature consistent with this patient’s skin lesions, and areas of serpiginous erythema, known as larva currens. Pulmonary manifestations include dry cough and asthmalike symptoms. Rarely, a syndrome similar to Löffler’s syndrome can be seen.

In this case, the recurring abdominal symptoms, the rash, and the results of examination of gastrointestinal-biopsy specimens obtained during endoscopic evaluation are consistent with a diagnosis of enterocolitis caused by strongyloides. I think it is unlikely that the patient cleared the initial infection. In addition, his low-grade fevers, weight loss, and profound malnutrition raise concern for a syndrome known as hyperinfection.

**Strongyloides Hyperinfection Syndrome**

Hyperinfection with *S. stercoralis* is the accumulation of a large burden of parasites during the autoinfection cycle. Parasites accumulate primarily in the colon, more in the right colon than in the left colon. The parasitic burden in the colon may be so high as to trigger mucosal compromise and sepsis caused by gram-negative rods. Major risk factors for hyperinfection are infection with human T-cell lymphotropic virus type I
are effectively down-regulated. Cellular parasitic infections such as strongyloides (HTLV-I) or the human immunodeficiency virus (HIV), iatrogenic immunosuppression, malignant tumors, and hypogammaglobulinemia. Eosinophilia may be absent, as it is in this case. Mortality associated with strongyloides hyperinfection is estimated to exceed 10%. Of all the risk factors, infection with HTLV-I is the most likely in this patient, in view of his history. HTLV-I is endemic in the Caribbean, South America, southern Japan, south and central Africa, and the Middle East. Transmission typically occurs vertically from mother to child through breast-feeding but can also occur from sexual contact, blood transfusions, or intravenous drug abuse. Infection with HTLV-I promotes a type 1 helper T-cell (Th1) response (characterized by interferon-γ production and the promotion of a cellular immune response to intracellular pathogens), rather than a type 2 helper T-cell (Th2) response (characterized by the production of interleukins 4, 5, and 13 and IgE, facilitating a humoral immune response to extracellular pathogens); therefore, the host defenses against extracellular parasitic infections such as strongyloides are effectively down-regulated. For this reason, HTLV-I infection is also associated with treatment failure. Stool examination for ova and parasites can be insensitive in patients without hyperinfection, but organisms are usually detectable in patients with hyperinfection. The presence of filariform larvae and rhabditiform larvae in the stool is a clue that autoinfection has occurred, and a high parasite burden suggests hyperinfection. Serologic tests for anti-strongyloides antibodies can be helpful, but endoscopic biopsies can greatly assist in making the diagnosis. In patients with disseminated disease and pulmonary symptoms, the organism may be found in the sputum.

In summary, I believe the likely diagnosis in this case is S. stercoralis hyperinfection, in association with HTLV-I infection. If stool examinations for ova and parasites are negative, I would recommend performing endoscopic examination of the upper and lower gastrointestinal tract and obtaining biopsy specimens to look for the organisms.

**Dr. Eric S. Rosenberg** (Pathology): Dr. Gala, you saw this patient on the consultation service. What was your thinking when you saw him?

**Dr. Manish K. Gala:** I saw this patient on the second hospital day as part of the gastroenterology consultation team. Our differential diagnosis was similar to Dr. Xavier’s. For the reasons he summarized, we doubted the diagnosis of celiac disease and were concerned about recurrent strongyloidiasis with autoinfection and possible hyperinfection. We recommended HLA typing for the HLA-DQ2 and HLA-DQ8 phenotypes, the absence of which would rule out celiac disease; protein electrophoresis and testing for blood immunoglobulin levels to rule out CVID; and examination of stool specimens for enteric pathogens, ova and parasites, and fecal fat. We scheduled upper and lower gastrointestinal endoscopy for the next possible day (fifth hospital day).

**CLINICAL DIAGNOSIS**

Probable *Strongyloides stercoralis* hyperinfection.

**DR. RAMNIK J. XAVIER’S DIAGNOSIS**

*Strongyloides stercoralis* hyperinfection associated with HTLV-I infection.

**PATHOLOGICAL DISCUSSION**

*Dr. Gala:* Examination of a stool specimen obtained on the second hospital day showed numerous rhabditiform larvae and a few filariform larvae of *S. stercoralis*, reported on the fourth day. The next day, given the severity of the patient’s symptoms, we performed upper and lower gastrointestinal endoscopic evaluation to document the extent of strongyloidiasis. There was marked erythema, edema, and villous blunting in the distal duodenum and jejunum (Fig. 2A). Colonoscopy revealed extensive areas of inflammation characterized by erythema, edema, and deep, serpiginous ulcerations throughout the entire colon (Fig. 2B). The right colon was more severely affected than the left and had only occasional intervals of normal-appearing mucosa. Biopsy specimens were obtained from the abnormal areas.

The findings of extensive inflammation of the small and large bowel, with a right-sided predominance in the colon, together with the history of previous infection, were consistent with enterocolitis caused by strongyloides. The extensive intestinal involvement revealed on endoscopy was consistent with hyperinfection and would explain the patient’s profound malnutrition.

*Dr. Paul J. Kelly:* Four years before this presentation, a laparotomy was performed for small-bowel obstruction due to a subserosal, benign
myxoid neurofibroma, 3 cm in greatest dimension. Histologic sections also revealed larval and adult forms of a parasite that were consistent with *S. stercoralis*, lying within crypts with shedding into the lumen (Fig. 3A and 3B). There was no evidence of invasion of the parasite beyond the epithelial compartment.

Nine months before admission, duodenal and colonic biopsies were performed at another hospital (Fig. 3C and 3D). The duodenal-biopsy specimens showed villous atrophy, crypt hyperplasia, intraepithelial lymphocytosis (with fewer than 40 intraepithelial lymphocytes per 100 enterocytes), and foci of active inflammation. Parasites were not identified. The reporting pathologist described the appearances as being consistent with celiac disease. Three points should be noted. First, the combination of villous atrophy, crypt hyperplasia, and intraepithelial lymphocytosis is not specific for celiac disease. Second, active inflammation is not a typical feature of celiac disease. The colonic biopsy specimens showed active inflammation and signs of chronic damage, suggesting that a different disease process was occurring. Finally, serologic tests for celiac disease were negative at that time. No parasites were seen.

In both the duodenum and the colon, the histologic findings indicated active inflammation with evidence of chronicity. Interpretation of histologic findings often depends on the clinical context, but if the findings in this case were taken in isolation, one would have to consider the possibility of inflammatory bowel disease and, in particular, Crohn’s disease. Celiac disease is in the differential diagnosis but is less likely in view of the negative serologic tests. The absence of parasites does not rule out the diagnosis of strongyloidiasis, since the infection can have a patchy distribution and specimens obtained by endoscopic biopsy may not include a sample of the parasite.

During the patient’s second admission to this hospital, biopsy specimens of the duodenum, jejunum, and colon were submitted for pathological examination (Fig. 4). The duodenum showed florid active duodenitis, and parasites were not seen. Examination of the jejunum also showed florid active jejunitis with small aphthous ulcers on the surface, subtotal villous atrophy, and pseudopyloric metaplasia (which, along with the villous atrophy, suggests chronicity). Strongyloides organisms were seen in crypts eliciting mainly neutrophilic cryptitis (Fig. 4A). The colonic-biopsy specimens showed variable chronic active inflammation, with ulceration and fibrosis. *S. stercoralis* was identified (Fig. 4B, 4C, and 4D). The parasite was not confined to the epithelial compartment and was seen in the lamina propria, muscularis mucosae, and submucosa. Granulomas with foreign-body–type giant cells that contained degenerated parasitic matter were present. These features differ from the findings 4 years earlier, both in the numbers and invasiveness of the parasite.

*S. stercoralis* is typically localized in the small intestine, but involvement of the colon and stomach may occur. Localization in the colon and association with severe inflammation, ulceration,
and burrowing beyond the mucosa are uncommon in uncomplicated infection and suggest autoinfection and hyperinfection. Detection of the infective filariform larvae of *S. stercoralis* and the rhabditiform larvae in a stool sample supports this diagnosis.

The clinicopathological features in this case suggested strongyloidiasis hyperinfection syndrome; therefore, a disease process resulting in immunosuppression was considered by the infectious disease team. Serologic testing for HTLV-I was positive, confirming HTLV-I infection.

Dr. Rosenberg: Dr. Famous, would you tell us how you treated this patient and how he is now?

Dr. Famous: After the diagnosis was made, the administration of ivermectin was begun for a 2-week course, with a follow-up dose 2 weeks after completion. Examination of the sputum was negative for *S. stercoralis* larvae. Stool examinations were performed daily until the parasite was no longer seen, and then periodically thereafter. Testing for HIV infection was negative. Hyponatremia, hypocalemia, and anemia all improved after the completion of ivermectin therapy and vitamin and iron supplementation. The patient was discharged on the 17th day. A test for anti-strongyloides antibody performed at outpatient follow-up 1 month after discharge was positive. Eight months after discharge, on evaluation in the infectious disease clinic, the patient reported

![Figure 3. Pathological Examination of Specimens Obtained before This Admission (Hematoxylin and Eosin).](nejm.org)

A photomicrograph of the resected jejunum obtained 4 years before admission (Panel A) shows larvae consistent with *Strongyloides stercoralis* (arrows). At higher magnification (Panel B), *S. stercoralis* larvae and ova are seen in the jejunal crypts (arrows). No invasive parasites were seen in the lamina propria or muscularis mucosae. A duodenal-biopsy specimen obtained 9 months before admission (Panel C) shows total villous atrophy, crypt hyperplasia, and intraepithelial lymphocytosis. Foci of active inflammation were identified (not shown). A colonic-biopsy specimen obtained at the same time (Panel D) shows active cryptitis with numerous eosinophils. Also noted is a vague histiocytic aggregate, or so-called cryptolytic granuloma (encircled), which has formed in response to the epithelial damage. Glandular architectural distortion and basal plasmacytosis were noted elsewhere, suggesting that the inflammatory process is beyond an acute phase.
feeling well; his weight was 69 kg. A stool sample was negative for ova and parasites, and a test for anti-strongyloides antibody was negative. T-cell subsets were normal, and his HTLV-I infection remained asymptomatic.

Dr. Rosenberg: Dr. Xavier, why is hyperinfection with strongyloides less common in patients infected with HIV than in those infected with HTLV-I?

Dr. Xavier: In patients infected with HTLV-I, the Th1 program is enhanced, and the Th2 response is blunted, resulting in impaired ability to defend against helminths. In HIV infection, loss of CD4+ T cells can affect both the Th1 and the Th2 responses, and in some patients a Th2 response may even predominate. As a result, the Th2 response is not as disproportionately blunted in patients with advanced HIV infection as it is in patients with HTLV-I infection.

A Physician: Abnormalities on the lung examination and on the chest radiograph were mentioned in the clinical history. Are these findings related to the diagnosis in this case?

Dr. Gala: After the diagnosis was made, we checked the sputum for strongyloides larvae to determine whether there was pulmonary involvement, but the smear was negative. This result may not rule out a low level of pulmonary involvement and autoinfection. However, given the patient’s hypoalbuminemia and peripheral edema, the chest radiograph may reflect interstitial edema.

Figure 4. Pathological Examination of Biopsy Specimens from the Second Admission (Hematoxylin and Eosin).

A biopsy specimen of the jejunum (Panel A) shows severe injury to the epithelium, with surface erosion and villous atrophy; the villous atrophy suggests chronicity. S. stercoralis infection (arrows) is noted subjacent to the surface erosion. The biopsy specimen of the colon (Panel B) shows architectural distortion, with an increased inflammatory infiltrate in the lamina propria. Ulceration was noted (not shown). The larval form of S. stercoralis can be seen in the superficial muscularis mucosae (arrow). At higher magnification, the same S. stercoralis larva (Panel C, arrow) is in the muscularis mucosae, away from the epithelial layer. Numerous eosinophils can be seen in this field. Another area shows numerous larvae (Panel D, arrows) lying in fibrous tissue in the submucosa of the colon. These findings raise suspicion of autoinfection.
ANATOMICAL DIAGNOSIS

Strongyloides stercoralis hyperinfection associated with HTLV-I infection.

This case was discussed at the Medical Case Conference. No potential conflict of interest relevant to this article was reported.

REFERENCES


Copyright © 2012 Massachusetts Medical Society.