CASE REPORT

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A child with an acanthocephalan infection

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Acanthocephalan worms are endoparasites of animals. They form a unique phylum by virtue of their unique structure and extreme parasitic habits. Very few cases of human infection by these worms have been reported. We describe a 20-month old Saudi child with recurrent passage of long worms that were confirmed to be the acanthocephalan, *Moniliformis moniliformis*.

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Case

A 20-month-old Saudi girl from the Eastern Province of Saudi Arabia was brought to the outpatient department of the Sulaimanyah Children's Hospital, Riyadh, by her mother in January 2000. The mother complained that long worms were frequently seen in the baby's diapers in the preceding 2 months. On average, 1 to 2 worms were seen daily. The baby was also noted to have increasing perianal itching and poor appetite, but was otherwise healthy with no history of fever, vomiting, diarrhea, abdominal colic, or bleeding per rectum. There was no history of a similar problem in the family. The mother noticed the presence of cockroaches in the house and on several occasions the baby was seen ingesting cockroaches.

On examination the baby looked well. The growth chart parameters were within the fiftieth percentile. Apart from some perianal redness, the rest of the examination was normal. Laboratory investigations revealed a hemoglobin level of 118 g/L (normal, 96-154), mean corpuscular volume (MCV) of 75.5 fL (normal, 67-89), and white blood cells of 6.9 x 109/L (normal, 3.7-12.9 x 109), with 36% polymorphs, 58% lymphocytes, 6% monocytes, and no eosinophils. Stool culture was negative. Stool examination confirmed the presence of a worm, which at first sight was mistaken as *Ascaris lumbricoides*. A careful examination of the worm revealed a complete adult worm that was 133 mm in length and 2 mm in diameter, creamy in color and beaded in appearance (Figure 1). Stool microscopic examination showed ova that were 100 (m in length and 65 (m in width, with three distinct envelopes and internal hooks, typical for the morphology of Moniliformis moniliformis ova (Figure 2). The worm was transferred into several drops of lactophenol on a slide and left for 30 minutes, after which, examination of the anterior end of the worm showed a retracted proboscis armed with hooks (Figure 3). Representative histological longitudinal (Figure 4) and transverse (Figure 5) sections of the worm were examined under the microscope. The worm had a smooth tegument, thick hypodermis, an outer circular and an inner longitudinal layer of somatic muscle. Many developing ova were seen in the body cavity (Figure 4). Also noted was a complete absence of the digestive tract and circulatory system. All of these features confirmed that this worm was *Moniliformis moniliformis*. The patient received mebendazole 100 mg twice daily for 3 days, following which the worms disappeared for only two days to reappear again afterwards. Another 3-day course of mebendazole was given one week after the first. Two-weeks later the mother noticed complete

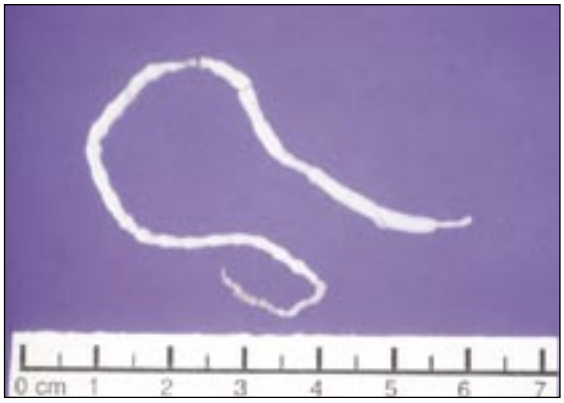

Figure 1. Complete adult female *Moniliformis moniliformis* worm, 133 mm in length and 2 mm in diameter. The worm has a pseudosegmented appearance.

Figure 2. Unstained egg (100 µm long x 65 µm wide) of Moniliformis moniliformis worm containing a mature embryo with internal hooks.

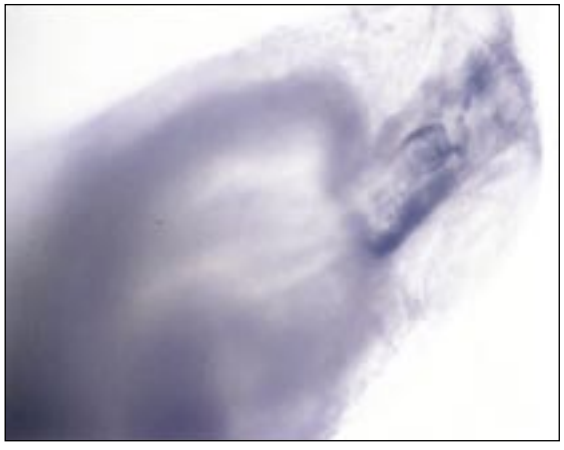

Figure 3. Anterior end of Moniliformis moniliformis worm showing retracted proboscis.

disappearance of the worms. Stool examination was repeated on several occasions (2, 4, and 6 weeks after the second treatment course) and was negative for both ova and parasites.

Discussion

Parasites of human importance are classified into five major subdivisions: protozoa (amebae, flagellates, ciliates, sporozoae, coccidians, microsporidians), platyhelminthes or flat worms (cestodes, trematodes), achelminthes or nematodes (round worms or pinworms), arthropoda (insects, spiders, mites, ticks), and acanthocephala or thorny-headed worms (*Moniliformis moniliformis*, *Macracanthorhyncus hirudinaeceus*,*Macracanthorhynchus ingens*,*Acanthocephalus bufonis*, *Corynosoma strumosum*, *Acanthocephalus rauschi* and *Bolbosoma*).[1]

Acanthocephalan worms are all endoparasitic organisms. They form a unique phylum by virtue of their structure and extreme parasitic habits. They were named Acanthocephala by Koelruther on 1771. They were initially lumped into the Aschelminthes, but Hymen removed Acanthocephala from Aschelmithes and considered them a separate phylum.[2] The body wall of Acanthocephala has a completely different type of structure when compared to other helminths. The presence of canals in the tegument and the arrangement of deeper layers of the body wall are distinctive features. The absence of a digestive tract, true coelom, and circulatory system are also characteristics of acanthocephalan worms that help in differentiating them from nematodes and cestodes. Food is characteristically taken up across the body wall. They have a spinous retractile proboscis and a nerve ganglion associated with the proboscis. Sexes are separate, and male worms are distinguished from female worms by their smaller size and muscular copulatory bursa. The length of the adult worm ranges from a few millimeters to over 60 centimeters. It has an unsegmented elongated cylindrical or spindle-shaped body that is attenuated at both ends. The structure is irregularly roughened by transverse ridges, which give a pseudo-segmented appearance. The anterior end of the body (praesoma) is modified into a hook-bearing retractable proboscis, which serves as an attachment to the intestinal wall. The posterior end (metasoma) includes the other organs and tissues of the body. The body wall consists of five layers, a thin outer epicuticle, a tough cuticle penetrated by numerous pores that lead into a canal of the striped layer which merges into the fibrous felt layer. The innermost layer of the body wall is the

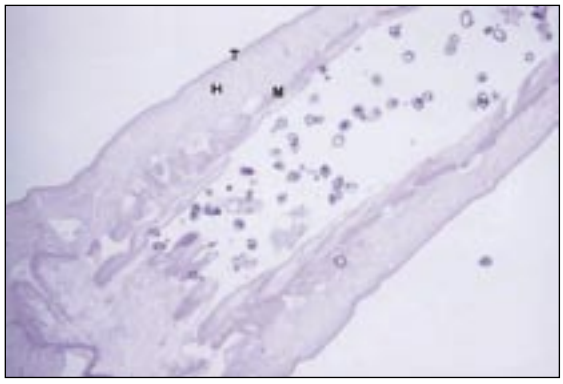

Figure 4. Longitudinal section through an adult female Moniliformis moniliformis worm demonstrating many developing eggs in the body cavity. T: thin tegument, H: thick hypodermis, M: an outer circular and an inner longitudinal layer of somatic muscles.

thickest layer and is referred to as the radial layer.[1]

With the exception of the egg stage, acanthocephalan worms are always parasites of the intestine of their vertebrate definitive hosts. The definitive hosts vary according to the species. For instance, *Moniliformis moniliformis* is a parasite of rats, mice, hamsters, dogs, and cats (definitive hosts), with beetles and cockroaches serving as intermediate hosts; *Macracanthorhyncus hirudinaeceus* is a parasite of wild and domestic pigs and dogs and cats, with beetles serving as intermediate hosts; *Bolbosoma* is a parasite of fish and sea mammals, with crustaceans serving as the intermediate hosts. Eggs are evacuated in feces and deposited in the ground or water. On being ingested by the intermediate host, eggs hatch and develop through a number of stages in the arthropod midgut. The acanthor, the first larval stage, which hatches from the egg in the intestine of the arthropod intermediate host, is provided with hooklets that are employed in boring through the gut wall into the hemocoel where the acanthor metamorphoses into a second-stage larva, the acanthella, which gradually acquires a proboscis and rudiments of other structures of the mature worm. The last immature stage in the arthropod host is the cystacanth, in which the rudiments of structures become recognizable as those of the adult worm. On ingestion of the infected arthropod the appropriate vertebrate host acquires the infection and the worm develops to maturity and mates and begins to lay eggs.[1]

Several species from this phylum have been reported to cause human infection including *Moniliformis moniliformis, Macroacanthorhyncus hirudinaeceus, Bolbosoma, Macracanthorhynchus ingens, Acanthocephalus bufonis, Corynosoma strumosum, and Acanthocephalus rauschi*.[1] *Moniliforms moniliformis*, also known as *Echinorhynchus moniliformis* and *Moniliformis dubius*, has a cosmopolitan distribution. Male worms are 4 to 13 cm and female worms are 10 to 27 cm long. The cylindrical proboscis has 12 to 15 rows of curved hooks. The ellipsoidal eggs (85-118 (m x 40-52 (m) have three envelopes and four hooklets. Man is an accidental host. Children probably acquire infection of *Moniliformis moniliformis* by ingesting cockroaches and beetles containing infective larvae.[3]

Cases of human infection by *Moniliformis moniliformis* have been reported from Iran, Rhodesia, Egypt, Iraq, the United States of America, Australia, and Nigeria.[4-11] Reported manifestations varied from asymptomatic passage of worms, to loss of appetite, weight loss, severe abdominal pain, diarrhea, fever, general malaise, vomiting, retarded development, and irritability.[4-12] The diagnosis in these reports was usually established by identifying adult worms or eggs of *Moniliformis moniliformis* in the feces. The presence of an armed, retractable proboscis, and the absence of the digestive tract, true coelom, and circulatory system, distinguish intact adult acanthocephalans from other helminthes. Treatment with different antiparasitic drugs including pyrantel pamoate, extract of aspidium, mebendazole, niclosamide had variable results.[8-12] In this case report, treatment with two courses of mebendazole (3 days each) separated by one week, lead to cure.

In conclusion, *Moniliformis moniliformis* is a cosmopolitan intestinal parasite of animals that may accidentally infect humans by ingestion of larvae-con-

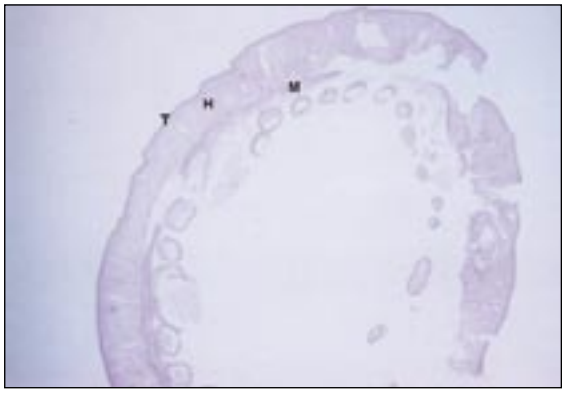

Figure 5. Transverse section through an adult female Moniliformis moniliformis worm. T: thin tegument, H: thick hypodermis, M: an outer circular and an inner longitudinal layer of somatic muscles.

taining cockroaches and beetles. It must be included in the differential diagnosis of large worms passed rectally and be particularly differentiated from *Ascaris* worms by careful laboratory examination of the eggs and the adult worms.

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