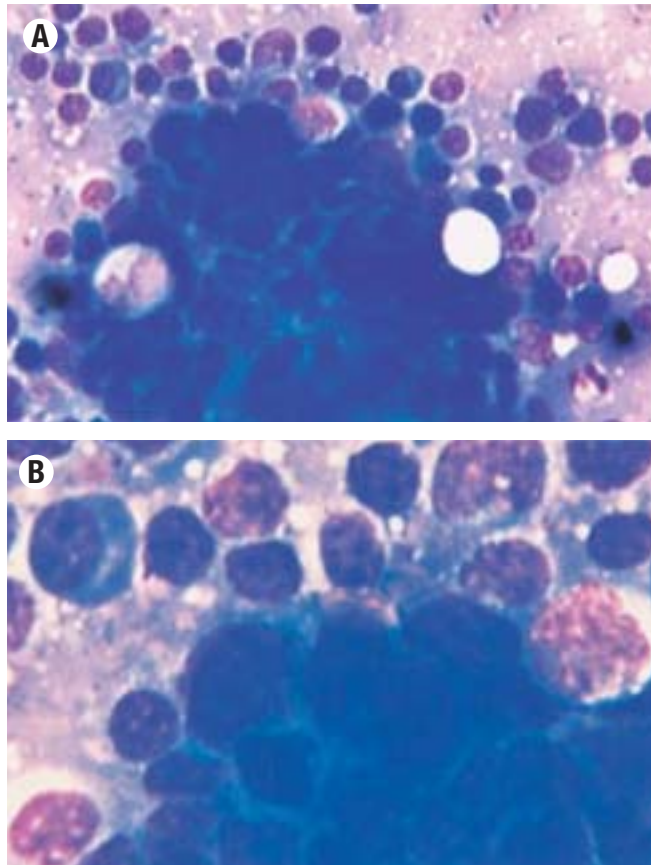


# Popliteal Lymph Node Aspirate from a Dog with a Maxillary Mass

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**Figure 1.** Fine needle aspirate of the left popliteal lymph node. Diff Quik, 400X (A), 1000X (B).

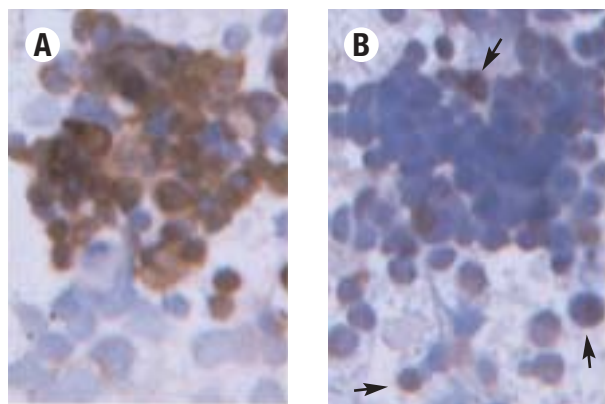
## Case Presentation

A 12-year-old, castrated male Airedale terrier was referred to the Texas Veterinary Medical Center at Texas A&M University for further diagnostic evaluation of masses detected during a geriatric examination. Physical examination revealed a 2 cm erythematous dermal mass over the left hock, a 1 cm dermal mass overlying the left popliteal lymph node, enlarged left popliteal and left prescapular lymph nodes, a 2 cm raised gingival mass on the right maxilla near the canine tooth, a 4 cm perianal mass, and a grade V/VI systolic murmur. Radiographs of the thorax were unremarkable; however, mitral valve endocardiosis was diagnosed on ultrasound evaluation.

The dermal mass and enlarged left popliteal lymph node had been slowly enlarging for 1 to 2 years. The maxillary mass had not been noted during a physical examination 1 year prior. Cytologic examination of a fine needle aspirate from the mass on the left hock ~1 year previously showed pyogranulomatous inflammation with possible epithelial neoplasia. A concurrent fine needle aspirate of the left popliteal lymph node revealed reactive lymphoid hyperplasia with possible pyogranulomatous inflammation.

Blood samples were collected for a complete blood count and chemistry panel. The only abnormality was mild hypernatremia (153 mmol/L, reference interval 138-148 mmol/L). Cytologic examination of fine needle aspirates from the perianal mass and the small mass overlying the popliteal lymph node were consistent with lipomas. Fine needle aspirates from the left popliteal lymph node were evaluated cytologically (Figure 1).

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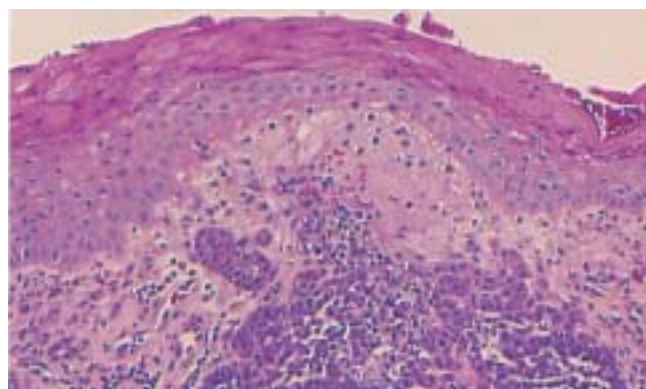
**Figure 2.** Immunocytochemical stains of fine needle aspirate specimens from the left popliteal lymph node, 400X. **(A)** Anti-broad spectrum cytokeratin antibody. A cluster of epithelial cells shows light brown, positive staining for cytokeratin, compared to the negative, unstained lymphocytes in the lower portion of the smear. **(B)** Anti-vimentin antibody. The cluster of epithelial cells is negative for vimentin, compared to the positive, light brown stained lymphocytes (arrows) located within and around the epithelial cell clump.

### Cytologic Interpretation

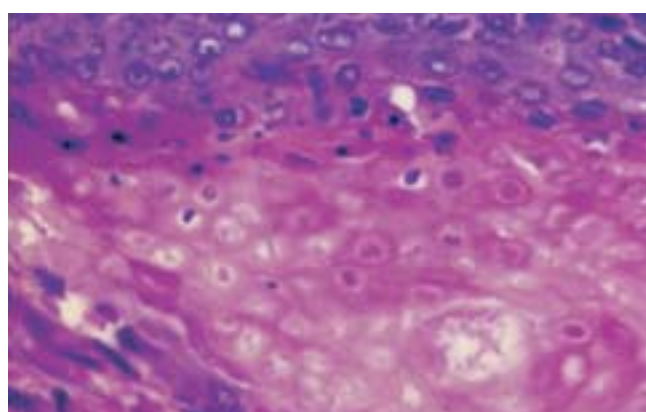
The smears were highly cellular and contained many nucleated cells and abundant RBC dispersed in a lightly proteinaceous background with a few keratin particles. Nucleated cells consisted mostly of small lymphocytes with a slight increase in medium- and large-sized lymphocytes and a moderate increase in plasma cells. Scattered throughout the smears were small clusters of tightly cohesive, small epithelial cells (Figure 1). The epithelial cells were uniform in size, and had a small amount of deep blue, granular cytoplasm. Individual cells had round to oval, uniformly sized nuclei, and high N:C ratios. Nucleoli were rarely visible. Chromatin was finely to coarsely stippled. Many moderately vacuolated macrophages, scattered neutrophils and a few moderately granulated melanocytes also were observed. The melanocytes did not exhibit criteria of malignancy. Etiologic agents were not observed. The cytologic diagnosis was probable basal cell tumor with metastasis to the popliteal lymph node, and reactive lymphoid hyperplasia with chronic inflammation.

Immunocytochemical staining was performed because the epithelial cells were dispersed adjacent to the lymphoid cells, making distinction between epithelial and lymphoid cells difficult. The clustered epithelial cells stained strongly positive for broad-spectrum cytokeratin and could be clearly distinguished from the lymphoid cells, which did not stain for cytokeratin (Figure 2). The lymphoid cells stained positive for vimentin, in contrast to the vimentin-negative epithelial cells.

The epithelial cell morphology was highly suggestive of a basal cell population. Although the cells did not



**Figure 3.** Hyperplastic gingival epithelium overlying clusters and lobules of basaloid epithelial cells in the deeper stromal tissue. H&E, 100X.



**Figure 4.** Loss of nuclear detail associated with "shadow cell" formation adjacent to the basaloid cells in the mass from the left hock (pilomatrixoma). H&E, 400X.

display significant cytologic criteria of malignancy, their location in the lymph node indicated metastasis from a primary site. Differential diagnoses for this tumor included malignant basal cell tumor, malignant pilomatrixoma and malignant trichoepithelioma.

The animal subsequently was anesthetized for biopsy and possible surgical excision of the maxillary and hock masses. Cytologic examination of an intra-operative aspirate of the maxillary mass revealed a basaloid cell population similar to that in the popliteal lymph node. The decision was made to perform a partial maxillectomy. Complete removal of the mass was not possible due to extensive invasion of the bone and adjacent nasal cavity by the tumor. Due to anesthetic complications, biopsy and surgical excision of the mass on the hock were not performed.

### Histologic Interpretation

Histologic evaluation of the maxillary mass revealed a poorly demarcated, infiltrative neoplasm in the gingival

mucosa, overlaid by hyperplastic gingival epithelium (Figure 3). The mass was supported by fibrous stroma and was composed of lobules, nests and islands of basaloid cells. The lobules often had necrotic centers and occasionally displayed abrupt keratinization with rare "shadow cell" formation. The cells were polygonal, with indistinct borders and a small amount of eosinophilic cytoplasm, which was occasionally vacuolated. Nuclei were large, round to oval with finely stippled chromatin, and contained 1 or 2 distinct nucleoli. Mitotic figures were frequent and averaged 5/HPF (400X magnification). There was significant extension of the mass into the alveolar bone of the associated canine tooth. There were moderate accumulations of lymphocytes and plasma cells in the supporting stroma. The histologic features were consistent with a carcinoma with matrical keratinization.

### Necropsy Findings

The dog was euthanatized 5 months later and a necropsy was performed. Gross and histologic examination revealed metastases involving additional lymph nodes, kidney, lung, first cervical vertebra and ribs, and recurrence of the mass in the maxilla. Histologic examination of the mass over the left hock revealed a well circumscribed, non-encapsulated mass composed of aggregates of densely packed basaloid cells. There were areas of shadow cell formation and abrupt keratinization (Figure 4), which are distinct features of the hair matrix tumor, pilomatrixoma.<sup>1</sup> The same histologic pattern was seen in tissue sections from the left popliteal lymph node, the maxillary, lung, and cervical masses, and other lymph nodes. Most of the tumors contained focal areas of mineralization and calcification similar to what have been reported in pilomatrixomas in dogs and in people.<sup>2-6</sup>

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### Discussion

Distinction between various types of basaloid tumors based solely on cytologic examination is difficult, such that histologic examination is often essential for definitive classification. Cytologic evaluation of pilomatrixomas in human beings often reveals sheets of basaloid cells, shadow or ghost cell formation in parabasal-sized cells, squamous differentiation, cytoplasmic keratinization, and frequent clumps of keratin.<sup>7</sup> With the exception of clusters of basaloid cells and keratin clumps, these features were not evident in cytologic specimens from the left popliteal lymph node. Immunocytochemical stains were used as an adjunct to differentiate basaloid cells and lymphoid cells in the lymph node aspirate. In this case, the pattern of immunocytological staining was similar to what was reported for immunohistochemical staining of keratin intermediate filaments for normal epithelial cells and epithelial tumors in dogs.<sup>4,5,8-11</sup>

Given the clinical history of this dog, the most likely origin of the tumor was the mass over the left hock, thus implicating a primary malignant pilomatrixoma with disseminated secondary metastases. Pilomatrixomas are the second most common follicular tumor in dogs, and account for approximately 20% of hair follicle tumors.<sup>12,13</sup> Primary malignant pilomatrixoma and metastatic malignant pilomatrixoma have been documented rarely in both veterinary and human medical literature.<sup>2-6</sup> ◇

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**Key Words:** Canine, cytology, malignant, pilomatrixoma, metastatic

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