

Studies on Intestinal Trematodes in Korea

XII. Two Cases of Human Infection by *Stellantchasmus falcatus**

Byong-Seol Seo, Soon-Hyung Lee, Jong-Yil Chai and Sung-Jong Hong

*Department of Parasitology and Institute of Endemic Diseases,
 College of Medicine, Seoul National University*

INTRODUCTION

The flukes of the family Heterophyidae are minute intestinal trematodes of fish-eating birds and mammals. Natural and/or experimental human infections have been recorded in more than 25 species of 8 genera belonging to this family (Seo, 1979). It is generally accepted that mild gastrointestinal troubles such as abdominal pain and diarrhea are the main clinical symptoms due to these fluke infections. However, it was reported that several species of the genera *Haplorchis*, *Stellantchasmus* and *Procerovum* may cause visceral spreading of their eggs and fatal erratic parasitism in heart, brain and spinal cord (Africa *et al.*, 1940).

Stellantchasmus falcatus, one of these species, was firstly described by Onji *et Nishio* (1915) from the cats experimentally fed with the mullets (*Mugil cephalus*) harbouring the metacercariae. Human infections by this fluke have been reported in Japan, the Philippines, Thailand and Hawaii (Africa *et Garcia*, 1935; Alicata *et Schattenburg*, 1938; Glover *et Alicata*, 1957; Kagei *et al.*, 1964; Kliks *et Tantachamrun*, 1974; Tantachamrun *et Kliks*, 1978). But no case was found in Korea. In the present paper the authors report two natural human cases of *S. falcatus* by obtaining adult worms after treatment with praziquantel.

CASES DESCRIPTION

Case 1: Han, O.O., 24-year old male residing in Seoul and whose native village is a coastal area of Kohŭng-gun, Chollanam-do (Case 2 of Chai *et al.*, 1984). He visited Out-patient Department of Internal Medicine, Seoul National University in August 1983 with the clinical complaints of easy fatiguability, palpitation, weakness, indigestion, diarrhea and abdominal pain. Auscultation on chest revealed cardiac arrhythmia with grade II-III systolic murmur at apex and left sternal border. The electrocardiographic (EKG) diagnosis was ventricular premature beat. Stool examination revealed positive for the eggs of *Diphyllbothrium latum* but not for heterophyid eggs. He was referred to our Department for treatment of tapeworm infection and given 15mg/kg praziquantel (Distocide) and 30 g magnesium sulfate for purgation. Concomitantly with one complete strobila of *D. latum* (Lee *et al.*, 1983), 4 kinds of heterophyid flukes were collected through stereomicroscopy of the diarrheal stools. The flukes collected were 188 specimens of *Stellantchasmus falcatus*, 67 of *Heterophyes heterophyes nocens*, 2 of *Heterophyopsis continua* and 2 of *Stictodora* sp., but this paper only concerns with *S. falcatus* infection. He said he had eaten raw flesh of brackish water fish such as mullets, perches (*Lateolabrax japonicus*) and gobies (*Acanthogobius flavimanus*).

Case 2: Yang, O.O., 55-year old male residing in Seoul. He visited our Department in December 1983 because of indigestion and discharge

* This study was supported by the Grant from the Ministry of Education, Republic of Korea (1983)

of tapeworm segments since 6 months before. Stool examination revealed only the eggs of *Taenia* sp. He was treated with 20mg/kg praziquantel and purgated with 30 g magnesium sulfate, and one strobila of *T. saginata* without scolex was recovered from the diarrheal stools. But concomitantly with the tapeworm, 5 minute heterophyid flukes were collected through stereomicroscopy and they were identified as *S. falcatus*. He said he used to eat raw flesh of beef, pork and brackish or marine water fish.

PARASITOLOGICAL DESCRIPTION

Stellantchasmus falcatus Onji et Nishio, 1915:

A total of 15 formalin-fixed worms from Case 1 and Case 2 were observed and 10 worms from Case 1 were measured (Table 1). Body small, pyriform or ovoid in shape, covered with fine scale-like spines, and 0.39-0.78mm in length and 0.31-0.40mm in width (Fig. 1, 2, 3 and 4). Oral sucker subterminal and 0.057-0.068 mm in diameter. Prepharynx present, pharynx well developed and 0.040-0.052mm in diameter.

Table 1. Measurements* of adult *S. falcatus* in comparison with those by previous authors (unit: mm)

Items	Author (Year)				
	Onji et Nishio (1915)	Kagei et al. (1964)	Pearson (1964)	Kobayasi (1968)	Present authors (1984)
No. worms measured	?	5	10	?	10
Body length	0.44	0.52	0.48	0.60	0.70
Body width	0.22	0.27	0.27	0.23	0.36
Oral sucker					
length	0.055	0.034	0.040	0.036	0.062
width	0.055	0.046	0.046	0.042	0.061
Pharynx					
length	0.035	0.025	0.024	0.029	0.044
width	0.025	0.038	0.028	0.021	0.041
Esophagus (length)	0.070~0.105	0.075	0.094	0.098	0.108
Ventral sucker					
length	0.037	0.042	0.030	0.028	0.042
width	0.037	0.043	0.029	0.028	0.042
Seminal vesicle (expulsor)					
length	0.120	0.099	0.077	0.119	0.111
width	0.030	0.047	0.026	0.047	0.060
Ovary					
length	0.050	0.065	0.046	0.063	0.071
width	0.050	0.070	0.042	0.054	0.070
Testis (right)					
length	0.096	0.090	0.070	0.116	0.100
width	0.078	0.065	0.057	0.062	0.071
Testis (left)					
length	0.088	0.089	0.070	0.120	0.096
width	0.075	0.074	0.057	0.065	0.066
Eggs, intrauterine					
length	0.027	0.025	0.023	0.023	0.027
width	0.014	0.012	0.013	0.012	0.012

* Only average value

Esophagus slender and 0.079-0.134mm long. Intestinal bifurcation in front of ventrogenital sac at about anterior one-third body. Ceca thick-walled and extend to beyond anterior border of testes. Ventrogenital sac (Fig. 5 and 6) slightly submedian to right side and contains ventral sucker, gonotyl and separated male and female pores. Ventral sucker small, 0.040-0.051 mm in diameter, muscular, displaced toward left side of median line (Fig. 5), not protruded but slightly embedded in parenchyma (Fig. 6) and armed with minute spines of less than 1 μm in length on its inner rim. Gonotyl unarmed and forms a small triangular flap. Two testes side by side, ovoid or globular in shape, and 0.079-0.110 by 0.055-0.095mm in size. Seminal vesicle bipartite (Fig. 4 and 5) and locates obliquely between the levels of ventral sucker and ovary; the proximal part small and thin-walled on left side and the distal one strongly muscular as an expulsor with thick wall in elongated sac-like form and 0.095-0.126mm long and 0.051-0.066mm wide. Ejaculatory duct short, thick-walled, muscular and opens into ventrogenital sac. Ovary submedian, slightly toward right side between ventral sucker and right testis, and 0.060-0.079mm in diameter. Seminal receptacle small and dorsolateral to ovary. Vitellaria consists of 5-8 groups of small follicles on both sides and distribute from anterior border of ovary to posterior end. Uterus long between ventral sucker and posterior end with numerous windings and many eggs. Intrauterine eggs yellowish in colour, oval and a little elongated in shape with slightly attenuated anterior end, and 0.024-0.030mm long and 0.010-0.013mm wide (Fig. 6). The eggs lack the muskmelon pattern at their shell surfaces. The average values of the measurements of the present specimens are compared with those by previous authors (Table 1).

DISCUSSION

In the genus *Stellantchasmus* five species have been recorded so far; *S. falcatus* (Onji et Nishio,

1915), *S. (Diorchitrema) pseudocirrata* (Witenberg, 1929), *S. formosanus* (Katsuta, 1931), *S. amplicaealis* (Katsuta, 1932) and *S. aspinosus* (Pearson, 1964). The major differential points among the species were relative body size, width of intestinal ceca, size and shape of seminal vesicle (expulsor), size and location of testes, etc. However, there are several reports on the synonymy among the above species under the consideration that such differences are not valid enough to be distinct ones. *S. pseudocirrata* and *S. amplicaealis* were considered the synonyms (Morosov, 1952), and *S. pseudocirrata* and *S. formosanus* were regarded the synonyms of *S. falcatus* (Alicata et Schattenburg, 1938; Chen, 1951). In this connection, Pearson (1964) described that the former 4 species are all synonyms of *S. falcatus* and he proposed *S. aspinosus* as a new species. The most important morphological difference between the two species was armed and modified ventral sucker in the former species while unarmed and little modified one in the latter. The present specimens apparently have minute spines along inner rim of ventral sucker and all other morphology was not different from *S. falcatus* (Table 1 and Figs. 1-6). A little larger dimensions in the present specimens seem to be due to fixation under pressure and regarded an intraspecific variation.

Human infections with *S. falcatus* have been reported in several countries. Takahashi (1929) discovered the eggs from 105 Japanese among 6,680 examined but did not collect adult worms from them. Africa et Garcia (1935) were the first to collect adult worms of *S. falcatus* by mucosal scraping of postmortem cases with visceral heterophyidiasis in the Philippines. Two human cases were also identified by worms in Hawaii (Alicata et Schattenburg, 1938; Glover et Alicata, 1957). Afterwards the adult worms were found from two Japanese (Kagei et al., 1964) and from four Thailanders (Kliks et Tantachamrun, 1974; Tantachamrun et Kliks, 1978).

The natural final hosts of *S. falcatus* other than man are dogs, cats, rats and fish-eating

birds in many countries (Onji *et* Nishio, 1924; Witenberg, 1929; Ash, 1962a & b; Pearson, 1964). The snail intermediate host has not been fully studied except in Hawaii where *Stenomelania newcombi*, *Thiara granifera* and *T. granifera mauiensis* were reported to be the natural or experimental hosts for the cercariae (Martin, 1958; Noda, 1959). The second intermediate host is the brackish water fish such as *Mugil* sp. in many geographical areas; Korea (Seo *et al.*, 1979), Japan (Onji *et* Nishio, 1915; Otagaki *et* Kanemitsu, 1953), Formosa (Katsuta, 1931 and 1932), China (Kobayasi, 1968), the Philippines (Africa *et al.*, 1940), Palestine (Witenberg, 1929) and Hawaii (Alicata *et* Schattenburg, 1938). Other brackish water fish such as *Liza menada*, *Acanthogobius flavimanus* and *Gobius* sp. are also known to harbour the metacercariae in Japan and China (Otagaki *et* Kanemitsu, 1953; Kobayasi, 1968). And it is certain that the source of infection in the present cases is the brackish water fish which they said to have eaten.

In the report of Africa *et al.* (1940) on the visceral heterophyidiasis, *S. falcatus* was included among five kinds of flukes collected from the autopsy cases; *Haplorchis yokogawai*, *H. taichui*, *H. vanissima*, *S. falcatus* and *Procerovum calderoni*. The Case 1 in the present study was infected with 4 kinds of heterophyid flukes including *S. falcatus* and he had the clinical problems of palpitation and ventricular premature beat. It is suggested that there may be some relations between the heart problem and the fluke infections, however, unfortunately there is no way to verify it. Demonstration of heterophyid eggs from heart tissue is impossible in this case. In order to verify the cause-effect relationship of heterophyid flukes and such heart problems, further studies should be done with animal experiments.

Martin (1958) was of opinion that if a survey were made of Hawaiians who eat raw mullet most of them would be found to harbour *S. falcatus*. This speculation may also be true in Korea because the brackish water fish including

mulletts are preferably eaten raw by many Koreans. Nevertheless, there had not been detected any human case of *S. falcatus* based on finding of either the eggs or adult worms. Probably this is due to the scarcity of eggs in feces unless human is infected with numerous flukes and to the liability to misinterpret the heterophyid eggs as those of *Clonorchis sinensis* during mass fecal examinations because of much similarity in their size and shape. In this respect it is suggested that repeated examination of feces and keen observation on the morphology of small trematode eggs should be the prerequisites to detect further human cases of *S. falcatus* or other heterophyid flukes and to know the true figure of intestinal parasitism in man.

SUMMARY

Two cases of human infection by *Stellantchasmus falcatus* (Heterophyidae) were identified by collection of adult worms during the treatment of some tapeworm infections in Korea. The cases were 24 (Case 1) and 55-year old (Case 2) males residing in Seoul. The Case 1 had gastrointestinal troubles such as diarrhea and abdominal pain, and heart problems such as palpitation and arrhythmia, revealing the eggs of *Diphyllobothrium latum* in the feces. The Case 2 complained indigestion and discharge of tapeworm (*Taenia saginata*) segments. Praziquantel at the dose of 15-20mg/kg body weight and 30 g magnesium salt were given to them for treatment of the tapeworm infections and the discharged strobilae were identified. However, concomitantly with the tapeworms, 188 and 5 specimens of *S. falcatus* were collected from Case 1 and Case 2 respectively through stereomicroscopy of the diarrheal stools. The Case 1 was infected also with 3 other kinds of heterophyid flukes. They said to have eaten raw brackish water fish such as mullets which are considered to be the source of heterophyid fluke infections.

REFERENCES

- Africa, C.M. and Garcia, E.Y. (1935) Heterophyid trematodes from man and dogs in the Philippines with description of three new species. *Phil. J. Sci.*, 57(3):253-267.
- Africa, C.M., de Leon, W. and Garcia, E.Y. (1940) Visceral complications in intestinal heterophyidiasis of man. *Acta Medica Philippina*, Monographic Series, No. 1:1-132.
- Alicata, J.E. and Shattenburg, O.L. (1938) A case of intestinal heterophyidiasis of man in Hawaii. *J. Am. Med. Ass.*, 110(14):1, 100-1, 101.
- Ash, L.R. (1962a) Helminth parasites of dogs and cats in Hawaii. *J. Parasit.*, 48(1):63-65.
- Ash, L.R. (1962b) The helminth parasites of rats in Hawaii and the description of *Capillaria traveræ* sp. n. *J. Parasit.*, 48(1):66-68.
- Chai, J.Y., Seo, B.S. and Lee, S.H. (1984) Studies on intestinal trematodes in Korea XI. Two cases of human infection by *Heterophyes heterophyes nocens*. *Korean J. Parasit.*, 22(1):37-42.
- Chen, H.T. (1951) *Stictodora manilensis* and *Stellantchasmus falcatus* from Hong Kong with a note on the validity of other species of the two genera (Trematoda: Heterophyidae). *Lingnan Sci. J.*, 23: 165-175.
- Glover, M.A. and Alicata, J.E. (1957) Intestinal heterophyidiasis. *Hawaii Med. J.*, 16:636, 688.
- Kagei, N., Oshima, T., Ishikawa, K. and Kihata, M. (1964) Two cases of human infection with *Stellantchasmus falcatus* Onji et Nishio, 1915 (Heterophyidae) in Kochi Prefecture. *Jap. J. Parasit.*, 13(6):472-478 (in Japanese).
- Katsuta, I. (1931) Study on the trematodes taking the brackish water fish as their intermediate host in Taiwan I. On a new trematode *Stellantchasmus formosanus* taking *Mugil cephalus* as its intermediate host. *Taiwan Igakkai Zasshi*, 30(12):1, 404-1, 417 (in Japanese).
- Katsuta, I. (1932) *Ibid.* V. A new trematode *Stellantchasmus amplicæcalis*. *Taiwan Igakkai Zasshi*, 31(4):457-471 (in Japanese).
- Kliks, M. and Tantachamrun, T. (1974) Heterophyid (Trematoda) parasites of cats in North Thailand, with notes on a human case found at necropsy. *Southeast Asian J. Trop. Med. Publ. Hlth.*, 5:547.
- Kobayasi, H. (1968) Studies on trematoda in Hainan Island, South China and Viet-Nam (French Indo-China). Reports of scientific works by H. Kobayasi, pp. 155-251.
- Lee, S.H., Seo, B.S., Chai, J.Y., Hong, S.T., Hong, S.J. and Cho, S.Y. (1983) Five cases of *Diphyllobothrium latum* infection. *Korean J. Parasit.*, 21(2):150-156 (in Korean).
- Martin, W.E. (1958) The life histories of some Hawaiian heterophyid trematodes. *J. Parasit.*, 44(3):305-321.
- Morozov, F.N. (1952) (In Skrjabin, K.I., *Trematodes of animals and man*, 6:153-615, Moscow, Acad. Nauk, U.S.S.R.)
- Noda, K. (1959) The larval development of *Stellantchasmus falcatus* (Trematoda: Heterophyidae) in the first intermediate host. *J. Parasit.*, 45:635-642.
- Onji, Y. and Nishio, T. (1915) Studies on the trematode metacercariae in *Mugil cephalus* (Second report). *Tokyo Iji Shinshi*, No. 1, 946:2, 390-2, 395, No. 1, 948:2, 499-2, 505 and No. 1, 950:2, 600-2, 603 (in Japanese).
- Onji, Y. and Nishio, T. (1924) A monograph of intestinal trematodes. *Chiba Igakkai Zasshi*, 2(3): 113-161 (in Japanese).
- Otagaki, H. and Kanemitsu, T. (1953) On the trematode cysts of brackish water fishes from the market in Binan District, Hiroshima Prefecture. *Tokyo Iji Shinshi*, 70(10):575-578 (in Japanese).
- Pearson, J.C. (1964) A revision of the subfamily Haplorchinae Looss, 1899 (Trematoda: Heterophyidae) I. The *Haplorchis* group. *Parasitology*, 54:601-676.
- Seo, B.S. (1979) Biology and clinical aspects of Heterophyidae. *Human Sci.*, 3(10):784-791 (in Korean).
- Seo, B.S., Cho, S.Y., Chai, J.Y. and Hong, S.T. (1979) Identification of the metacercariae of *Heterophyes* sp. and *Stellantchasmus* sp. from mullets of Yongsan River and Geoje Do. *Korean J. Parasit.*, 17(2):165-166 (Abstract in Korean).
- Takahashi, S. (1929) On the eggs of several kinds of intestinal trematodes, which resemble that of *Clonorchis sinensis*, especially the eggs of *Stellantchasmus falcatus* and *Pygidioopsis summus* found in human stools with a supplement on the examinations of the helminthic parasites of the dogs and cats in Okayama Prefecture. *Okayama Igakkai Zasshi*, 41(7):1, 502-1, 513 (in Japanese).
- Tantachamrun, T. and Kliks, M. (1978) Heterophyid infection in human ileum: Report of three cases. *Southeast Asian J. Trop. Med. Publ. Hlth.*, 9(2):

＝國文抄錄＝

韓國의 腸吸蟲에 관한 研究

XII. *Stellantchasmus falcatus*에 의한 人體感染 2例

서울大學校 醫科大學 寄生蟲學教室 및 風土病研究所
徐丙高 · 李純炯 · 蔡鍾一 · 洪性琮

異形吸蟲類의 하나인 *Stellantchasmus falcatus*에 의한 인체기생 2례가 praziquantel 投藥後 成蟲을 수집함으로써 확인되었다. 환자는 서울에 거주하는 24세(제 1례) 및 55세(제 2례) 男子로 제 1례는 泄瀉, 腹痛 등 消化器症狀과 不整脈(arrhythmia) 등 心臟症狀을 호소하면서 大便內에 廣節裂頭條蟲卵이 陽性이었고 제 2례는 消化不良과 條蟲類 片節 排出을 호소하였다. 條蟲感染 治療를 위해 praziquantel 15~20mg/kg를 投與하고 MgSO₄ 30 g으로 蟲體 排出을 유도한 바 排出된 條蟲을 각각 확인하였다. 그러나 나머지 泄瀉便을 立體解剖顯微鏡으로 세밀히 調査한 결과 제 1례에서는 188마리의 *S. falcatus*와 다른 3種의 異形吸蟲類가, 제 2례에서는 5마리의 *S. falcatus*가 수집되었다. 환자들은 鰯魚(*Mugil cephalus*) 등 半鹽水魚을 臍로 먹었다고 하며 이들이 感染源일 것으로 추측되었다.

EXPLANATIONS FOR FIGURES

- Fig. 1. Adult worm of *S. falcatus* collected from Case 1 (Scale: 0.1mm).
- Fig. 2. *Ibid* from Case 1 showing a little different size of seminal vesicle (expulsor) and width of ceca (Same magnification).
- Fig. 3. *Ibid* from Case 1 showing nearly round form expulsor (Same magnification).
- Fig. 4. *Ibid* from Case 2 (Same magnification). Note the relatively larger body size, bipartite seminal vesicle (large arrow, proximal part; small arrow, expulsor), thick intestinal ceca, etc.
- Fig. 5. Magnification of Fig. 4 near the middle portion of body (Scale: 0.05mm). Note the location of ventrogenital sac (arrows) in relation to the expulsor part of seminal vesicle.
- Fig. 6. Higher magnification of ventrogenital sac (arrows) and seminal vesicle with ejaculatory duct (Scale: 0.02mm). Note the characteristic intrauterine eggs.



