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Cytological and histopathological findings of recurrent canine squamous cell carcinoma

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Abstract

Cutaneous squamous cell carcinoma (SCC) is a malignant neoplasm of keratinocytic origin that may show locally invasive behaviour and variable biological aggressiveness in dogs. The present case describes the clinical, cytological and histopathological features of a recurrent cutaneous SCC in a four-year-old intact male non-descript dog. Clinically, the lesion was erythematous, firm, raised and ulcerated, with maggot infestation. Fine-needle aspiration cytology (FNAC) revealed moderate cellularity composed of round to polygonal neoplastic cells arranged singly and in clusters, with anisocytosis, anisokaryosis, increased nuclear-to-cytoplasmic ratio, multinucleation, coarse chromatin and inflammatory cells. Following surgical excision, mass was submitted for histopathological examination. Histologically, invasive nests of neoplastic squamous cells infiltrated the dermis with desmoplasia; cells showed eosinophilic cytoplasm, vesicular nuclei, intercellular bridges and nuclear pleomorphism, with occasional keratin pearls, consistent with moderately differentiated SCC. Recurrence was documented 45 days after surgery, cranial to the original lesion, and histology of the recurrent mass again showed atypical squamous-cell nests and cords, keratin pearl formation and stromal invasion. The rapid local recurrence emphasizes the importance of complete excision, histopathological assessment of margins, and structured postoperative surveillance in canine cutaneous SCC.

Keywords: Cutaneous squamous cell carcinoma, FNAC, histopathology, keratin pearls

Introduction

Squamous cell carcinoma (SCC) is a malignant epithelial neoplasm arising from keratinocytes and is recognized as an important cutaneous malignancy in dogs. SCC accounts for approximately 5% of cutaneous neoplasms in canines and commonly occurs in the oral cavity, nail beds, paw pads, nasal planum, ears, abdomen, extremities and perianal region, with a tendency to occur in sparsely haired or mucocutaneous areas (Begum *et al.*, 2023; Schneider *et al.*, 2021) ^[2].

The development of canine cutaneous SCC is multifactorial. Chronic ultraviolet (UV) exposure is an important environmental risk factor, particularly in poorly pigmented and sparsely haired skin, along with viral, immunological and alterations in cellular adhesion (Alves *et al.*, 2022; Schneider *et al.*, 2021) ^[1]. Tumor may present from relatively differentiated lesions with limited metastatic potential to more invasive tumours with a greater risk of regional spread (Schneider *et al.*, 2021; Chandrashekariah *et al.*, 2011) ^[3].

Cytology is useful for recognizing epithelial malignancy and guiding initial diagnostic decisions, whereas histopathology provides information on tissue invasion, differentiation, keratinization, stromal response and surgical margins (Begum *et al.*, 2023; Nagamine *et al.*, 2017) ^[2, 6]. In canine SCC, histological evaluation of the invasive front may be particularly informative because the advancing tumour front can display a different grade from the superficial component (Nagamine *et al.*, 2017).

Local recurrence is clinically important because residual microscopic tumour at or near the surgical margin may permit regrowth. In a prospective study of surgically excised cutaneous malignant tumors, infiltrated and close margins were associated with substantially more recurrence than clean margins, supporting careful histological assessment of excision margins

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(Scarpa *et al.*, 2012) ^[7].

The current describes a canine cutaneous SCC that recurred only 45 days after surgical excision and correlates the clinical appearance with cytological and histopathological findings. The case is relevant because the rapid recurrence illustrates tumor grading, assessment of local invasion and margin evaluation is necessary.

Materials and Methods

In the present case, a non-descript intact male dog aged four years was presented with a history of an ulcerated mass in the right shoulder region for approximately one month. Grossly the mass was erythematous, firm, raised and ulcerated with maggot infestation.

Fine needle aspiration cytology (FNAC) was performed using 22-gauge needles, with smears stained using Giemsa stain. The cytological smears were initially assessed for staining quality and cellular adequacy. Cytological assessment focused on cellularity, cellular arrangement, nuclear and cytoplasmic morphology, pleomorphism, keratinization and associated inflammatory cells.

Representative tumor tissues were fixed in 10% neutral buffered formalin, processed, and processed using routine paraffin embedding techniques. Thin sections measuring 4 μ m were prepared with a rotary microtome and stained using the Hematoxylin and Eosin (H & E). Histopathological interpretation considered cellular architecture, degree of differentiation, keratinization, nuclear pleomorphism, stromal response and invasion.

Results

On clinical examination, 5 $\times$ 5 $\times$ 3 cm mass was observed at the right shoulder region with a history of gradual increase in size in the last 1 month (fig.1 and fig.2). FNAC smears showed moderate cellularity. Neoplastic cells were round to

polygonal and occurred predominantly in clusters, with occasional singly dispersed cells. The cells exhibited anisocytosis and anisokaryosis, an increased nuclear-to-cytoplasmic ratio, distinct cytoplasmic borders, coarse chromatin and multinucleation. Occasional emperipolesis and a variable inflammatory background were also observed. Collectively, the cytomorphological features supported a diagnosis of epithelial malignancy consistent with carcinoma (fig.5; fig.6; fig.7).

The animal underwent surgical excision of the mass. Grossly, the cut surface of the excised tissue was ulcerated, white in color and friable in consistency (fig.3). Histopathology revealed invasive nests of neoplastic squamous epithelial cells infiltrating the dermis and accompanied by a desmoplastic stromal response. The neoplastic cells had eosinophilic cytoplasm, vesicular nuclei, intercellular bridges and variable nuclear pleomorphism (fig.8). Occasional keratin pearls were present (fig.9). On the basis of the reported cellular organization, keratinization and stromal invasion, the primary lesion was diagnosed as moderately differentiated cutaneous squamous cell carcinoma.

Despite surgical excision, recurrence occurred 45 days later cranial to the original lesion (fig.4). Histopathological examination of the recurrent tissue revealed nests and cords of atypical squamous cells, keratin pearl formation and stromal invasion (fig.10). These findings are suggestive of recurrent SCC and were supportive of persistence of locally invasive neoplastic cells and/or inadequate clearance at the primary site.

The short recurrence interval is clinically significant. The recurrence in this case should not, however, be attributed to incomplete margins alone but also consider microscopic extension beyond the grossly visible lesion and the intrinsic local invasiveness of SCC.



Fig 1: Clinical presentation of the dog showing the ulcerated cutaneous lesion in the right shoulder region.



Fig 2: Gross appearance of the tumor mass.



Fig 3: Cut surface of the tumor mass showing ulceration and friable in consistency.



Fig 4: Clinical presentation of the dog showing recurrent mass cranial to the previous excision site.

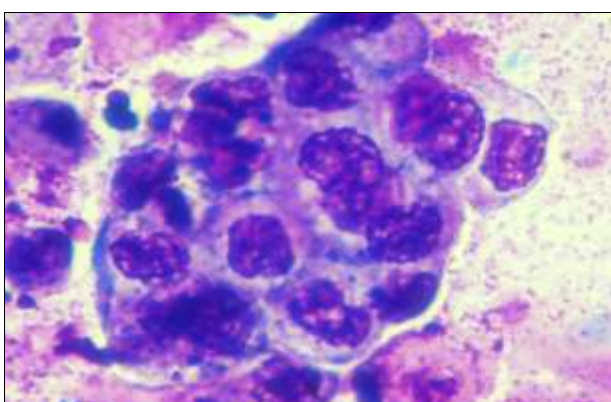


Fig 5: Cytological smear showing clusters of pleomorphic neoplastic cells with prominent nuclear atypia.

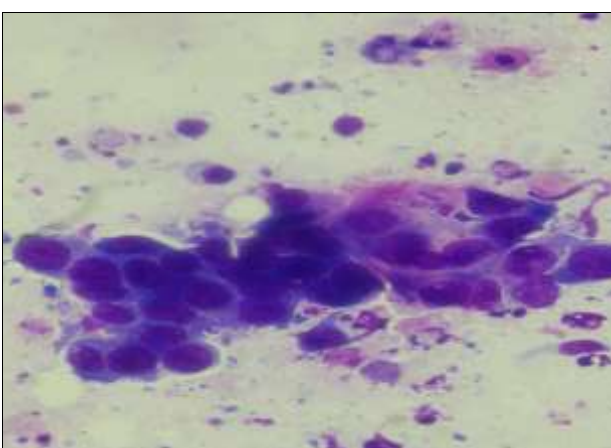


Fig 6: Cytological smear showing a cluster of polygonal neoplastic cells with anisokaryosis and cytoplasmic variation.

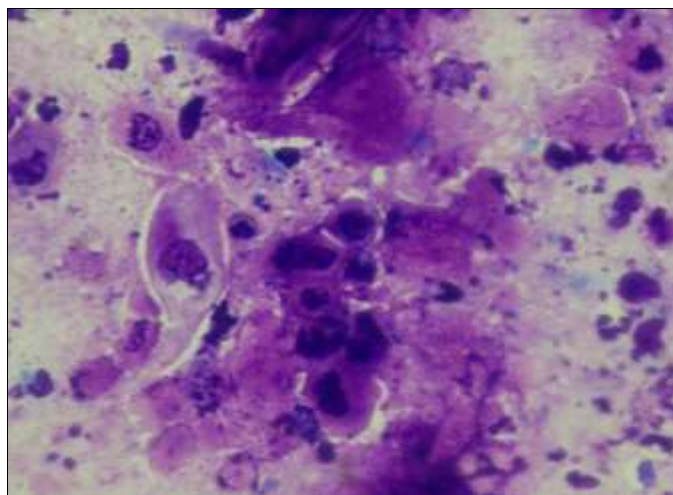


Fig 7: Cytological smear demonstrating neoplastic squamous epithelial cells in an inflammatory background.

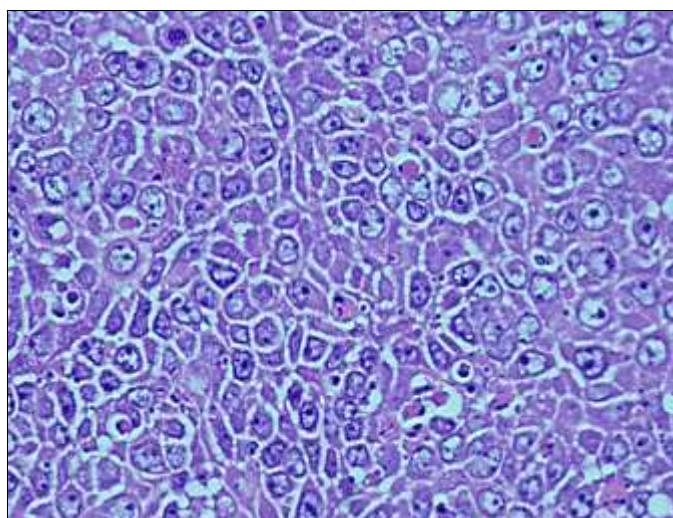


Fig 8: Histopathological section of the primary lesion showing proliferating neoplastic epithelial cells with squamous differentiation.



Fig 9: Histopathological section of the primary lesion demonstrating invasive nests/cords of squamous neoplastic cells within the dermal stroma

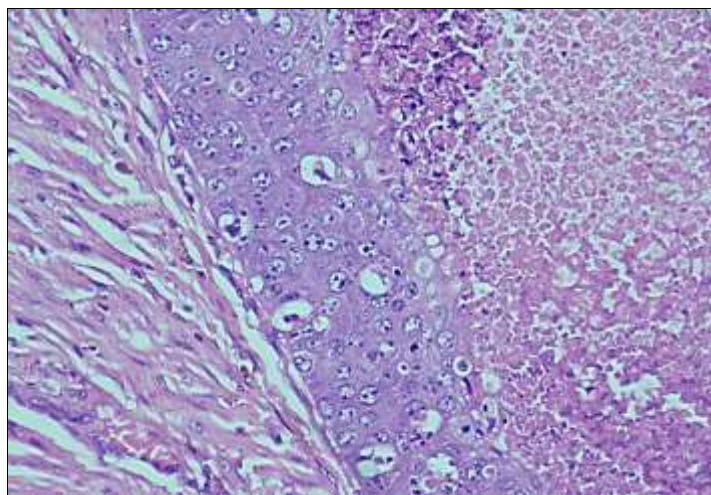


Fig 10: Histopathological section of the recurrent mass showing squamous differentiation and stromal invasion.

Discussion

Canine cutaneous SCC is characterized by a range biological behavior as well as etiological factors and presents a variation in gross appearance, microscopic appearance and histological grade (Schneider *et al.*, 2021). In the present case, the clinical appearance of the mass with maggot infestation is compatible with a chronic ulcerated malignant cutaneous lesion. Myiasis may develop secondarily in ulcerated masses and should not be regarded as the primary diagnosis when the underlying lesion is neoplastic.

The cytological findings were strongly supportive of epithelial malignancy. Clustering of polygonal cells, distinct cytoplasmic borders, anisocytosis, anisokaryosis, increased nuclear-to-cytoplasmic ratio and multinucleation are characteristic cytological features of SCC (Begum *et al.*, 2023; Marques *et al.*, 2020) [2, 5]. A previous review of 17 canine SCCs similarly reported that malignant squamous cells occurring singly or in clusters, with pleomorphism, anisokaryosis and anisocytosis (Marques *et al.*, 2020) [5]. Previous reports also suggested that well-differentiated tumors showed keratin pearls and moderately differentiated tumours formed cords or nests separated by fibrous stroma (Begum *et al.*, 2023; Marques *et al.*, 2020) [2, 5].

Histopathology remains essential because cytology cannot fully characterize tissue invasion and margin status. In the present case, dermal invasion, desmoplasia, intercellular bridges and keratin pearl formation supported a diagnosis of moderately differentiated SCC. These findings are consistent with the literature in which the degree of squamous differentiation and tumour architecture are used for histological grading (Schneider *et al.*, 2021; Marques *et al.*, 2020).

Assessment of the invasive nature is increasingly recognized as an important component of SCC grading. Nagamine *et al.* (2017) [6] reported that grading based on invasiveness could yield higher histological grades than grading based on the superficial component and suggested that epithelial mesenchymal transition-related changes may contribute to invasive behavior.

The most striking feature of this case was recurrence 45 days after excision. Histological margin evaluation has been shown to be clinically useful in predicting recurrence of cutaneous malignant tumors. In a study by Scarpa *et al.* (2012) [7], recurrence was markedly higher when margins were

infiltrated or close compared with clean margins, and the authors recommended prolonged postoperative surveillance. The rapid recurrence in the present case therefore supports the need for submission of the entire excised lesion for careful margin evaluation and for follow-up examinations even when the primary tumor appears clinically removed.

Recent studies also reinforce the prognostic value of histological grade in canine cutaneous SCC. A case-series study of inguinal SCC reported a substantially longer median survival in dogs with low-grade tumours than in those with the highest grade and concluded that histological grade and clinical staging were useful prognostic factors (Jiménez-Alonso *et al.*, 2025) [4]. Molecular and immunohistochemical studies have investigated additional prognostic markers. Thus, conventional histopathological assessment remains central to routine diagnosis, while additional biomarkers should be considered adjunctive rather than replacements for morphological assessment.

Conclusion

The current case demonstrates recurrent canine cutaneous squamous cell carcinoma with close clinicopathological correlation. FNAC provided an early indication of epithelial malignancy, while histopathology established the diagnosis and demonstrated invasive squamous differentiation with keratin pearl formation. Recurrence within 45 days highlights the locally invasive potential of canine SCC and the importance of complete excision, meticulous histological margin assessment and continued postoperative surveillance. This illustrates that apparently successful initial surgery does not eliminate the need for postoperative monitoring, particularly when the tumor is ulcerated, infiltrative or incompletely characterized at the margins.

Conflict of Interest

Not available

Financial Support

Not available

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