Principles of Surgical Oncology
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Surgery remains a pivotal component of the treatment of pets with cancer. Much to the frustration of medical and radiation oncologists alike, surgery cures more cancer than any other treatment modality. Optimal surgical intervention requires knowledge of tumor type and behavior. Appropriate application of surgical dose and an understanding of some basic oncology surgery techniques are necessary to ensure a positive outcome for pets with cancer. When applied incorrectly, however, surgical intervention can negatively influence the treatment plan for the oncology patient.

Let’s consider how two different approaches to the same tumor may have very different outcomes. A 6-year-old fifty-pound mixed breed dog is presented for evaluation of a 4cm long x 2cm wide mass on the lateral aspect of the pelvic limb. (Figure 1) The mass has been present for two months with slow but steady growth. The owners want the mass removed as soon as possible because they are hosting a family reunion in 2 weeks and they don’t want to have to answer numerous questions about the dog’s lesion. The mass is soft and fluctuant. Doctor A assumes it is a lipoma. He agrees to remove the mass that day. An incision is made over the mass in an orientation that is perpendicular to the long axis of the limb. The mass is shelled out. However, the resected tissue does not have the appearance of fat, so a piece of the tissue is submitted for analysis. Dr. A is surprised when the pathologist indicates the mass is a grade 2 Soft Tissue Sarcoma. The pathologist cannot comment on the margins because only a small sample of the mass was submitted. The owners consult with a veterinary oncologist who recommends radiation therapy of the entire surgical scar. This recommendation is based on the fact that the only other surgical option is an amputation because the orientation of the incision precludes additional surgical intervention. In addition, given the method of removal it is unlikely the surgical margins are free of tumor cells, so radiation is needed to address the remaining cancer cells which are assumed to be present.

Doctor B is presented with the same patient. She aspirates the lesion and obtains a cytological diagnosis of Soft Tissue Sarcoma. A wide...continued on page 2
Excision is planned 3cm around the mass and a muscle fascial layer deep to it. The tumor and associated fascial layer are removed en bloc. The cut surface of the resected tissue is marked with ink and the tissue is submitted in its entirety to the pathologist. Surgery is successful, and the final histopathology report indicates the Grade 2 Soft Tissue Sarcoma has been successfully resected with adequate margins. No additional treatment is needed.

When presented with a patient having a mass the first step should be to identify the lesion. A biopsy is often required prior to surgery to provide definitive diagnosis, to determine the need for additional diagnostics or staging, to plan the surgical approach, and to provide information needed to properly educate owners on expected outcome. A fine needle aspirate (FNA) is the easiest method for obtaining a diagnosis. (Figure 2) No sedation is needed and cytology will provide basic information as to the nature of the mass. Disadvantages of a FNA are that the mass cannot be graded and sometimes a diagnosis cannot be made if only a small number of cells are obtained. An incisional biopsy can be utilized if the fine needle aspirate is not diagnostic. One must plan the incision appropriately. The incision is considered “contaminated” by tumor cells so it will need to be removed with the definitive surgical resection of the mass. A small incision is made in an appropriate location and orientation and tissue samples obtained with a scalpel blade or a disposable skin biopsy punch. A needle biopsy can be obtained with a Trucut for soft tissues and a Jamshidi for bone lesions. Excisional biopsies are commonly performed but rarely indicated. Removal of masses without knowledge of tumor type carries a high risk of incomplete resection resulting in the need for additional treatment (radiation therapy or surgery) and its associated costs.

Therapeutic goals (curative intent surgery versus cytoreduction) for each case should be discussed with the owner before surgery is initiated. The optimal treatment plan for each case should be determined. This plan should include discussions with the owner about preoperative staging, whether surgery is intended to be curative or part of a larger treatment plan to include other modalities such as radiation therapy or chemotherapy. Expected function, cosmetic outcome, costs and potential complications should also be discussed.

Local control of malignant cancer requires that variable margins of normal tissue be removed around the tumor. The first surgical attempt at mass removal carries the best chance for cure. The prescribed margins will be determined by knowledge of the tumor type. Tumors with high probability of local recurrence (Soft Tissue Sarcoma, Mast Cell Tumors, and Feline Mammary Adenocarcinoma etc.) should have 2 to 3 cm margins removed in 3 dimensions. Tumors are not flat, and wide removal in one plane does not ensure complete excision. Fixation of cancer to adjacent structures mandates removal of the adherent area in continuity with the tumor. Depending on the location of the lesion the deep margin may be less than 2-3cm. However, the deep resection may be adequate if a fascial layer is also removed. A fascial layer should be considered any sheath or dissectible connective tissue aggregation. An excellent example of this is the external fascia of the extensor muscles of the front limb. It does not,
however, include adipose tissue. A radical resection involves removal of more than 3cm of normal tissue with the tumor. Removal of an entire anatomic component (such as an amputation or pinnectomy) may be needed if a wide local excision is not possible. A marginal excision is considered a 1cm or less cuff of normal tissue around the palpable mass. This will be acceptable for lipomas or other benign lesions but will not be adequate for attempting a surgical cure for most malignancies. An exception to this principle is in the case of cytoreductive surgery. A marginal excision is acceptable and sometimes planned for large tumors where there is no chance for surgical cure. We may consider this approach to decrease the size of the tumor to make radiation therapy more effective than it would otherwise be with bulky disease. This plan should be discussed at length with the radiation oncologist and owner before undertaking it.

Certain oncologic surgery techniques can be used to improve the chance of surgical success. Surgeons should avoid contact with open or ulcerated areas of the tumor. Sharp dissection is preferred over blunt to decrease the chance of straying from pre-established margins. Control of hemostasis and prevention of seroma due to dead space is encouraged. Seromas or hematomas following incomplete excision can allow tumor cells to gain access to tissue planes beyond the surgical field as these cells can be dispersed through the fluid. A drain can be placed when indicated. However, the location of the drain exit hole(s) must be carefully planned. If the resection is not clean, then the surgical scar and any place the drain touched will need to be considered contaminated and as such removed with a second surgery.

Incisions should be oriented parallel to the ribs, long axis of the limbs, ventral midline, or spine. This should improve the chance of being able to undertake a second surgery if necessary to achieve wider margins around an incompletely excised tumor. In tumors that have been previously biopsied, the biopsy scar should be removed at the time of definitive surgery. This scar is considered a part of the tumor and as such removed through the same incision. Any adhesions associated with the tumor should be removed. If the tumor appears to have a capsule it should not be penetrated. Most tumors do not have a true capsule. This “shell” around the tumor is actually a layer of compressed viable tumor cells, not healthy reactive patient cells, which must be removed with the mass. These cells that make up the perceived capsule are actually the most aggressive cells of the tumor and should not be left in the patient. A new set of gloves, instruments, and possibly drapes should be used for closure. This also applies to the removal of multiple masses in the same patient. If multiple masses are being removed new instruments and gloves should be used for each anatomic site to avoid cross contamination of tumor cells which may affect the histopathology results from each site. Excised masses should be submitted in their entirety for evaluation. Sending in part of the lesion will allow for a histopathologic diagnosis but will not allow for margin evaluation. When possible, the margins of the resected tissue should be clearly marked for the pathologist. This may be done with suture material of various colors being placed at the deep, lateral, proximal and distal margins. Alternatively, tissue marking ink systems (such as the Davidson tissue marking system ®) are available to help mark and identify the different margins which are to be evaluated. If multiple masses are removed from the same patient, they should all be clearly labeled and submitted separately in individual jars.

Surgery is an important part of the treatment of cancer in companion animals because it can often provide an immediate cure. However, when
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performed in an incorrect manner, surgery can do more harm than good. It is essential that correct oncologic surgical techniques are used, and that the surgeon has an adequate knowledge of tumor type and behavior.

Reference:

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♦ Fluoroscopic urinary, GI, and tracheal studies
♦ Nuclear imaging
• GFR scans
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• Thyroid scans
♦ Splenic scintigraphy
♦ Radiographic interpretation
♦ CT and MRI interpretation

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Dermatology
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♦ CO₂ laser for ablation of skin tumors
♦ Testing for food allergies and hypoallergenic diets
♦ Ear disease diagnosis and treatment
♦ Bacterial and fungal skin disease diagnosis and treatment
♦ Cytological smears and microbiologic examinations
♦ Ectoparasite identification and treatment
♦ Immune-mediated and hormonal skin disease diagnosis and treatment
♦ Treatments of nail and nail bed disorders
♦ Skin biopsy sampling and histopathology interpretation
♦ Liquid nitrogen cryotherapy

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Southwest Veterinary Surgical Service, PC

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- Airway surgery
- Angular limb deformity surgery
- Arthroscopy
- CT Scans
- External skeletal fixation
- Fracture repair
- Laparoscopy and Thoracoscopy
- Neurologic surgery
- Oncologic surgery
- Oral surgery, such as maxillofacial surgery and oral fractures
- Orthopedic surgery
- Otologic surgery
- Perineal surgery
- Reconstructive surgery
- Ring fixators
- Soft Tissue surgery
- Thoracic surgery
- Tibial Plateau Leveling Osteotomy (TPLO)
- Triple Pelvic Osteotomy (TPO)
- Total Hip Replacement (THR) both cemented and cementless procedures available
- Tracheal Stenting
- Tibial Tuberosity Advancement (TTA)

**Anesthesia and Pain Management**
- Anesthetic management of high risk and critical care patients
- Extensive anesthesia monitoring
  - Blood pressure, both direct and indirect
  - Pulse oximetry
  - Electrocardiogram
  - Capnography
  - Body temperature
  - Ventilator therapy
- Pain patches
- Chronic pain management consultations

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  - Ethylene glycol (Antifreeze) testing
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- Radiologist interpretation
- Scanning ultrasound
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  - Blood component therapy
  - Rattlesnake antivenom therapy
  - Oxygen
  - Short and long term ventilator therapy
  - Anesthetic ventilator
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