

A case report on metastatic mammary gland carcinoma in a cat: combined radiography and cytology-based approach



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A case report on metastatic mammary gland carcinoma in a cat: combined radiography and cytology-based approach



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Abstract

Mammary gland carcinoma is the third most frequent aggressive feline neoplasm that usually occurs in senile, female cats with an age ranging between 10 and 14 years and a poor prognosis. In this study, we examined a 14-year-old non-spayed female Calico cat, presented with a mammary gland tumor at Teaching & Training Pet Hospitals and Research Center, Dhaka. After a comprehensive assessment of clinical history and physical examinations non-pruritic, small nodular mass (>6 cm), surrounding the nipple of the inguinal right mammary gland was observed. Regional pain was noted during palpation, and the subcutis was firm. Therefore, the mass was subjected to a fine needle aspiration biopsy for cytological study. Mammary gland carcinoma was diagnosed initially based on the presence of cellular aggregates with neoplastic features, such as anaplastic cells with bizarre nuclei and multinucleated pleomorphic cells, suggesting a high degree of malignancy using PAP staining. Subsequently, radiographic image was taken from the thoracic and abdominal region to understand the aggressive pattern of the tumor or any metastatic lesions. A radiographic image showed a 7x5x4 cm mass that affected the position of various organs, and a nodular mass was also observed in the lungs. Furthermore, thoracocentesis was done for FNAC from lung tissue, and similar neoplastic cells were identified which clearly indicates the metastasis stage. Therefore, it was challenging to make any decision for a local excision due to the metastasis in the visceral organ and grave prognosis. However, the surgeon also did not agree about opting for a local surgical procedure due to potential pain and the uncertainty of its success as the cat was not fit for surgical stress or anesthetic procedures. Moreover, we have no facility for radiotherapy or chemotherapy treatment for malignant tumors in cats. So, understanding the overall condition of the cat and its therapeutic limitations and grave prognosis the owners finally decided on euthanasia. For performing euthanasia, firstly a sedative agent (Xylazine) was administered with a dose of 1mg/kg body weight. Then an injection with an overdose (60 mg/kg body weight) of thiopental sodium is used and the cat loses consciousness quickly without showing any pain symptoms and death occurred within a few moments

Keywords: mammary gland tumor, FNAC, X-ray, metastasis, grave prognosis, euthanasia, cat

Chapter I

Introduction

A mammary gland tumor refers to an abnormal growth of cells within the breast tissue which can be benign or malignant. Benign tumors tend to remain localized and do not spread, whereas malignant tumors have the potential to invade surrounding tissues and metastasize to other parts of the body (Laci Schaible, 2021). Mammary gland tumors are most commonly seen in un-spayed female cats between 10-14 years old and also recorded in male cats which is extremely rare (Katherine A Skorupski *et al.*, 2005). Spaying female cats before their first heat cycle significantly reduces the risk of developing these tumors (Laci Schaible, 2021). Malignant types are significantly more common in cats, with at least four cases being malignant for every single benign case which suggests that cats are more susceptible to developing cancerous forms (Johnson, 1994; Misdrop and Van der Heul, 2002; Amorim *et al.*, 2007). Anatomically cats possess four pairs of mammary glands, and the tumor mass is usually found in the caudal glands as single subcutaneous nodules or masses, sometimes with attachment to underlying tissues or ulceration, and some may appear cystic, making it challenging to differentiate between benign and malignant nodules in cats (Laci Schaible, 2021). Microscopic examination of fine needle aspiration biopsy slides helps in identifying the specific type of cells involved, their growth patterns, and any signs of malignancy, which is crucial for determining the appropriate treatment and prognosis for the cat.

In case of a mammary gland tumor in cat, microscopically irregularly shaped rapidly dividing cells with increased nuclear size, abnormal cell shape, and loss of normal tissue organization is found (Maggie F *et al.*, 2021). Feline mammary gland tumors rank high among prevalent diseases, especially after hematopoietic and skin tumors. Around 80% of these tumors progress into adenocarcinomas, leading to metastases in the lungs, lymphoid tissue, and liver (Hughes and Dobson, 2012). Cats experience more aggressive tumor growth compared to dogs, with a significant likelihood of malignancy (80% to 90%) (Hayes HM, 1981).

In feline medicine, fine needle aspirates (FNAs) are more reliable compared to canine medicine for confirming the diagnosis of a mammary mass. Since the majority of feline mammary tumors are typically malignant, FNAs serve as a crucial diagnostic tool in confirming the presence of neoplastic changes in the tissue (Morris, 2013). To determine the tumor's stage and metastasis additional diagnostic testing like chest X-rays or imaging, and abdominal ultrasounds are used (Laci Schaible, 2021). Imaging is crucial for diagnosing the prognosis of mammary gland tumors in cats as it allows for accurate assessment of the size, location, and potential spread of the tumor. Other techniques such as complete mammography, MRI, or CT scans, can also help to determine the extent of the disease and aid in treatment planning.

Treatment options may include surgery, radiation, chemotherapy, and hormone therapy, depending on the type and stage of the tumor (Muhammad Hambal *et al.*, 2018). When dealing with suspected or confirmed mammary tumors, it's crucial to conduct thorough investigations to determine the local extent and potential spread throughout the body before any surgical intervention. Survival rate also depends on the accurate diagnosis in the early stage without metastasis and complete removal of the mass. It was found that tumors smaller than 3 cm in diameter are associated with better survival rates in cats (Weijer K, 1983).

The prognosis for most cats with mammary tumors is uncertain, as the survival rate is typically limited due to the high likelihood of local recurrence or metastasis (Weijer K, 1983). More than 60% of mammary tumors in cats have a high probability of reemergence within 12 months following their initial diagnosis and subsequent removal (Ehrhart, 2008; Morris, 2013). Chemotherapy is the primary treatment for mammary gland tumors, while mastectomy remains the most effective approach. For the best chance at a cure, chemotherapy following complete tumor removal is often recommended (Morrison WB, 1998). However, it's crucial to understand that once this type of tumor turns malignant; achieving a complete cure is seldom possible due to recurrence issues (Katherine A Skorupi *et al.*, 2005). If a cat is facing any of the challenges mentioned, it might be worth

having a compassionate conversation with the veterinarian about the option of euthanasia (Maria Soares, 2021; Laci Schaible, 2021).

Given the prevalence of malignant masses, relying solely on visual appearance to distinguish between benign and malignant tumors is unreliable. Therefore, a comprehensive diagnostic approach mixed with cytology and radiography is necessary for all mammary masses in cats for prognosis.

So, the objective of this study was to diagnose the mammary gland tumor based on fine needle aspiration cytology and also to observe any metastatic lesion in the visceral organs using radiographic examinations for further decision of surgical removal or not. This study also helped the clinician, surgeon, and owners with the final decision for surgery. or euthanasia based on the prognosis report.

Chapter II

Materials and Methods

History and clinical examination:

In March 2023, a 14-year-old female non-spaying Calico cat with a mammary gland tumor was presented at Teachers and Training Pet Hospital, Purbachal, Dhaka. The clinical history of the cat was lethargy, anorexia, loss of weight, and difficulty in breathing. comprehensive physical examination and laboratory tests, including FNAC. Additionally, regional lymph node palpation and X-rays were conducted on the thoracic and abdominal areas, revealing enlarged nodules on the right side of the mammary gland, with anatomical and pathological changes observed.

Diagnostic procedure:

- FNAC (Fine Needle Aspiration Cytology) from skin mass in the mammary region.
- Examinations of FNAC slide
- An X-ray was performed on both the thoracic and abdominal parts of that cat.
- FNAC from lung tissue after thoracocentesis

Fine needle aspiration cytology (FNAC) is a simple and minimally invasive procedure used to obtain a sample of cells from a suspicious mass or lump, such as a mammary tumor. The procedure involves the following steps:

1. **Patient Preparation:** The patient is typically positioned comfortably, usually lying down, with the area being examined exposed.
2. **Local Anesthesia:** local anesthesia is applied to the area to minimize discomfort. Lidocaine spray is used as a local anesthetic.
3. **Needle Insertion:** A thin, hollow needle is inserted into the mammary tissue to extract a sample of cells from the tumor.
4. **Aspiration:** Negative pressure is applied to the syringe, which helps in drawing the cells into the needle.

5. **Cell Smearing:** The collected cells are smeared onto a glass slide to create a thin, even layer.
6. **Fixation:** The cells on the glass slide are then fixed with an appropriate fixative, such as 100% alcohol, for subsequent staining.
7. **Staining:** The fixed cells are stained with specific dyes named Pap's solution to highlight their different structures and cellular components.
8. **Microscopic Examination:** Then examine the stained cells under a microscope.

Chapter III

Results

The radiographic results revealed signs of widespread lung and abdominal metastases. Specific details of the X-ray findings are included in Figure 02.

During the FNAC test, a cluster of polygonal neoplastic epithelial cells with irregular cell size called anisocytosis and irregularly shaped nuclei called anisokaryosis, some of which are multinucleated, along with noticeable prominent nucleoli, often several per nucleus, was observed, included in Figure 03. After FNAC from lung tissue, similar cellular characteristics are found in the PAP staining (Fig. 3B)

After these findings, the decision was made to proceed with euthanasia as the tumor was showing malignancy in different organs so local excision may not be fruitful because of the possibilities of tumor recurring. Therefore, the owner did not agree with local surgical procedures or not to allow pain if it was not successful.

For performing euthanasia, firstly a sedative agent was administered to the cat to keep it calm and quiet, as a sedative agent, xylazine is used with a dose of 1 mg per kg body weight. Then an injection with an overdose of an anesthetic agent was given, as an anesthetic agent thiopental sodium was used with a dose of 60 mg per kg body weight and the cat lost consciousness quickly and didn't feel any pain. Death occurred within a few moments, shown in Figure 04.



Figure 1: Mammary gland tumor



Figure 2: Nodular mass in lung is observed indicate metastasis in radiographic examinations.

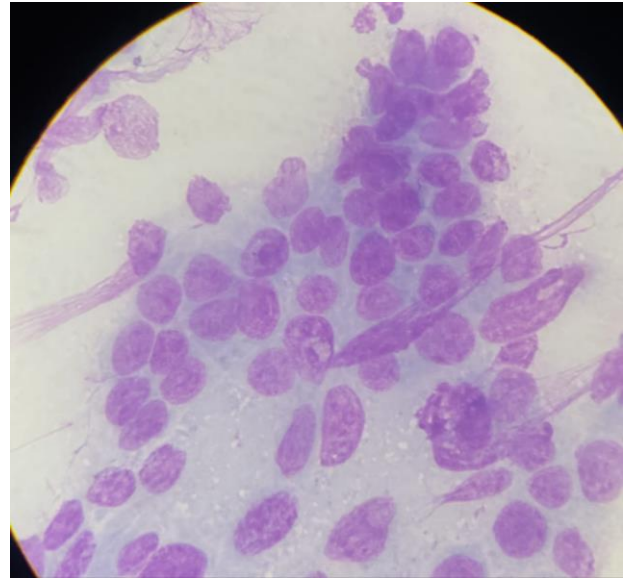
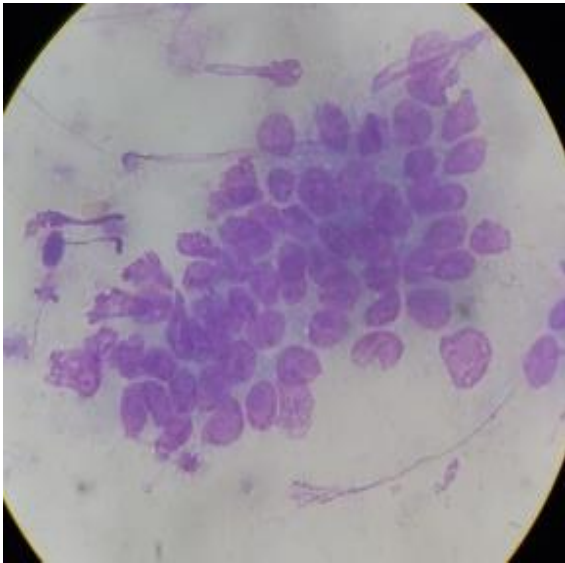


Figure 3: Cytology of mammary gland tumor cell; pleomorphic cells with bizarre shaped nucleus, anaplasia is observed in fig A and B; Fig A-FNAC from skin area, Fig B-FNAC from lung tissue after thoracocentesis.



Figure 4: Euthanized cat

Chapter IV

Discussion

Feline mammary carcinoma refers to a type of cancer that originates in the mammary tissue of cats. It is commonly known as a mammary gland tumor and is predominantly malignant, with around 95% of cases being cancerous (Munson and Moresch, 2007). According to Misdorp (2002), and Seixas *et al.*, (2011), the primary causal agent of mammary tumors in cats is mammary gland carcinoma, with an increased incidence in older animals, typically over 8 years old. This is matched to my study. In recent years, the incidence of sarcomas and/or carcinomas in cats and dogs has significantly risen, potentially due to various factors such as age, environmental pollution, viruses, and other carcinogens (Misdorp 2002, Munson and Moresco 2007). The aggressive and invasive nature of these tumors often leads to metastasis in other organs . Further observation is necessary to determine the extent of metastasis. in the context of evaluating the presence of distant metastases, the recommendation suggests conducting three-view thoracic radiographs, encompassing ventrodorsal and right and lateral views, ideally performed under anesthesia with inflated lungs. This approach helps in obtaining detailed and comprehensive images of the thoracic region, aiding in the identification of any abnormal pulmonary nodules, which may appear as varying sizes of nodular opacities on the radiographs. These nodules can be indicative of the presence of metastases in the lungs (Von Euler, 2011). This is closely related to this study. In this study, thoracic and abdominal metastasis was confirmed by whole-body radiography. Definitive diagnosis of mammary cancer typically involves surgically removing part or all of the affected tissue and then analyzing the sample through a biopsy. As feline mammary tumors tend to be malignant, FNAs are more dependable compared to dogs, serving as a valuable means to confirm the diagnosis (Morries, 2013). In this study, FNAC (Fine Needle Aspiration Cytology) was done for tumor confirmation. Although surgical removal of mammary tumors (MTs) is the commonly accepted treatment for feline MTs, it is often not curative because these tumors can invade surrounding and distant tissues, leading to potential regrowth and metastasis (Gimenez, 2010). The size of the tumor is crucial to the prognosis, and measuring it with calipers is recommended. Tumors with a diameter of 3 cm or less are

linked to better survival rates compared to those larger than 3 cm. Older cats generally have a poorer prognosis when diagnosed with mammary tumors (Sorenmo, 2013). In this case, euthanasia is performed in spite of surgery as the prognosis of the cat was very poor and there was a possibility of tumor recurrence because of metastasis.

Chapter V

Conclusion

Pet animals, like cats and dogs, are gaining popularity among the elite people. Owners should understand the risks of mammary gland tumors in their pets and stay informed. To prevent mammary gland tumors in cats, a few key steps are essential: ensure spaying at an early age, maintain a healthy weight through a balanced diet and regular exercise, conduct routine check-ups with a vet, and keep an eye out for any abnormal lumps or changes in the mammary area.

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Biography

I am **Shahrina Afruj Shuchi**, Daughter of Late MD. Shahjahan Siraj & Forida Yesmin. I have an impressive academic background, having excelled in both of my Secondary School Certificate and Higher Secondary Certificate examinations. I passed my Secondary School Certificate from Nabarun Bidhya Nikaton, Muktagachha, Mymensingh in 2015 & Higher Secondary Certificate from Shohid Smriti Govt. College from Muktagachha, Mymensingh in 2017. Currently, I am an intern veterinarian at Chattogram Veterinary and Animal Sciences University, with a strong ambition to become a veterinary practitioner and contribute to the betterment of animals in Bangladesh.