

Principles of Surgical Oncology

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A diagnosis of cancer often brings thoughts of terminal disease, disfiguring surgery, and a tragic death to a beloved pet. However, advances in cancer treatment have allowed for better care of the cancer patient, curing many and improving the quality and quantity of life for others. Surgical management of cancer can be the sole treatment option, although it is more commonly part of a multimodal treatment plan along with chemotherapy and/or radiation therapy. Surgery is used to diagnose, treat, and palliate disease in cancer patients. Appropriate dosing of surgical intervention at each stage is important to achieve success. Surgery can be quite successful and complete surgical removal cures more cancer patients than any other treatment modality. We will focus here on the surgical management of cancer and the primary care veterinarian's role in helping to move the process of diagnosis and treatment in the right direction to improve definitive management of cancer in our pets.

Identification of the Tumor

This is the most important step! Your part in the process cannot be overstated. Accurate diagnosis and prompt care is critically important to make a treatment plan be successful. Most mistakes in the surgical treatment of cancer are made because of a lack of tumor diagnosis prior to treatment and subsequently underdosing surgical intervention. With inadequate surgical treatment, tumors are incompletely excised, metastases are missed or not pursued because the clinician failed to suspect their presence.

The diagnosis of a cellular tumor type BEFORE surgical treatment is especially important when the type or extent of treatment may be affected by the diagnosis :

eg: Is a SQ mass on a lateral thorax of a dog a lipoma or a hemangiosarcoma?

Is a mass on the rostral mandible of a dog an epulis or a melanoma?

Is a lytic bone lesion in a dog an osteosarcoma or blastomycosis?

Additionally, the cellular diagnosis will provide more information about prognosis and expected response to surgical intervention which may affect the owner's willingness to treat.

eg: The grade of Mast cell tumor is an important predictor of prognosis.

The only time when presurgical diagnosis via biopsy is not indicated is if biopsy may be more risky than the treatment and cellular diagnosis would not change the surgical treatment

eg: splenic mass or solitary lung mass

Methods of Obtaining a Diagnosis:

Start with the least invasive and keep moving forward - don't quit until a diagnosis is made!

1. Fine Needle Aspiration:

A 20g -25g needle is passed through the mass multiple times to obtain a sample of cells which are transferred to a slide. Aspiration with a small syringe may yield more cells for evaluation.

Most useful for: mast cell tumors, carcinomas, some sarcomas, and lipomas

Pros:

- safe, simple, cheap, generally well tolerated in awake patients
- no special equipment

Cons:

- Cannot grade or determine the invasiveness of a tumor.
- Not very sensitive (few false positives, but many diagnoses might be missed -especially sarcomas)

2. Trucut Biopsy:

A special cutting instrument that cores a cylinder of tissue (1-2mm in diameter)

Pros:

- Safe, simple, cheap, requires little special equipment.
- Allows accurate determination of histologic type.



- In some cases, may get information about grade and invasiveness.
- Can be done with sedation/local anesthesia in many patients

Cons:

- A relatively small amount of tissue recovered (could miss changes in heterogeneous masses making diagnosis inaccurate or incomplete)
- Need to be careful with direction of biopsy so that biopsy tracts can be removed with surgical excision

3. Incisional Biopsy:

A wedge or plug of tissue is removed from the tumor

Pros:

- No special equipment required
- Large amount of tissue is submitted
- Provides information about grade
- Junction of normal/abnormal tissue submitted to allow more accurate determination of invasiveness
- Can be done with sedation/local anesthesia in many patients

Cons:

- General anesthesia usually required.
- A poorly placed biopsy can make future attempts at surgical excision difficult

4. Excisional Biopsy

The entire grossly apparent tumor is removed before a diagnosis is made

Pros:

- No special equipment required
- May diagnose and treat the tumor at the same time

Cons:

- General anesthesia usually required.
- Can make definitive surgery impossible in some anatomic locations (head and extremities)

NOTE: Excisional biopsy is generally overused. These should only be performed in anatomic locations where either the widest surgical margins (2-3cm) are achieved in the first place (ie. do the definitive surgery at the time of biopsy) or where a second more aggressive surgery can easily be performed if margins are found to be inadequate.

Considerations BEFORE you move to surgery:

1. Local and systemic effects of the tumor:
 - What is the likely organ or structure of origin?
 - How far are tumor cells likely to exist in grossly normal tissue from the observable tumor?
 - Where are metastases likely to go?
2. Common paraneoplastic syndromes that might complicate management or affect outcome:
 - eg: hypercalcemia with anal sac adenocarcinoma
 - thrombocytopenia with splenic masses
 - mast cell degranulation (gi ulcers, anaphylaxis) with MCT
3. Is adjuvant therapy (chemotherapy/radiation) of benefit?
 - eg: Can radiation be used to clean up "dirty margins"?
 - If so mark surgical wound with hemoclips in SQ
4. Is surgery needed at all?
 - Is radiation or chemotherapy a better choice?



eg: lymphoma is often NOT surgically managed
epulides can be very effectively managed with radiation

5. Species differences

The biological behavior of a tumor type varies from species to species

eg: MCT is more benign in the cat than the dog
Mammary tumors are more aggressive in cats

6. Median survival time for each treatment plan

- This is where I/you send the owners for a consultation with your friendly neighborhood oncologist (NOTE: it is more helpful if a cellular diagnosis is already obtained)
- Helpful to owners and clinicians to balance the morbidity of a treatment plan with range of expected outcomes.

7. General health:

- Age is not a contraindication for surgery.
 - In fact old dogs (>2) with osteosarcoma have better prognosis with amputation alone than do young dogs (<2).
- However, with age comes disease and concurrent disease might be a contraindication for surgery (eg; severe arthritis when considering amputation.)
- Paraneoplastic conditions are important to remember.

Staging:

This is the evaluation of the extent of the primary tumor and the hunt for metastasis. A cellular diagnosis will help to guide staging (ie where do mets commonly go for this tumor type?). The staging process is important to prevent us from taking patients with fulminant disease (and poor prognosis) to surgery or to back off on the surgical dosage. Most owners are willing to spend the money to avoid an unnecessary surgery.

- Evaluate local lymph nodes, especially if enlarged (FNA or biopsy)
- **Three** view thoracic radiographs
- Complete blood count/chemistry/urinalysis
- +/- abdominal ultrasound
- +/- CT scan
- +/- bone marrow

Osteosarcoma: 3 view thoracic radiographs (+/- nuclear scan)

MCT: lymph node aspirate or biopsy, abdominal ultrasound +/-splenic aspirate or biopsy, +/- bone marrow biopsy,

Soft tissue sarcoma: 3 view thoracic radiographs, lymph node aspirate or biopsy

Anal gland masses: 3 view thoracic radiographs, abdominal ultrasound to evaluate sublumbar lymph nodes.

Note: it is important that owners are aware that no metastases found does NOT mean no metastases are present. Micrometastases are a common cause of treatment failure.

Surgical Considerations of the primary mass:

1. What is the extent of the primary tumor
 - radiographs, CT, or nuclear scans might be indicated.
2. What structures are likely to be involved if an adequate margin is achieved?
3. What functional impairments are likely to occur with curative surgery?
4. What reconstructive techniques may be required to close the defect?



Surgery with Curative Intent

Goal: separate the patient from the tumor. The surgeon MUST be resolute in the attempt.

Determining the Surgical Dosage:

Decide on the amount (dose) of surgical resection needed to cure the regional disease without causing unnecessary morbidity.

1. Cytoreductive surgery (aka debulking or intracapsular):

- This is usually contraindicated.
- Leaves macroscopic (visible) tumor behind.
- While theoretically improving success with adjuvant therapy, likely more theoretical than realistic

2. Marginal Resection (aka shelling out):

- Usually contraindicated, except in benign tumors (ie lipomas)
- Leaves microscopic tumor behind.
- For malignant tumors, this MUST be followed with adjuvant therapy (usually radiation) or malignant cancer will recur.

3. Wide Local Resection

- Distance from visible mass depends on histological diagnosis.
- Recommended margins are in ALL directions around the mass (don't forget deep)
- The deep margin may be a muscle or fascial plane

Guidelines:

1cm and one fascial plane:

- grade 1 Mast cell tumors
- low grade soft tissue sarcomas
- osteosarcomas that have not invaded soft tissues

2cm and one fascial planes:

- grade 2 Mast cell tumors
- intermediate grade soft tissue sarcomas
- most oral tumors

3cm and one to two fascial planes:

- grade 3 Mast cell tumors
- high grade soft tissue sarcomas
- osteosarcomas that have invaded surrounding tissues

4-5cm and two fascial planes

feline vaccine associated soft tissue sarcomas

4. Palliative surgery:

- Used to reduce pain and clinical signs in patients
- eg: amputation in patient with metastatic osteosarcoma
inflammatory/infected mammary adenocarcinoma with met
splenectomy in ruptured hemangiosarcoma



General Principles to remember in surgical management of tumors:

Your first surgical attempt is the best chance for a cure!!

It is better to leave an open wound than to leave tumor behind!!

You must divide yourself into two teams:

a. The Tumor Removal Team:

- You cannot temper the extent of resection with a fear of closing. This is not the time to chicken out.
- Mark your tumor and margin of excision with a sterile marker and start cutting - take no prisoners.

b. The Closing Team:

- Lots of expletives for the tumor removal team means your more likely to cure the pet!
- Preplanning is important for this part (ie. understanding flaps and tension relieving techniques and reconstructive techniques) is important. The hole will almost always be larger than you anticipated.
- Local therapy: Chemotherapy beads or sponges (eg cisplatin) might be indicated for some tumors. Have them ready

Operative Guidelines for Oncologic Surgery

- Do not place drains in remaining wounds. Tumor cells will seed the tract, leaving a larger area for reoperation if incomplete margins. Instead use diligent hemostasis and close dead space.
- Handle tumors gently (to avoid rupture and seeding your surgical incision)
- Ligate venous drainage from the mass ASAP during surgery
- Change instruments and gloves/gowns after tumor removed for closing.
- If you are removing more than one mass or doing two procedures - change instruments after mass removal.
- Intraoperative lavage after mass removal and prior to closure - to help remove any exfoliated tumor cells.
- If postoperative radiation is a consideration, mark the margins of the surgical wound subcutaneously with hemoclips.

Mark and evaluate all surgical margins

India ink from office supply store used to mark surgical margins

- Apply with cotton tip applicators (roll on)
- NO double dipping
- Be careful not to get ink between layers

If the pathologist sees tumor cells touching ink = tumor was left behind

If margins are dirty -- reoperate or irradiate

Reoperation:

- The entire incision is considered "dirty" and is resected with new appropriate margins
- This is why it is important to make the first surgery count! These can get very dicey quickly.

Irradiation:

- Does nothing for metastases - only for local control
- Effective for many cell types: soft tissue sarcomas, melanoma, mast cell tumor, ceruminous gland adenocarcinomas, and many other sarcomas and carcinomas
- Does have side effects that owners should be aware of

Chemotherapy: See Rachel Reiman



Pain Control:

Pain is easier to prevent than it is to treat.

Aggressive preemptive local or regional anesthesia is very beneficial to the patient by lowering anesthetic requirements and improving postoperative comfort.

- IV regional limb block for surgery of the distal limbs
- Epidural - for all pelvic limb and abdominal procedures, some benefits seen for thoracic procedures as well
- Nerve blocks
 - Brachial nerve block- for all forelimb amputations
 - Infraorbital and mandibular nerve blocks for oral masses
 - Intercostal nerve blocks for thoracic surgery
 - Ring blocks for distal limb
- Splash blocks - I use these is most all incisions after the mass has been removed.

Postoperative pain medications to consider:

- Lidoderm (5%) patches
- Fentanyl patches
- Constant rate infusions (MLK, fentanyl, butorphanol, dexdomitor)
- Multiple oral pain medications (NSAID, tramadol, gabapentin, amantidine, buprenorphine in cats)

