

THE IMPORTANCE OF FECAL EXAMINATION IN THE DIAGNOSIS OF STRONGYLOIDIASIS

JOHN W. KING, M.D.

Department of Clinical Pathology

BETWEEN 1942 and 1952 there were 35 patients seen at the Clinic in whom diagnoses of infestation with *Strongyloides stercoralis* were made. This was the most commonly reported nematode, occurring slightly less than once in each thousand stools examined. This report summarizes the symptoms of which the infested patients complained, and emphasizes the importance of fecal examination in the diagnosis of this disease.

The life cycle of *S. stercoralis* is similar to that of the hookworm but is slightly more complicated. The filariform larvae develop in soil and infest the host by penetrating the skin, and eventually reach the intestines by way of the heart and lungs where they develop into adults. The adults mate, and the females penetrate the intestinal mucosa where the eggs are laid. These hatch into rhabditiform larvae which are released into the lumen of the intestines. Detection of the parasite depends upon observation of larvae in the feces. These forms are quite easy to identify because *S. stercoralis* is the only common parasite in which the ova hatch within the intestines. The larval form pass into the soil and the life cycle may then follow either of two courses. The rhabditiform larvae may develop directly into adults whose eggs hatch into more rhabditiform larvae which in turn can develop into adults. The second type of life cycle is the parasitic one in which the rhabditiform larvae develop into filariform larvae which have the power of infesting man. In man, furthermore, infestation is self-perpetuating because the larvae can penetrate the colonic mucosa or perianal skin to produce auto-infection.^{1,2}

Since the original description of this parasite by Normand³ in 1876, many workers have described the occurrence of these parasites in human disease and have discussed their role in the production of the symptoms observed. In general, the ability of the parasite to produce symptoms is recognized, although many patients who harbor the parasites have no complaints which can be related to this infestation.⁴

On the basis of the parasite's life cycle, these symptoms would be expected to be confined to the skin, lungs and gastrointestinal tract. The symptoms referable to the gastrointestinal tract are variable. The chief of these is abdominal pain which may occur from the epigastrium to the lower abdomen and may be diffuse or well-localized. It has been described as colicky, cramp-like, gnawing, dull, and heavy. Food has a variable effect on it. Some patients find that their discomfort is exacerbated by eating, others feel better afterwards, and still others believe that food has no effect on their condition. Diarrhea, frequently bloody, is said to be present, but others complain of constipation. Weight loss, nausea, vomiting, malaise, weakness, anorexia, jaundice, and

indigestion have been mentioned. Anemia, leukocytosis and eosinophilia are the only laboratory findings of significance aside from those in the stool examinations. Several reports have described strongyloidiasis of the urinary tract but this is of rare occurrence.⁵ All of the clinical signs and symptoms associated with this disease are nonspecific for any of them may occur in patients with other gastrointestinal tract disease.

In this series of 35 patients, diagnoses were made through demonstration of the larvae in this laboratory in all but one case; in the majority of patients the final diagnoses would have been that of a functional disease had the parasites not been found. The one diagnosis, not confirmed by laboratory demonstration of the parasite here, was made on the basis of a history of the demonstration of the larvae at another hospital.

A stool examination is a simple procedure, requiring a little practice at recognizing the presence of parasites, a microscope, and containers for the feces specimens. In our laboratory, pint ice cream containers are used for collecting the specimens. It is a simple matter to make an emulsion of feces in a little saline on a slide. Best results are obtained from normally formed or soft, mushy stools, produced naturally or following a saline laxative. Examination of the stool specimen for 15 or 20 minutes reveals most parasites which occur as larval forms in strongyloidiasis. Of the 34 cases in the present series in which the parasites were found here, they were seen in the first stool specimen examined in all instances except one.

DESCRIPTION OF THE PATIENTS

Thirty-three of the 35 patients were adults; there were two children, both girls, two and a half and eleven years of age. Initial examinations of these patients were made by 22 different clinicians representing six departments. The significance of the sex distribution among the adults, 26 men and 7 women, is not immediately apparent although possibly men are subject to greater exposure than women. Occupations seemed to play no part in the epidemiology of the disease. Of the 35 patients, eight gave a history of having lived or traveled extensively outside of the United States. Three were veterans who had histories indicating previous parasitic infestations. Of the group in which the infestations were seemingly contracted in this country, eight were from the Cleveland-Akron area and six from other cities and villages in Ohio, 12 were from West Virginia and one from Pennsylvania.

CLINICAL CONSIDERATIONS

On admission 22 of the group mentioned gastrointestinal symptoms as their major or only complaint. Five patients were seen with skin conditions which might possibly be related to strongyloidiasis. Three patients were seen because of eosinophilia which proved to be caused by strongyloidiasis. The

others were admitted for symptoms entirely unrelated to their parasitic infestation. The chief complaints of the patients which were believed to have possible connections with the presence of the parasites are summarized in Table 1.

Table 1

"Chief Complaints" Believed to be Due to *Strongyloides stercoralis*

Infestation in 35 Patients

Upper abdominal pain	11
Lower abdominal pain	7
Change in bowel habits	6
diarrhea	3
constipation	1
"change"	2
Gas in stomach, rumbling in bowels, etc.	5
Urticaria, rash, peeling	5
Hematologic disorders (eosinophilia)	3
Nervousness	3
Unrelated complaints	16

After a review of the charts in an attempt to determine which, if any, symptoms or signs are of significance in the diagnosis of this disease, it became apparent that none is pathognomonic of the presence of the parasite with the exception of the detection of the larvae of the nematode in the stool of the patient. Abdominal pain which is usually mentioned first among such symptoms occurred in 71 per cent of this series and was so variable that any attempt to characterize it fails; the most common type recorded was lower abdominal pain, most frequently described as a heavy, dull pain which occasionally became colicky. Gas, bloating, meteorism, and excessive flatus are too easily considered neurotic symptoms and dismissed as evidence of the functional nature of a patient's illness. However, 88 per cent of the patients in this series suffered from some form of excessive gas production or accumulation; indeed, a number of them listed this as their only presenting complaint. Change in bowel habits is a common symptom described as associated with parasitism. In this series constipation was much more frequent than diarrhea, contrary to most of the textbook descriptions.¹ Blood in the stool is usually described in the literature but occurred in only 20 per cent of this series (Table 2).

Of the patients on whom differential blood counts were available, only two had white counts above 11,000. One of these was hospitalized because of eosinophilia as it had been noted at another hospital that her white count was 45,000 with 75 per cent eosinophils. By the time she was seen in our hospital, her white count had dropped to 15,450 with 45 per cent eosinophils. Further investigation led to the discovery of *S. stercoralis* larvae in her stool. The other patient with leukocytosis had a total white blood cell count of 19,000 with 8 per cent eosinophils, but clinically did not differ from other patients in the

series. Four of the patients had eosinophil counts of 4 per cent or less and were considered normal; the remainder ranged from 6 to 22 per cent. As there was no method of determining the duration of infestation, it was impossible to correlate it with the eosinophil count as suggested by Liebow and Hannum.⁶ None of the patients showed anemia.

A review of some of the working impressions recorded following the initial physical examination shows that only 13 of these patients were suspected of having parasitism, and in many instances this was considered to be sufficiently improbable that the term "rule out parasites" was used. There were 43 initial tentative diagnoses referable to the gastrointestinal tract and the majority of these were of functional conditions. There were, however, five impressions which were strictly organic in nature, involving possible neoplasms or gall-bladder disease. Ten were associated with skin disease which may or may not have any relationship to intestinal parasitism. One possible hematologic diagnosis, that is "rule out leukemia," proved to be related to the patient's parasitic infestation. The remainder of the impressions were directly related to definite pathologic conditions patients presented.

The final diagnoses, other than strongyloidiasis, entered in the charts covered almost every system of the body as might be expected in patients with such many and varied complaints. It is interesting that of the entire series, with the exception of the patient whose primary diagnosis was carcinoma, none of the patients were seriously ill. This contradicts the experience of many others who have noted that the patient with an infestation of this type can be extremely ill. Because the great majority of these patients are referred back to their own physicians for follow-up, the results of treatment cannot be evaluated here. In all cases the recommended treatment was gentian violet tablets.

Table 2'

Most Common Signs and Symptoms Associated with *Strongyloides stercoralis*

Infestation in 35 Patients

Parasites found in stool	97%
Accumulation of gas, belching, distension, flatus	88%
Abdominal pain	71%
epigastric	14%
lower	57%
Eosinophilia*	71%
Change in bowel habits—diarrhea, constipation	54%
Energy loss	28%
Blood in stool	20%
Foreign residence	20%
Other intestinal parasites present	17%
Skin conditions—urticaria, rash, peeling	14%
Indigestion	11%

* Ten out of 14 patients only.

SUMMARY

The diagnosis of infestation by the nematode *Strongyloides stercoralis* is primarily made on laboratory examination; aside from actual observation of larvae in the stool, there is no laboratory test that is diagnostic. In 33 out of 35 patients seen during a ten year period, there was no suggestion in the patients' admitting diagnoses of the possibility of parasitism with this organism. In one instance in which strongyloidiasis was suggested prior to fecal examination, diagnosis was made on the basis of a definite history of discovery of the larvae at another hospital. There are no physical signs pathognomonic of the disease. The history of gastrointestinal distress is so common in patients seen in departments of general medicine or gastroenterology that it offers little help in establishing a diagnosis. The importance of routine stool examinations for parasites in patients with any type of gastroenterologic distress cannot be over-emphasized.

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