A Case of *Diphyllobothrium yonagoense* Infection

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**Abstract**—A human case of *Diphyllobothrium yonagoense* infection was found by morphological study of a strobila recovered from a 65-year old man in March 1982. The patient, a seaside villager of Wando-gun, Chollanam-do (Province), revealed diphyllobothrid eggs (64-68 x 46-49 um in size) in his feces, and discharged a tapeworm strobila, 3.2 m long, after treatment with 40 mg/kg bithionol and purgation. The segments were characterized morphologically by parallel uterine loops, large thick-walled seminal vesicle, and thick-shelled eggs with deep pits, which were compatible with *Diphyllobothrium yonagoense* Yamane et al., 1981.

**Key words:** *Diphyllobothrium yonagoense*, Human tapeworm infection, Marine fishes

**INTRODUCTION**

Human diphyllobothriasis, chiefly caused by *Diphyllobothrium latum*, has been relatively uncommon but shows an increasing tendency in Korea (Lee SH et al. 1983 & 1987). Although the number of infected people may be much more, only 49 cases have been so far reported in the literature, either by recovery of eggs or by collection of strobilae (Lee SH et al. 1983 & 1987; Lee SK et al. 1987). Most of the cases were just regarded as *D. latum* infection, with no detailed consideration on its morphology and taxonomy.

The taxonomy of diphyllobothriid tapeworms has been intensively studied in Japan. As a result human infections with *Diphyllobothrium* species other than *D. latum* have been detected in more than 6 species (Kamo et al. 1981, 1982, 1988a & b; Kagei et al. 1987; Fukumoto et al. 1988). *D. yonagoense* Yamane et al. 1981 is one of those newly found, human-infesting species in Japan.

The present authors re-examined a diphyllobothriid strobila expelled from a Korean fisherman in 1982 (case No. 3 of Lee et al. 1983), and found that it is consistent with the descriptions of *D. yonagoense* (Yamane et al. 1981; Kamo et al. 1988a).

**CASE RECORD**

The patient was a 64-year old man and a seaside villager of Kogun-myon, Wando-gun, Chollanam-do (Province). In March 1982, diphyllobothrid eggs, 64-68 x 46-49 um in size, were found in his feces during a screening stool examination. He was given 40 mg/kg single dose of bithionol, and purged with magnesium sulfate to collect the strobila. After 4 hours, a complete diphyllobothrid strobila, with scolex, was recovered from his diarrheal stool (Fig. 1). He had no special clinical symptoms related to this tapeworm infection. He said he used to eat various kinds of raw marine fishes collected from the sea near his village.

**PARASITOLOGICAL DESCRIPTIONS**

The strobila, with scolex and neck, was 3.2 m in whole length (Fig. 1), and composed of about 1,200 segments, the maximum width being 11.5
Fig. 1. Whole strobila of *D. yonagoense* recovered from the present case.

Fig. 2. Close-up view of gravid segments of *D. yonagoense* showing dark uterine fields and longitudinal striations.

Fig. 3. A gravid segment of *D. yonagoense* showing elliptical uterine field with 7-8 almost parallel uterine loops, two ovaries and a Mehlis’ gland, and numerous longitudinal grooves at lateral fields. Acetocarmine stain.

Fig. 4. An egg of *D. yonagoense* showing relatively thick shell.

Fig. 5. SEM view of *D. yonagoense* egg, which reveals numerous deep pits.

Fig. 6. SEM view of *D. latum* egg showing inconspicuous pits.
mm (Fig. 2). The length/width ratio of pre-gravid segments was about 1:8, much wider than long, but in gravid ones the ratio became 1:4.5 and in terminal segments 1:3. Maximum thickness was 1.1 mm. It had many longitudinal deep grooves on the ventral and dorsal surfaces (Figs. 2 & 3). In each gravid segments, 7-8 parallel uterine loops were characteristically seen, forming an elliptical uterine field in the center of the segment (Fig. 3). Posterior to the uterine branches, two symmetrical dumbbell-shape ovaries and a Mehlis’ gland were seen (Fig. 3). Two sets of genital organs in a segment, reported by Yamane et al. (1981), however, were not found in the present specimen.

For detailed observation of uterine eggs, several gravid segments were destroyed with a pin and eggs were liberated. They were ellip-
soidal to oval with or without apical knob, 64.7–67.9 um long and 46.6–49.0 um wide (66.3 x 47.8 um in average)(Fig. 4). Egg shells were relatively thick, about 1.8 um. In scanning electron microscopy, the eggs of D. yonagoense showed numerous small and deep pits at their surface (Fig. 5), while those of D. latum (Lee et al. 1983) revealed only a few, shallow pits (Fig. 6).

In longitudinal sections of gravid segments, genital pore (Gp) was opened ventrally near the anterior 1/5 portion of each segment (Fig. 7). Cervix sac (Cs) was pyriform, 0.33–0.37 mm long and 0.23–0.31 mm wide, and opened into the genital pore. Seminal vesicle (Sv) was large, spherical, 0.35–0.39 mm long and 0.29–0.31 mm wide, and connected to the cervix sac almost right behind (Fig. 8). Its thick wall, 0.09–0.12 mm of thickness, was a characteristic feature. Vagina (V) ran anteriorly and then turned ventrally near the posterior wall of the cervix sac (Fig. 7 & 8). Uterus (U) was sectioned into at least 7–8 parallel loops, with its pore at about 25% of segment length. Mehlis’ gland (Mg) was observed near the posterior end (Fig. 7).

In transverse sections, two kinds of muscle fibers were observed; longitudinal (Lm) and transverse (Tm) ones. Abundant vitelline follicles (Vf) were distributed along the dorsal and ventral surfaces of each segment, and testes (T) were seen in deeper level than the transverse muscle (Fig. 9).

**DISCUSSION**

The present case was at first reported as a D. latum infection (Lee et al. 1983). However, re-examination of its morphology, both in whole mount and sectioned specimens, with scanning electron microscopy of eggs, revealed several characteristic features that are compatible with D. yonagoense; muscular body, 7–8 parallel uterine loops, thick-walled seminal vesicle, and thick-shelled eggs with deep pits.

The species, D. yonagoense, was first described based on a strobila expelled from a 41-year old man in Yonago city, Japan, as a marine species of diphyllobothriid tapeworm (Yamane et al. 1981). Two (Hirai et al. 1988) and three (Kamo et al. 1988a) additional human cases have been reported. However, there may be some more cases, since Kamo et al. (1988a) suggested that D. yonagoense, in broad sense, should include the “Koga-Okamura type” of Diphyllobothrium, originally described by Kamo et al. (1977). If their suggestion is accepted two other reports on “Koga-Okamura type” (Hasegawa et al. 1984; Kagei et al. 1987) should be regarded as D. yonagoense infection.

The importance of occurrence of Diphyllobothrium species other than D. latum in man is that those tapeworms probably are marine species of which life cycles are maintained in marine intermediate and final hosts. As for the “Koga-Okamura type”, marine (coastal) fish, and marine mammals such as the dolphin, were suspected as its intermediate and final hosts respectively, although its exact life cycle is not known (Kamo et al. 1977). Final hosts of D. yonagoense were also suggested to be some kinds of marine mammals (Yamane et al. 1981). The source of infection in the present case is considered one of marine fish the patient consumed.

The deep pits observed on the egg shell surface of D. yonagoense, as in the present case (Fig. 5) and others, are a strong evidence that this tapeworm should belong to a marine Diphyllobothrium species (Hilliard, 1972). It is based on the finding that hatching, of diphyllobothriid eggs with deep pits as in marine species, greatly depended upon salinity rather than light, while hatching, of eggs with shallow pits as in fresh water species, depended upon light (Hilliard, 1972). The shell thickness as well as the size and shape of eggs can also be adopted as differential criteria of diphyllobothriid tapeworms (Maejima et al. 1983). However, Andersen et al. (1978) suggested that the size and shape of eggs should be affected by the kinds of host as well as the population of parasite within a host. There is an increasing tendency of consuming raw marine fish in Korea. Therefore, attentions should be given to this type of marine Diphyllobothrium sp. infection.

**REFERENCES**


Diphyllolothrium yonagoense의 인체감염 1례

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Diphyllolothrium yonagoense의 인체감염 1례가 1982년 3월 64세 남자 환자로부터 수집된 중체에 대한 생태학적 검토 결과 확인되었다. 환자는 전라도 광양군 대안에서 지방에 거주하는 어부로서 대범한 사상 길이 64~68×46~49 μm인 뼈가 대퇴부의 중첩(diphyllolothriidal eggs)이 검출되었다. Bithionol 40 mg/kg(1회)와 열대포 두어 바히 스크로에스(scolex)가 포함된 중첩이 3.2 미리미터 중체를 완전히 수거할 수 있었다.

중체는 성숙생식단(Gravid segments)에서 좌우 나란히 배열한 7~8개의 임신관(uterine loops)과 두 개의 백을 가질 임신관(uterine vessel)에 전장되어, 중간의 구조를 차단하며, 광란의 인체감염시의 전형과 대체로 균형(pits)이 있는 코인으로 D. yonagoense Yamane et al., 1981으로 진단되었다. 환자는 여러 중독의 병태증상을 보이지 않아도 하여 반대 성인의 감염원이었음으로 추정되며, 이 중에는 D. yonagoense의 국내 최초 인체감염이며 이러한 해양 게획류의 대퇴부에 존재하는 중체에서 의의가 있다고 하였다.