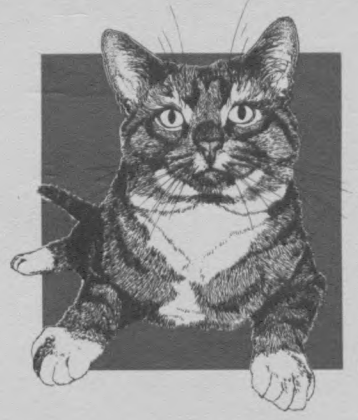

Feline Health Topics

for veterinarians

Volume 1, Number 4

Mammary Tumors Are Third Most Common Cancer in Cats

Mammary tumors are the third most common cancer in cats, after skin cancer and lymphosarcoma. The incidence of mammary tumors is 25.4 per 100,000 female cats at risk.[1] Those cats at higher risk include middle-aged cats (10 years and older), Siamese and domestic shorthair breeds, and intact female cats. There is no evidence that an ovariohysterectomy before one year of age lowers the incidence of mammary cancer in the cat as it does in the dog.[4]

Etiology

Mammary tumors are epithelial in origin and until recently were considered to develop independently of hormonal stimulation. However, recent studies indicate that hormones can influence the development of mammary tumors in the cat as they do in dogs. In a group of 39 female cats that received oral progestins to treat refractory eosinophilic granuloma, 15 percent developed pathology of the mammary glands. Further research has identified progesterone and possible corticosteroid receptors on mammary tumor tissue.[2] Also, C-type viral particles have been observed in malignant mammary tissue, although their role has not been determined. These viral particles may only be passenger viruses and not a probable cause.

Mammary hyperplasia occurs when there is an increase in the number of mammary gland cells. This increase has been directly associated with young female cats coming into their first heat or with the administration of megesterol acetate (Ovaban) to treat behavioral or dermatologic problems.[2] Mammary hyperplasia usually regresses after estrus ends or when exogenous hormonal stimulation is withdrawn.

Pathology

Feline mammary tumors grow rapidly and metastasize quickly. Approximately two-thirds of afflicted cats have multiple mammary tumors which may affect one or both mammary chains. The most common forms of mammary tumor are tubular or papillary adenocarcinomas followed by solid carcinoma. Feline mammary sarcomas have been reported but are rare. Adenomas (benign mammary gland tumors) are much less common, comprising about 14 percent of mammary tumor cases.[4]

Typical histologic features of mammary tumors include extensive areas of necrosis, often with lymphocyte and plasma cell infiltration. Histologically, mammary tumors are graded according to cellular differentiation and degree of tubule formation, nuclear pleomorphism and

Inside this issue . . .

mitotic frequency. Cats with well-differentiated tumors with low pleomorphism and few mitotic figures appear to have increased survival time.[2] Also, survival rate appears to be inversely related to the size of the tumor -- the smaller the tumor the greater the survival time. For example, it was reported that cats with tumor volume of less than 8 cc have an average survival time after surgery nearly four times longer than cats with tumor volumes of 65 cc or more (12.4 months versus 3.5 months).[1]

Mammary tumors metastasize by way of the lymphatic vessels and tumor cells can occasionally be observed within the lymphatic system that drains the involved glands. Nearly two-thirds of all cats with mammary cancer ultimately succumb to metastasis of tumor to the lungs.

Clinical Signs and Diagnosis

Feline mammary tumors may be hard and nodular or soft and fluid-filled. The tumors usually lie in the subcutaneous tissue adjacent to the nipple. Invasion into underlying musculature is common, as is cutaneous ulceration.

Involvement of the regional lymph nodes occurs early. Cats with large, chronic tumors are frequently presented with signs of weight loss, dyspnea, and coughing that may indicate lung metastasis.

Since 85 percent of feline mammary tumors are malignant, a presumptive diagnosis of mammary gland cancer can be based on the presence of a mass lesion noted in the breast tissue. Definitive diagnosis can only be made by a surgical biopsy. Fine needle aspiration cytology may reveal malignant cells, but false negative cytology is possible.[4] Because of the high incidence of metastatic lung tumor, a thoracic radiograph is recommended before any surgical procedure is performed.

Treatment

Surgical:

The preferred form of treatment is aggressive surgical removal of the affected tissue (radical mastectomy).[3] For example, if a malignant tumor is in the pectoral gland, then all pectoral glands on the side involved along with the axillary and inguinal lymph nodes should be removed. The Animal Medical Center found that the radical surgery provided a longer disease-free time (575 days) for the patient than more conservative surgery (325 days).[2] Bilateral disease is treated by staged radical mastectomies.

Radical surgery benefits the patient by quickly returning the cat to a disease-free status. Theoretically, the chance of recurrence is reduced because most of the remaining mammary chain is removed. Also, it is a standard surgical procedure, thus providing a standard method to evaluate the efficacy of therapy. However, the frequency with which local recurrence and distant metastasis occur means that surgery, no matter how radical, is often inadequate therapy especially for advanced disease.

Feline Health Topics

A publication for veterinary professionals

The ultimate purpose of the Cornell Feline Health Center is to improve the health of cats everywhere, by developing methods to prevent or cure feline diseases, and by providing continuing education to veterinarians and cat owners. All contributions are tax-deductible.

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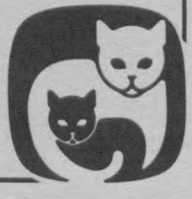

Immunotherapy:

Although tumor-specific antigens have not been found in feline mammary tumors, it is theorized that adjuvant immunotherapy may help prevent recurrence; thereby, extending life. A study conducted at The Animal Medical Center compared survival time of surgical patients to patients receiving surgery and microbial immunoadjuvant (MBV; Farben, Fabriken, Bayertal of Germany).[2] The results of this nonrandom study were not statistically significant (i.e. mean average of 450 days versus 875 days). The Center is continuing to compare data gathered on surgical treatment and combined forms of treatment.

Other Treatments:

Other therapy methods available include radiation, chemotherapy, and hormonal treatment. However, little or no published data exist on the effectiveness of these alternate forms of treatment. At The Animal Medical Center low-dose chemotherapy using vincristin, cyclophosphamide, and methotrexate was found to be ineffective in the prevention of recurrence or metastasis.[2]

A recent paper revealed that Adriamycin R and cytoxan are active agents for feline mammary cancer. However, the routine use of this protocol is not yet recommended.[4]

Follow-up Examinations:

Frequent follow-up examinations and fully informing the owner of the nature of the disease are equally important as the surgery. A standard protocol is to examine recovering cats on a bi-monthly basis. The incision, remaining glands, and node regions should be palpated during the examination to detect recurrence of the tumor. Also, thoracic radiographs every 3 to 6 months can provide data on possible metastasis to the lungs.[2]

Summary

The majority of feline mammary tumors are malignant. They readily metastasize to regional and distant tissues, especially affecting lymph nodes and lungs. Early detection, aggressive surgery (i.e. radical mastectomy), and frequent follow-up examinations provide the best chance for a cat's survival. ■

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Acknowledgment: *Special thanks to Dr. Jay Harvey, assistant professor of surgery at the NYS College of Veterinary Medicine, for reviewing this article.*

Research Notes

Treatment of Lymphosarcoma in Pet Cats by Extracorporeal Immunoadsorption with Prosorba Columns

The topic of treating feline lymphosarcoma by extracorporeal immunoadsorption with prosorba columns was presented this spring at the American Society of Clinical Oncologists Forum held in Los Angeles, CA. Grady H. Shelton and Frank R. Jones of the Pacific Northwest Research Foundation in Seattle, WA were the presentors. The following is the abstract from their paper:

"Spontaneously occurring lymphosarcoma in cats is induced by the feline leukemia virus (FeLV) and is progressive leading to death in 3 to 5 months even during classical treatments such as chemotherapy or irradiation.

Cats with histologically determined lymphosarcoma which had received no prior anti-tumor therapy were treated only by extracorporeal immunoadsorption using protein A-silica (Prosorba) columns (IMRE Corp.) to remove IgG and IgG-related circulating immune complexes. Cats were treated between 3 and 40 times on a two-treatment per week schedule. Five of 9 cats treated responded by lymphosarcoma regression; four had complete regression and one had a

(continued on page 6)

Basic Principles of Fel

Blood transfusions are commonly used to treat cases of acute blood loss, severe anemia, thrombocytopenia, and vitamin K deficiency. If a feline patient has a packed cell volume (PCV) of 10 or less, a transfusion is indicated. However, if there has been a sudden massive hemorrhage, the PCV and hemoglobin tests can be misleading because of compensatory vasoconstriction and splenic contraction which falsely elevate hemoglobin and PCV. Therefore, clinical assessment of the patient is very important. Signs of blood loss include pale mucous membranes, prolonged capillary refill time, weakness, postural hypotension, tachycardia, tachypnea, and thirst.[3]

Although blood transfusions are a standard procedure, reactions can occur. However, most of the reactions can be avoided by taking precautions in the collection, storage, and transfusion process.

Collection and Storage

The donor cat should be a healthy, lean adult (10-15 lb.) without parasites, test negative for feline leukemia, have a low titer for coronaviruses, and be current on all vaccinations. The donor cat can be anesthetized with xylazine HCL (1 mg/kg IM) and ketamine HCL (10 mg/kg IM). Atropine (0.02 mg/lb SQ) can be administered to block cardiac arrhythmias and decrease salivation.[4]

Usually an 18-gauge or 20-gauge needle, inserted into the jugular vein, is used to collect blood. Standard aseptic techniques should be used in the collection of blood to avoid bacterial contamination. The recommended amount to collect from a donor cat is 10 ml per pound. Bleeding should not be repeated more often than every two weeks. The collected blood can be used immediately (after crossmatching) or can be stored for use later.

A hypertonic solution of acid citrate dextrose (ACD) or citrate phosphage dextrose (CPD) are the anticoagulants of choice for storing blood. The blood should be stored at 4°C. The maximum storage time is 3 to 4 weeks for ACD and 6 weeks for CPD.[2] Cat blood stored in heparin keeps for a very short time, and within one week hemolysis occurs. Plasma can be salvaged from outdated blood, if hemolysis has not occurred.

Feline Blood Types

Three blood groups have been identified for cats: A, B, and AB. Antibodies A and B occur naturally in the plasma of cats (isoantibodies). A hypersensitivity reaction occurs when these antibodies attach to the corresponding introduced red cell antigens. The reaction may be immediate or delayed. Studies show that cats in group B are at greater risk of suffering severe incompatibility reactions.[3] Because anti-A has strong agglutinating properties, it is easier to detect incompatibility by a slide agglutination crossmatch. A crossmatch should be done before performing any blood transfusion to avoid the risk of immunological reactions.

Crossmatching Blood Types

The following procedure for crossmatching, as outlined by Auer and Bell[1], is relatively easy and can be performed in animal hospitals:

1. Collect small samples of donor and recipient blood in heparin or EDTA containers. Separate the plasma and red blood cells either by centrifuging for 10 minutes (3000 rpm) or by allowing samples to stand for 30 minutes.

2. The following are needed to perform the crossmatch: (a) donor plasma, (b) recipient plasma, (c) donor 4% RBC suspension (0.2 ml of packed red cells and 4.8 mls 0.9% saline), and (d) recipient 4% RBC suspension.

3. Set up four slides with the following tests:

Slide 1: 1 drop donor plasma and 1 drop

ine Blood Transfusions

donor RBC suspension (donor control - should not react).

Slide 2: 1 drop recipient plasma and 1 drop recipient RBC suspension (recipient control-should not react).

Slide 3: 1 drop donor plasma and 1 drop recipient RBC suspension (minor crossmatch).

Slide 4: 1 drop recipient plasma and 1 drop donor RBC suspension (major crossmatch).

4. Gently rock each slide from side to side.

5. Look for agglutination reactions on slides 3 and 4, which will occur within 5 to 15 minutes at room temperature (22°C). If you are uncertain about the reactions, compare the questionable slide with the control slides 1 and 2. The anti-A and group A cells will produce a strong agglutination; whereby, anti-B is generally a weak agglutinin, resulting in a reaction that is not visible to the naked eye. Therefore, a group-B recipient will show a positive reaction on slide 4 with a group-A donor but no reaction on slide 3. The reaction patterns are reversed for A-recipient and B-donor cats (i.e. slide 3 positive and 4 negative). The AB type is so rare (0.4%) that its reactions have not been considered in the crossmatch.

Administering Transfusions

After performing the crossmatch, the volume of blood needed for transfusion must be calculated. The standard formula is:

$$\text{ml of donor blood needed} = \frac{\text{(recipient wt (lbs) x 30 ml/lb) X (PCV desired} - \text{recipient PCV)}}{\text{Donor PCV}}$$

Blood transfusions are usually administered through the jugular vein or cephalic vein. Use of a butterfly catheter provides freedom of movement, thus requiring minimal or no restraint of the cat. Also, it allows for gently mixing the blood during administration.[4] The rate of administering whole blood to an average sized cat is 4 to 5 ml per minute.

Post-transfusion care of the patient is important. The PCV should be measured in 12 to 24 hours. This will provide a more accurate picture of the true influence of the transfusion on the blood volume and PCV. The patient should be carefully observed to see if there are any signs of reaction to the transfusion (i.e. jaundice, fever, cardiac arrhythmias). If reactions occur, appropriate therapy should be initiated.

Complications

Incompatibility Reactions:

Either an immediate or delayed reaction may occur when incompatible blood is transfused into a cat. Severe immediate transfusion reactions are classified into two phases. Phase 1 occurs 30 seconds to 2 minutes after the introduction of the incompatible cells. Severe hypotension occurs simultaneously with bradycardia and erratic respiration. The usual respiratory pattern is a cessation of breathing for 15 to 20 seconds, followed by one or two brief gasps. Sometimes there is a complete absence of electrical activity of the heart for periods up to 18 seconds. The signs associated with Phase 1 are thought to be caused by vasoactive substances released from mast cells and basophils by anaphylatoxins. The bradycardia suggests an interaction with other mediators including bradykinin, serotonin, prostaglandins, and oxygen-free radicals. Hematology during phase 1 shows hemoconcentration and leukopenia.[1]

Phase 2 is characterized by an elevated arterial blood and pulse pressures (i.e. 225/125 mm Hg) and increased respiratory and heart rates, and cardiac arrhythmias. Most cats will stabilize within 30 minutes unless they are in shock.[1]

The delayed reaction may be in the form of hypertension, cardiac arrhythmias, edema,

disseminated intravascular coagulation, renal damage and jaundice. The last four reactions have not been observed in cats; however, it is assumed they can occur based on experiences with human reactions to transfusions.

Bacterial Contamination:

Blood that was frozen and warmed to room temperature and not used, should be discarded. Also, proper aseptic technique used during collection and administering will help to eliminate reactions caused by contamination. Dark brown or black supernatant plasma indicates digested hemoglobin from bacterial growth. Patients receiving contaminated blood will show a febrile response within 15 to 20 minutes of receiving the transfusion.

Hemorrhaging:

Bleeding can occur following a transfusion of large quantities of refrigerated whole blood that are deficient in clotting factors (platelets, fibrinogen, Factors V and VIII). The problem can be compounded further if the blood is stored in glass bottles. Apparently, the glass surface activates the platelets and Factor XII, resulting in a deficit of these coagulation factors.[2]

Circulatory Overload:

This can occur when blood is transfused at a rapid rate into anemic cats that have normal blood volumes and increased venous returns. Special precautions should be taken with cats with chronic anemia or impaired kidneys. Signs of overinfusion include vomiting, urticaria, and pulmonary edema. A rule of thumb is not to exceed 10 ml per pound within 24 hours.[2]

Other Reactions:

Pulmonary microembolization and respiratory insufficiency can occur from microaggregates in stored blood. Therefore, blood stored five days or more should be filtered.[2]

If large quantities of citrate are used as an anticoagulant for stored blood, citrate toxicity (hypocalcemia) can result. This can be prevented by using the recommended proportions of ACD to donor blood.

When blood cells become hemolyzed the potassium ion is released and causes hyperkalemia. If unchecked, it may result in heart failure and possibly death. Cardiac arrest can also be caused by transfusing cold, refrigerated blood; therefore, stored blood should be warmed to 37°C before used for a transfusion.

Summary

The selection of blood donors, crossmatching blood types, proper collection, storage, and administering the transfusion, and post-transfusion care of the patient are important steps in having successful blood transfusions. If adverse reactions occur, usually you can determine the cause based on the reaction. Fortunately, most transfusion reactions are not fatal, and the patient will recover within 12 to 24 hours. ■

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Acknowledgment: *Special thanks to Dr. Julia Blue, assistant professor of clinical pathology at the NYS College of Veterinary Medicine, for reviewing this article.*

Research Notes *(continued from page 3)*

partial (50%) anti-tumor response. Cats that responded by tumor regression also developed antibodies to a tumor-specific protein related to the envelope glycoprotein.

These data confirm previous observations of anti-lymphosarcoma responses following extra-corporeal immunoadsorption on cats using S. aureus Cowan I which has IgG binding protein A on its surface. In addition, since Prosorba columns have covalently bound purified protein A, it appears to be safer to use in this model than S. aureus and has similar clinical anti-tumor effects." ■

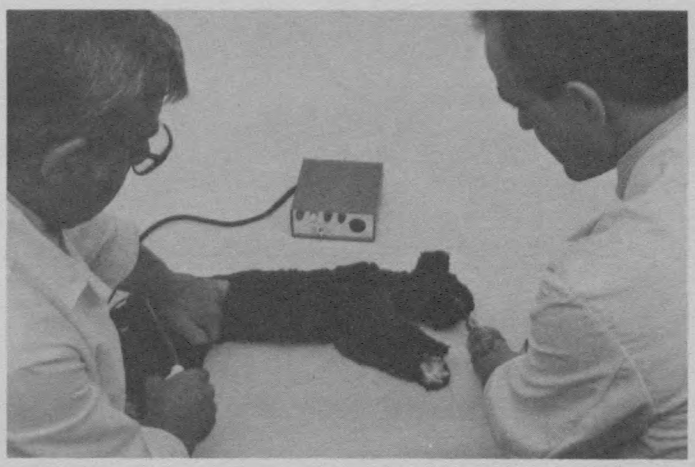
(Resource: The Veterinary Cancer Society Newsletter, 10(3), 1986.)

Resusci-cat to the Rescue!

Necessity is the mother of invention, and such was the situation when Dr. Charles E. Short, chief of anesthesiology at NYS College of Veterinary Medicine, developed the concept of a realistic cat model for CPR training. Funds for the model's development were provided through a grant from the Fund for the Animals, Inc.

The cat model, resusci-cat, is an ingenious contraption of electronics, with indicator lights which provide immediate visual feedback to the student on their CPR technique. A computer software program is being developed to simulate different blood pressures and cardiopulmonary rates, thus providing a more lifelike simulation of various emergency situations requiring CPR. However, despite the technological devices, resusci-cat closely resembles a real cat, both in appearance and in touch.

According to Dr. Short, resusci-cat will be fully operational and on the market by early 1987 after it receives some needed modifications. Resusci-cat will be used to train veterinary students, animal health technicians, and humane society staff on the basics of CPR. ■



Dr. Charles Short (left) checks the indicator as Dr. Lee Tyner (right) intubates the prototype resusci-cat.

Special Thanks . . .

We wish to express our thanks to **Ciba-Geigy** for donating the following equipment to the Cornell Feline Health Center, thereby providing us with the necessary tools to continue our work on important feline diseases.

(2) Sorvall centrifuges
(4) centrifuge heads
(2) Beckman dynographs
(3) waterbaths

* * * * *

We also wish to thank those people who made the **charity softball game** between WNEW-FM Alstars and the St. George's Vets a success: Dr. Joel Friedman, Frank Kantor, Mary Alice Jansky, and Dr. Jane Bicks.

Local animal hospitals that donated to the Center in conjunction with the charity game were: St. George's Veterinary Hospital, Dover Veterinary Clinic, Basking Ridge Animal Hospital, Briarwood Veterinary Clinic, Woodbridge Veterinary Group, Berkeley Heights Animal Hospital, Manalpan Animal Clinic, Central Jersey Veterinary Emergency Service, and Iselin Veterinary Hospital. The donation of $2,076 will be used to continue our FIP studies.■

Feline Advisory Council

The Cornell Feline Health Center staff meets every year in June with a select group of people from across the United States that serve as Advisory Council members. Each member serves a three-year term on the council. Council members help the staff develop short term and long range goals. Dean Phemister appointed three new council members this year: **Dr. Jane Bicks** (New York), **Joan Blackburn** (Texas), and **Marjorie Cornell** (Florida).

Returning to the council this year are: **Dr. George W. Abbott** (Massachusetts), **Joan M. Arnoldi** (Wisconsin), **Nancy A. Bull** (California), **Roger Caras** (New York), **Dr. Jean Holzworth** (Massachusetts), **Hazel Lindstrand** (Illinois), **Dr. Mark L. Morris, Jr.** (Kansas), **Dr. Theodore A. Rude** (Wisconsin), **Ellen Sawyer** (Illinois), **Mordecai Siegal** (New York), and **Joan Wastlhuber** (California). ■

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