Endometriosis in a Rhesus Monkey

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Abstract: Spontaneous endometriosis was found in a 15-year-old female rhesus monkey. Macroscopically, there was thickening of the intestinal wall, mesenterium, and the gastrocolic omentum. Sporadic nodules were noted in the serosa of the jejunum and ileum. Histopathologically, a large number of glandular tubules along with massive connective tissue was observed in the serosa and subserosa. The glandular tubules were covered with mono- or multilayered epithelial cells with ciliary structures protruding into the glandular lumen. The connective tissue was composed of mesh-like fiber, fibroblast-like cells, and tortuous blood vessels. The glandular tubules and the connective tissue were similar to the glands and interstitial tissue in the endometrium. (*J Toxicol Pathol* 2001; **14**: 313–315)

Key words: endometriosis, rhesus monkey, histopathology, spontaneous, etiology

Endometriosis is the presence of endometrium outside the uterine cavity. It occurs spontaneously only in species that menstruate including human and most Old World primates. In the human, it is an extremely common gynecologic problem and is a frequent cause of dysmenorrhea and infertility. In nonhuman primates, it occurs as a common complication of repeated hysterotomies or caesarean sections, but is infrequent as a spontaneous disease¹. This is a report of a case of spontaneous endometriosis in a rhesus monkey with no history of treatment with drugs or surgery.

A 15-year-old female rhesus monkey, which was born in CSK Research Park in Japan, showed abdominal distention with fluctuation. The animal rapidly became moribund. At laparotomy, a large amount of dark-red fluid was observed in the peritoneal cavity. Wide-spread adhesion was seen among the peritoneal organs. Judging the prognosis to be poor, the animal was sacrificed under inhalation anesthesia. The animal was kept for breeding and had a history of 3 births. The last birth was 2.5 years prior to death.

Macroscopically, thickening of the intestinal wall was observed in the small and large intestine. In the serosa of the jejunum and ileum, sporadic nodules which were 5–10 mm in diameter and dark-red or light yellow in color, were noted.

Thickening of the mesenterium and the gastrocolic omentum was also observed. In addition, adhesion among liver, kidney, stomach, small intestine, and ascending colon was seen together with 2–3 liters of dark-red fluid. No abnormal changes were found in the reproductive organs. At necropsy, the small intestine, large intestine, gastrocolic omentum, liver, and spleen were collected for histopathological examination. These tissues were fixed in 20% neutral-buffered formalin and embedded in paraffin. Thin sections were prepared and stained with hematoxylin and eosin (HE).

Histopathologically, a large number of glandular tubules along with massive connective tissue was observed in the small intestine, large intestine, and gastrocolic omentum (Fig. 1). In the small and large intestine, the tubules were distributed between the tunica muscularis and serosa. In the gastrocolic omentum, the glandular tubules were seen in the subserosa. Similar glandular tubules were also found in the capsule of the liver and spleen.

The glandular tubules were covered with mono- or multilayered epithelial cells, and these cells occasionally formed papillae. The epithelial cells had large, round to egg shaped nuclei, and the cytoplasm was acidophilic and rich. Ciliary structures protruding into the glandular lumen were observed in the epithelial cells (Fig. 2). In the glandular lumens, large numbers of erythrocytes, acidophilic secretion, and degenerative cells were found.

The connective tissue was composed of mesh-like fibers and fibroblast-like cells (Fig. 3). Frequently, a large number of fibroblast-like cells surrounding the glandular tubules were observed. There was also hemorrhage in the connective tissue. In the gastrocolic omentum, tortuous

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Fig. 1. Gastrocolic omentum. A large number of glandular tubules along with massive connective tissue are observed. HE. $\times 80$.

Fig. 2. Gastrocolic omentum. The glandular tubules are covered with mono- or multilayered epithelial cells. The epithelial cells have large, round to egg shaped nuclei, and abundant cytoplasm. Note epithelial cells with ciliary structures protruding into the glandular lumen. HE. $\times 400$.

Fig. 3. Gastrocolic omentum. The connective tissue is composed of mesh-like fibers and fibroblast-like cells. G: glandular tubule. HE. $\times 400$.

Fig. 4. Gastrocolic omentum. Tortuous arteries (arrow heads) are observed. HE. $\times 100$.

Fig. 5. Large intestine. Cell aggregations are composed only of fibroblast-like cells. HE. $\times 100$.

arteries were found (Fig. 4). In the large intestine, there were cell aggregations composed only of fibroblast-like cells with scant cytoplasm (Fig. 5).

The glandular tubules and the connective tissue in the serosa of various organs were similar to the glands and interstitial tissue in the endometrium. The tortuous blood vessels in the gastrocolic omentum resembled the spiral arteries in the human and simian endometrium². The morphological structures in the present case were similar to those of reported endometriosis in rhesus monkeys^{3–5}, and this case was, therefore, diagnosed as endometriosis.

Endometriosis is only seen in primates. Metaplasia of coelomic epithelium, transformation of tissue rests, regurgitation of endometrium through the infundibulum of the oviduct at the time of menstruation, implantation at the time of uterine surgery, and dissemination of endometrium by lymph or blood vessels have been assumed to be the causes of endometriosis, but the etiology is yet unknown⁶. In the rhesus monkey, it has been reported that the incidence of endometriosis increases by surgical treatment and hormone administration in reproduction research⁷, radiation⁸, and when fed a vitamin D deficient diet⁹. It has also been shown that spontaneous endometriosis is only observed in monkeys with birth experience, and that it increases with age and elapsed time from the final pregnancy before death¹⁰.

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