CASE REPORT

Four Human Cases of Acanthotrema felis (Digenea: Heterophyidae) Infection in Korea

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Abstract: Acanthotrema felis is an intestinal trematode of cats originally reported from the Republic of Korea. Only 1 human case infected with a single adult worm has been previously recorded. In the present study, we report 4 human cases infected with a total of 10 worms recovered after anthelmintic treatment and purging. All 4 patients reside in coastal areas of Jeollanam-do, Korea, and have consumed brackish water fish including the gobies, Acanthogobius flavimanus. The worms averaged 0.47 mm in length and 0.27 mm in width, and had 3 sclerites on the ventrogenital sac; 1 was short and thumb-like, another was long and blunt-ended, and the 3rd was long and broad-tipped. They were identified as A. felis. Sohn, Han, & Chai, 2003. Surveys on coastal areas to detect further human cases infected with A. felis are required.

Key words: Acanthotrema felis, human infection, intestinal fluke, heterophyid fluke

INTRODUCTION

The genus Acanthotrema (Digenea: Heterophyidae) are intestinal parasites of fish-eating birds and mammals [1]. Acanthotrema acanthotrema, the type species, was originally described from a bird (Sterna maxima) in 1928 in Brazil [2], and other species were subsequently documented. Currently, 8 species are included in this genus: A. acanthotrema, A. armata, A. cursitans, A. felis, A. hancocki, A. martini, A. tanayensis, and A. tridactyla [1]. The newest species is A. felis, which was described in 2003 from the small intestine of stray cats in the Republic of Korea [1]. Various brackish water fish have been reported to be the second intermediate host for Acanthotrema species including the mud sucker Gillichthys mirabilis and the Southern California killifish for A. hancocki [3] and the goby Acanthogobius flavimanus for A. felis [4].

The geographical locality of Acanthotrema spp. is wide. For example, A. acanthotrema has been reported from Brazil [2], A. hancocki, A. martini, and A. cursitans from the United States [3,5,6], A. tridactyla from Egypt [7] and Kuwait [8], A. armata from Spain [2], A. tanayensis from the Philippines [9], and A. felis from Korea [1]. The definitive hosts for A. acanthotrema, A. armata, A. hancocki, and A. martini are birds, including sea gulls, and those of A. felis, A. cursitans, and A. tanayensis are mammals, particularly cats [1]. A. tridactyla can experimentally infect kittens [8] and chicks [7].

Human infections have never been reported in Acanthotrema spp., with the exception of A. felis [10]. A 70-year-old man residing in Muan-gun, Korea, expelled a single adult worm of A. felis after praziquantel treatment, together with 148 Heterophyes nocens, 65 Gymnophalloides seoi, 30 Stictodora fuscata, 1 Stictodon lari, and 1 Stellantchasmus falcatus [10]. We describe here 4 additional human cases naturally infected with A. felis in southern coastal areas of Korea.

CASE RECORD

During surveys of human intestinal flukes in Shinan-gun (1990), Muan-gun (1995), and Yeongam-gun (2003), Jeollanam-do, Korea, small trematode egg (STE) positive cases in Kato-Katz fecal smears were subjected to adult fluke collection after anthelmintic treatment and purging. Briefly, praziquantel at a dose of 10-15 mg/kg was orally administered and an hour later the patient was given 30 g of magnesium sulfate. All the diarrheic stools were collected from each case for 4-5 hr and examined under a stereomicroscope. The fluke specimens, if
positive, were morphologically examined using a light microscope. Informed consent was obtained from each patient regarding the adult worm recovery.

Ten specimens of *A. felis* were recovered from 4 patients (1-7 per person, average 2.5 worms) (Table 1). All 4 patients were commonly infected with other heterophyid flukes including *H. nocens*, *Pygidiopsis summa*, *S. fuscata*, and *Heterophyopsis continua*. The number of specimens of the aforementioned fluke species was much higher than that of *A. felis* (Table 1). The patients were suffering from vague abdominal discomfort and indigestion, sometimes accompanied by frequent stool, lethargy, and anorexia. However, it was considered that these symptoms were not necessarily due to *A. felis* infection. The patients had habitually eaten raw flesh of brackish water fish, such as the mullet and goby.

**Table 1.** *Acanthotrema felis* and other trematode specimens recovered from the patients

| Patient code | Age/sex | Residence  | Date     | No. of *A. felis* specimens recovered | Other flukes recovered (no. of specimens) |
|--------------|---------|------------|----------|---------------------------------------|-------------------------------------------|
| A            | 36/M    | Shinan-gun | Feb. 1990| 7                                     | *H. nocens* (86), *P. summa* (33), *S. fuscata* (5), *H. continua* (1) |
| B            | 56/M    | Shinan-gun | Feb. 1990| 1                                     | *H. nocens* (155), *P. summa* (16), *S. fuscata* (14) |
| C            | 50/M    | Muan-gun   | Jan. 1995| 1                                     | *H. nocens* (81), *P. summa* (70), *S. fuscata* (34) |
| D            | 54/M    | Yeongam-gun| Nov. 2003| 1                                     | *H. nocens* (146), *S. fuscata* (9) |

*H. nocens*, *Heterophyes nocens*; *P. summa*, *Pygidiopsis summa*; *S. fuscata*, *Stictodora fuscata*; *H. continua*, *Heterophyopsis continua*.

**Fig. 1.** (A) An adult fluke of *Acanthotrema felis* recovered from a patient. Acetocarmine stained. Bar = 45 µm. (B) Line drawing of the worm in Fig. 1A showing its internal organs. The same magnification as Fig. 1A. OS, oral sucker; Ph, pharynx; VS, ventral sucker; VGS, ventrogenital sac; SV, seminal vesicle; SR, seminal receptacle; Ov, ovary; T, testis; Vt, vitellaria.

**Brief description of worms**

The morphological characteristics and measurements (µm) of the recovered *A. felis* adults are as follows (Table 2). The worms were pear-shaped and were covered with fine tegumental spines, except near the posterior extremity (Fig. 1A, B). Their average body size was 472 in length (range, 405-510) and 269 (230-300) in width. These dimensions were slightly smaller than previously described [1]. The ventral sucker was embedded in the ventrogenital sac which had a distinct membranous covering. The ventrogenital sac was located in the median line, usually at the anterior end of the middle third of the body. Inside the ventrogenital sac, 3 sclerites were observed; 1 was short and thumb-like, 1 was long and blunt-ended, and 1 was long and broadly tipped (Fig. 1). In some specimens, minute spines were seen at the base of the sclerite complex. The gonotyl was U-shaped, unspined, located right to the
human cases, the number of worms recovered per individual was usually 1 with the present exception of 1 patient who expelled 7 worms. This strongly suggests that the human cases may be accidental infections. This low number of infected worms probably would not cause any harmful effect to humans. Humans may have innate resistance against this fluke, although this issue needs further clarification.

*A. felis* is morphologically close to other heterophyids such as *Stictodora* spp. However, *Acanthotrema* has fewer than 12 spines or sclerotizations, and *Stictodora* has more than 12 spines on the ventral sucker or ventrogenital sac [13]. It was not difficult to assign our specimens to *Acanthotrema* because they typically had 3 sclerotizations in the ventrogenital sac [1]. Other morphological characters included a submedian ovary, a bipartite seminal vesicle, a short prepharynx, absence of spines on the gonotyl, and the presence of 3 sclerites on the ventrogenital sac. *A. tanayensis* has 4 sclerites which are unarmed [9] and the sclerites of *A. acanthotrema* consist of 2 armed pieces and a third unarmed piece [2]. *A. tridactyla* has 3 sclerites having minute spines on the tip [7]. *A. armata* has 2 armed sclerites [2], and *A. carsiens* has 2 unarmed, branched sclerites [6]. *A. hancocki* and *A. martini* have 1 U-shaped sclerite [3,5]. The present specimens displayed 3 sclerites with spines on the tip, differing from *A. acanthotrema* and *A. tridactyla*, which have 2-3 clerites with minute spines on the tip. The shape of the sclerites in our specimens was slightly different from that in the original report of this species [1]. The sclerites in the original report consisted of 1 short, thumb-like piece and 2 long and pointed ones [1]. However, in our specimens, the sclerites consisted of 1 short and thumb-like piece, 1 long and broadly tipped piece, and 1 long and blunt-ended piece. We regard this as an intraspecific variation and identify our specimens as *A. felis*.

The present study is the second report on human *A. felis* infection following the report of Cho et al. [10]. This fluke should be included among the list of human-infecting foodborne intestinal flukes in Korea [14] and Asia [15]. Further studies are required to clarify the geographical distribution and host-parasite relationships of *A. felis* infection.

**CONFLICT OF INTEREST**

We have no conflict of interest related to this study.
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