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☐ **Brief Communication** ☐

Intestinal pathologic findings at early stage infection by *Centrocestus armatus* in albino rats

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Abstract: This study was performed to observe intestinal pathology in early infection by *Centrocestus armatus*. The flukes were in the lowermost part of the intervillous space of the duodenum and jejunum from 1 day to 7 days postinfection (PI). The stroma of villi around the young fluke was edematous and infiltrated by inflammatory cells such as lymphocytes, plasma cells and eosinophils. The crypt became mildly hyperplastic and villi were moderately atrophied at 4 days PI. The intestinal lesion produced was confined to the areas around the fluke. The pathologic findings were not significantly different between 1,000 and 5,000 metacercariae infection groups. It is suggested that the lesion should be produced by mechanical destruction of the fluke on the enteroepithelial cells.

Key words: *Centrocestus armatus*, intestinal pathology, early infection, villous atrophy

Centrocestus armatus is a minute intestinal trematode of the family Heterophyidae and parasitizes in the small intestine of birds and mammals feeding on fresh water fishes (Yamaguti, 1958). Human infections by three species of the genus *Centrocestus* were reported; one case by *C. armatus* in Korea (Hong *et al.*, 1988), two others by *C. formosanus* var. *kurokawai* or *C. asadai* in Japan (Kurokawa, 1935; Mishima, 1959). *Zacco platypus, Z. temminckii, Pseudorasbora parva, Gobius similis, Pelteobagrus fulvidraco, Rhodeus ocellatus, etc.* were recorded as the second intermediate host of *C. armatus* in Korea (Lee *et al.*, 1983 & 1984; Hong *et al.*, 1989a). Of the second intermediate hosts, *Z. platypus* and *Z. temminckii* were heavily infected with the metacercariae of *C. armatus*, and were eaten raw by inhabitants of riverside areas in Korea (Hong *et al.*, 1989a). It is, therefore, expected that there are many human cases of *C. armatus* infection in riverside areas, even though not found by stool examinations.

C. armatus grows to an adult producing eggs at 3 days postinfection (PI) in albino rats, and retains the infection until 7 days PI (Hong *et al.*, 1989b). Flukes of the family heterophyidae such as *Metagonimus yokogawai* and *Pygidiopsis summa* were known to cause villous atrophy such as fusion, blunting and shortening, and stromal changes such as crypt hyperplasia, edema and cellular infiltration (Chai, 1979; Seo *et al.*, 1986). This study was carried out to observe intestinal pathologic findings at early stages of infection by *C. armatus* in rats.

Metacercariae (MC) of *C. armatus* were collected from *Z. platypus* by artificial digestion (6 gm of pepsin and 10 ml of conc. HCl per 1 liter of H_2O). Twenty-four albino rats (Sprague-Dawley, 6-7 week-old) were divided into two groups and fed 1,000 MC (group I) or 5,000

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MC (group II) with a garbage needle. The infected rats were sacrificed by 3 in number at 1, 2, 4, and 7 days PI by cervical dislocation. The small intestine was resected 3 parts and fixed in 10% neutral formalin by perfusion. Three pieces, 7-10 mm long, were taken at 3, 5, and 7 cm distal to the pylorus from the fixed duodenums. For the jejunum, three pieces were taken from the fixed jejunums at 5, 8, 12 cm from the duodenojejunal junction. The pieces of the small intestine were dehydrated in graded ethanols and embedded in paraffin. The tissue block was cut into thin films of 7 μm thickness and stained with hematoxylin and eosin.

At one day PI, young flukes were found in 2-3% of sectioned specimens of the duodenum and jejunum. Half of the flukes were at the luminal surface of intestinal villi and another half were holding the mucosal epithelium of the lowermost part of villi with their oral sucker (Fig. 1). Crypt hyperplasia was not observed in both groups. Villous edema was mild in the duodenum. Infiltration of eosinophils, lymphocytes and plasma cells was mild in the lamina propria of duodenum and jejunum in both groups. Shortening and blunting of intestinal villi was not remarkable in both groups.

At two days PI, epithelial cells adjacent to the flukes in the duodenum and jejunum of both groups became thicker than that at one day PI. Almost all of the juvenile flukes were found in the lowermost part of the intervillous space (Fig. 2). General pathologic findings were similar to those at one day PI.

In 10% of prepared slides at four days PI, flukes having 1-7 intrauterine eggs were observed chiefly in the intervillous space of the duodenojejunal area. The flukes stick to the crypt opening with their circumoral spines and ventral concavity (Fig. 3). The mucosal epithelium around the oral sucker was destroyed and that in contact with the mid-posterior portion of the fluke was severely thickened and/or compressed. Villi near the fluke were fused moderately but appeared not shortened. Crypts were mildly hyperplastic in the duodenum and jejunum. In both groups, edema of the lamina propria was mild in the duodenum and moderate in the jejunum. The inflammatory cells infiltrating into the villous stroma consisted of many eosinophils but less lymphocytes and plasma cells in both groups. The pathologic changes were independent on the dose of metacercariae given.

At seven days PI, villi were fused with moderate frequency, but not shortened in their height in duodenum and jejunum of both groups. Crypt hyperplasia was mild. The epithelial thickening of villi adjacent to the flukes was moderate in group I but severe in the duodenum of group II. In both groups, the villous stroma of the duodenum was moderately infiltrated by inflammatory cells, and that of the jejunum was moderately edematous (Fig. 4).

In *C. armatus* infected rats, lesions such as villous atrophy and stromal changes were observed. Such intestinal lesion is commonly observed in intestinal helminth infections and is considered a non-specific change by the infection (Ruttenberg *et al.*, 1977). Mechanical trauma is one of the major causes giving rise to such pathologic changes in intestinal trematode infections (Chai, 1979). Trauma is closely related with the worm burden, size and morphological characters of the flukes, duration of infection, *etc.* (Lee *et al.*, 1990). Pathologic changes by *C. armatus* infection were mild to moderate and confined to the villi near the flukes. The circumoral spine of *C. armatus* is considered to give mechanical damage to the epithelial cells of the intervillous crypt resulting in fusion of villi adjacent to the fluke. However, the area of villous fusion was not so extensive since the flukes parasitizing were small in number and spread over a large area of the duodenum and jejunum (Hong *et al.*, 1989b). Crypt hyperplasia by *C. armatus* infection was mild. It is also suggested at early stages that the function of damaged crypts by *C. armatus* may be compensated by villous fusion without crypt hyperplasia (Rho *et al.*, 1984).

A small number of *C. armatus* flukes collected from a human infection together with other species of intestinal trematodes (Hong *et al.*, 1988) or recovered from experimental rats (Hong *et al.*, 1989b) is considered insufficient to give rise any subjective clinical symptoms. From these observations, it could be speculted

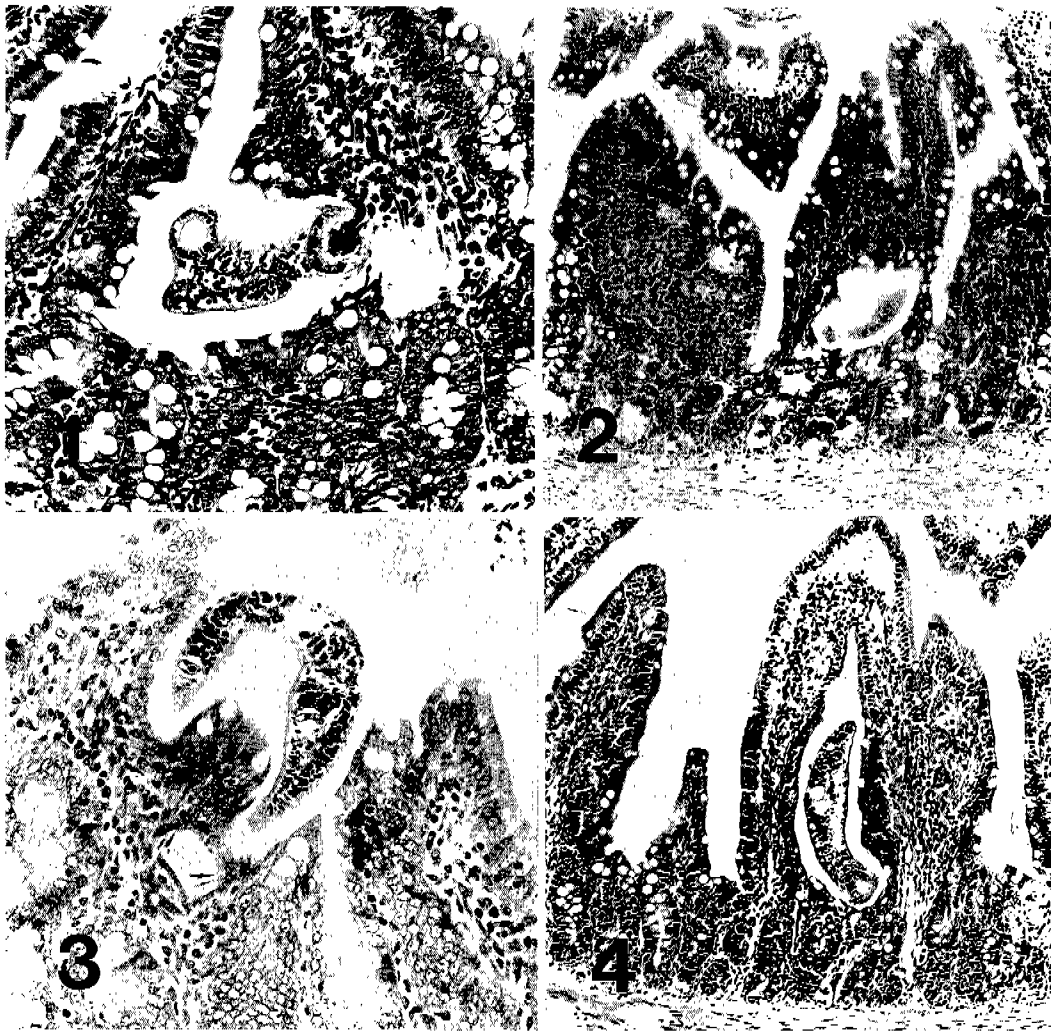

Fig. 1. A young *C. armatus* is pinching the epithelium of the duodenum of a rat in group I at 1 day postinfection (PI). × 200. **Fig. 2.** At two days PI, a juvenile fluke is in a cave of a broadly fused villus in group I. × 100. **Fig. 3.** At four days PI, a fluke puts its oral sucker and circumoral spines into the crypt opening and embrasses the intestinal mucosa with its ventral concavity in the duodenum of a rat in group I. × 200. **Fig. 4.** At seven days PI, a fluke is found in the intervillous space of a fused villus, of which the tip is moderately edematous, in the jejunum in group II. × 100.

that humans or albino rats are not a suitable final host.

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=초록=

가시입이형흡충에 감염된 흰쥐의 초기 장병변

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이 연구는 가시입이형흡충 감염에 의한 초기 장병변을 관찰하기 위하여 수행되었다. 감염 1일부터 7일까지 가시입이형흡충은 십이지장과 공장의 융모간국 최하부에서 관찰되었다. 피낭유충 1,000개와 5,000개 감염군 사이에 병변의 정도 차이는 인정되지 않았다. 충체 둘레에 있는 융모 기질에 가벼운 부종과 염증세포침윤이 있었다. 감염 4일에 선와는 경도의 과증식을 보였으며 융모는 중등도로 위축된 소견을 보였다. 장병변은 충체 주위에 국한되었으며 광범위하게 확산되지 않았다. 따라서 장병변은 가시입흡충의 장상피세포에 대한 기계적으로 손상으로 인하여 야기되었다고 생각된다.

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