Whipworm Disease

Intestinal Structure and Function of Patients with Severe
Trichuris trichuria Infestation

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Three children suffering from heavy Trichuris trichuria infestation are reported. They presented with chronic watery diarrhea and iron deficiency anemia. Two also had rectal prolapse. Small intestinal function was normal, and jejunal biopsies in 2 were within normal limits. Rectal biopsies showed marked cellular infiltration of the lamina propria. The diarrhea is assumed to be due to impaired water reabsorption from the colon. Treatment with dithiazanine iodide produced rapid cure.

Trichuris trichuria (whipworm) is the third most common helminthic infestation of the human gastrointestinal tract, only roundworm and hookworm occurring more frequently (1). In 1947, it was estimated that there were at least 355 million people harboring whipworms (2). It is, therefore, interesting that clinically severe whipworm disease, characterized by chronic diarrhea, iron deficiency anemia and rectal prolapse (3), has been reported only in a relatively few instances (4,5), and in none of these have the structure and function of the small and large intestine been documented. This paper presents detailed studies of 3 children with heavy Trichuris trichuria infestation.

MATERIALS AND METHODS

The 3 children were admitted to a metabolic ward. Routine hematologic investigations were done

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RESULTS

Clinical Features

The 3 children, aged 11, 8 and 5 years, respectively, presented with a history of chronic diarrhea of 5–56 months duration. In each case, the stools were said to be
watery and occasionally contained traces of blood or mucus. The patients' relatives had noticed that they were becoming increasingly pale. In Case 1 and 3 there was a history of rectal prolapse. There were no other associated gastrointestinal symptoms. All 3 children gave a history of geophagia for several years duration.

On physical examination, the children were pale but otherwise adequately nourished. Case 1 and 3 had prolapse of the rectum on straining. Sigmoidoscopic examination revealed an edematous and congested rectal mucosa covered by a film of mucus in which enormous numbers of whipworms could be seen. The worms were firmly attached to the mucosa and could not easily be dislodged. Case 5 also had multiple capillary hemorrhages on the face and in the optic fundus.

**Investigations**

The results of investigations on these patients are shown in Table 1. All 3 patients had iron deficiency anemia, and the stools were voluminous and watery in consistency. Microscopic examination showed the presence of large numbers of *Trichuris trichiura* eggs in each case. The stool fat excretion and other tests of small intestinal absorption were normal.

Jejunal biopsy in Case 1 and 2 showed that the villi were leaf-like. On histologic examination, the crypt layer showed some increase in thickness. The epithelial cells were tall and columnar with a well-preserved brush border. The cellularity of the lamina propria was within normal limits (Fig 1). A jejunal biopsy was not done in Case 3 because of the possibility that hemangiomata may be present in the small intestine.

Rectal biopsies were obtained in Case 1 and 3. Histologic examination showed a similar picture in both (Fig 2). The thickness of the mucosa was within normal limits. The epithelial cells on the luminal surface appeared slightly flattened, and the goblet cells were slightly reduced in numbers. There was a marked increase in the

| Table 1. Results of Laboratory Investigations in 3 Patients Infected with Whipworms |
|-------------------------------|-----------------|-----------------|-----------------|
|                               | Normal values   | Case I          | Case II         | Case III        |
| Hemoglobin (g/100 ml)         | 7.1             | 8.5             | 10.2            |
| Packed cell volume (%)        | 31              | 32              | 34              |
| Serum iron (μg/100 ml)        | > 80            | 30              | 26              | 60              |
| Serum folate (ng/ml)          | > 6.0           | 8.5             | 8.4             | 14.0            |
| Serum vitamin B₁₂ (pg/ml)     | > 140           | 223             | 332             | 680             |
| Serum albumin                 | > 3.5           | 4.0             | 4.0             | 2.5             |
| Stool weight (g/day)          | < 150           | 1200            | 1100            | 720             |
| Stool fat (g/day)             | < 5             | 3.8             | 2.6             | 4.9             |
| d-Xylose excretion (%)        | > 25            | 30.6            | 46.0            | 28              |
| Vitamin B₆ excretion (%)       | > 6             | 18.9            | 17.5            | 14              |
| Barium meal                   | N               | N               | N               | N               |
| Jejunal biopsy                |                 |                 |                 |                 |
| Villous architecture          | leaves          | leaves          |                 |
| Section                       | N               | N               |                 |
| No. of TT ova/g feces         | 70,000          | 53,000          | 47,000          |

N, within normal limits.

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Fig 1 (top). Jejunal biopsy from Case 1 showing some increase in depth of crypts. (H&E) Fig 2 (bottom). Rectal biopsy from Case 1 showing slight flattening of surface epithelial cells and marked increase in cellularity of lamina propria. There is also an increased number of cells in underlying muscle. (H&E)
cellularity of the lamina propria, due to the presence of lymphocytes, plasma cells, mast cells and a few eosinophils. In areas, there were also small collections of polymorphs without any surrounding necrosis. There was also an increase in cells even deep to the muscularis mucosae.

**Treatment**

Hexylresorcinol, 0.2%, retention enema was tried in Case 1 (the oldest child), but the patient was not able to retain the enema, and the solution produced inflammatory changes in the perianal skin. Piperazine citrate, orally, in appropriate dosage was tried in Case 1 and 2 without any change in the clinical picture. Piperazine citrate retention enema was also tried but was unsuccessful. After this, it was decided to use dithiazanine iodide (Delvex), 300 mg daily, in divided doses for 5 days. The third patient was treated only with dithiazanine iodide. In each case, once therapy was instituted, there was a rapid decrease in stool volume (Fig 3) and a remarkable improvement in the clinical picture. Repeat sigmoidoscopy, 10 days after treatment, did not reveal any whipworms and revealed a normal looking mucosa. In Case 1 and 5 the rectal prolapse also disappeared after therapy. In each case the iron deficiency anemia was treated with ferrous sulfate tablets.

**DISCUSSION**

The clinical syndrome of whipworm disease, presenting with watery diarrhea, iron deficiency anemia and rectal prolapse, has been documented in several instances (8, 14–19). It has been shown that the chronic diarrhea is related to the worm load (15), and in patients with less than 30,000 eggs/g of feces, diarrhea is unlikely to occur. Rectal prolapse is a result of chronic diarrhea and is not always a feature of the syndrome.

In the 3 children described herein, the tests of small intestinal absorption were normal, and the two jejunal biopsies were similar in appearance to those from asymptomatic control subjects in this area (20).

Since small intestinal structure and function are normal, it appears that the diarrhea in patients with whipworm disease is not of small intestinal origin. It is presuma-
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bly caused by irritation and inflammation of the colon, which can be demonstrated on sigmoidoscopy and in rectal biopsies. The large volume of watery diarrhea suggests that the lesion interferes with colonic water reabsorption. The rapid reduction in stool volume, after the infestation is adequately treated (Fig 3), clearly indicates a causal relationship to the presence of the parasites. The mechanism of this impaired water reabsorption is not understood and needs investigation.

Iron deficiency anemia, as found in these children, has been present in the majority of cases that have been reported. Significant blood loss due to whipworm infestation has been demonstrated. It is calculated that 0.005 ml of blood is lost per worm per day (21), and this is presumably the major factor in the production of the anemia.

The eradication of whipworm infestation is difficult, and for a long time 0.2% hexylresorcinol retention enema was the anchor of therapy (15), but this may be irritant to the perianal skin. In the present cases, piperazine was tried without any response. Dithiazanine iodide almost completely eradicates the infestation (22), and the present patients responded extremely well to this medication. In spite of its reported toxicity, this agent would appear to be the drug of choice in severe whipworm disease.

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