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 enteropithelial 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. asadae* in Japan (Kurokawa, 1935; Mishima, 1959). *Zaccu platypus*, *Z. temminckii*, *Pseudorasbora parva*, *Gobius similis*, *Peltobagrus 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 *Pygidiotis 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$_2$O). 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 ethanol 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 intervillus 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 intervillus 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 intervillus 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 speculated
Fig. 1. A young *C. armatus* is pinching the epithelium of the duodenum of a rat in group I at 1 day postinfection (Pl). × 200. Fig. 2. At two days Pl, a juvenile fluke is in a cave of a broadly fused villus in group I. × 100. Fig. 3. At four days Pl, a fluke puts its oral sucker and circumoral spines into the crypt opening and embraces the intestinal mucosa with its ventral concavity in the duodenum of a rat in group I. × 200. Fig. 4. At seven days Pl, 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.

**REFERENCES**


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가시입이형흡충에 감염된 허주의 초기 장병변

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이 연구는 가시입이형흡충 감염에 의한 초기 장병변을 관찰하기 위하여 수행되었다. 감염 1일부터 7일까지 가시입이형흡충은 심장질환과 같은 동물의 움직임에 따라 이동하지 않았다. 피부하에서 1,000개와 5,000개의 가시입이형흡충이 관찰되었다. 감염 1일에 선화는 질병의 과정을 보였으며, 음모는 중동도로 위축된 소견을 보였다. 장병변은 중제 주위에 국한되었으며, 가시입이형흡충의 장상화로 인해 야기되었다고 생각된다.