VARIOUS MORPHOLOGIC FEATURES OF *GNATHOSTOMA SPINIGERUM* IN HISTOLOGIC SECTIONS: REPORT OF 3 CASES WITH REFERENCE TO TOPOGRAPHIC STUDY OF THE REFERENCE WORM

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Abstract. Gnathostomiasis is common in Southeast Asian countries and can be found sporadically in other parts of the world mainly due to human migration. The definitive diagnosis can be given either by identification of the parasite isolated from the patient or through histologic section of the lesion. It is therefore important for pathologists to be familiar with the morphology of parasitic larvae which varies according to the levels of section-cutting so that the diagnosis will not be misled. We present three cases of gnathostomiasis with different features of parasitic morphology and compare these with the reference adult worm.

INTRODUCTION

Gnathostomiasis is one of the common parasitic diseases in Southeast Asia, where people have the habit of ingesting uncooked or partially cooked food. At the time being, influx of Southeast Asian people to various parts of the world increases the chance of spreading the disease to other regions since there are now more reported cases in non-endemic areas (Nagler *et al*, 1983; Kagen *et al*, 1984; Ollaqua *et al*, 1984; Rusnak *et al*, 1993). Definite diagnosis of the disease is usually done by identification of the worm isolated from the patients or through histologic sections of the lesion. However, the morphologic features of the parasite as recognized in the histologic sections vary from cases to cases and may make difficulty for distinction from other tissue parasites, especially for pathologists who are not familiar with this parasite. It is therefore our purpose to demonstrate *Gnathostoma spinigerum* which presented with varying different histologic features and compare them with the topographic morphology of the reference adult *G. spinigerum*.

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MATERIAL AND METHODS

Cases were selected from approximately 200,000 surgical materials submitted to the Department of Pathology, Ramathibodi Hospital, Bangkok, Thailand during 1987-98. Among these, six cases were diagnosed as gnathostomiasis and 3 of them were selected for this presentation whereas the other three were discarded due to inadequate clinical information and excessively degenerated parasites. The reference worm was obtained by recovering from the nodular lesions in the stomach of a cat that had been infected with the third stage larva of *G. spinigerum* for two and a half months. The recovered worm was confirmed by parasitologists as mature adult female *G. spinigerum*. This worm was employed as reference for comparing with our reported cases by serially cuttings at four levels starting from the upper cervical part (A), lower

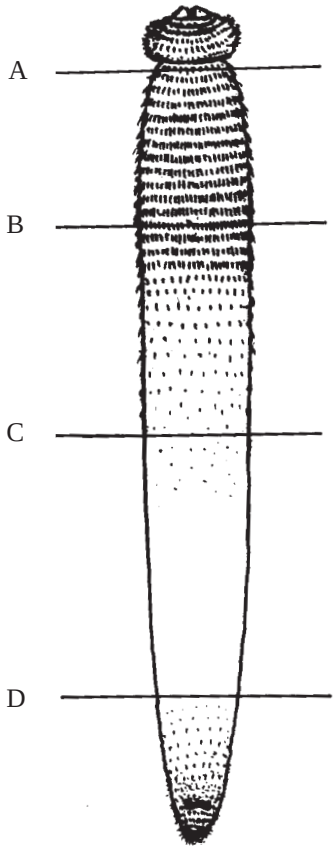

Fig 1–A diagram of the adult mature larva of *Gnathostoma spinigerum* showing levels of cross-section cuttings at A) upper cervical part, B) lower cervical part, C) mid-body and D) near caudal part.

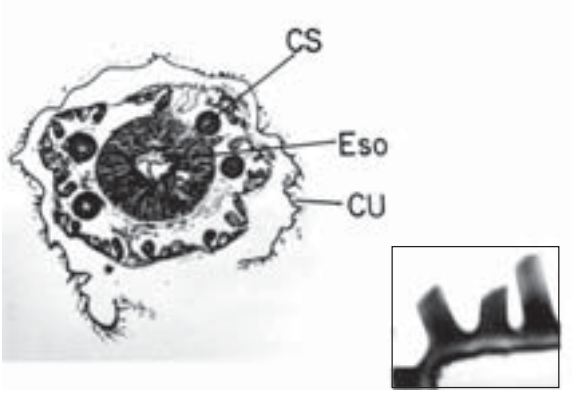

Fig 2–At upper cervical level showing presence of esophagus (Eso), cervical sacs(CS), the cuticle(CU). Inset: focusing at the cuticle(CU) exhibiting the oblong shaped cuticle spines.

cervical part (B), mid-body (C) and near caudal part (D) and submitted for histologic sections as shown in Figs 1, 2.

CASE REPORTS

Case 1: A 35-year-old female from the eastern part of Thailand developed severe right lower quadrant abdominal pain with nausea and vomiting 14 hours prior to admission. Physical examination revealed rebound tenderness at the right lower quadrant. No mass

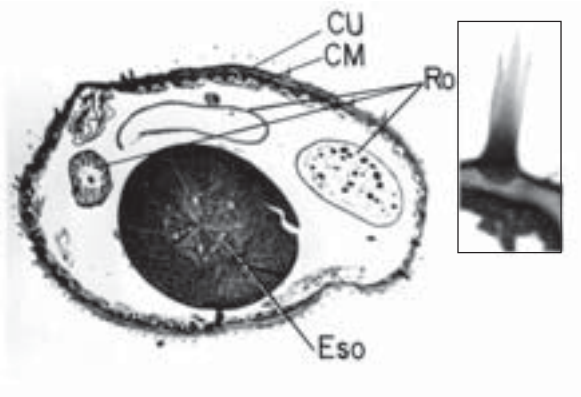

Fig 3–At lower cervical level showing presence of triradiated lumen of esophagus(Eso), reproductive organ (Ro), coelomic muscles(CM), and cuticle(CU). Inset: showing three-fanged cuticle spine.

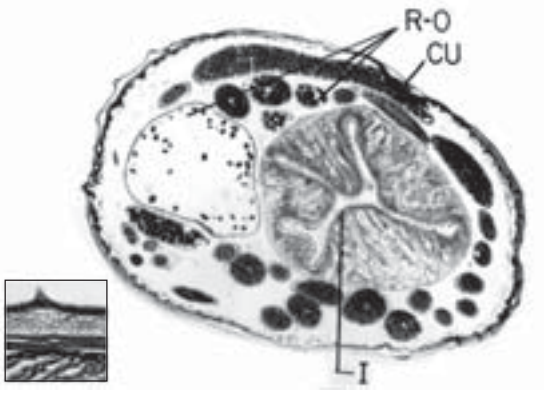

Fig 4–At mid-body level showing presence of intestine(I), reproductive organ(RO), and cuticle(CU). Inset: showing one-pointed cuticle spine.

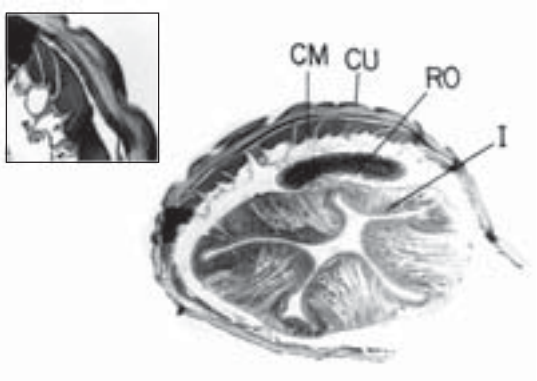

Fig 5–At near caudal part showing presence of intestine(I), reproductive organ (RO) and undulate cuticle. Inset: showing undulate cuticle.

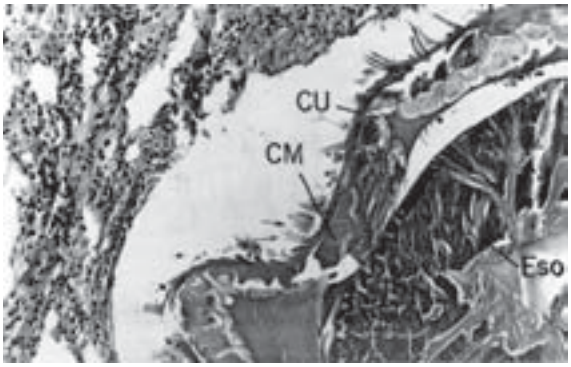

Fig 6–Case 1 showing the cross-section of gnathostomiasis larva surrounded with granulation tissue. Esophagus (Eso), coelomic muscle (CM) and three-fanged cuticle spines (arrows) are observed.

was palpable. The per vaginal examination showed tenderness at the right adnexa. No other abnormality was detected. The laboratory findings showed hemoglobin of 12.8 g/dl, hematocrit of 40%, WBC 28,500 cells/mm^3, neutrophils 69%, lymphocytes 3%, eosinophils 28%. Other laboratory tests were within normal limit. Exploratory laparotomy was done and revealed constriction and adhesion at the serosa of the jejunum. Resection of jejunum of about 15 cm long was then performed. The mucosa was unremarkable whereas the cut surfaces at the constrictive area revealed focal hemorrhagic tract. The histologic sections of the lesion showed numerous eosinophils and polymorphonuclear leukocytes infiltrating together with moderate degree of fibrosis surrounded a cross-section of a parasitic larva which was about 1 mm in the largest axis. The striking findings of the parasite were presence of numerous oblong, occasional tripods or three fanged cutaneous spines and radiated esophageal lumen which corresponded to the level A and B and represented the cervical portion of the reference worm (Fig 6).

Case 2: A 68-year-old female developed fever and abdominal pain for 1 month. One week prior-to-admission, she palpated a mass in the epigastrium with radiating pain to the back. Physical examination revealed body temperature of 39.5ºC, pulse 100/minutes, blood pressure of 150/90 mmHg, and respiratory rate of 28/minutes. The abdominal wall revealed an oval shaped mass of about 6 inches in greatest dimension. The mass was rubbery-firm. Complete blood count revealed hematocrit of 30%, hemoglobin 9.8 g/dl, WBC 12,300 cells/mm^3, neutrophils 84%, lymphocytes 13%, eosinophils 3%. Computerized tomogram showed an ill-defined mass at the body and antrum of stomach which extended to the transverse colon. The size of the mass was 10 cm in diameter. Clinical diagnosis was carcinoma of stomach or leiomyosarcoma. Subtotal gastrectomy with resection of transverse colon was done and showed a huge mass involving the body and antrum of stomach which extended to the serosa of transverse colon. The histopathology findings of the mass revealed dense infiltration with eosinophils producing minute eosinophilic abscesses and presence of longitudinal section of *Gnathostoma* at the level of cephalic and cervical parts which prominently showed one-fanged hooklet spines at the cephalic part (Fig 7).

Case 3: A 31-year-old male from eastern part of Thailand had clinical history of abdominal pain for a few days. He had a history of consuming raw food and frequently migratory

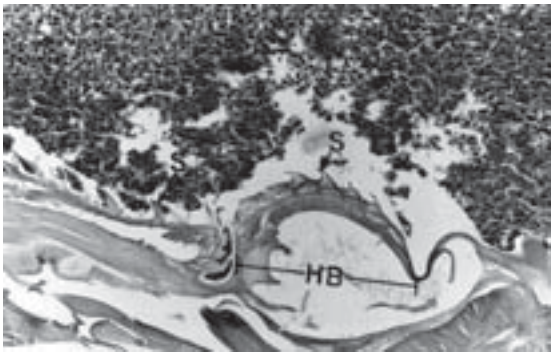

Fig 7–Case 2 showing the longitudinal section of gnathostomiasis larva surrounded with inflammatory exudate. Portion of esophagus (Eso), head bulb (HB), and part of upper cervical part are recognized. The head bulb and cervical part are covered with cuticle which decorated with hooklet spines (S).

Fig 8–Case 3 showing the cross-section of gnathostomiasis larva surrounded with granulation tissue and fibrous tissue. The internal structures of parasite as recognized are intestine (I), coelomic muscles (CM), reproductive organs (RO). The cuticle layer (CU) shows undulations instead of covering with spines.

eruptions. The laboratory findings revealed hematocrit of 50%, WBC 19,600 cells/mm^3, neutrophils 68%, eosinophils 18% and lymphocytes 14%. Physical examination revealed a mass in the right lower quadrant. The clinical diagnosis was either cancer or appendiceal abscess. An explorative laparotomy with right half colectomy was performed. The gross specimen of the colon revealed multiple small abscesses along the mucosal surface of the cecum and its cut surfaces showed several hemorrhagic tracts. Histologic findings revealed granulation tissue rich with eosinophils surrounded the cross-section of a parasitic larva which possessed striking undulate cuticle layer but absence of spines; beneath the subcuticle layer revealed coelomic polymyarian muscles. The internal organs showed presence of intestine and sex organ. This should represent the hind portion of the parasite (Fig 8).

DISCUSSION

Gnathostomiasis is a nematode of which its adult form usually inhabits the stomach wall of felines, such as leopards and tigers, as well as domestic cats and dogs. The most important endemic areas for human gnathostomiasis are in Southeast Asia, Japan and India. The life cycle requires passage through two aquatic hosts, first the cyclops , followed by a variety of fresh-water fishes that feed on the infected cyclops. Man acquires the infection by eating raw, or poorly cooked parasitized fish (Swanson, 1976). The external surface of the adult worm shows trilobed lips, head-bulb decorated with 8-11 rows backwardly directed hooklets, body covered with cuticle spines down to anterior one half or two thirds leaving the hinder part of the body naked. The immediate proximal part of the body often shows three to four short pointed cuticle spines, the more distal part is followed by three fanged spines of which the middle point is the longest one occupying down to beyond the level of the end of esophagus and further followed by two-pointed and single-pointed spines respectively which in turn diminish in size and finally disappear beyond the distal one half or one third of the body length (Swanson, 1976; Daengsvang *et al*, 1980).

Even though we had only 6 cases retrievable from our surgical specimens during 1987-98, this number seemed to be far less than

the true incidence of the cases for this country. The explanation for this small number of histopathologically diagnosed cases was possibly due to: firstly, the majority of cases were clinically diagnosed with the manifestation of cutaneous migratory lesions, for which surgery was not performed; secondly, our hospital is situated in the capital of the country which is not the endemic area for the disease. As observed in case 1, the cross-section was estimately cut at the level of lower cervical part since the three fanged cuticle spines and the esophagus were noted. In case 2, the longitudinal sections illustrated the proximal portion of the larva including the lips, head-bulb which was covered with hooklet spines and upper cervical part showing three fanged spines along the cuticle and esophagus. In comparison to the reference worm, the level of cutting in case 1 should correspond with Fig 2 while that of case 2 should agree with Figs 2, 3. For case 3, the cross-section was cut at about the distal one third of the parasitic larva since the intestine, undulate cuticle and reproductive organ were observed. The findings were compatible with the level in Fig 5 of the reference worm.

Pathology of the tissue caused by this parasitic infection showed parasitic tracts surrounded with granulation tissue and pronounced eosinophilic infiltration; some foreign body granulomas or eosinophilic abscesses are also mentioned (Swanson, 1976). However, such findings are quite similar to those evoked by other tissue parasites and there is no histologic hallmark responsible for any specific parasite as yet, since gnathostomiasis can migrate to any organ in the human (Swanson, 1976; Sirikulchayanonta and Chontinant, 1979; Srisuwai *et al*, 1988; Rusnak and Lucey, 1993). The differential diagnosis in the histologic sections from other parasites depends on the site of lesion and morphologic features of the parasite. For instance if the lesion was found in the skin and subcutaneous tissue the differential diagnosis includes other parasites which cause creeping eruptions such as hook worm, filaria and sparganum (Thune, 1972; Swanson, 1976; Sookasom and Reichart, 1982; Chabasse and Cauchy, 1988). If the lesions are found in the gastrointestinal tract or visceral organs, the differential diagnosis includes anisakis, schistosomiasis, ascariasis, sparganosis, *Macracanthorynchus hirudinaceus* and *Eustoma rotundatum* (Ashby *et al*, 1964; Swanson, 1976; Hemsrichart *et al*, 1983). If the lesion is found in the brain or spinal cord, the most important differential diagnosis is angiostrongyloides (Boongird *et al*, 1977; Schmatzhard *et al*, 1988; Gutierrez, 1990). The morphologic feature was therefore very helpful in making definite diagnosis.

Gnathostoma is usually differentiated from other parasitic larva by the presence of peculiar spines. However the variation of spine morphology at different levels of cuttings along its body may cause a problem in diagnosis, especially for pathologists who are not familiar with this parasite. It should also be addressed that if we got the sections that were cut across at distal one-third of the parasite, the absence of spines might mislead the diagnosis to other types of parasite.

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