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CASE REPORT

High-Grade Lymphoblastic Lymphoma Mimicking Burkitt - Like Lymphoma in a Puppy: Case Report

Naik H. Srinivasa, C. Jyothi*, P. Revathi[1], C. Yugandhar, V. Gnani Charitha[2], L. Sivasudarshan[3], K. Anjali[3] and G. David[3]

Department of Veterinary Pathology, College of Veterinary Science, Proddatur, Sri Venkateswara Veterinary University, SVVU, Tirupati, Andhra Pradesh, India, [1]Department of Veterinary Medicine, [2]Department of Veterinary Parasitology, [3]Department of Veterinary Clinical Complex

Address for Correspondence

C. Jyothi, Department of Veterinary Pathology, College of Veterinary Science, Proddatur, Sri Venkateswara Veterinary University, SVVU, Tirupati, Andhra Pradesh, India, E-mail: jyothichatta1833@gmail.com

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ABSTRACT

Burkitt-like lymphoma (B-LL) is a rare and aggressive high-grade B-cell malignancy in dogs. Present report describes a case of high-grade lymphoblastic lymphoma in a 2-month-old, non-descriptive male puppy with clinical signs of progressive abdominal distension, emaciation and vomiting. Radiographic, haematological, cytological, histopathological and immunohistochemical evaluations were performed. The neoplastic cells were negative for CD10 and CD20, ruling out classical B-LL. Based on histopathological and immunohistochemical findings, the case was diagnosed as high-grade lymphoblastic lymphoma, likely of T-cell origin. Present case emphasizes the importance of immunephenotyping in diagnosing canine lymphomas and highlights the occurrence of aggressive lymphoid neoplasms in young dogs.

Keywords: Burkitt-like lymphoma, histopathology, immunohistochemistry, Lymphoblastic lymphoma

Neoplasms are a significant health concern in canines, with increasing prevalence due to improved longevity and veterinary diagnostics. Among various tumors, hematopoietic neoplasms are particularly prevalent, accounting for a significant proportion of canine malignancies. Lymphoid neoplasms, especially lymphomas, are among the most frequently diagnosed cancers in dogs, representing approximately 7-24% of all canine neoplasms and 83% of all hematopoietic tumors[1]. Canine lymphomas constitute a heterogeneous group of disorders that differ markedly in their anatomic location, histological grade, immunophenotype (B-cell or T-cell), and clinical behavior, influencing both therapeutic response and prognosis[2].

Lymphoblastic lymphoma (LBL) is a high-grade, aggressive neoplasm arising from immature lymphoid precursors, predominantly affecting young dogs. It is histologically and clinically comparable to Burkitt-like lymphoma in humans, characterized by a diffuse proliferation of medium-sized lymphoblasts with high mitotic index, a "starry-sky" appearance due to interspersed tangible body macrophages, and rapid systemic dissemination[1,3]. In canines, LBL is most commonly of T-cell origin, often presenting with a mediastinal mass, respiratory distress, or signs of thymic involvement. T-cell lymphoblastic lymphomas generally exhibit a more aggressive clinical course and are associated with a poorer prognosis than B-cell variants[1]. Although rare, Burkitt-like lymphomas in dogs are histologically distinct from conventional lymphomas due to their extremely high proliferation rate and potential for extranodal involvement, including bone marrow and central nervous system infiltration[3].

The classification and diagnosis of lymphomas require a multimodal approach, incorporating clinical evaluation, imaging, cytology, histopathology and immunohistochemistry. Immunophenotypic characterization is particularly essential in distinguishing B-lymphoblastic lymphoma (B-LL) from T-cell lymphoblastic lymphoma, as treatment response and prognosis may differ between these subtypes. Burkitt-like lymphoma, is rarely reported in Veterinary Medicine[4]. While lymphoblastic lymphoma predominantly affects young animals, its clinical and histopathological resemblance to B-LL can lead to diagnostic challenges[5].

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In Veterinary oncological diagnosis, the differentiation of lymphomas is often challenging due to their diverse clinical presentations and overlapping cytological features with other diseases. This is particularly true in young dogs, where lymphoblastic lymphoma (LBL) a high-grade, rapidly proliferating neoplasm of immature lymphoid

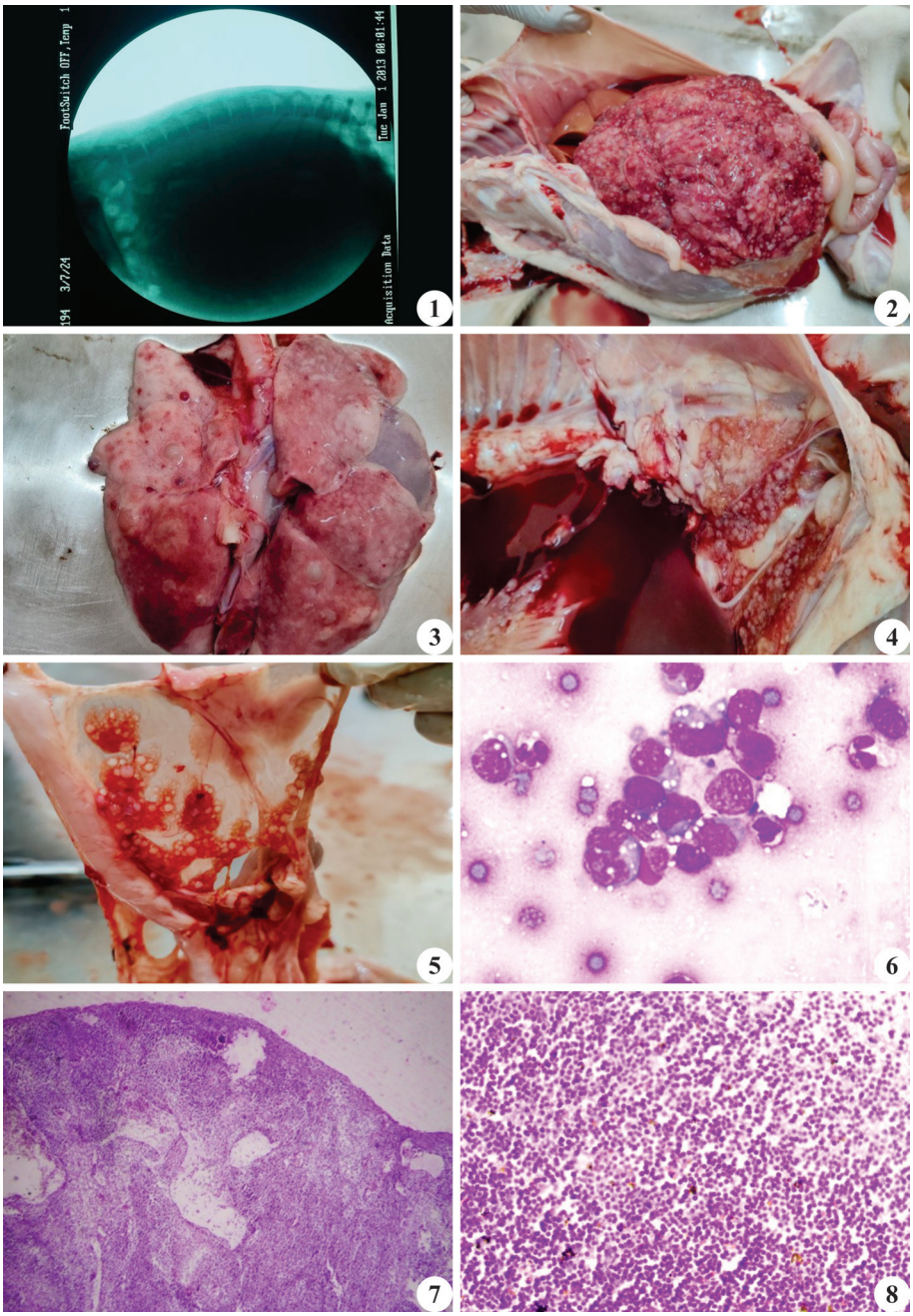

Fig. 1. Lateral abdominal radiograph revealed diffuse soft tissue opacity with poor serosal detail, suggestive of peritoneal effusion or presence of a mass in the right side of the abdominal cavity; **Fig. 2.** Large ball-like soft mass weighing around 2.5 kg with multiple small grey nodules occupied the entire right and ventral abdomen, extended to the left portion of the abdominal cavity; **Fig. 3.** Multiple diffuse raised greyish-white nodules were embedded in all the lobes of lung tissue; **Fig. 4.** Small greyish-white multiple grape-like nodules on the parietal layer of the thoracic cavity; **Fig. 5.** Small greyish-white multiple bunches of grape-like nodules on the mesentery of intestine; **Fig. 6.** Cytological smears revealed malignant neoplastic cells with round to oval nucleoli with a thin rim of basophilic cytoplasm containing lipid vacuoles (Giemsa stain 100X); **Fig. 7.** Section of tumor showing diffuse proliferation of lymphoid cells (H&E 10X); **Fig. 8.** Section of tumor mass showing diffuse proliferation of medium to large sized lymphoid cells (H&E 40x).

precursors can clinically and cytologically mimic a variety of conditions. These include juvenile immune-mediated diseases, reactive or infectious lymphadenitis (e.g., *Ehrlichia* spp., *Leishmania* spp.) and other round cell tumors such as histiocytic sarcoma, acute leukemia, or transmissible venereal tumor[4,6]. LBL often presents with generalized or mediastinal lymphadenopathy, hepatosplenomegaly or leukemic blood profiles, complicating its distinction from acute lymphoid leukemia (ALL) and making immunophenotyping and clonality assays essential for definitive diagnosis[1,3]. Given its aggressive nature and rapid progression, early diagnosis is critical

for implementing therapeutic strategies and determining prognosis.

Present report describes a rare case of lymphoblastic lymphoma in a young puppy, emphasizing the importance of comprehensive diagnostic techniques, including histopathology and immunohistochemistry, in establishing diagnosis. These findings add to the understanding of lymphoid cancers in young dogs and highlight the importance of immunophenotypic markers in identifying different types of lymphoma.

A 2-month-old mixed-breed male puppy, weighing approximately 5 kg, showed progressive abdominal swelling, severe weight loss, emaciation and vomiting. Clinical examination revealed dullness, weakness, pale mucous membranes and a firm mass palpable on the right side of the abdomen. Abdominal radiography showed diffuse soft tissue opacity with poor serosal detail, suggestive of peritoneal effusions or neoplastic infiltration (Fig. 1). While blood picture revealed a decrease in RBC count (5 million/mm^3), Hb (4 g/dL), increase in TLC (> 1 lakh) count and differential leukocyte examination revealed lymphocytosis (92%)[7].

Fine-needle aspiration cytology revealed a population of pleomorphic malignant round cells, comprising of large lymphoblasts with high nuclear-to-cytoplasmic ratios, round to irregular nuclei, coarse chromatin, prominent nucleoli and scant to moderate amounts of deeply basophilic cytoplasm suggestive of lymphoid neoplasm. Due to poor prognosis, on the same day euthanasia was performed with the owner's consent.

A complete necropsy was performed, and gross pathological lesions were systematically recorded. For histopathological evaluation, representative samples from the pulmonary nodule and abdominal tumor mass were collected and fixed in 10% neutral buffered formalin. Tissues were processed using standard paraffin-embedding techniques, and serial sections of 5 μm thickness were stained with hematoxylin and eosin (H&E) as per established protocols[8]. Impression smears were prepared from the cut surfaces of the tumor and lung nodules for cytological assessment. Immunohistochemistry for CD10 and CD20 markers was performed using routine avidin-biotin-peroxidase complex methods to characterize the lymphoid phenotype[3].

Postmortem findings revealed a large, firm abdominal mass (-2.5 kg) occupied the entire right and ventral abdomen, extended to the left portion of the abdominal cavity[7] (Fig. 2). The mass was red to greyish in colour and studded with miliary nodules and soft to firm in consistency. The heart chambers showed a currant jelly clot. Multiple diffuse greyish-white nodules were embedded in all the lobes of lung tissue (Fig. 3) and cut section revealed froth in the bronchi and bronhioles, while the kidneys appeared pale with adherent capsules. Metastatic involvement was evident in multiple organs, including the liver, spleen, kidneys, intestines and mesentery. In addition to metastatic growths, the liver was icteric with a distended gallbladder. Small greyish-white multiple bunches of grape-like nodules were noticed on the parietal layer of the thoracic cavity and peritoneum of the abdominal cavity (Fig. 4 & 5).

Cytological examination of the neoplastic mass revealed round to oval cells with prominent nucleoli and basophilic cytoplasm containing lipid vacuoles, indicative of a high-grade malignant process[7] (Fig. 6).

Histopathological examination of the tumor mass and lung nodule revealed a diffuse proliferation of medium to large-sized lymphoid cells exhibiting moderate to marked anisokaryosis, vesicular nuclei with multiple prominent nucleoli and scant cytoplasm (Fig. 7 & 8). The neoplastic population showed high mitotic activity and scattered apoptotic bodies, consistent with an aggressive high-grade lymphoid malignancy. These features closely resemble those described in canine Burkitt-like lymphoma[7]. To differentiate between B-LL and other lymphoid neoplasms, immunohistochemistry was performed. The neoplastic cells were negative for CD10 and CD20, ruling out classical B-LL (Fig. 9 & 10). Based on histopathological and immunohistochemical

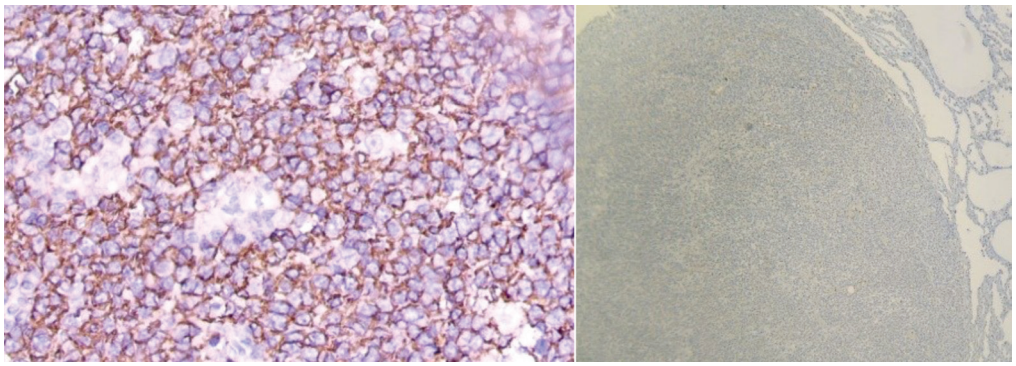

Fig. 9. Immunohistochemical staining of lung tissue revealed negative for CD10, 10X.

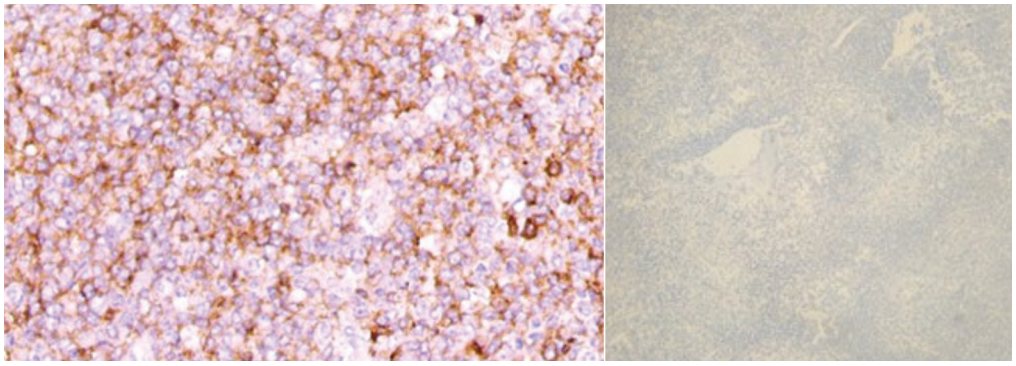

Fig. 10. Immunohistochemical staining of tumor revealed negative for CD20, 10X.

findings, the case was diagnosed as high-grade lymphoblastic lymphoma (lymphosarcoma), likely of T-cell origin. The aggressive nature of T-cell lymphomas correlates with a poorer prognosis in canines, similar to findings in human cases[5].

Lymphoblastic lymphomas in young dogs are rare and may be misdiagnosed as B-LL due to overlapping histological features. Burkitt lymphoma, commonly reported in humans, exhibits a high mitotic rate and a characteristic starry-sky appearance due to tangible body macrophages[9]. Present case report documents a rare case of high-grade lymphoblastic lymphoma mimicking Burkitt-like lymphoma in a puppy. Early diagnosis and classification are crucial for understanding lymphoma progression and optimizing therapeutic application.

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