

Two Cases of Human Infection by Adult of *Spirometra erinacei*

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tapeworm in Korea.

INTRODUCTION

Spirometra erinacei is a tapeworm of which adults occur in the intestine of cats or dogs and plerocercoids (spargana) are found from a variety of animals such as amphibia, reptiles, birds, and mammals including man (Faust *et al.*, 1929; Iwata, 1972). It is well known that when the plerocercoid infects man it takes no further development in intestine but migrates in tissues such as subcutis, muscle, eye, scrotum, brain, *etc.*; which state is called human sparganosis (Seo, 1978). Therefore, the adults of *S. erinacei* normally do not occur in man. However, in very rare occasions, 6 cases up to present, the adult worms were recovered from the intestine of man (Faust *et al.*, 1921; Suzuki *et al.*, 1982).

In Korea, although human sparganosis is relatively not uncommon (Cho *et al.*, 1974a & 1975), human infection by adult *S. erinacei* was never found. The authors re-examined the formalin-fixed proglottides of two diphyllbothriid tapeworms recovered from two young men residing in a mountainous village of Kangwŏn-do in 1974 and tentatively diagnosed as *Diphyllobothrium latum* (Cho *et al.*, 1974b). They are proved to be *Spirometra erinacei* (Rudolphi, 1819) and this paper firstly describes two cases of human infection by adults of this

CASES DESCRIPTION

Case 1: Byun, O.O., 24-year old male residing in Hoengsŏng-gun, Kangwŏn-do since birth. The diphyllbothriid eggs, 53-59 × 37-42 μ m in size and yellowish brown in color, were found from stool examination. He was treated with 500mg of atabrine followed by purgation with magnesium sulfate. After 3-4 hours several chains of tapeworm without scolex were collected from the diarrheal stools. He had the episodes of intermittent abdominal pain and epigastric discomfort but otherwise was healthy. He said that he had eaten raw flesh of several kinds of the snakes and fresh water fish but no kinds of brackish or marine fish.

Case 2: Cho, O.O., 21-year old male residing in the same village as Case 1. He also complained the symptoms of abdominal pain and discomfort and stool revealed diphyllbothriid eggs. He was treated by the same procedure as Case 1 and several chains of pseudophyllidean tapeworm without scolex were recovered. He also had the history of eating raw flesh of the snakes and fresh water fish.

PARASITOLOGICAL DESCRIPTION

The total lengths of the recovered segments

without scolices were about 72 and 50cm in Case 1 (Fig. 1) and Case 2 (Fig. 2) and the approximate numbers of proglottides 420 and 345 respectively. Observation and the measurements of internal organs were performed with whole mounts (acetocarmine stained) and longitudinal sections (H-E stained) of several gravid proglottides.

The proglottides wider than long (Figs. 3 & 4) and the gravid ones 6.63~7.08mm wide, 1.52~2.23 mm long and 0.43~0.52mm thick. Cirrus sac and its opening at anteromedian portion of each proglottid and 0.416~0.179mm in diameter. Vagina separately opened below the cirrus sac not forming a common sinus (Figs. 5, 6 & 8). Uterus not forming the rosette but spiral in shape with 2~3 coils (Figs. 3, 4 & 5) and with external opening (Figs. 6 & 8). Ovary transversely long in dumbbell shape near the posteriormost portion (Fig. 3). Vitellaria and testes distributed whole lateral fields (Figs. 3, 4 & 5) even at the junctional portion between proglottides (Fig. 7) and 0.044~0.055mm in diameter and 0.071~0.095×0.119~0.126mm in dimension respectively. Vitellaria superficial and testes deep in their locations (Fig. 7). Seminal vesicle behind the cirrus sac but entirely incorporated into the sac (Fig. 8).

Intrauterine eggs (Fig. 9), 0.061×0.039mm, and those in stool (Fig. 10), 0.056~0.039mm, in average size. Many of the eggs broadly oval and symmetrical in shape closely resembling *D. latum* but about 30~40% asymmetrical and slender in shape with slightly pointed one end.

DISCUSSION

The present cases were presented at the meeting of the Korean Society for Parasitology in 1974 under the tentative diagnosis of *D. latum* infections (Cho *et al.*, 1974b). However, the final report was deferred because of several doubtful points; smaller size of the proglottides, not rosette form uterus, atypical shape of eggs in stools, and no history of eating brackish or marine water fish. Recent detailed observations

on the whole mounts and longitudinal sections of the proglottides revealed that they are identical to *Spirometra erinacei* (Rud.).

The original generic name of *S. erinacei* was *Diphyllobothrium*. But Faust *et al.* (1929) proposed to divide it into two subgenera, *Diphyllobothrium* and *Spirometra*, enlisting some differential features in the morphology of uteri and eggs. Later Mueller (1937) elevated the latter to a generic level, which is agreed by many workers (Yamaguti, 1959; Schmidt *et Roberts*, 1981). As for the species of *Spirometra*, it was described by Iwata (1972) that 9 species among those reported from various areas including *S. mansoni* and *S. mansonioides*, seem to be all synonyms of *S. erinacei*, the type species. Yamaguti (1959) is also of the same opinion. The morphological characteristics of *S. erinacei* are spirally coiled uterus, separated vaginal opening from the cirrus sac, incorporated seminal vesicle into the cirrus sac, distribution of testes at the junction between proglottides, asymmetrical eggs with one pointed end (Faust *et al.*, 1929; Mueller, 1937; Wardle *et McLeod*, 1952; Iwata, 1972).

Human infection by the adult of Manson's tapeworm was firstly depicted by Faust *et Wessel* (1921) in China. They detected the eggs from a native of Kiukiang and one complete strobila at autopsy of another man in Shanghai. The strobila from man was later re-described as a new species, *Diphyllobothrium houghtoni* (Faust *et al.*, 1929). However, now it is regarded the synonym of *Spirometra erinacei* (Iwata, 1972). In Japan, the first human infection by adult of this tapeworm was reported by Iwata *et al.* (1967) from a 6-year old child. And afterwards 4 additional cases have been proved by identifying the worms (Iwata *et al.*, 1971; Okamura *et al.*, 1970; Suzuki *et al.*, 1982). Therefore, the total number of human cases with adult *S. erinacei* proved by worms are 8 in the Far East including the present two cases from Korea.

Although not certain, the source of infection in the present cases is likely to be the snakes

which they said to have eaten. In Korea, the snakes and the frogs are well known as the most important reservoir hosts of the spargana of *S. erinacei* (Cho *et al.*, 1973 & 1975; Kim *et Shin*, 1975; Kim, 1983). The 5th human case in Japan (Suzuki *et al.*, 1982), 37-year old man, had the history of eating the frogs which were suggested to have been the source of infection.

However, as stated already, the spargana introduced orally to man take no development in intestine but penetrate into intestinal wall and go through various organs causing sparganosis. Therefore, what kinds of factors have enabled the establishment of adult worms in human intestine is hardly explained. A suggestion by Iwata *et al.* (1971) is that certain altered chemical or enzymatic environment of human gut might be responsible for the unusual maintenance and development of spargana in the intestine. In this respect, attentions should be paid hereafter to such extremely rare condition of human infection by adult *S. erinacei*.

SUMMARY

Two cases of human infection by adult *Spirometra erinacei* were proved by collection of worms in Korea. The patients were 24 and 21-year old males residing in a mountainous village in Kangwŏn-do. They had the clinical complaints of abdominal pain and epigastric discomfort, revealing the diphyllbothriid eggs, 53~59×37~42μm in size, in their stools. They were treated with 500 mg atabrine and purgated with magnesium salts, and 3~4 hours later several chains of tapeworm segments were recovered from the diarrheal stools.

The recovered worms revealed the morphological characteristics of spiral-form or coiled uteri, separated vaginal opening from the cirrus sac, incorporated seminal vesicle into the cirrus sac, distribution of testes at the junction between proglottides, asymmetrical eggs with one pointed eggs, *etc.* and were identified as *Spirometra erinacei* (Rudolphi, 1819). The cases

had the history of eating raw flesh of the snakes and these are considered the source of infection.

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＝國文抄錄＝

만손裂頭條蟲 成蟲에 의한 人體感染 2例

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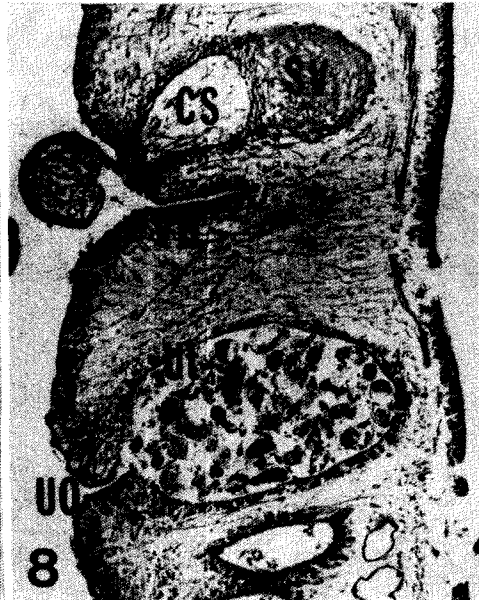
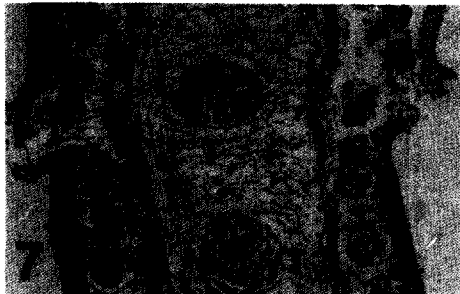
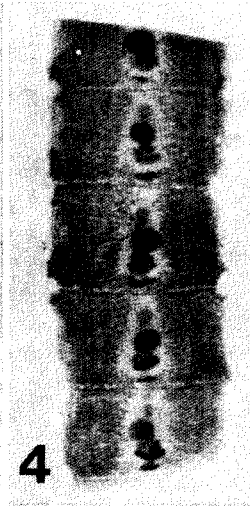
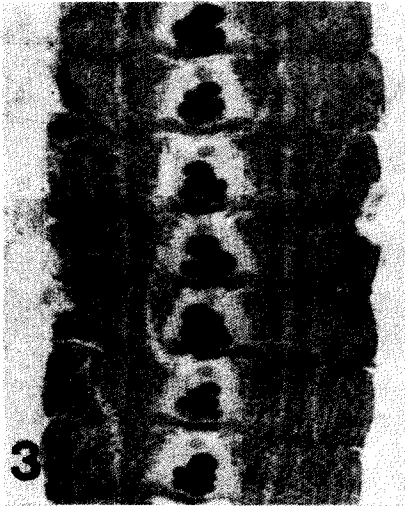
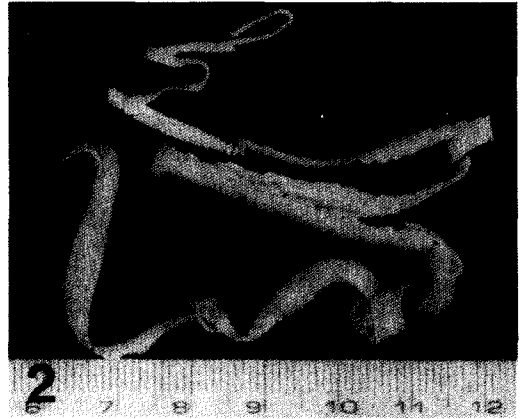
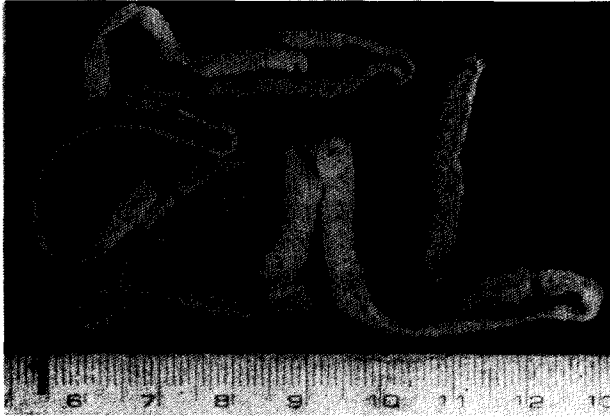
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만손裂頭條蟲(*Spirometra erinacei*)의 成蟲에 의한 人體感染 2例가 투약후 蟲體를 수집함으로써 확인되었다. 환자는 江原道 산간지방에 거주하는 24세 및 21세 남자로 腹痛 및 上腹部 痛症이 있다고 하였으며 대변에서는 크기 53-59×37-42 μ m의 條蟲類 蟲卵이 발견되었다. 치료를 위해 atabrine 500mg과 下劑를 투여한 바 3~4시간후 泄瀉便으로부터 條蟲類 片節이 다수 수집되었다.

수집된 蟲體는 螺線型 子宮, 陰口(vaginal opening)가 陰莖囊(cirrus sac)으로부터 분리되어 開口된 점, 貯精囊(seminal vesicle)이 陰莖囊內로 포함된 점, 片節의 이음새부위에도 辜丸이 分布하는 점, 蟲卵이 길고 한쪽 끝이 뾰족한 경향이 있으며 비대칭형인 점 등으로 *Spirometra erinacei*(Rudolphi, 1819)로 同定하였다. 환자는 모두 뱀을 날로 먹은 경험이 있으며 따라서 뱀이 感染源이었을 것으로 추측된다.



EXPLANATION FOR FIGURES

- Fig. 1.** The segments of *S. erinacei* recovered from Case 1.
- Fig. 2.** *Ibid* from Case 2.
- Fig. 3.** Seven proglottides of *S. erinacei* from Case 1. Whole mount. Note the cirrus sac at anteromedian portion of each proglottid and spiral or coiled shape of uteri. $\times 8$.
- Fig. 4.** Five proglottides from Case 2. The number of uterine coils is 3 in each proglottid. $\times 8$.
- Fig. 5.** Magnification of two proglottides from Case 1. Whole mount. Note the cirrus sac with cirrus opening (large arrow) and vaginal opening (small arrow) beneath it. $\times 60$.
- Fig. 6.** Magnification of anteromedian portion of a proglottid of *S. erinacei* from Case 2. Whole mount. The cirrus (CO) and vaginal (VO) openings are separated and the uterine opening (UO) is seen beneath them. $\times 120$.
- Fig. 7.** Longitudinal section showing uninterrupted testes (T) between two proglottides from Case 1. Note the superficially distributing vitelline follicles (arrows). H-E stain. $\times 120$.
- Fig. 8.** Longitudinal section at middle portion of a proglottid from Case 1. Note the separated cirrus and vaginal openings (VO) and incorporated seminal vesicle (SV) into the cirrus sac (CS). Uterine opening (UO) and uterus (Ut) with many eggs are seen. H-E stain. $\times 120$.
- Fig. 9.** An intrauterine egg of *S. erinacei* from Case 2. It is asymmetrical in shape with a little pointed anterior end.
- Fig. 10.** Another egg of *S. erinacei* from stool of Case 1. Note asymmetrical shape with one pointed end and apical knob.