Surgical Management of Mammary Gland Tumor in Cat: A Case Report

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Surgical Management of Mammary Gland Tumor in Cat: A Case Report

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Table of contents Page

List of figures

ABSTRACT

A 12.5-year-old female cat was referred to the Teaching and Training Pet Hospital and Research Center at CVASU after showing symptoms of inappetence, decreased water intake, non-responsiveness to medication, and growth that had been growing every day for the previous month. During the clinical examination, dyspnea and caudal abdominal edema were found. The cat was found to have a malignant mammary tumor after a number of diagnostic tests. The cat was pre-medicated with a combination of xylazine hydrochloride (1 mg/kg body weight, IM) and atropine sulfate (0.04 mg/kg body weight) for surgical correction. A 50 g tumorous mass was excised during surgery. Vicryl 2-0 absorbable sutures were used in a simple, continuous manner to seal the muscles and subcutaneous tissue. The skin was sealed using a simple interrupted suture. After surgery, post-operative care was given. Through histological investigation, fibrosarcoma of the mammary gland was identified. A follow-up was advised after ten days. Following the successful treatment, the recovery process proceeded well. Doxorubicin was used as chemotherapy for six weeks. There were no metastases observed during this period. Furthermore, no odd symptoms or indications were observed during this period. Prevention through early bitch spaying and a suitable diagnostic strategy may still be major factors driving the improvement of the results, but more research into molecular approaches can be seen as new possible avenues in the tendency of the therapy of the pathology.

Keywords: Cat, Mammary gland tumor, Surgical technique, Post- operative care, Chemotherapy

CHAPTER 1

INTRODUCTION

Mammary gland tumors are the most common neoplastic diseases reported in female cats. Extensive studies demonstrate that mammary tumors account for 17% of feline neoplasia and 80-90% of them are malignant, primarily adenocarcinomas. (Sorenmo, 2003). These tumors have an age dependency with a median age at the time of diagnosis of 10-12 years of age (Misdorp et al., 1991). Potential predisposing factors for these tumors include age, reproductive status, hormone influence and particularly un neutered female. Oestrogen is a hallmark of feline mammary cancer development (Moe, 2001). When endogenous oestrogens are used in aging studies, the risk of the disease is reduced by 91% in cats spayed before six months and by 86% in cats spayed between six and twelve months. (Overley et al., 2005). Misdorp et al., (1991) examined invasive ductal carcinomas in a large retrospective cohort analysis with 1553 patients. These cancers have one of the poorest prognoses among malignant histotypes due to their high rate of metastatic and recurrent events. According to molecular research, TP53 mutation and HER2 overexpression are most likely the primary genetic variables linked to biological aggression (Martin de las Mulas et al., 2002).

One or more nodules in the region of the mammary glands are clinical indicators of mammary tumors in afflicted cats. Since large or ulcerative masses are more likely to be malignant, these masses can be categorized based on their size, form, or if they are ulcerated. Dependency, loss of perspicuity, loosening of the bowels, and vomiting are examples of leftist intermittent symptoms. Systemic signs include weight loss, decreased appetite, and respiratory distress, and they may appear in advanced stages, particularly when the cancer has spread to the lungs or any other organs, which in this case are the lungs (Hellmén and Bergström, 1997).

Diagnostic techniques include the physical examination, imaging and histopathology studies. The two most important modalities for assessing the local disease burden and searching for metastases are mammography and ultrasonography (Millanta et al., 2005). While histological analysis is required for additional tumor characterisation, fine-needle aspiration (FNA) cytology can help distinguish between benign and malignant tumors (Sorenmo et al., 2011Additionally, immunohistochemical staining for molecular markers such HER2, Ki-67, and hormone receptors

has been proposed as a supplementary tool for prognosis and management planning (Martin de las Mulas et al., 2002).

The major method of treating feline mammary tumors is still surgical excision. While lumpectomy may be used for comparatively smaller benign tumor masses that have not spread outside of the breast tissue, total mastectomy, either unilateral or bilateral, is preferred for malignant tumors to lower the risk of local recurrence. According to research, cats who undergo radical mastectomy in addition to lymph node excision have higher survival chances; this is especially true if the diagnosis is made early (Millanta et al., 2002). However, the survival rate for adenocarcinomas varies from one to three years following surgery, and distant metastases and recurrence remain problems (Millanta et al., 2005). Radiation and chemotherapy have also been tried, although the results in cats are still unpredictable. Although mitoxantrone, carboplatin, and doxorubicin have shown some advantages, their effects on survival are still encouraging (Simon et al., 2009). Radiation therapy is one type of adjuvant treatment that is particularly advised in situations with inadequate surgical margins or local recurrence (Sorenmo et al., 2011). To establish strict treatment indications, more research must be done in either scenario.

This clinical report describes a feline mammary gland carcinoma case and uses the findings of other studies to emphasize the importance of early discovery, careful treatment, and additional research.

CHAPTER 2

CASE PRESENTATION

Signalment

- **Patient:** Cat
- **Age:** 12.5 years
- **Reproductive status:** Fertile (Not spayed)
- **Weight:** 5.2 kg

History

The patient at Teaching and Training Pet Hospital and Research Center, CVASU reported having an external mass in the right side of their last pair's teat for the previous month. According to the owner, she occasionally felt drowsy, had a poor appetite, and lost 0.5 kg weight within a month. The owner was unaware of pregnancy issues earlier and the cat was not neutered.

Physical Examination

- General appearance: The patient had a physical condition score of 4/9, which indicates that they were malnourished and somewhat underweight.
- Palpation: When the right caudal mammary gland was palpated, a hard, irregular, spherical body of roughly 40 millimeters in diameter was found. The mass was somewhat infiltrative with the underlying tissues but was not ulcerated.
- Lymph nodes: The right inguinal lymph node was somewhat enlarged.
- Thoracic auscultation: There were audible pleural friction rubs in the lower lobes.

Differential diagnosis

- Malignant mammary gland tumor (adenocarcinoma)
- Benign mammary hyperplasia or adenoma
- Mastitis

Diagnostic plan and diagnosis

Thoracic radiographs

No nodule was found in lung and other internal organs (Figure 1).

Abdominal ultrasound

No indication of liver, spleen, or other abdominal organ metastases was found. Other mammary glands were unremarkable aside from the identified masses (Figure 2).

Diagnosis

Malignant tumor but still it's not in metastasis stage.

Figure 1: Thoracic radiography

Figure 2: Abdominal ultrasound

CHAPTRT 3

TREATMENT PLAN

Surgical plan

Restraining and anesthesia

The cat was restrained using both chemical and physical means. Lateral recumbancy was used to restrain the cat. A mixture of atropine sulphate (0.04 mg/kg body weight) and xylazine hydrochloride (1 mg/kg body weight IM) was used to premedicate the cat. After that, the cat was prepared for aseptic surgery. The animal was maintained during surgery with a mixture of injections of injected ketamine hydrochloride at 10 mg/kg body weight and injections of injected diazepam at 10 mg/kg body weight. The ventral abdominal region was prepared for operation with the use of all aseptic precautions. The targeted incision site was shaved and soaked with the tincture iodine (Figure 3).

Surgical technique

The location where the surgery will take place was covered with a draper. A Babcock forcep was used to make a circular incision around the mass and remove the tumorous tissue from its base. Then we removed a big tumor that weighed 2.5 kg. Blood vessels were ligated with chromic catgut. The muscles and subcutaneous fascia were closed with Vicryl 2-0 absorbable sutures in a routine, uncomplicated continuous manner. After that, the skin incision was closed in routine manner with simple interrupted suture. Finally, a Povidon Iodine Ointment was applied over the sutured line. And then white micropore tape placed on the suture line (Figure 3).

Post-operative care

Antibiotics, antihistamines, anti-inflammatory drugs, and multivitamins were administered following surgery. For seven days, intramuscular injections of the antibiotic Ceftriaxone (Trizon Vet) at a dose of 25 mg/kg body weight and the antihistamine Phenadryl Vet at a dose of 2 mg/kg body weight were administered once daily. For three days, 0.5 mg/kg body weight of anti-inflammatory medication (Melvet) was administered subcutaneously once daily. For seven days,

a 1 cc intramuscular injection of multivitamin (V-Plex Vet) was administered every day. On the fourteenth postoperative day, the incision was covered with an antiseptic covering made of betadine solution until it had completely healed and the skin sutures were taken out. The animal did not exhibit any recurrence following the procedure.

Histopathological analysis

- The mass was confirmed to be a high-grade mammary adenocarcinoma with evidence of lymphatic invasion.

Adjuvant chemotherapy

Due to the high likelihood of further metastasis, chemotherapy with doxorubicin was initiated. A regimen of six cycles was planned over a period of 12 weeks. No metastasis was seen in this period.

Outcome

Post-surgery, the patient recovered well and completed the first cycle of chemotherapy without significant side effects. Despite chemotherapy, in most cases the overall prognosis was guarded due to the aggressive nature of the disease and the presence of distant metastasis. So we can say that it will be metastasis in future.

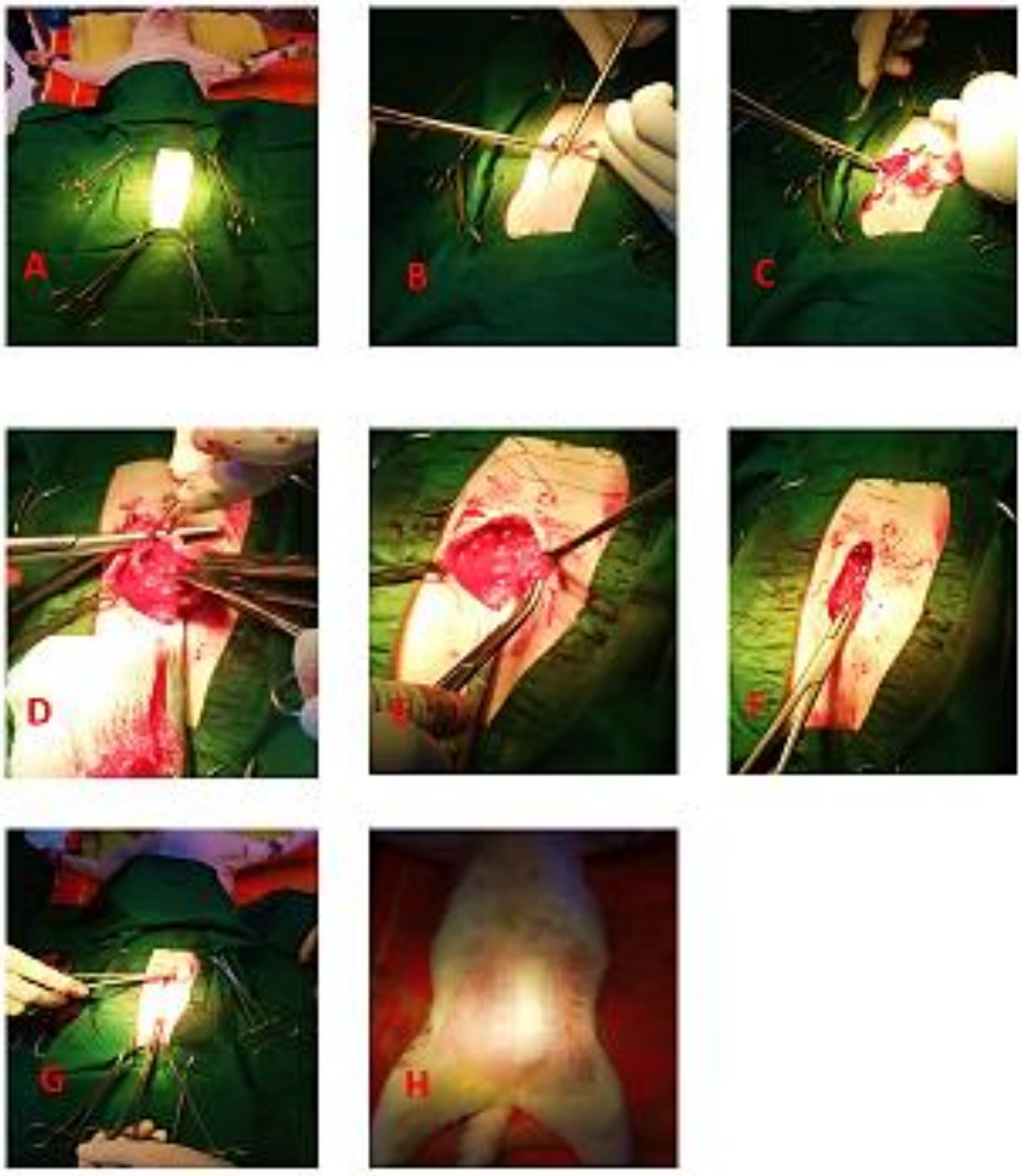

Figure 3: Surgical plan; Preparation of patient for surgery (A), Circular Incision within the tumor (B), Exposed the skin and fat layer (C), Detaching tumor from surrounding (D), After removal of tumor (E), Suturing the muscle (F), Suturing the skin (G), Micropore tape placed in the suture line (H)

CHAPTER 4

DISCUSSION

Mammary adenocarcinoma is one of the most malignant and common tumors in female cats with mostly per-estrous animals affected and intact females most at risk. This case highlights a number of typical features that are classically associated with feline mammary gland tumors including; older age at presentation, rapid growth and high probability of metastatic disease. The outcome for feline mammary tumors is often unfavorable, particularly where the tumor is malignant, and it shows an aggressive biological profile. The epidemiological investigation has high percentages consistent with 80-90% of feline mammary tumors being malignant and adenocarcinoma as the most frequent histological type (Sorenmo, 2003; Chang et al., 2009).

Patient's reproductive history formed an important part of the risk factors in this case. More to the point, the failure to spay the patient throughout her life will have greatly contributed to the growth of the tumor. It is now well established that hormones, especially estrogen and progesterone have significant impact on mammary tumor formation. Overley et al., (2005) showed that early neutering diminishes the risk by 91% when the dog is neutered before the first heat; neutering after the first heat also decreases the risk of mammary tumors. Underlying estrogen promotion of mammary tumorigenesis is the necessity for early spaying according to the results. However, in this case the patient remained intact throughout her life, they would have thus had greater cumulative hormonal exposure in her over lifetimes creating greater risk of tumor formation.

In histological assessment, feline mammary adenocarcinomas show a prognostication that is unfavorable relative to other tumor categories. Unlike benign lesions, malignant tumors show invasive behavior and high proclivity for early lymph node metastasis, and distant metastases such as lung (Chang et al., 2009). In this case there was confirmation of metastasis to the inguinal lymph node and lungs which is typical of the metastatic pattern observed in mammary tumors at later stages. Investigations have established that more than 50% of feline mammary adenocarcinomas are likely to have spread by the time they are diagnosed. This is a very poor sign because metastatic disease to the lungs means that the cancer has spread systemically and becomes difficult to treat surgically.

It is important to also note that there is a molecular and genetic component to tumorigenecity and these tumors tends to be aggressive. Current developments involved investigation of molecular parameters of FMCA and pathways similarity between feline and human breast cancers. Among them the overexpression of HER2 (ErbB2) have been identified, which is proved to have trampled behavior and considered as a biomarker of bad prognosis (Martin de las Mulas et al., 2002). The same aggression as human cells is reported in feline patients, HER2-positive tumors being more inclined towards metastatic formation and relapse. Similarly, loss of heterozygosity has been observed, and changes in tumor suppressor genes such as TP53 have also been found in feline mammary carcinoma and sampled tumor progression and resistance to treatment. When new treatments for these signaling pathways are developed, they may provide new hope for the treatment of feline mammary tumors although this is still under investigation.

The surgical treatment for feline mammary tumors is surgical excision and in this instance a right sided mastectomy was done. Surgery focuses on eradicating the primary tumor and appropriate axillary/inguinal nodes to decrease tumor relapse. In general, radical mastectomy (the removal of the entire chain of mammary glands at one or two sides) provides the highest percentage of long-term recovery if the disease is diagnosed at the initial stages (Millanta et al., 2002). However, in cats with metastatic disease, as is this case, the role of surgery is mainly for relief of symptoms and to decrease the volume of the tumor instead of to cure the disease. According to Hellmen and Bergstrm (1997), cats with histologically confirmed pulmonary metastasis have less than six months' median survival time, despite optimal de-bulking surgery.

Chemotherapy and radiotherapy are recommended ancillary treatments in cases of malignant mammary tumor. Their usage is still considered experimental in feline patients, although they are widely used in the treatment of human cancer. Doxorubicin, carboplatin and mitoxantrone replied chemotherapy in the treatment of feline mammary tumor with different level of achievement (Simon et al., 2009). In this case, after surgery, chemotherapy with doxorubicin was started to treat the metastases, but the outlook for the patient is not very favorable due to the advanced lung involvement. Accordingly, published data show that although chemotherapy may help increase survival rates it cannot always be considered a cure since responses differ. In a similar study by Simon et al., (2009) only some of the cats could undergo chemotherapy and overall survival was still not greatly prolonged.

Chemotherapy can also be given depending of the completeness of the surgical margins or in the eventuality of a local relapse (Sorenmo et al., 2011). Still, radiation therapy in feline mammary tumor is less commonly employed because of the difficulties in defining the areas of metastatic disease and complications of radiation therapy. More specifically, in this case, radiation was not used because the disease was known to have metastasized almost to every organ in the body.

The major issue which arises more or less directs to the management of feline mammary tumors is an unpredictable biological behavior. Most tumor when seeming localized have already demonstrated metastatic spread; hence recurrences are frequent even after what seems to be efficient surgery. This case also emphasizes the importance of initial staging with imaging and cytological sampling when approaching a patient with a suspected malignancy. Currently, more comprehensive information on the tumor and its potential metastasis, the use of CT or MRI imaging may provide a more discriminative understanding (Zappulli et al., 2015).

The outcome of feline mammary adenocarcinoma depends on the size of the tumor, involvement of the lymph nodes, grade of tumor and whether metastasis is present in other parts of the body. Common clinical signs include those of decreased appetite, lethargy, or even anorexia and weight loss while cats with tumors less than 2 cm in diameter are said to have a better prognosis, with median survival of 1- 3 years after surgery (Misdorp et al., 1991). However, when the tumor size is more than 3 cm or the cancer has affected the lymph nodes or there is distant metastasis, which is true in this case, the prognosis is far worse and, at best, the median survival is less than a year. The described case of the patient with both lymphatic and pulmonary metastases is closer to the pattern observed in end-stage disease.

Determination of molecular biology of feline mammary tumors remains active and new possibilities of treatment might be found in the future. The revelation made on HER2 overexpression and TP53 mutations in some tumors are indicative of the fact that, like in human oncology; there are targeted treatments for example, HER2 inhibitors; such as trastuzumab that can be tried in feline patients (Martin de las Mulas et al., 2002). However, such treatments are still in a very experimental form and more data is necessary to estimate the effects of such treatments on the cats. Further, the applicability of hormonal treatments, like tamoxifen as in human breast

cancer, is undefined in cats because of differences, the hormonal receptors possessed by their tumors.

These are the objectives, which remain invaluable for the decrease in the occurrence of mammary tumors in cats that can be reached by means of early spay. Because reproductive status has a close relationship with mammary tumorigenesis in cats, providing owners with professional advice to choose spaying for their cats is crucial. When it does happen, the animals' best hope is early diagnosis and treatment from routine checkups with the vet and an immediate surgical removal of the affected growth.

CONCLUSION

To sum up, the current case emphasized the need of identifying and treating risk factors for feline mammary adenocarcinomas. The survival rate of cats with metastatic diseases is not particularly high, even when combination surgery and medical therapy are implemented with tremendous zeal. Current general management strategies are solely focused on early detection, aggressive surgery, and supportive care, including chemotherapy and/or radiation therapy, for locally advanced or metastatic disease. New avenues for molecular diagnostics for particular treatments may open up in the future.

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BIOGRAPHY

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