Brief Survey of Common Intestinal Parasites in the Tokyo Metropolitan Area

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(Received: February 26, 1998)
(Accepted: May 14, 1998)

Key words: intestinal parasite, incidence

Summary

Since 1955, when sanitary conditions were poor, the incidence of intestinal parasitism has steadily decreased. Similarly, the number of requests for fecal examinations by physicians has also decreased. However, in our hospital, the incidence of parasites detected in fecal material has been increasing since 1994, regardless of the decreasing number of stool exams performed. Possible reasons for this situation can be summarized as follows: First, an effective drug for treating Trichuris trichiura and Enterobius vermicularis infections has reduced the incidence of these two helminths. Second, an apparent increase in the incidence of infections with the tapeworms Diphyllobothrium latum and Diplogonoporus grandis may just be a reflection of patients gathering at a few facilities for treatment. Third, the number of individuals infected with a single Ascaris is significantly increasing. Fourth, parasites related with travel abroad (Schistosoma haematobium and Opisthorchis viverrini) are appearing due to the increase in travel to and from foreign countries. Of the above, we think particular attention should be paid to the increase in A. lumbricoides infections.

Introduction

Intestinal parasites are very common in tropical and subtropical regions. Helminths such as hookworms, Ascaris and Trichuris are estimated to infect approximately 3.5 billion individuals worldwide1). The diagnosis of these infections is very important because the intestinal parasites can cause a wide variety of symptoms, and may lead to cancer and even death. The infections are diagnosed by the detection, in the stool, of ova and larvae of helminths and cysts and trophozoites of protozoa. Stool examinations are part of the daily routine in hospital laboratories.

Parasitic infections in Japan were common until 1955, due to unsatisfactory nutritional and sanitary conditions. A high incidence of soil-transmitted Ascaris lumbricoides (62.5%) was recorded during the years 1945 to 19552). However, with the improvement in sanitary conditions, i.e., clean water supply, efficient sewage disposal, and the use of organic fertilizers rather than human excrement in farming, the incidence of parasitic infections dropped dramatically and, indeed, is still decreasing. In contrast to the decrease in soil-transmitted parasites, infections with helminths undergoing larval migrations in tissues following ingestion of undercooked meat have been increasing3) although eggs of these migrating worms are not found by fecal examination because the...
parasites do not mature in humans. However, the introduction of new freezing techniques should reduce the number of these infections. Since 1990, parasitic infections have become rare in Japan, except for cases involving human-to-human transmission such as Enterobius vermicularis. On the other hand, parasitic infections are common in developing countries, and many Japanese travel to these countries, and some may acquire parasitic infection(s). It also seems likely that some food products imported into Japan may be contaminated with helminth eggs. We report here on the variety of parasites detected in stool samples in Tokai University Hospital during 1985 to 1996, and discuss the present situation.

Materials and Methods

Study population: A total of 15,030 stool samples was collected from hospitalized patients and individuals visiting the out-patient clinics in the Tokai University Hospital during the 12 years from 1985 to 1996. The samples were requested by physicians to screen for intestinal parasites.

Diagnostic criteria: The fecal specimens were examined according to Kato’s method using a strip of cellophane paper rinsed in 0.015% malachite-green and 50% glycerin solution, and all helminth ova encountered were identified microscopically under ×200 magnification. Cysts and trophozoites of intestinal protozoa were also microscopically identified after concentration of fecal aliquots by the formalin-ether method.

Statistical analysis: The detection rates of each parasite in two groups, 1985–93 and 1994–96, respectively, were calculated. Data were analysed statistically by the chi-square test, and differences were considered to be significant at p<0.05.

Results

Changes in number of requests for fecal examination

In 1985, 2,408 fecal samples were provided for examination upon request of physicians. Thereafter, the number of requests from physicians decreased yearly, and the number in 1995 was 606, a quarter of that in 1985. In 1996, only 334 fecal samples were examined (Fig. 1).

Changes in detection rate of parasites

Fig. 1 Yearly changes in the number of requests for stool examination by physicians, and stool-positive rate for parasites. Fecal samples (15,030) were examined in the Tokai University Hospital during the 12 years from 1985 to 1996. Helminth ova and protozoan parasites were microscopically identified according to Kato’s method and the formalin-ether method, respectively.
The incidence of helminth ova and protozoans found in the samples was less than 1% in the period between 1985-1993. However, the incidence rose to 1.5% in 1994 (Fig. 1). After 1994, the rate of positive cases has continued to increase, in contrast to the decrease in the number of exams requested. The rate in 1996 (3.3%) was 3-fold higher than in 1992.

Parasite species encountered

Positive cases were divided into two groups, 1985-93 and 1994-96, based on the year of diagnosis. Along with the significant increase in rate of detection from 0.0078 to 0.0222, the numbers per year during 1994-96 increased, from 11.67 to 12.00 (Table 1). *Metagonimus yokogawai* was the parasite detected most frequently in both time intervals. In as much as the egg of *Heterophyes heterophyes* cannot be differentiated from that of *M. yokogawai* morphologically, our diagnosis of *M. yokogawai* very likely includes *H. heterophyes*. The frequency of *M. yokogawai* positive cases decreased from 8.11 (1985-93) to 4.67 (1994-96) cases per year. Similarly, the incidence of *Trichuris trichiura* and *E. vermicularis* decreased, although the decrease was not significant. In contrast, the numbers of positive cases of *Diphyllobothrium latum* (and *Diplogonoporus grandis*), *Opisthorchis viverrini*, *Gonapodasmius* sp. and *A. lumbricoides* increased significantly during 1994-96 (Table 1). In 4 cases of *A. lumbricoides* infection diagnosed during 1994-96, only unfertilized eggs were found in the stools. In 1996, for the first time *Schistosoma haematobium* and *Cryptosporidium parvum* were detected.

**Discussion**

Although many physicians consider parasitic infections an important problem, the number of requests for fecal examinations continues to decrease. One likely reason is the significant decrease in the incidence of parasitic infections in Japan. However, we have found a growing in the number of patients with intestinal parasites, regardless of the decrease in number of requests for fecal examination (Fig. 1 and Table 1).

The incidence of soil-transmitted (*T. trichiura*) and human-to-human transmitted (*E. vermicularis*)...
is) parasites has decreased, as indicated by our survey. However, according to the “Trend of Public Health in 1996”\textsuperscript{5}), the incidence of \textit{E. vermicularis} is still high among kindergarten and elementary school children. Because an effective drug, mebendazole, has been used for treatment since the late 1970s, the reported incidence of these parasites has gradually decreased\textsuperscript{6}) and they have not been found in our hospital since 1990.

Humans become infected with \textit{M. yokogawai} by ingestion of fresh-water fish. The incidence of \textit{M. yokogawai} (and/or \textit{H. heterophyes}) is still high in 1994–96, as shown in Table 1. In addition, the number of non-pathogenic \textit{Gonapodasmius} sp. increased significantly. Parasitic infections related to the ingestion of raw fish have shown a rising incidence in recent years.

Similarly, tapeworm larvae encysted within the tissues of salmon and trout (\textit{D. latum}) and in whitebait (\textit{D. grandis}), are a threat to people who eat sashimi and sushi. Patients become aware of their infection after noticing segments of the tapeworms in their stool, which leads to a visit to clinic or hospital for chemotherapy. The physicians in clinics tend to recommend the patients to our hospital for treatment, which consists of a combination of an effective drug (praziquantel) and Golytery\textsuperscript{7}). Because infected individuals are referred to a few central facilities for treatment, the incidence of tapeworm infections seems to have apparently increased in 1994–96.

Only one case of \textit{A. lumbricoides} infection was detected during 1985–93. However, 4 cases were found during 1994–96, all of whom were infected with a single \textit{Ascaris}. \textit{Ascaris} infection is very important because migration of adult worms through Vater’s ampulla can cause biliary tract obstruction, pancreatitis and hepatic ascariasis\textsuperscript{8}). Fujita reported that the use of human excreta may accelerate environmental contamination with \textit{Ascaris} eggs because the spread of raw sewage on vegetable fields has increased 3-fold since 1988\textsuperscript{9}). He also pointed out that imported vegetables possibly contaminated with eggs may be related to the recent increase in \textit{Ascaris} infections\textsuperscript{9}). However, whether the \textit{Ascaris} infections were due to ingestion of home-grown or imported vegetables could not be established by the patients’ history.

The increase in parasitic infections is also related to travel abroad. Two cases of \textit{O. viverrini} were found during 1994–96, in individuals from Vietnam and Thailand. One of the individuals was also infected with \textit{Giardia lambia}. The \textit{S. haematobium} found in 1996 undoubtedly was an imported case. The patient was diagnosed as having dengue fever, although ova of the parasite were first detected both in urine and feces. The imported cases indicate that not only single infections of parasites but also mixed infections with bacilli, viruses, and other parasites, must be considered. In addition, there was one case of \textit{C. parvum} infection diagnosed in 1996. Prior, \textit{S. haematobium} and \textit{C. parvum} had rarely been found in the stool in Japan, so these parasites can be considered as “emerging” species.

Recently, Sanmon reported that the incidence of parasitic cases had increased from 0.95\% to 7.95\% during 1991–1995\textsuperscript{10}). In the Kanto-Koshinetsu area (Eastern Japan), a medical technologist group recently reported that the incidence of \textit{M. yokogawai} (and/or \textit{H. heterophyes}), \textit{G. lamblia}, and \textit{A. lumbricoides} infections had increased, but not those of \textit{D. latum} (or \textit{D. grandis}) and \textit{O. viverrini}\textsuperscript{6}). Although their results are somewhat different from ours, we suggest attention should be paid to the parasitic infections, in particular the revival of \textit{Ascaris} and the newly emerging parasites such as \textit{S. haematobium} and \textit{C. parvum}.

Acknowledgments

We are grateful to Professor Y. Kaneda, Dr. W. Stahl and Dr. F. Osaka, Tokai University School of Medicine, for their helpful suggestions.
References