but limited value in the differentiation of exudates and transudates.

REFERENCES

AN EVALUATION OF FINDINGS IN GIARDIA INFESTATION

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ALTHOUGH GIARDIA LAMBLIA is frequently found in man, its pathogenicity and etiologic significance in patients with chronic diarrhea or other gastrointestinal complaints is difficult to evaluate. Recent surveys of approximately 25,000 ambulatory patients in the South have shown the incidence of infestation with this parasite to be as high as 14 to 16 per cent (1). When the parasite is found on stool examination in a patient with gastrointestinal complaints, its relationship to symptoms is of considerable interest and importance.

A review of the literature reveals that disease of almost every portion of gastrointestinal tract has been attributed to Giardia. These disorders have included gastritis, symptoms resembling peptic ulcer, the occurrence of jaundice, acute cholecystitis, epidemic diarrhea, dysentery and even manifestations of pancreatic insufficiency (2-8). Studies on experimental animals seem to indicate that the parasite may play a role in the production of such symptoms (1,8). Other reports have indicated that the parasite has little clinical significance in man, except perhaps in isolated instances (10,11,12).

The diagnosis is readily made when the parasite or cyst is demonstrated by microscopic examination of material obtained from duodenal drainage or from freshly passed liquid or semifluid stools. These may be obtained by saline purgation, if necessary. Concentration techniques are of value only in identification of the cyst forms, since the trophozoites are killed by hypertonic solutions.

The trophozoite is pear shaped, coming to a point posteriorly and averaging 14 microns in length and 7 microns in width. It is motile, colorless, and finely granular. There are four pair of flagella. At the anterior end, on the ventral surface, is a large sucking disk by which it attaches itself to the mucous membrane. The parasites are located predominantly in the small intestine, and are most numerous in the duodenum. They are transmitted by the ingestion of contaminated food or water, in essentially the same fashion as Endamoeba histolytica.

CLINICAL STUDY

During the three year period from January 1, 1947, through December 31, 1949, the parasitology laboratory of the Bowman Gray School of Medicine performed by direct examination, and zinc sulfate flotation technique, a total of 5,399 stool examinations, on 2,522 patients seen in the North Carolina Baptist Hospital.
Seventy-eight patients, or 3.1 per cent, were found to have *G. lamblia*. The data reported below were obtained from 59 of the above patients for whom adequate records were available.

Although approximately equal numbers of males and females were examined, 71 per cent of the infestations were found in males. Fifty-four per cent of the patients were less than 14 years of age, but only 25 per cent of the stools examined were from the pediatric wards.

Gastrointestinal complaints were present in only 23 patients, or 40 per cent. In order of frequency, they were as follows: abdominal pain (17), diarrhea (15), and abdominal pain and diarrhea (10). The abdominal pain had no constant location or character, and was never severe nor incapacitating. Weight loss, blood in the stools, fever, nausea, and vomiting did not occur unless some other disease was also present.

Of the 23 patients who harbored *Giardia* and had gastrointestinal complaints, 14 had other associated disorders which can produce abdominal pain and diarrhea. There were six instances of amebiasis, two of polyposis, and one each of malnutrition, carcinoma of the cervix, rectal abscess, esophageal hiatus hernia, irritable colon, and strongyloidiasis.

Thirty-seven patients who were infested with *Giardia* had no other intestinal parasites. Six had *Endamoeba histolytica*, 5 had Ascaris, 3 had hookworm, and 1 Strongyloides. Seven had a mixture of *Escherichia coli* and *Endolimax nana*.

**Accessory Data**

In no patient with a hemoglobin of less than 12 Gm. could the anemia be attributed directly or indirectly to *Giardia* infestation. In those patients harboring *Giardia* alone the percentage of eosinophils averaged 3.2 per cent, and the leukocyte count 6,200.

Ten patients were examined by the sigmoidoscope. Three had punched out lesions which yielded *E. histolytica* on smears, but *G. lamblia* was not identified. There was one instance of polyposis and one of non-specific idiopathic ulcerative colitis.

Eight patients had barium studies of the colon. Seven of these examinations were reported as normal, and one revealed loss of haustations in the transverse colon and some irregularities in the lower descending colon. This patient was subsequently found to have *E. histolytica*. Three patients had roentgen examination of the stomach and duodenum, which were reported as negative. Cholecystograms were done in 2 patients who had symptoms suggestive of chronic cholecystitis. Both were negative.

Routine examination of the stool revealed *Giardia* in an 8 year old boy who was hospitalized for bacterial meningitis and who had no gastrointestinal symptoms. He expired two weeks later, and postmortem examination showed the gallbladder and small bowel to be normal.

**Treatment**

Eight patients with giardiasis, six of whom had gastrointestinal complaints, were treated with Atabrine. The *Giardia* disappeared from the stools of all these patients, and the 6 with gastrointestinal complaints showed clinical improvement. In 2 of these, however, the improvement was transient. One returned later with proctoscopic and roentgenologic evidence of chronic idiopathic ulcerative colitis, and the other with amebiasis. In one patient, whose chief complaint was pruritus ani, disappearance of the parasite from the stool failed to produce any clinical improvement.

There were 5 patients in whom *Giardia* was demonstrated by a single stool examination and who received no treatment. When these patients returned for re-evaluation, parasites could not again be demonstrated. In 4 patients who had *E. histolytica* and *Giardia*, both parasites disappeared following treatment for amebiasis with carbarsone and chloroquine, or Diodoquin and emetine.

**Comment**

Where duodenal drainage or routine examination of liquid stools is performed in patients with gastrointestinal complaints, trophozoites of *G. lamblia* are frequently found. Stool examinations performed over a three year period by the parasitology laboratory of the Bowman Gray School of Medicine showed the parasites to be present in 3.1 per cent (78) of 2,522 patients. Trophozoites were identified in one-third of these cases. Thirty-seven patients had *Giardia* alone. Fifteen patients were also infested with *E. histolytica*, Ascaris, hookworm, or Strongyloides. The higher incidence of infestation found in males can probably be attributed to the fact that men more often eat away from home, possibly in less hygienic conditions, and hence are more likely to be exposed to the parasite.

No clear-cut clinical picture was presented by the group harboring *Giardia*. Only 40 per cent of the patients had associated-gastrointestinal complaints. These usually consisted of generalized abdominal discomfort, diarrhea, or both. Accessory laboratory studies, which included blood counts, cholecystograms, and roentgen examinations of the stomach, small intestine and colon, were of no diagnostic significance. Anemia and eosinophilia were not found. Sigmoidoscopy was helpful in disclosing associated diseases such as anemic and chronic ulcerative colitis, but not in the diagnosis of *Giardia* infestation. The majority of the patients who had definite gastrointestinal signs and symptoms usually had pathologic findings other than *Giardia* which have accounted entirely for their complaints.

*Giardia* disappeared rapidly from the stools of all patients who were given Atabrine. In two instances such treatment was helpful in disclosing another gastrointestinal disorder which was the primary cause for the presenting complaints. It is of interest that in several patients to whom no treatment was given, stool examinations repeated at a later interval no longer revealed *Giardia*. This finding suggests that the parasite may often disappear from the gastrointestinal tract without specific therapy.

From this study it would appear that *G. lamblia* is a common and usually nonpathogenic inhabitant of the human gastrointestinal tract. In the presence of anatomic defects or other pathologic processes, it may act as a secondary factor in producing gastrointestinal symptoms, particularly if the parasites are present in large numbers. There is no actual evidence that *per se* it can invade tissue. However, when it is found by stool examination or duodenal drainage, particularly if