Lymphoplasmacytic Lymphoma in a Stallion

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ABSTRACT. Lymphoplasmacytic lymphoma found in a 6-year-old Anglo-Arabian stallion was investigated histologically, immunohistochemically and ultrastructurally. The animal showed a large mediastinal mass and generalized lymph node involvement. The neoplastic cells were in various differentiation stages of small lymphocyte, centrocyte, centroblast, immunoblast and plasma cell. Some neoplastic cells showed positive cytoplasmic reactivity for mu and lambda chains. There were well developed rough endoplasmic reticulum (RER) and Golgi complexes in plasmacytoid cells, and slightly developed RER or a few long strands of RER in medium-sized to large lymphoid cells. These findings suggest that this neoplasm is of B-cell origin.—**KEY WORDS:** horse, immunoglobulin, lymphoplasmacytic lymphoma.

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Equine lymphosarcoma is not uncommon [12] and many cases have been reported especially for the past ten years [3]. Several cases were histologically or ultrastructurally identified as B-cell lymphomas such as follicular centre cell lymphoma and plasmacytic lymphoma [15, 16], while a few were categorized into T-cell lymphomas by histological, ultrastructural, immunological or functional examinations [10, 14]. This study describes a case of equine lymphoplasmacytic lymphoma, in which neoplastic cells varied in differentiation and some had cytoplasmic immunoglobulin.

A 6-year-old Anglo-Arabian stallion, which was brought to an abattoir, was well-nourished, but showed depression, deficient pulse, jugular venous distension and pitting oedema of ventral surfaces of the thorax and abdomen and the forelegs. Body temperature, pulse and respiration were 36.7°C, 70/min and 36/min, respectively. Haematological evaluation revealed high-normal red blood cell count (11,140,000 cells/ μ l), high haematocrit (68%) and leukocytosis (22,400 cells/ μ l) due to neutrophilia (78%), and 17% of leukocytes were atypical lymphoid cells sometimes with nuclear cleavage.

At necropsy, a large mass, 15 cm in diameter, was present in the mediastinum, and was fused with thoracic lymph nodes such as cranial mediastinal, cranial sternal and caudal deep cervical lymph nodes. The aortic arch, brachiocephalic trunk and cranial vena cava were embedded in this tumour. The mesentery was highly oedematous and the mesenteric lymph nodes were enlarged, oedematous and haemorrhagic. There was a 40 × 20 × 10-cm mass, presumably composed of enlarged, fused lymph nodes at the site of the medial iliac and lumbar aortic lymph nodes. The wall of the pelvic canal was oedematous.

Microscopically, the mediastinal mass was composed of severe neoplastic growth of lymphoid cells. There was neoplastic involvement in all lymph nodes examined such

as thoracic, mesenteric, medial iliac, lumbar aortic, superficial cervical and subiliac lymph nodes. Neoplastic infiltrates were detected in the spleen and left auricle of the heart. The bone marrow was not investigated, because it appeared to be macroscopically normal. The neoplastic cells grew diffusely and residual lymphatic follicles were present in some involved lymph nodes. Macrophages were scattered in the neoplastic tissues.

The neoplastic cells were varied in size, and small to large lymphoid cells predominated (Fig. 1). The small cells with very narrow cytoplasmic bands resembled small lymphocytes, but had less condensed chromatin. The medium-sized to large cells, which possessed small to moderate amounts of cytoplasm frequently with nuclear cleavage, were fairly similar to follicular centre cells. Some centroblastoid cells were very large. Plasmacytoid cells were admixed with these cells and immunoblastoid

Fig. 1. Lymph node. Lymphoid cells of varied size reveal considerable mitotic activity (arrows). HE-stain, × 400.

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Fig. 2. Lymph node. Some cells exhibit λ light chain expression. $\times 400$.

Fig. 3. Mesenteric lymph node. Arrows indicate cleaved nuclei and a nuclear pocket is also observable (arrowhead). $\times 2,100$.

Fig. 4. Mesenteric lymph node. Long strands of RER (arrow) are evident in a lymphoid cell. $\times 3,400$.

Fig. 5. Mesenteric lymph node. A large neoplastic cell has a multilobular nucleus with a nuclear bleb (arrow), and each lobule has a relatively smooth contour. A neighbouring cell shows plasmacytoid morphology. $\times 3,400$.

Fig. 6. Mesenteric lymph node. A neoplastic cell with well-developed RER bears an immature, slightly irregular nucleus resembling nuclei of surrounding lymphoid cells. $\times 5,100$.

cells were inconspicuous. Mitotic figures were frequent.

The immunoperoxidase method was applied to paraffin sections using antisera to mu (μ), gamma (γ), kappa (κ) and lambda (λ) chains. Rabbit antisera to human κ chain and human λ chain, biotinylated goat anti-rabbit immunoglobulins, biotinylated rabbit anti-goat immunoglobulins and peroxidase conjugated streptavidin were purchased from BioGenex Laboratories, Dublin, CA, U.S.A. Rabbit antiserum to equine IgM (μ chain specific) and goat antiserum to equine IgG (Fc specific) were obtained, respectively, from Immuno Biological Laboratories, Takasaki, Japan and Bethyl Laboratories Inc., Montgomery, TX, U.S.A. For comparison, this method was applied to lymph nodes of a healthy 10-year-old Thoroughbred stallion. The cells in the neoplastic tissues occasionally showed cytoplasmic reactivity for μ or λ chain (Fig. 2), but rarely for γ chain, and extremely rarely for κ chain. Lambda-positive cells were far greater in number than κ -positive ones in lymph nodes of a normal animal.

Ultrastructurally, the neoplastic cells often had cleaved nuclei sometimes with nuclear pockets (Fig. 3). There were slightly developed rough endoplasmic reticulum (RER) or a few long strands of RER in medium-sized or large lymphoid cells (Fig. 4), and poorly developed organelles in smaller cells. A lobulated appearance in large lymphoid cells was considered to be a variant of nuclear cleavage (Fig. 5). Scattering plasmacytoid cells contained well developed RER and Golgi complexes, and a few cells showing a transitional shape had moderately to well developed organelles and nuclei resembling those of lymphoid cells (Fig. 6). Intranuclear fibrillary inclusions, cytofilaments, dense bodies and lipid droplets were rare findings.

The present case was characterized by a large mediastinal mass and similar cases had anatomically been designated mediastinal or thymic form [11, 18]. Most lymphomas of this form are considered to be derived from thymic T-cells in man [9] and swine [4, 5], although B-cell lymphomas of follicular centre cell origin have been reported in man [17]. Our case may have originated from either a B-cell of a mediastinal lymph node or a B-cell of the thymus.

Most equine lymphomas were microscopically classified according to the size of neoplastic cells alone. In few studies, some cases were considered to be of B-cell lineage by light or electron microscopy [1, 15, 16]. Although plasmacytoid or immunoblastoid cells were not so numerous in the present case, the neoplastic cells showed varied differentiation from small lymphoid cells to plasmacytoid cells. This case was diagnosed as lymphoplasmacytic lymphoma and similar cases have been reported in man [9] and swine [13]. Equine follicular centre cell lymphomas were composed of centrocytoid and centroblastoid cells and accompanied with plasmacytic differentiation [15]. In contrast, our neoplasm contained not only cells resembling follicular centre cells but also small lymphoid cells, and had no relation to lymphatic follicles.

Canine and feline plasma cell tumours have been

immunostained with rabbit anti-human κ or λ chain [7, 8]. The antibodies used in the present study were also applicable to immunoglobulin-producing cells in the horse. Most domestic animals express predominantly either λ or κ chain in normal serum [2], and λ -positive cells were much larger in number than κ -positive ones in equine normal tissues. This may cause a higher incidence of λ -positive tumours, and actually λ -positive cases predominated in a study of canine plasmacytomas [7]. In the present study, the immunohistochemistry suggests that some neoplastic cells contain immunoglobulin-M (μ and λ chain), and that κ -positive cells are reactive infiltrates. Gamma-positive cells may also be reactive, although it is possible that some of them are neoplastic cells showing heavy chain class switching [6].

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