

CLINICAL PRESENTATION, DIAGNOSIS, TREATMENT AND TREATMENT OUTCOME OF SALIVARY MUCOCELES IN DOGS: A CASE SERIES

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SUMMARY: A salivary mucocele is an accumulation of saliva in tissue spaces consequent to a leak of a damaged salivary gland or duct. This article describes the clinical presentation, diagnosis, treatment and treatment outcome of twenty one cases of salivary mucocele presented to the Veterinary Teaching Hospital, University of Peradeniya. The age of the dogs ranged from two to ten years; the breeds included both local and crosses of imported breeds. The diagnoses of salivary mucocele in all cases were made on clinical presentation and confirmed by fine needle aspiration cytology (FNAC). All cytological smears displayed windrowing and contained increased numbers of neutrophils, haemosiderin-laden macrophages, haematoidin crystals and bacteria. The causes for salivary mucocele were identified as trauma and inflammation, salivary adenocarcinoma and idiopathic. All dogs were treated surgically under general anaesthesia; surgical drainage, with removal of affected salivary gland and surgical drainage with removal of salivary carcinoma. In addition to surgical intervention, the dogs were prescribed with antibiotics, anti-inflammatory drugs and an Elizabethan collar was applied to prevent self-trauma. The treatment outcome was excellent in all dogs except one dog which had a salivary gland adenocarcinoma that succumbed a few weeks following surgery, despite supportive management.

BACKGROUND

The soft or flocculant painless swelling caused by accumulation of saliva in the tissues of the mouth and proximal neck is called a salivary mucocele. A damaged or inflamed salivary gland or duct begins to leak saliva into the adjacent tissues, causing inflammation. Therefore, the development of salivary mucoceles is often a slow and subtle process, making it difficult for the dog owners to detect them at early stages. The inflammation induced by the accumulating saliva becomes chronic and often worsens over time (Hulland & Archibald, 1964; Yasuno *et al.*, 2011).

There are four types of salivary mucoceles based on the location. Mucoceles that occur in the upper neck and around the lower jaw are known as cervical mucoceles. The second type is sublingual mucocele, which is also known as a ranula that occurs within the mouth, below and alongside the tongue (Timur *et al.*, 2022; Chandra Sutradhar *et al.*, 2022; Mullins *et al.*, 2018). Pharyngeal mucocele occurs within the pharynx, while zygomatic mucoceles, which are the least common type of mucoceles, occur in the cheek below the eye. Generally, dogs with cervical or zygomatic salivary mucoceles do not show clinical signs other than the soft swelling, while dogs with sublingual or pharyngeal mucoceles show dysphagia, difficulty in chewing or swallowing and

respiratory distress due to the compression of the pharynx. The location or the type of salivary mucocele is important as it is a major determinant of the impact of the mucocele as well, and it plays a significant role in determining the correct treatment. (Ibrahim, 2020; Olimpo *et al.*, 2023; Lira *et al.*, 2024).

In most instances, a preliminary diagnosis of a mucocele is made during the routine physical examination, except for pharyngeal mucoceles. Pharyngeal mucoceles may require oral examination under deep sedation or general anaesthesia. The diagnosis of a salivary mucocele is typically confirmed by fine needle aspiration from the swelling (Avazi *et al.*, 2024; Watanabe *et al.*, 2012).

The treatment of choice for salivary mucoceles is surgical intervention. In addition, some veterinarians perform conservative treatment for salivary mucocele that involves removing the accumulated saliva from the tissues and monitoring the area for recurrence which is rarely successful and reported to have higher rate of recurrence than surgery (MacPhail, 2023; Khunram *et al.*, 2024). In addition, this method may lead to bacterial infections of the salivary gland due to repeated aspiration (Pozzobon *et al.*, 2023; Kazemi *et al.*, 2012).

Salivary mucoceles are almost exclusively reported in dogs. Despite the common occurrence of salivary mucocele in dogs, only a limited number of case reports are available in veterinary literature. This paper describes the clinical presentation, diagnosis, treatment and treatment outcome of twenty one canine salivary mucoceles cases presented to the Veterinary Teaching Hospital, University of Peradeniya.

CASE PRESENTATION

Signalment

Thirteen of the dogs diagnosed with salivary mucoceles were intact males, and the other dogs were females (intact =7, spayed = 1). The age of the dogs ranged from 2 -10 years, and most of the dogs were young adults (n=13, age ranged from 3-6 years). The dog breeds included German Shepherd (n=9), Golden Retriever (n=3), Dachshund (n=3) and crossbred dogs (n=6).

Presenting complaints and duration of signs

In all dogs, the most common presenting complaint was soft, non-painful and flocculant swelling. Additional clinical signs included dysphagia (n=2) and pain upon opening the mouth (n=1) and reduced appetite (n=6). Three dogs were pyrexia without any other signs of systemic diseases. The duration of the signs ranged from 4 days to 45 days. One dog was previously diagnosed with a salivary mucocele by a veterinarian, and saliva was removed by aspiration, but the condition had recurred after five days.

Size and the location of the mucocele

The size of the mucoceles was < 2cm diameter (n=8), 2-8 cm diameter (n=12) and > 8 cm (n = 1). Based on the location, there were eleven cervical (n=11), five pharyngeal (n=6). three sublingual (n=4) and one zygomatic mucocele.

This information on signalment and clinical history is best presented in a table with the following headings. Eg Case No. Breed, age and Summary of clinical presentation, including duration of signs.

DIAGNOSIS AND CYTOLOGY

The diagnosis of salivary mucocele in all cases was confirmed by fine needle aspiration cytology (FNA). The cytological smears displayed windowing, lakes of homogeneously light blue material (saliva) (n=12), an increased number of hemosiderin-laden macrophages (n=15), haematoidin crystals (n=10), an increased number of neutrophils (n=8) and bacteria (n=6) (Figure 1). Multinucleated giant cells were identified in 6 smears, and cytology was suggestive of carcinoma in one smear.

Except for the epithelial cells in the salivary gland neoplasm, the other epithelial cells were well differentiated. These cells had eccentric, round nuclei with mostly inconspicuous nucleoli, moderately defined cytoplasmic borders and lightly basophilic and variably vacuolated cytoplasm (Figure 1). In some cases, it was difficult to differentiate between the well differentiated salivary epithelial cells and macrophages with vacuolated cytoplasm. The haematoidin crystals observed in the cytoplasm of some macrophages were indicative of chronic haemorrhage and degradation of haemoglobin under anaerobic conditions, most likely to occur secondary to trauma. In addition, haemosiderin is present in the cytoplasm of some macrophages, were most likely results consequent to erythrophagocytosis. The bacteria seen in some cases were either extracellular or intracellular. In all cases, there was a mixed population of bacteria comprised of cocci and bacilli. The cytology of salivary carcinoma showed moderate to high cellular and nuclear pleomorphism. The nuclear criteria of malignancy included anisokaryosis, anisonucleoliosis, megakaryosis and nuclear moulding. There were no acinar or cellular arrangements suggestive of tubules were seen in cytology. Therefore, it was difficult to determine whether the neoplasm originated from the acinar or tubular areas of the gland.

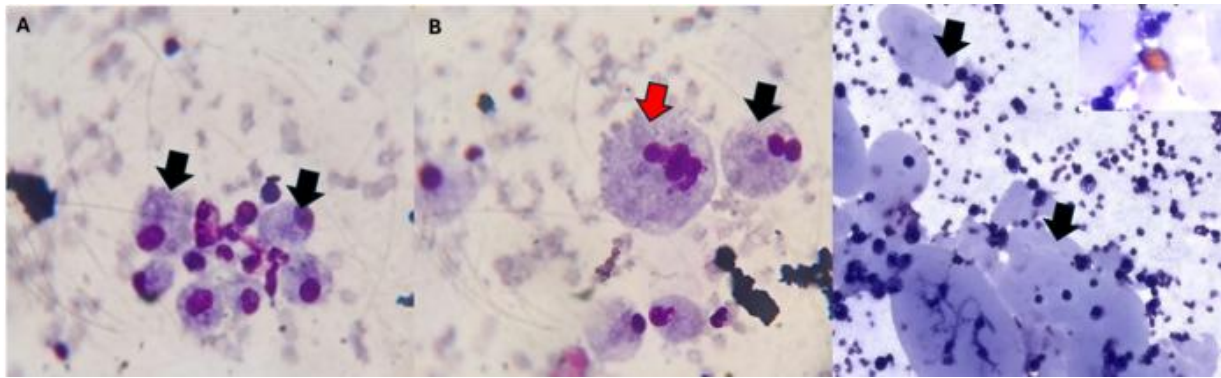


Figure 1: Cytology of fine needle aspirates from the salivary mucocoeles. A: Normal salivary epithelial cells/macrophages with variably vacuolated cytoplasm and hemosiderin (black arrows). B: Binucleated (black arrow) and multi-nucleated cells (red arrow). C: Lakes of saliva (black arrows). Inset: (diamond shape haematoidin crystals). Leishman's stain, 1000x

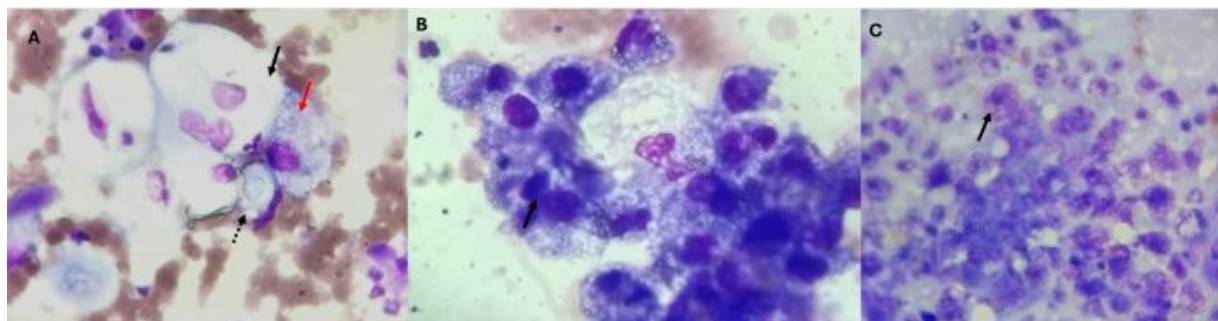


Figure 2: Cytology of fine needle aspirates from a salivary carcinoma. A, B and C are from the same tumour. A: Cells display marked anisocytosis (black arrow and broken arrow points to small and large cells in the same cluster, and red arrow points to a cell with vacuolated cytoplasm different from other cells). B: Nuclear moulding (black arrow). C: Large prominent nucleoli (black arrow). Also, the nuclei size is highly variable (anisokaryosis). Leishman's stain, 1000x

CAUSES, TREATMENT AND OUTCOME

The causes for salivary mucocoele were identified as trauma and inflammation (n=13), inflammation without trauma (n=3), salivary adenocarcinoma (n=1) and idiopathic (n=4).

All dogs were treated surgically under general anaesthesia; surgical drainage (n=15), surgical drainage with removal of salivary gland (n=5) and surgical drainage with removal of salivary carcinoma (n=1). In addition to surgical intervention, the dogs were prescribed antibiotics (n=5), anti-inflammatory drugs (n=3) and asked to put on an Elizabethan collar (n=3). Amoxicillin-clavulanate (20mg/kg) twice a day was used after the surgery to prevent the risk of potential bacterial infections. Meloxicam (0.2 mg/kg) once a day was used to reduce postoperative pain and inflammation

The treatment outcome was excellent for all dogs except five. The dog which had a salivary gland adenocarcinoma, succumbed to the condition a few weeks after surgery. The other five dogs had suture

dehiscence that occurred due to the removal of the Elizabethan collar prematurely by the dog owners. The average time taken for complete recovery was 7-14 days.

Statistical analysis

According to the Chi-square analysis, male dogs were more likely to have trauma-related salivary mucocoeles than female dogs ($p=0.045$). Similarly, relatively older mucocoeles had haemosiderin-laden macrophages and haematoidin crystals compared to relatively recent mucocoeles. The size of the mucocoele ($p=0.56$) did not have any association with the time taken for complete recovery, while the location of the salivary mucocoele had a statistically significant association with the time taken for complete recovery. Accordingly, dogs with cervical mucocoeles had recovered earlier than dogs with mucocoeles in other locations ($p=0.039$).

DISCUSSION

Clinical Presentation and Demographics

This study shows that male dogs are more frequently affected by salivary mucocele than females. In addition, a higher proportion of intact males (13 out of 20) compared to females (7 intact, 1 spayed) were shown to be affected. These results suggest that male dogs, especially intact male dogs, are more prone to developing salivary mucoceles, although it is difficult to confirm without the population statistics of male and female dogs. Statistical analysis also showed that there is an association between the reproductive status and the development of salivary mucocele, showing that intact male dogs are significantly more likely to develop mucoceles than other dogs. Intact dogs are more likely to be involved in dog fights than castrated dogs and this could be a possible cause for the observed association. However, further investigations with a larger sample size are essential to clarify this relationship. The age distribution revealed that most dogs were young adults, with the age range of 3–6 years, which aligns with earlier studies suggesting a peak incidence in dogs between 2 and 5 years of age.

The breed distribution demonstrated a higher incidence of salivary mucoceles in German Shepherds (45%), followed by Golden Retrievers (15%) and Dachshunds (15%). This breed predisposition is noteworthy, with German Shepherds being a breed commonly reported in salivary mucocele studies. However, as German Shepherd is a popular breed in Sri Lanka it is difficult to perform whether there is a true breed disposition without the population statistics of different dog breeds in Sri Lanka. Crossbred dogs also represented a significant portion of the study population (30%), which reflects the diversity of dogs affected by this condition.

The primary presenting complaint for all dogs was a soft, non-painful lump, which is characteristic of a salivary mucocele. In addition to the lump, many dogs exhibited difficulty in swallowing ($n=2$), pain upon mouth opening ($n=1$), and reduced appetite ($n=6$). These symptoms are consistent with the local effects of a mucocele, which can cause mechanical compression and irritation in the surrounding tissues. A notable proportion of dogs (15%) presented with fever, which was observed in the absence of other systemic illnesses, suggesting a local inflammatory response to the mucocele. The duration of symptoms varied widely, ranging from a few days to over a month. The recurrence of a mucocele in one dog, which was initially drained via aspiration but reappeared within five days, underscores the recurrent nature of the condition and

highlights the need for more definitive management strategies.

The sizes of the mucoceles varied, with the majority falling into the 2–8 cm range. Only one mucocele exceeded 8 cm in diameter, which is relatively large compared to the typical presentation in clinical practice. Interestingly, the size of the mucocele did not correlate with the time taken for complete recovery, as demonstrated by the statistical analysis.

Salivary mucoceles were predominantly located in the cervical (55%) and pharyngeal (30%) regions, with a smaller proportion affecting the sublingual (15%) and zygomatic areas. The cervical location is the most common site for mucoceles, which is consistent with previous findings. The location of the mucocele was shown to have a significant impact on the recovery time, with cervical mucoceles recovering more quickly than those in other locations. This could be attributed to the relative ease of surgical access and fewer complications associated with cervical mucoceles compared to deeper, more challenging locations.

Fine needle aspiration (FNA) cytology was employed in all cases, confirming the diagnosis of salivary mucocele. The cytological features observed in the smears were consistent with those typically seen in mucoceles, including windowing, hemosiderin-laden macrophages, and haematoidin crystals. These findings indicate chronicity and haemorrhagic leakage from the affected salivary glands, which is characteristic of the condition. The presence of bacteria and neutrophils in some cases suggests a secondary bacterial infection, highlighting the potential for complications in mucoceles.

The primary cause of salivary mucoceles in this study was trauma (65%), followed by inflammation without trauma (15%), salivary adenocarcinoma (5%), and idiopathic causes (20%). Trauma-related mucoceles were significantly more common in male dogs, as shown by the Chi-square analysis ($p=0.045$). This finding supports the hypothesis that male dogs, particularly intact males, may be more prone to traumatic injuries, which could predispose them to developing mucoceles.

Surgical intervention was the primary treatment modality for all dogs, with the majority undergoing surgical drainage (75%). In some cases, the affected salivary gland was removed in conjunction with drainage (25%), and in one instance, a salivary carcinoma was excised. The overall treatment outcome was excellent for most dogs, with full

recovery in 75% of cases. However, five dogs experienced suture dehiscence, which was attributed to premature removal of the Elizabethan collar by the owners. This highlights the importance of post-operative care in ensuring successful outcomes, as premature collar removal can lead to wound complications.

The average recovery time for dogs was 7-14 days, with most dogs achieving full recovery within this timeframe. However, one dog with a salivary gland adenocarcinoma died a few weeks after surgery, underscoring the potential for poor outcomes in cases of malignant neoplasia.

CONCLUSION

This study provides valuable data on the clinical presentation, diagnosis, treatment, and outcomes of dogs with salivary mucoceles. Trauma appears to be the most common cause of mucoceles, and male dogs, especially intact males, are more likely to develop trauma-related mucoceles. Surgical drainage is the most effective treatment, and the prognosis is generally favourable, although post-operative care is crucial for optimal recovery. Further studies are needed to explore the pathogenesis of salivary mucoceles in different dog breeds and to refine treatment protocols for this condition.

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