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Perianal gland tumours in dogs: Incidence and clinicopathological diagnosis of 223 cases

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Abstract
Perianal gland tumours were diagnosed in 223 dogs through cytological and histopathological examination of samples collected from tumour-suspected masses. Of these, 102 cases were identified as perianal gland adenomas, while 121 cases were classified as perianal gland adenocarcinomas. In the analysis of tumour occurrence by breed, sex, age, and anatomical location, perianal gland adenomas were most commonly observed in non-descript and Labrador breeds, male dogs, dogs aged 5-10 years, and primarily in the perianal region. Perianal gland adenocarcinomas were most prevalent in non-descript and Spitz breeds, male dogs, dogs aged 5-10 years, and also predominantly in the perianal region. Cytological examination of the tumours revealed clusters of hepatoid cells characterized by round to oval nuclei, prominent nucleoli, and faint to deeply basophilic cytoplasm. Histopathological examination showed multiple lobules composed of sheets of hepatoid cells with indistinct cell outlines and round to oval vesicular nuclei. Notably, mitotic figures were evident in perianal gland adenocarcinomas, indicating their malignant nature.

Keywords: Dog, tumours, perianal tumours, perianal adenoma, perianal adenocarcinoma, cytology, histopathology

Introduction
Perianal gland tumors, also known as hepatoid gland tumors, originate from modified sebaceous glands located around the anus and are more frequently observed in aged, intact male dogs. These tumors may develop not only in the perianal region but also on the upper and lower surfaces of the tail, the preputial area, and the caudal region of the hind limbs (Williams *et al*., 2003) [14]. According to Gross *et al*. (2005) [7], perianal glands are the modified sebaceous glands predominantly located in perianal skin and are also referred to as circumanal glands due to their location or hepatoid glands due to their histological resemblance to hepatocytes.

Multiple etiological factors and risk elements have been associated with the development of perianal tumors. These include hormonal influences (particularly androgens), advanced age, chronic irritation of the anal and perianal region, genetic mutations, and exposure to environmental carcinogens. In gender wise occurrence, intact male dogs are more predisposed to perianal tumors, likely due to the presence of androgen receptors. Martin *et al*. (2008) [9] reported that perianal gland tumors are the third most common type of neoplasia in male dogs, following testicular and cutaneous neoplasms.

Perianal tumours are classified into two primary types based on morphological and clinical characteristics, such as metastatic potential, local invasiveness, and recurrence post-surgery as perianal adenoma (the benign form) and perianal adenocarcinoma (the malignant form). Metastasis may involve the regional lymph nodes and vital organs such as the lungs and liver.

Clinically, the dogs with perianal tumours exhibit a spectrum of symptoms including general discomfort, restlessness, aggression, dyschezia, constipation, and straining, primarily due to the pressure exerted by the tumour mass in the perianal area.

Grossly, perianal tumors may present as solitary, discrete lesions or multiple nodular masses (Morris and Dobson, 2001) [10]. Jane and Duncan (2003) [8] observed that perianal gland tumors can reach up to 10 cm in diameter.

It's also a common finding that perianal tumours may clinically be presented with ulceration and bleeding due to the scooting behaviour of the dogs in a way to relieve the discomfort caused by the presence of tumours, wherein, the tumour mass may get inflamed, infected and ulcerated with the discharge of raw blood.

Cytology, histopathology and immunohistochemistry are the diagnostic modalities employed for the diagnosis of perianal gland tumours in dogs. Subapriya *et al.* (2021) [12] observed strong positive expression of cytokeratin in their immunohistochemical studies on perianal gland adenocarcinomas.

In light of the above, the present study was undertaken to investigate the pathological features and epidemiological distribution of perianal gland tumours in dogs.

Materials and Methods

The present study was conducted through cytological screening of clinical samples submitted for tumour diagnosis to the Centralised Clinical Laboratory, Madras Veterinary College, Chennai-07. The samples comprised Fine Needle Aspiration Cytology (FNAC) specimens, touch impression smears, and blood and serum samples collected from dogs suspected of having tumours.

Smears prepared from FNAC and impression samples were air-dried and stained using the Leishman-Giemsa (LG) stain. Tumour diagnosis was established by meticulous examination of the stained smears under light microscopy, progressing from low to high magnification to assess cellularity and nucleo-cytoplasmic features. In selected cases, tissue biopsies were collected, processed, and stained following the procedures described by Bancroft and Gamble (2008) [3]. Demographic details of confirmed tumour cases, including breed, sex, age, and tumour location were recorded from the information provided on the sample processing requisition forms.

Results and Discussion

In our study, a total of 223 dogs were diagnosed with perianal tumours based on pathological screening of samples collected from tumour-suspected masses. These cases represented an incidence of 3.96% of all tumours diagnosed in dogs during the study period. Perianal tumours, particularly those of glandular origin, are frequently encountered in intact male dogs and are associated with androgen influence (Gross *et al*., 2005; Goldschmidt and Goldschmidt, 2017) [7, 6].

Perianal Gland Adenoma

Tumour incidence

Among the perianal tumours, perianal gland adenoma was diagnosed in 102 dogs based on cytological and histopathological findings. This accounted for 1.81% of all canine tumours diagnosed during the study period and 44.74% of the perianal tumours. The finding is consistent with previous studies that report perianal gland adenoma as one of the most common benign cutaneous tumours in dogs (Yhee *et al*., 1996; Gross *et al*., 2005) [15, 6]. Earlier, Subapriya *et al.* (2021) [13] reported 6.25% incidence of perianal adenoma in their study on skin tumours in canine population.

Breed-wise Occurrence

The adenomas were recorded in eight breeds, with the highest incidence observed in non-descript dogs (n=55) and Labrador Retrievers (n=21), followed by other breeds (Fig. 1). This trend is a reflection of the higher representation of these breeds within the local dog population itself, again likely driven by pet ownership preferences in the region than indicative of the breed predisposition to the perianal tumours.

Sex-wise Occurrence

A significant majority of cases were recorded in male dogs (n=80) (Fig. 2). This trend is consistent with earlier findings that perianal gland tumours are hormonally influenced and occur predominantly in intact males (Goldschmidt and Shofer, 1992; Williams *et al*., 2003) [5, 14] as well as to the fact of higher male-to-female ratio within the local dog population due to pet ownership preferences in the region.

Age-wise Occurrence

The highest number of cases occurred in adult dogs aged between 5-10 years (n=58), followed by dogs older than 10 years (n=31). No perianal gland adenomas were diagnosed in dogs younger than one year of age (Fig. 3). This aligns with studies indicating that these tumours are more common in middle-aged to older dogs (Gross *et al*., 2005; Withrow *et al*., 2013) [6, 15].

Location-wise Occurrence

Anatomically, the tumours were predominantly located in the perianal region (n=97), with a few cases observed in the tail region (n=5) (Fig. 4). This corroborates with Gross *et al*. (2005) [6] who have reported earlier that perianal tumours are typically found in areas with abundant hepatoid (modified sebaceous) glands such as the perianal skin, tail base, and prepuce.

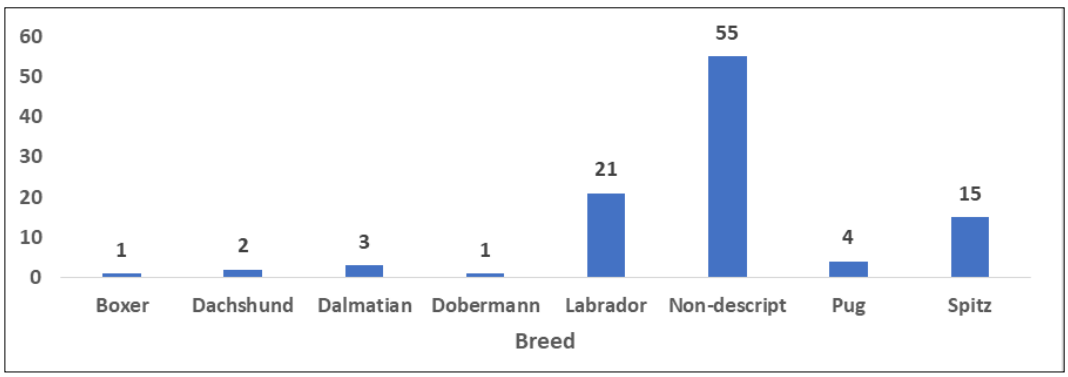

Fig 1: Breed wise incidence of canine Perianal gland adenoma (n=102)

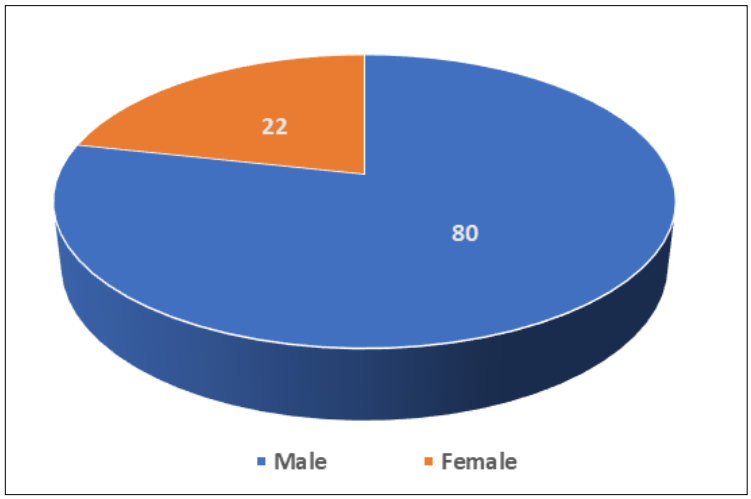

Fig 2: Sex wise incidence of canine Perianal gland adenoma (n=102)

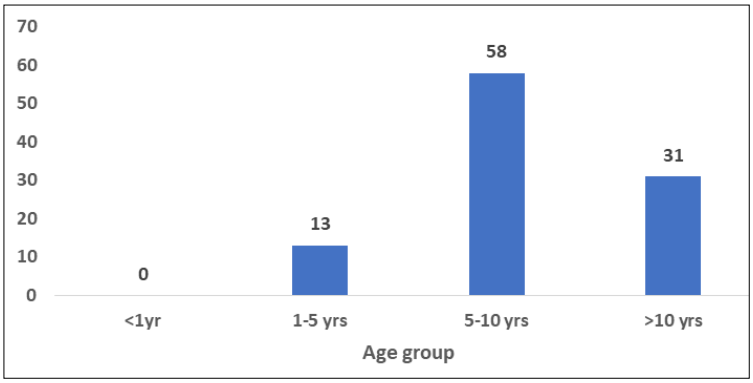

Fig 3: Age wise incidence of canine Perianal gland adenoma (n=102)

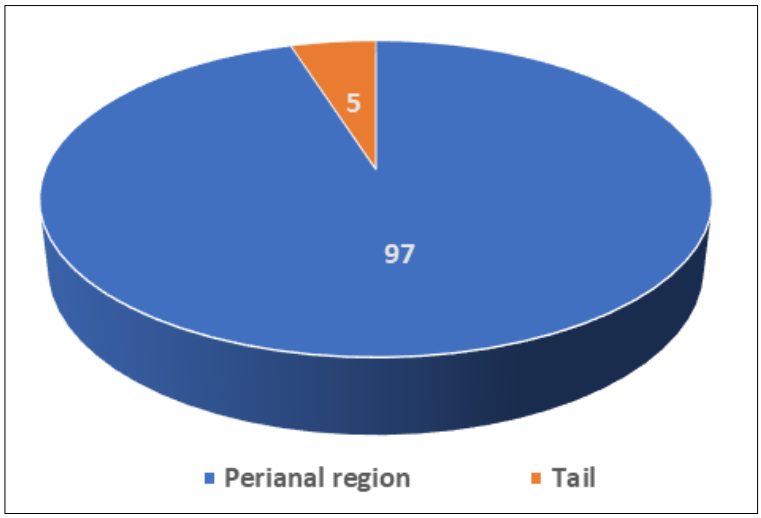

Fig 4: Location wise incidence of canine Perianal gland adenoma (n=102)

Gross appearance

Perianal adenoma exhibited varied gross appearances, typically presenting as irregular to round or spherical masses, measuring approximately 4-7 cm in diameter. They were generally hard to firm in consistency upon palpation. On cut section, the masses appeared grey-white to yellowish-white, with some showing evidence of internal haemorrhages. Ulceration and surface haemorrhage were observed in 11 cases, indicating either tumour progression or mechanical irritation due to anatomical location (Fig. 5, 6). These gross characteristics are consistent with previously reported features of perianal gland tumours (Gross *et al*., 2005; Withrow *et al*., 2013) [6, 15].

Cytological findings

Cytological examination of perianal gland adenomas revealed cohesive clusters and sheets of hepatoid cells (Fig. 7). The neoplastic cells were characterized by round to oval nuclei, finely stippled chromatin, prominent nucleoli, and a moderate amount of faintly basophilic cytoplasm. The cytoplasm appeared granular in some cells, indicative of sebaceous differentiation. In addition to the dominant hepatoid cells, small, round reserve cells were occasionally observed in the background which appeared smaller in size, with a higher nucleus-to-cytoplasm ratio and often seen as tight clusters. These cytological features are consistent with those described by Alleman and Bain (2000) [1], who emphasized the

diagnostic utility of cytology in differentiating benign perianal gland tumours from more aggressive neoplastic lesions.

Histopathological findings

Histopathological examination of perianal gland adenomas revealed multiple well-organized lobules composed of sheets of hepatoid cells with indistinct cell borders. The neoplastic cells exhibited round to oval, vesicular nuclei and granular, eosinophilic cytoplasm which are the hallmark features of sebaceous-type differentiation (Fig. 8). In focal areas, small clusters of reserve cells were noted. These cells were characterized by darkly stained, hyperchromatic nuclei and minimal cytoplasm, often arranged in compact groups. A moderate amount of fibrovascular stroma separated the lobules, providing architectural support to the neoplastic tissue. These histological features are consistent with those previously described in the literature and are in agreement with the findings of Aronson (2003) [2], who highlighted the benign nature, organized lobular architecture, and distinct cellular morphology of perianal gland adenomas.

Fig 5: Perianal adenoma - Labrador- Perianal region - Bulging mass with congestion

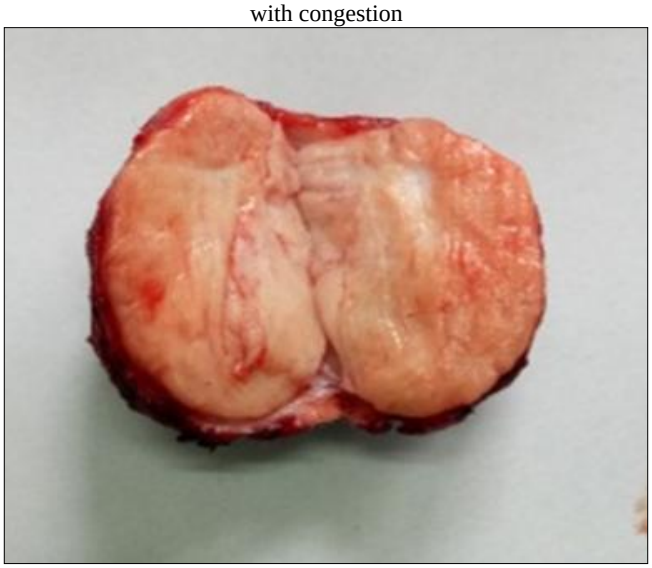

Fig 6: Perianal adenoma - Cut section - Yellowish white with haemorrhage

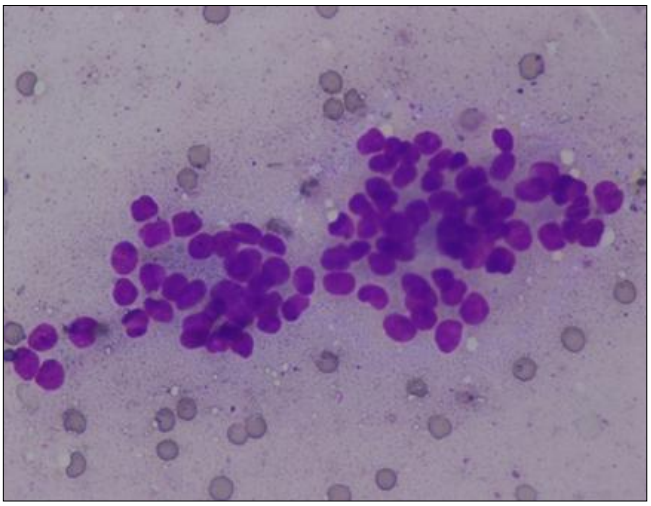

Fig 7: Perianal gland adenoma - Cluster of uniform sized hepatoid cells LG x400

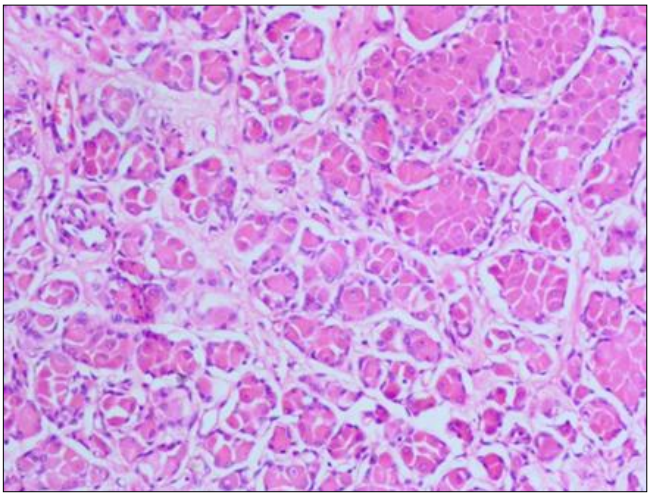

Fig 8: Perianal adenoma - Lobules containing sheet of hepatoid cells H&E x100

Perianal gland adenocarcinoma

Tumour incidence

During the study period, 121 cases of perianal gland adenocarcinoma were diagnosed in dogs on the basis of cytological and histopathological examination. These cases represented 2.15% of all tumours and 54.26% of perianal tumours in the study population.

Breed-wise Occurrence

The tumours were recorded in 13 breeds, with the highest incidence in non-descript dogs (n = 63), followed by Spitz (n = 20) and Labrador retrievers (n = 16) (Fig. 9). This distribution likely mirrors the larger proportion of these breeds in Chennai, reflecting pet-owner preferences.

Sex-wise Occurrence

Sex-wise analysis showed a marked predominance in male dogs (108/121) (Fig. 10), consistent with the androgen-dependent pathogenesis of perianal gland tumours described by Sanja *et al.* (2005) [11]. The skew toward males may also reflect their higher overall proportion in the local dog population.

Age-wise Occurrence

Age-wise distribution revealed the greatest number of cases in dogs aged 5-10 years (n = 66), followed by those older than

10 years (n = 46). No tumours were detected in dogs younger than one year (Fig. 11).

Location-wise Occurrence: The majority of perianal adenocarcinoma cases were recorded in the perianal region (n = 116), followed by the tail region (n = 5) (Fig. 12).

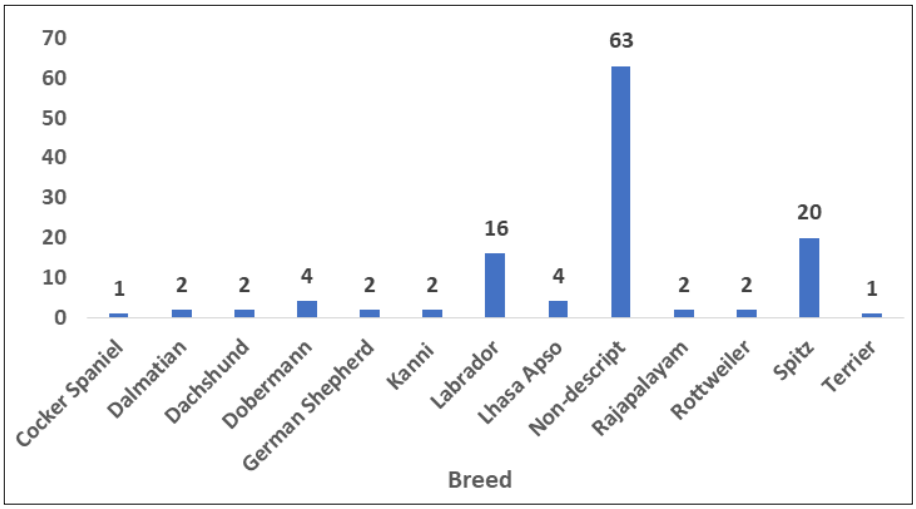

Fig 9: Breed wise incidence of canine Perianal gland adenocarcinoma (n=121)

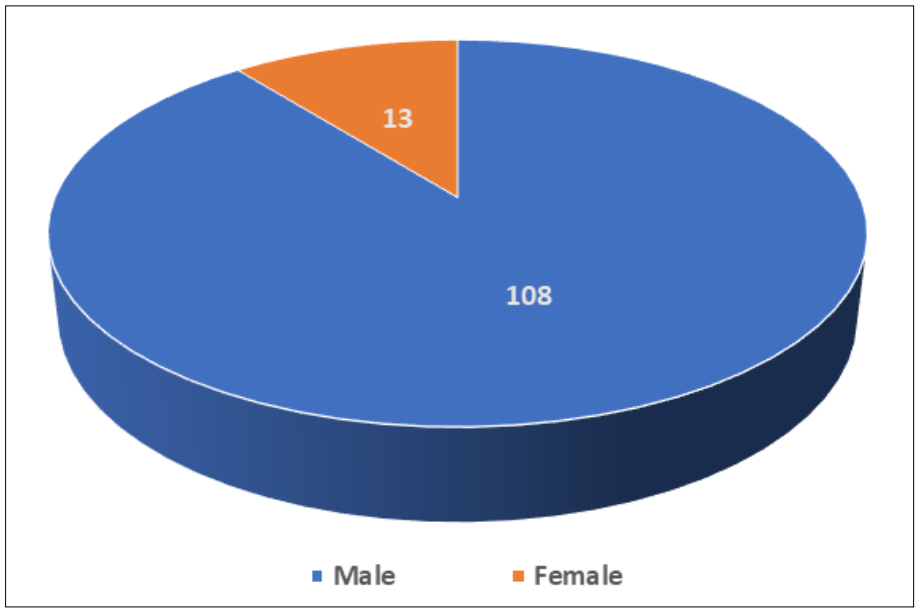

Fig 10: Sex wise incidence of canine Perianal gland adenocarcinoma (n=121)

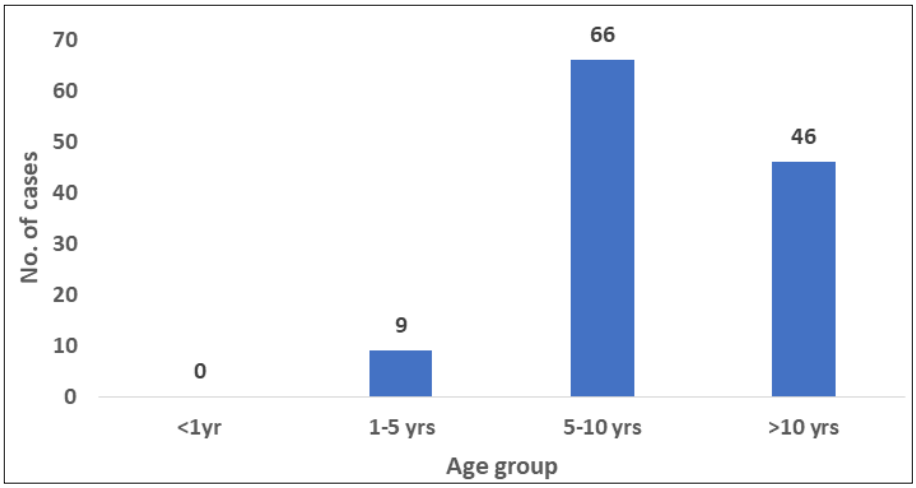

Fig 11: Age wise incidence of canine Perianal gland adenocarcinoma (n=121)

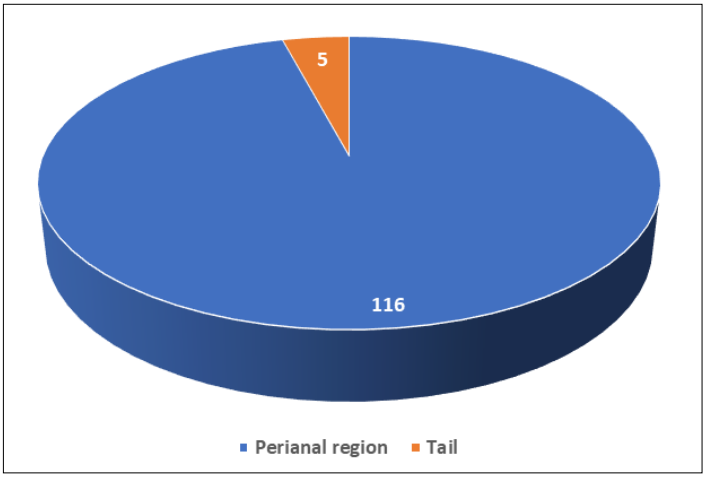

Fig 12: Location wise incidence of canine Perianal gland adenocarcinoma (n=121)

Gross appearance

Morphologically, the tumours appeared as irregular, ulcerated and haemorrhagic masses measuring 3-12 cm in diameter. The cut sections were gray white to haemorrhagic (Fig.13-16).

Cytological findings

Cytological smears of perianal adenocarcinoma revealed clusters of pleomorphic, hyperchromic hepatoid cells with basophilic cytoplasm. The cells were round to caudate shaped with basophilic, round to oval pleomorphic nuclei (Fig.17, 18). Few small cells with sparse cytoplasm and large round nuclei were seen. Hepatoid cells had spherical to oval nuclei with coarse chromatin and prominent multiple nucleoli. The nuclear cytoplasmic ratio was altered. The cytological findings observed agreed with Cowell *et al*. (2007) [4].

Histopathological findings

Histopathologic examination revealed sheets of polygonal hepatoid cells arranged in solid pattern with large vesicular nuclei and prominent nucleoli. Eosinophilic granular cytoplasm was seen. Darkly stained reserve cells with hyperchromatic nuclei and very little cytoplasm were also seen in focal areas. Mitotic figures were seen (Fig.5-9). Similar observations were made by Goldschmidt and Shofer (1992) [5]. Lipid vacuoles of varied sizes were observed in neoplastic cells in a case. Moderate amount of stroma was seen with neutrophilic and mononuclear cell infiltration in a few cases (Fig.19, 20).

Fig 13: Perianal adenocarcinoma -Non-descript- Perianal region - Spherical, ulcerated mass

Fig 14: Perianal adenocarcinoma - Lhasa Apso- Tail - Spherical, ulcerated mass

Fig 15: Perianal adenocarcinoma--Non-descript- Perianal region-multilobular ulcerated mass

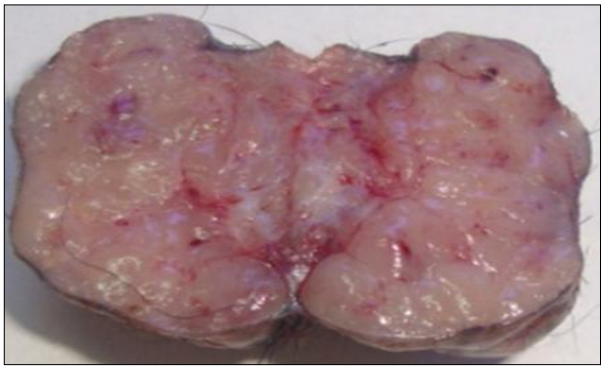

Fig 16: Perianal gland adenocarcinoma - Cut section - Greyish white with petechiae

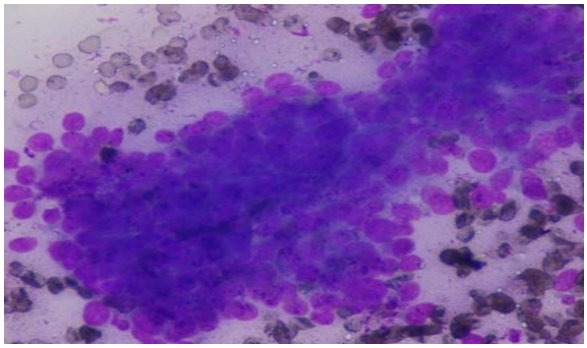

Fig 17: Perianal adenocarcinoma - Clusters of pleomorphic, hyperchromic hepatoid cells with basophilic cytoplasm LG x400

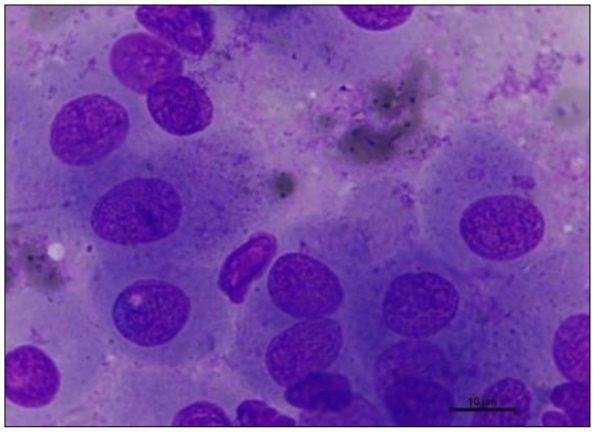

Fig 18: Perianal adenocarcinoma - Altered nuclear to cytoplasmic ratio LG x1000

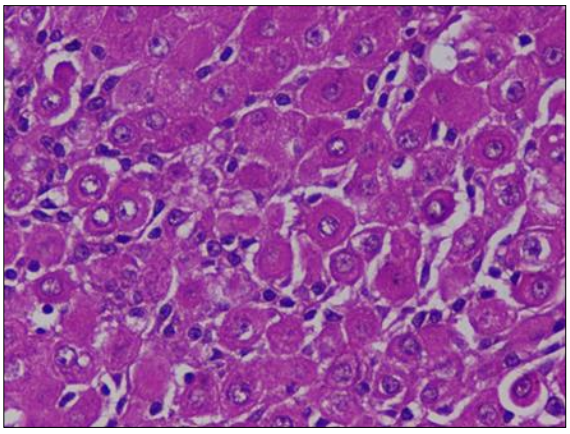

Fig 19: Perianal gland adenocarcinoma - Variable sized hepatoid cells and mitotic figures H&E x 400

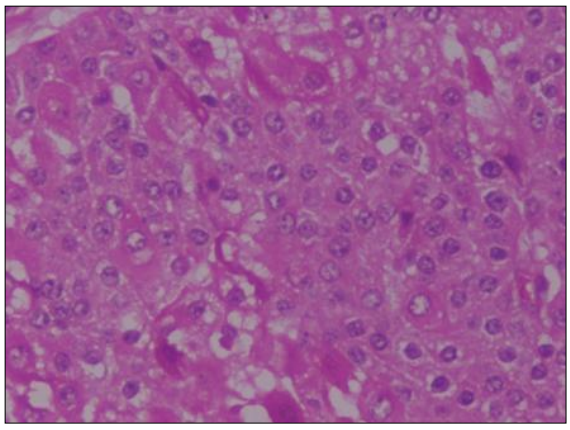

Fig 20: Perianal gland adenocarcinoma - Variable sized hepatoid cells containing vesicular nuclei H&E x 400

Conclusion

Our study of 223 canine perianal gland tumours established cytology as a useful, minimally invasive tool for the initial diagnosis of perianal tumours and histopathology as a complementary tool for definitive grading of tumours and for margin assessment of tumours for surgical planning. Further, given the metastatic potential of perianal adenocarcinomas, pre-operative radiography is also recommended to screen for metastatic foci of perianal tumours in vital organs.

Perianal adenocarcinomas can develop in both male and female dogs, yet, intact males show a higher incidence, implicating androgenic stimulation in development of perianal tumours. In this direction, castration of intact males serves both as a preventive measure and as an adjunct to surgery, reducing the risk of recurrence in dogs, post-surgical excision of perianal tumours.

Acknowledgement

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Conflict of Interest

Not available.

Financial Support

Not available.

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