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A *Gordius* Worm Found in a Three Year Old Girl's Vomitus

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Since the *Gordius* worm is a parasite of crickets and several arthropods, cases of humans infected with this worm have been rare and accidental. A *Gordius* worm was obtained from a three-year-old girl who consulted a local clinic in Gwangju, Kyunggi-do, Korea. She lived in a rural area, and had eaten an insect that looked like a cricket. She expelled the worm in vomitus 15 minutes later; in fact, she expelled two worms, but one was discarded. The worm had a grayish white color and an intact outer surface. It was 16 cm in length and 0.6 cm wide. The posterior end of the worm was spirally enrolled and furcated into two caudal lobes, which were nearly cylindrical but showed a somewhat concave medio-ventral surface. The cloacal aperture was round and situated anterior to the point of bifurcation of the lobes. The cloacal aperture was encircled by a dark ring, which was a little removed from the aperture. The crescent fold was reddish brown, and no hairs were noticed over the entire body surface. The worm had the morphological features of a male *Gordius*. Accidental human cases involving the *Gordius* worm are rare and this is the first such case in Korea.

Key Words: *Gordius*, case, Korea

INTRODUCTION

Nematomorphs are a phylum of animals that have been poorly studied. Despite their world-wide distribution, the life cycle details of the nematomorph life cycle are poorly documented. The *Gordius* worm belongs to the phylum Nematomorpha. Adults of the class Gordioidea, also commonly known as hair worms or gordian worms, are usually found emerging from insects, although a variety of other animals are known to serve as definitive hosts. The adults are elongated wiry worms, measuring from 10 to 50 cm in length, with bluntly rounded anterior ends. The caudal end of the male is either bifurcated or has a dorso-ventral groove. The *Gordius* worms are parasitic in their larval stages, and their hosts include the mantis and some carnivorous or omnivorous species of orthoptera and coleoptera.[1,2] Records of human accidental parasitism with *Gordius* are uncommon in literature, though many have been identified in different parts of the world from specimens recovered from the mouth, urethra, and anus.[3-8] Of the genus *Gordius*, two species have been reported in Korea: *G. robustus* and *G. lineatus*.[9,10] This report deals with a species of *Gordius* worm, which was vomited by a three-year-old girl.

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CASE REPORT

A three-years-old girl, living in rural area, vomited two *Gordius* worms with vomitus in November, 2000. Her mother observed that the girl ate a worm, which looked like a cricket about 15 minutes before vomiting, and brought a worm to a local clinic. It was preserved in 10% formalin before examination. Clinical examination, X-ray,

blood examination and psychologic examination of the girl showed no abnormality. For identification, the worm was sent to our laboratory.

Naked eye and microscopic examinations revealed the typical morphological features of a *Gordius* worm. The specimen measured 16 cm in length and had a uniform width of about 0.6 cm. The body was a whitish yellow in the preserved condition. The body was cylindrical and of the shows same diameter along its whole extent, though somewhat narrowed anteriorly (Fig. 1A). The posterior end of the male worm was spirally enrolled and furcated into two caudal lobes, which were nearly cylindrical, though somewhat concave on their medio-ventral surface. A crescentic-shaped transverse cuticular ridge was situated on the ventral side of the anterior ends of the caudal lobes, which had a posteriorly directed V-shaped sharp edge. The cloacal aperture was round and situated anterior to the point of the bifurcation of the lobes. A dark ring encircled the cloacal aperture, though at a short distance from the aperture. The crescentic fold (the post-cloacal cuticular ridge) was reddish brown in color. On the surface of cuticle areoles were absent and the whole body was free of surface hair (Fig 1B). The calotte of the anterior parts was white and the mouth was absent on the anterior tip (Fig. 1C). The sections at the 2/3 posterior part of the worm demonstrated that the worm had a cuticle (30 ㎛ in thickness) and musculature (60 ㎛) of a type peculiar to *Gordius* worms, having a more of less thin homogenous smooth outer cuticle, followed by a second thick layer of crossing diagonal fibers, third thin layer of nucleated, glandular and nerve elements constituting the hypodermis, and finally a very thick layer of muscle fibers. Two testis (200 × 350 ㎛) encircled with parenchyma and sperm were also observed.

The ventral nerve cord (65 ㎛) was placed below the testis under the muscle layer (Fig. 1D).

DISCUSSION

Members of the class Gordiacea belong to two recognized families, Gordiidae and Chordodidae. The former has a smooth cuticle, and body bris-

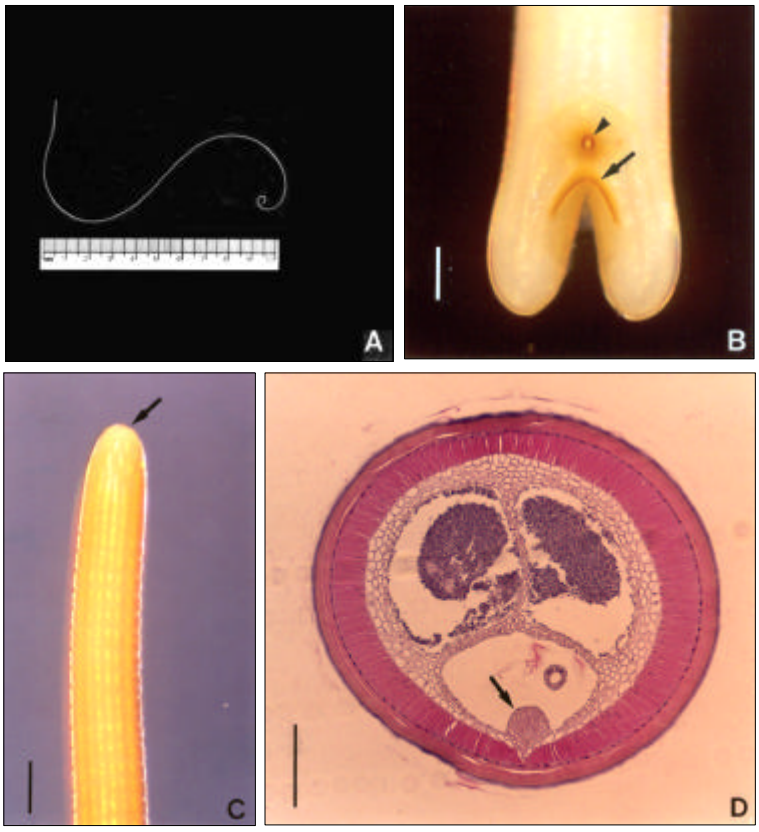

Fig. 1. Gross and microscopic findings. (A) A male *Gordius* worm vomited by the 3-year old girl. (B) Bi-lobed posterior part of the male *Gordius* worm (0.6 cm diameter) shows the cloacal aperture (arrowhead) and the crescentic fold (arrow). (Bar=200 ㎛). (C) Anterior part the male *Gordius* worm showing the calotte (arrow). (Bar=500 ㎛). (D) A cross section showing the characteristic structure of the cuticle, musculature, parenchyma, and of the ventral nerve cord (arrow) at the 2/3 posterior part of the worm (H & E staining, Bar=100 ㎛).

tles, when present, are derived from cuticular fibers; the posterior end of the male has two postanal projections and a postanal crescent; that of the female is entire. All species of this family belong to the genus *Gordius*. In the second family the cuticle is rough with true areoles; tubercles and bristles arise from a non-fibrous cuticle; the posterior end of the male is bifurcated or grooved, but without a postanal crescent; that of the female is either entire or trifurcated. The recognized genera include: *Chordodes, Paragordius, Parachordodes, Neochordodes,* and *Pseudogordius*.[1,11-13] Of the *Gordius* species, *G. robustus* and *G. lineatus* have been previously reported in Korea.[10] The latter species is easily identified by a dorsal and ventral line. These lines are distinctly darker than the rest of body, especially at the anterior part, but fade posteriorly. The dorsal line may be traced to the base of the tail lobes, whereas the ventral line disappears a short distance before the cloacal aperture. Both the species have many bristles on the anterior and posterior parts. Lighter spots were scattered over whole worm's body.[10]

However, our worm was more closely allied with the European *G. aquaticus* and *G. robustus*, as it had no areoles on the surface of the cuticle, but differed from the true Europian *G. aquaticus* because it did not possess a row of hairs around the male cloacal aperture, or a white spot on the cuticle.[14] On the other hand, *G. robustus* has short hairs over the whole body, especially on anterior and posterior parts, while our worm had no hairs. In addition, whereas the crescentic fold shape of *G. robustus* is wide and round, our worm had a V-shaped crescentic fold with a posteriorly directed sharp edge.[7,10] We believe that our worm may be one of a new species, *G. nudatus*, because the most distinct feature of this new species is the lack of bristles over the entire body and no ventral dorsal lines. This species was discovered by Baek and reported as a thesis with the title "Systematic studies on Gordioidea and Morphologic studies on *Chordodes koreansis* n.sp. in Korea" in 1990 in Korea (unpublished). It was described as a new species and named the worm *G. nudatus*. In Korea, there may be three species of *Gordius*, namely *G. lineatus, G. robustus*, and this species.

The life cycles of *Gordius* worms have been confirmed by several experiments and reports. The sexually mature *Gordius* worms mate in water, where the eggs are laid in strings. Development of the embryo within the eggshell requires about one month. The motile larva, which has a protrusible proboscis, is armed with three retractile stylets and three circlets of spines. These larvae first adopt an aquatic life-style but later actively bore their way indiscriminately and opportunistically into living animal tissue. In inappropriate hosts, they are said to encyst and usually fail to develop further. However, in suitable hosts, which include amphibious insects or those that accidentally contact the water, they metamorphose over a period of several months into juvenile thread-like worms in the body cavity of the host. Later they emerge into the water, rapidly mature and perform their sexual processes. *Gordius* worms facultatively utilize carrier hosts, such aquatic insect-larvae and insect hosts to complete the life cycle. Free juvenile *Gordius* worm larvae on hatching out of eggs in the water or those ingested by carrier hosts are not highly resistant to environmental conditions, and cannot survive if they are ingested by an unsuitable host.[1,2,15-17]

In general, it is matter of conjecture as to how this worm managed to infect a human. The girl who vomited these *Gordius* worms was able to play outside, and on that day, she had eaten an insect, so it is possible that she had been infected by eating crickets or beetles harboring well-developed young *Gordius* worms. No doubt, the present case was one of accidental parasitism, as has been the case with other infections involving this species. Most of the *Gordius* worm infections confirmed in Korea have been attributed to *Gordius robustus*. In this case, we found that the worm was an unknown species. This study is the first to report upon such a case in Korea.

REFERENCES

1. Thomas CC. The biology of Animal Parasites. Tokyo, Japan: W.B Saunders company Philadelphia and London, printed by Toppan printing company limited; 1964. p.378-89.
2. Bolek MG, Coggins JR. Seasonal occurrence, morphology, and observations of the life history of *Gordius* difficilis (Nematomorpha: Gordioidea) from southeas-

tern Wisconsin, United States. J Parasitol 2002;88:287-94.
3. Wei D, Yang W. Parachododes sp. (Nematomorpha) Human infestation of the lower urinary tract: The first case report in China. Acta Acad Med Wuhan 1981;1: 40-5.
4. Saito Y, Inoue I, Hayashi F, Itagaki H. A hairworm, *Gordius* sp., vomited by a domestic cat. Nipppon Juigaku Zasshi 1987;49:1035-7.
5. Durval TL, Campelo M. Accidental parasitism of man with two Gordiids. Rev Inst Med Trop Sao Paulo 1975; 17:390-3.
6. Herter CD, Nesse RE. Pseudoparasitism with *Gordius robustus*. Am Fam Physician 1989;39:139-42.
7. Sayad WY, Johnson VM, Faust EC. Human parasitization with *Gordius Robustus*. J Am Med Assoc 1936; 106:461-2.
8. Alikhan FEA, Alikhan Z. *Paragordius varius* (Leidy) (Nematomorpha) infection in man: A case report from Quebec (Canada). J Parasitol 1977;63:174-6.
9. Cho BS. Taxonomy of zoology. Seoul: Hong Ji Sa; 1959. p.189. in Korean.
10. Baek KM, Noh YT. Two Species of Genus *Gordius* (Gordioidea, Nematomorpha) From Korea. The Korean J Systematic Zoology 1992;8:223-30.
11. Carvalho JCM. Studies on some Gordiacea of north and south America. J Parasitol 1942;28:213-22.
12. Villalobos CD, Voglino D. Description of *Gordionus porosus* n. sp. and redescription of *Gordionus ondulatus* (Nematomorpha, Parachordodinae) with scanning electron microscopy. J Parasitol 2000;86:358-65.
13. Smith DR, Watson DD, Clevenger RR, Mcbride RC. *Paragordius varius*. Arch Pathol Lab Med 1990;114: 981-3.
14. Malmqvist B, Moravec F. *Gordius aquaticus* larvae found in the lampreys *Lampetra planeri* (Bloch) and *L. fluviatilis* (L.). Folia Parasitol 1978;25:40.
15. Hanelt B, Janovy J. The life cycle of a horsehair worm, *Gordius robustus* (Nematomorpha: Gordioidea). J Parasitol 1999;85:139-41.
16. Poulin R. Observation on the free-living adult stage of *Gordius dimorphus* (Nematomorpha: Gordioidea). J Parasitol 1996;82:845-6.
17. Poulin R. Hairworms (Nematomorpha: Gordioidea) infecting New Zealand short-horned grasshoppers (Orthoptera: Acrididae). J Parasitol 1995;81:121-2.