Cutaneous Mastocytomas in Djungarian Hamsters

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Abstract: Spontaneous cutaneous mastocytomas in Djungarian hamsters (D-hamster) were pathologically studied and compared with those in canine and feline cases. Eight (9.3%) of 86 cutaneous biopsy cases in D-hamsters were diagnosed as mastocytomas, being slightly higher in incidence than in canine and feline species. In 4 of 8 D-hamster cases, the tumor lesions were in the head and neck in contrast to most canine lesions in the extremities. The histopathology of the D-hamster mastocytoma was characterized by diffuse or massive proliferation of well-differentiated tumor cells with severe degeneration of collagen fibers and slight eosinophil infiltration in most cases.

Key words: Djungarian hamster, mastocytoma, skin

The Djungarian hamster, *Phodopus sungorus* (D-hamster) is popular not only as a companion but also as laboratory animal [5]. The species has been reported to show frequent incidences of cutaneous or mammary adenocarcinoma either spontaneously or after exposure to carcinogenic compounds or oncogenic viruses [4, 7], whereas only reticulosarcomatosis was reported as a spontaneous mesenchymal tumor [5]. This brief note is to describe the histopathology of 8 cases of spontaneous cutaneous mastocytoma in the D-hamster, and to compare the observations to those in canine and feline species.

Eight (9.3%) of 86 cutaneous biopsy cases of D-hamsters were diagnosed as mastocytomas in our laboratory during the 8 years from 1991 to 1998. The affected animals were from 10 to 24 months of age (Table 1) including 4 males, 3 females and one of unknown sex. The tumors were located at the head or neck in 4 cases, forelimbs in 2 cases, and cheek and

shoulder in one case each.

Tumor tissue samples 2 to 15 mm in diameter were taken and fixed in 10 or 20% formalin and sent to our laboratory from private animal clinics. Paraffin sections 5 μ m thick were made and stained with

Table 1. Cases examined

Case	Sex	Age (months)	Tumor size (mm)	Location
A		15	2x2x2	Head & neck
B		17	uk	Head & neck
C		12	uk	Head & neck
D		10	8x8x7	Head
E		17	15x17x7	Cheek
F	uk ^{a)}	uk	uk	Forelimb
G		12	5x5x5	Forelimb
H		24	uk	Shoulder

^{a)}unknown

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hematoxylin-eosin (HE), alcian blue at pH 2.5 (AB), Masson's trichrome (MTC), periodic acid-Schiff, toluidine blue (TB) and Watanabe's silver. Immunohistochemistry was done with an avidin-biotin peroxidase complex kit (DAKO, Copenhagen, Denmark). Antisera to human mast cell tryptase (DAKO, 1:50) and to proliferating cell nuclear antigen (PCNA) (DAKO, 1:50) were used as primary antibodies. For ultrastructural observation of 2 cases (Cases C and G), tissues were embedded in Epok-812 (Oken, Tokyo, Japan). Ultrathin sections 0.1 μm thick were stained with uranyl acetate and lead citrate and were observed with an electron microscope (JEM-1200, JEOL, Tokyo, Japan).

Histopathologically, tumor masses were surrounded with fine collagen fibers that separated the lesions into several lobules forming a multi-nodular pattern in 2 cases. The lesions extended toward the basal layer of the epithelium in 6 cases. Within the tumor masses neoplastic mast cells were densely proliferated in all cases (Fig. 1), and collagen fibers were very fine and shortened with an irregular fasciculation arrangement. The lesions sometimes contained a honeycomb pattern of argyrophil fibers (Fig. 2). In 3 of 8 cases, neoplastic cells were arranged in a moniliform pattern among the fine fibers (Fig. 3). Capillary vessels were slightly proliferated in 4 cases. Some necrotic foci with hemorrhage and inflammatory cells were observed. Erythrophagia by macrophages was observed in 3 cases. Eosinophil infiltration was moderate in one case and slight in 6 of 8 cases, but it was not seen in the remaining one.

The neoplastic cells were larger than normal ones and contained basophilic granules varying in number. The granules were stained blue after AB and metachromatic after TB stains (Fig. 4). In addition, the granules were positive for human mast cell tryptase in 2 (Cases E and H) of 5 cases tested. Electron microscopy revealed that neoplastic cells were round, oval or polyhedral in shape without surface interdigitations (Fig. 5). The cytoplasm was filled with electron-dense granules 0.2 to 1.0 μm in diameter (Fig. 6) and had a distinct Golgi apparatus. The specific lamellar patterns of the granules in mast cells were not clear, probably because of formalin fixation.

The nucleus was pale with a single or double oval clear nucleoli. No multinucleated cells were observed.

Fig. 1. A tumor mass located in the dermis and subcutis. Case C. HE stain. Bar=100 μm .

Fig. 2. Neoplastic mast cell lesion divided by argyrophil fibers into a honeycomb pattern. Case C. Watanabe's silver stain. Bar=50 μm .

Fig. 3. Basophilic neoplastic cells arranging in a moniliform pattern among immature collagen fibers. Case G. HE stain. Bar=50 μm .

Fig. 4. Metachromatic cytoplasmic granules of neoplastic mast cells. Case G. TB stain. Bar=20 μ m.

Fig. 5. Electron micrograph of neoplastic mast cells, showing the smooth cell surface and various-sized electron dense granules filling the cytoplasm. Case G. Bar=2 μ m.

Fig. 6. Electron micrograph of a neoplastic mast cell with electron dense granules 0.2 to 1.0 μ m in diameter. Case C. Bar=1 μ m.

By electron microscopy the nucleus appeared irregular in shape and sometimes indented. Mitosis was not frequent except in one case (Case B), cells of which had very few metachromatic granules in the cytoplasm. PCNA-positive nuclei were present but not very frequent (5 to 28%) in 6 cases examined including Case B.

The cutaneous mastocytoma is common in canine and feline species and histopathologically well characterized [1, 8]. The incidences of cutaneous mastocytomas in our laboratory were 94 (6.2%) out of 1,508 canine and 15 (5.9%) out of 256 feline cutaneous tumors, respectively. The incidence of D-hamsters (9.3%) in the present study was slightly higher than those of canine and feline species. Macy [1] reported that the common sites of cutaneous mastocytomas in canine species were the trunk, perineal regions and extremities, and the same tendency was seen in our laboratory. In 4 (50%) of the 8 present D-hamster cases, however, the tumors were seen in the head and neck regions.

In our laboratory the grade III undifferentiated type [3] were seen in 10 (10.6%) of 94 canine and 2 (13.3%) of 15 feline cutaneous mastocytomas, respectively. Of the present 8 D-hamster cases, only one case belonged to the undifferentiated type with few metachromatic granules and frequent mitosis. In other cases, neoplastic cells were histopathologically more differentiated showing infrequent mitosis. The abundant cytoplasmic granules in the neoplastic mast cells in D-hamsters had the same properties as in the differentiated connective tissue type of the canine and feline mastocytomas [2]. The PCNA positive nuclei in the differentiated type, as seen in canine cases [6], were not so frequent in most D-hamster cases including the undifferentiated type.

The collagen fibers within or surrounding the tumor masses were much finer, shorter, and looser in all the present D-hamster cases than in canine and feline cases. Qualitative and quantitative differences in the cutaneous collagen fibers among animal species might be of importance for analyzing the morphology of lesions and classifying the pattern of the neoplastic cells not only in mastocytoma but also in other cutaneous neoplasms in D-hamsters.

In conclusion, cutaneous mastocytoma in D-hamsters was characterized by a slightly higher incidence in total cutaneous tumors, occurrence in the head and neck,

slight infiltration of eosinophils and degenerative or rarefied collagen fibers, compared with those in dogs and cats.

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