Clinical management of mammary carcinoma in dogs: Current scenario

Manas Mondal, Dr. Anjan Kumar Sahoo, Indramani Nath, Aditya Prasad Acharya, Ashabaree Samal, Subhranshu Sekhar Biswal and Akshya Goud

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Abstract
Mammary carcinoma is one of the most common skin tumors of mammary gland area in canine. Fifty cases of mammary carcinoma were reported during the period of study at Teaching Veterinary Clinical Complex and Department of Veterinary Surgery and Radiology. Eighty animals were screened for selecting fifty mammary carcinoma and these are the subjects of present study population. The prevalence of tumors across the age groups were highest among 8 to 12 years, followed by 12 years and least in dogs below 8 years. Breed wise predisposition was highest among Labrador (36.67%), followed by Spitz and German shepherd (20% each), Mongrel (10%), Dachshund (6.67%), Rottweiler and beagle (3.33% each). More cases of mammary carcinoma were malignant (70%) with metastasis to regional lymph node a common finding. Malignancy criteria were size, hardness, of the tumor and metastasis to regional lymphocenter. Axillary lymph node for 1st, 2nd mammary gland tumor and inguinal, medial iliac lymph node for 2nd, 3rd, and 4th mammary gland were common site of regional metastasis. Most of the patient had clinical stage III tumor (30%) followed by stage II (23.33%). Three cases of stage IV mammary carcinoma were recorded in which three view thoracic radiography showed nodular opacities of the thorax and confirmed as positive sign of metastasis. Histopathologically, solid mammary carcinoma, fibroadenoma, adenocarcinoma were common types of carcinomas. Malignant mammary tumor dogs had significantly (p<0.01) higher serum Ca levels than benign tumor and healthy dogs. Alkaline phosphatase was the prognostic indicator for disease free interval and overall survival time.

Keywords: Mastectomy, regional lymph centre, clinical staging, adenocarcinoma, alkaline phosphatase

Introduction
Mammary tumour or mammary carcinomas are the most common neoplasm in canines accounting for 25-50% of all tumours diagnosed, and 50% of them are malignant [1, 2]. Surgical excision is the gold standard therapy for removal of the primary tumour mass and is considered to be the single most effective method to attain local tumour control [3, 4, 5, 6]. The various surgical options are lumpectomy or nodulectomy (excision of small, benign nodules <0.5-1 cm), simple (single) mastectomy (removal of single large tumour fixed to underlying tissue), regional mastectomy (glands, tumours along with venous and lymphatic channels and ipsilateral lymph nodes), unilateral or bilateral mastectomy (removal of glands 1 to 5 in a chain as a unit located on one side or both side) [7, 8]. Local recurrence or metastases are often observed in malignant mammary carcinoma resulting in death mostly within two years [9, 10]. Because of a high percentage of metastases and recurrences, prognostic factors such as the presence of lymph node metastasis are being sought to determine the course of the disease. Lymph node micro metastases with diameters up to 0.2 to 2 mm are targeted for better therapeutic approach and to improve the prognosis of survival time [11]. Clinical staging of mammary tumours is done according to T (tumour), N (lymph node), and M (metastasis) system. Currently, a modified version of the original system published by Owen, 1980 is being used [12] for the staging of mammary carcinoma in which stage IV represents lymph node metastasis and distant metastasis as stage V.

The present study aimed at clinical outcome in fifty patients affected with mammary carcinoma, in which treatment protocol was surgical excision of primary tumour mass, radical mastectomy including loco regional metastasis and surgery along with adjuvant chemotherapy.

Materials and Methods
Fifty clinical cases of mammary carcinoma presented to Veterinary clinical complex, and Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal
Husbandry, Odisha University of Agriculture and Technology, Bhubaneshwar (Odisha) for the period 2021-2022 were the subjects of present study population. Other skin tumour occurring in thoracic area and abdomen area were screened and excluded basing on histopathology or cytology findings. Signalment (age, sex, breed, body weight), neutering status, concurrent clinical symptom, soft or hard tissue growth in mammary gland area were recorded for the fifty cases. Blood parameter (Hb%, total leucocyte count, differential count (neutrophil, basophil, eosinophil, monocyte, lymphocyte)), hematobiochemical estimation (total erythrocyte count, Packed cell volume, liver function test, fasting blood sugar, serum calcium level) were examined where ever necessary. B-mode ultrasonography of the regional lymph node and primary tumour mass, three view thoracic radiography, cytology or histopathology was performed for clinical staging of the primary mammary tumour.

**Mastectomy**

After routine preoperative preparation, the patients were restrained with general anaesthesia (atropine injection @ 0.04 mg/kg body wt., xylazine injection @ 0.5 mg/kg body wt., ketamine injection @ 5 mg/kg body wt.). Surgical excision of the mammary gland with a minimum 3 cm surgical margin with any of the surgical options like lumpectomy, simple (single) mastectomy, unilateral mastectomy, or bilateral mastectomy was performed to excise the tumour mass and lymph node (Fig. 1). Pre and post-operative antibiotic (ceftriaxone injection @ 20 mg/kg body WT), analgesics (meloxicam injection @ 0.4 mg/kg body WT) were administered for wound healing. In case of suspected lymph node involvement, radical mastectomy was performed to remove the lymph nodes occurring in the region. Cases with stage III and IV metastasis were treated with local tumour control and administration of Tamoxifen tablet orally @ 0.5 mg/kg body wt. for a period of 120 days. Side effects of chemotherapy administration was also recorded and symptomatically treated. The tumours in bitches were staged according to the TNM system. Excised tumour mass and lymph node were preserved in 10% buffered formalin, sectioned, and stained with Haematoxylin and Eosin. Photo micrographic study of the prepared slide was done under 10x, 20x, 40x, and 100x magnification.

**Result and Discussion**

Mammary carcinomas were the most common spontaneously occurring neoplasm in intact old female dogs. The median age at presentation was 9.87 years, and the median weights of dogs were 22.57 kilograms. The most common reason for the presentation was soft-tissue growth on the ipsilateral or bilateral side in any of the five gland areas. Location, size, shape, and side of occurrence affect the clinical staging of mammary carcinoma. Physical examination and manual palpation of texture, size of the node was of less input towards the status of nodes in the regional lymph centrum. Three cases of mammary carcinoma were confirmed to be stage V with thoracic metastasis as seen in radiography (fig. 2). Fifty cases of mammary carcinoma were histopathologically divided into following types (table-1)

**Table 1:** Fifty cases of mammary carcinoma were histopathologically divided into following types

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Histopathological subtypes</th>
<th>No. of patients affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>lipid-rich mammary carcinoma</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>solid mammary carcinoma</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>malignant fibro sarcoma</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>anaplastic mammary carcinoma</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Tubulopapillary carcinoma</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>Tubular mammary carcinoma</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>Mammary adenocarcinoma</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Cystic papillary carcinoma</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Complex type carcinoma</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>fibro adenoma</td>
<td>2</td>
</tr>
</tbody>
</table>

Patient were divided into three groups and selected therapeutic regimen were administered along with local tumour control as follows (table 2)

**Table 2:** Patient were divided into three groups and selected therapeutic regimen were administered along with local tumour control as follows

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Therapeutic regimen</th>
<th>No. of patient treated</th>
<th>Average Overall survival time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>Surgical excision of primary tumour mass / mastectomy</td>
<td>31</td>
<td>540 days</td>
</tr>
<tr>
<td>Group B</td>
<td>Radical mastectomy involving regional lymph nodes</td>
<td>12</td>
<td>500 days</td>
</tr>
<tr>
<td>Group C</td>
<td>Surgery followed by adjuvant chemotherapy with Tamoxifen &amp; 0.5 mg/kg orally for 120 days</td>
<td>7</td>
<td>570 days</td>
</tr>
</tbody>
</table>

**Surgical margin**

When a primary tumour mass, such as a sarcoma or carcinoma, is surgically removed from a veterinary oncology patient, tumour cells may still be present outside the area that is not visible to the naked eye or the gross eye. Therefore, a "safety margin" around a surgical excision includes a margin of healthy tissue surrounding a tumour mass. There are two types of surgical margins: clean and wide surgical margin and clean and narrow margin. The type of recurrence and surgical prognosis are also determined by how much of the tumour mass is surgically removed. Sometimes, unnecessary surgical resection can also make an oncological patient more likely to experience postoperative morbidity. Clean and wide skin excision (=3cm) have been performed in 37 mammary carcinomas. Narrow but clean surgical excision has been performed in 13 patients including benign mammary tumour. During this study period, there was tumour recurrence in 5 patients.
As mammary carcinoma spread through lymphatic route, therefore knowledge of lymphatic drainage of the five pair of mammary carcinomas is highly essential for deciding the stages of metastasis and clinical staging of tumour into stage I to stage V. As reported by Patiskas et al., 2006 \cite{13}, lymph from 1st and 2nd mammary gland drains to axillary and sternal lymph nodes whereas lymphatic channel from 4th and 5th mammary gland drains to inguinal lymph node and hind limb lymphoid plexus.

In adverse cases, when there is recurrence and confirmatory regional metastasis are seen, adjuvant chemotherapy drug such as doxorubicin @ 10 mg/kg, carboplatin, paclitaxel and tamoxifen @ 0.5 mg/kg orally for at least 120 days are administered now a days to increase the disease-free interval and increase the overall survival times in canine patients. Simultaneously, supportive therapy should be continued to avoid side effects of these chemotherapeutic agents and decrease the morbidity rate in these patients.

**Conclusion**

Proper clinical staging is highly essential before proceeding for a therapeutic regimen in case of mammary carcinoma and other tumours types for successful outcome.

**References**

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