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Surgical Oncology: A Review

Kisani, A.I Department of Veterinary Surgery and Theriogenology, College of Veterinary Medicine, University of Agriculture P.M.B. 2373, Makurdi, Benue State, Nigeria

Nev, T Department of Veterinary Surgery and Theriogenology, College of Veterinary Medicine, University of Agriculture P.M.B. 2373, Makurdi, Benue State, Nigeria

ABSTRACT

Cancer is among the common diseases encountered in small animal practice. Surgeons need to understand the disease and the treatment options available to be able to meet the expectations of clients. The current approach to cancer treatment is multidisciplinary involving surgery, radiation therapy and chemotherapy. To obtain favourable results from these treatment modalities, the Surgeon must broaden the scope of his knowledge of the particular tumor type through continuing education or consultation with other oncologic specialists.

KEYWORDS

INTRODUCTION

The growth of the human –animal bond and advances in veterinary medicine has changed the treatment of oncology patients considerably (Calfee, 2014). The best practice of veterinary oncology combines advanced diagnostic, complex surgical procedures and intensive medical therapy. To provide the best or ideal care for the patient and owner, professional collaboration is often necessary between the generalist and specialists in medical, surgical and radiation oncology (Calfee, 2014). The most important challenge is to define the disease and develop the appropriate treatment plan. Animals with cancer often have very advanced disease at the time of presentation to a veterinarian. Many tumors demand an aggressive surgical approach. In addition to knowing when tumor resection is possible, it is equally important to realize when the extent of disease has become too advanced to recommend surgical treatment (Farese *et al*, 2012).

Surgical treatment of cancer has many advantages over other treatment modalities. It provides the opportunity for immediate cure is noncarcinogenic and less immunosuppressive than other treatment modalities and generally is more effective than chemotherapy or radiation for treatment of large localized tumor burden (Eberlein and Wilson, 1991; Gilson and Stone, 1990; Withrow, 1986). The oncologic suegeon considers each surgical procedure in the context of a treatment plan that may include chemotherapy, radiation therapy, interventional radiology, immunotherapy, molecular therapy or alternative approaches before, during and after surgery.

In human medicine, surgical oncology is a well established subspecialty and 60% of human patients who are cured of cancer are cured by surgery alone (Poston, 2007). Similarly, in veterinary medicine, surgery is considered the most important component of treatment in dogs and cats suffering from solid tumors (Farese *et al*, 2012). In recent years, veterinary surgical oncology has emerged as a growing specialty in the multidisciplinary care of small animal cancer patients

Patient Assessment and Staging

A complete physical examination is vital so that the primary lesion is correctly characterised, multifocal lesions or metastases are not missed and underlying or concurrent diseases can be detected (Elliott, 2014). In addition, visual inspection and palpation of the primary tumor should be carried out by the surgeon to establish the gross appearance, size and consistency of the tumor (Farese *et al*, 2012).

Staging diagnostics such as complete blood count, chemistry profile, urinarinalysis, thoracic radiographs and abdominal ultrasound are essential components for the preoperative assessment of veterinary oncology patients (Ehrhart and Culp, 2012). Generally hematologic evaluation (CBC and blood chemistries) is performed to evaluate overall patient health and prognostic information (Calfee, 2014). In addition to hematology, screening for evidence of metastasis is usually performed. This involves taking chest radiographs. At least both left and right lateral views with preferably an additional dorsoventral (DV) view (Elliot, 2014; Calfee, 2014). Other imaging modalities such as computed tomography (CT), magnetic resonance imaging (MRI) and nuclear scintigraphy are useful.

Computed tomography (CT) is becoming available in practice and has several advantages over conventional radiographs. It is often used to define the extent of disease in maxillofacial tumors and to evaluate for pulmonary metastasis (Zekas *et al*, 2005; Prather *et al*, De Rycke *et al*, 2005). MRI is better than CT when imaging either soft tissues or central nervous system structures (Garosi *et al*, 2003; Taga *et al*, 2000).

Nuclear scintigraphy is used to evaluate metastatic bone lesions and in describing the exact nature of disease for appendicular osteosarcoma.

Staging is evaluating a patient to determine the full extent and type of the primary tumor. Normally the surgeon considers the primary tumor size, presence or absence of local lymph node metastases (Argyle *et al*, 2009). Tumor staging is of prognostic value and also allows the surgeon to plan treatment strategy suitable to the patient (Williams and Fowler, 1999).

Biopsy

Biopsy is obtaining tissue sample for histopathology either before surgical resection (pre operative) or after resection of the tumor (post operative). The essence of biopsy is to characterize the tumor before surgical excision. However, the decision whether to take biopsy before or after excision depend on whether the information obtained will influence the management of the case. The type of biopsy technique used depends

on the invasiveness of the procedure and the potential for causing hemorrhage into a body cavity or along a needle tract (Gilson, 1995). The various types of biopsy techniques include fine needle aspiration, tru-cut, incisional wedge, marginal and excisional biopsy.

Surgical Therapy

The role of surgery in oncological therapy involved sharp surgical excision of the neoplasm with a scalpel, electrosurgery, cryosurgery and laser surgery (Levine, 1993). Surgical oncology requires careful attention to surgical technic to avoid contamination of surrounding normal tissue with cancer cells.

Surgical margins

The appropriate surgical margins for any tumor type depend on the histologic type, grade and anatomic location of the tumor (Gilson, 1990; Watts, 1980). Standard margins of 1 to 2 cm may be appropriate for some tumors, whereas this may be inadequate for others. Sterile markers should be used to outline the margins to be resected because inappropriate or poor resection of the surgical margins will leave tumor cells in the patient which will result in recurrence.

Wide and Radical Resections

This is when extensive margin of surrounding tissue is removed together with the primary tumor mass. Wide and radical resections are curative, prevent tumor recurrence and improve patient survival time (Farese *et al*, 2012). For wide and radical resection of tumors, a margin of normal appearing tissue is excised en block with the gross tumor. Surgical margins is determined on the basis of tumor type, tumor grade (Simpson *et al*, 2004), biologic behaviour, anatomic location and the barrier provided by surrounding tissues (Dernell and Withrow, 1998; Gildson and Stone, 1995; Soderstrom *et al*, 1995). Indications for wide excision include benign tumors with local infiltration (infiltrating lipoma) and malignant tumors with limited infiltrative potential (Lascelles and White, 1999).

Marginal Resection

This is en block removal of mass and pseudocapsule by dissecting peripherally the tumor pseudocapsule through reactive zone. Marginal resection is only successful with benign tumors such as lipomas. However, with malignant tumors this approach usually fails due to failure to remove microscopic satellite tumor cells that are present outside the tumor pseudocapsule (Farese *et al*, 2012).

Surgery as part of multimodal management

Multimodal therapy comprises some combination of surgery, radiation therapy, chemotherapy, immunotherapy and alternative therapies. This approach is aimed at maximizing the benefits of treatment and the potential for cure while minimizing adverse effects (Dernell and Withrow, 1998; Gilson and Stone, 1990; Soderstrom and Gilson, 1995).

In some cases of neoplastic disease, surgery as a single mode of therapy may provide may provide short term benefits but additional modes of therapy can significantly extend disease free intervals or prolong life (Calfee, 2014).

The timing of these therapies relative to surgical resection is an important consideration when treatment regimens are planned because both neoadjuvant (before surgery) and adjuvant (after surgery) treatments have specific advantages and disadvantages (Farese *et al*, 2012). Adjuvant therapies are aimed at eliminating residual microscopic tumor burdens, with adjuvant radiation therapy recommended for residual microscopic disease in the surgical wound (McEntee, 1995). Surgical resection of the tumor can facilitate adjunctive therapies by reducing the gross tumor burden, identifying tumor margins and removing drug and radiation resistant cells, circulating immune complexes and tumor associated immunosuppressants (Withrow, 2001).

Surgical Technique

Surgical technique has the potential to influence surgical morbidity in compromised animals. Therefore, for a surgical resection to be successful, the surgeon must have good understanding of the principles of general oncologic and reconstructive surgery (Balch, 1990; Gilson, 1990).

Surgical dissection

Scalpel blades are the least traumatic and ensures smooth incisions and are recommended particularly on the skin and hollow organs (Dernell and Withrow, 1998; Gilson and Stone, 1990; Karakousis, 1982; Soderstrom and Gilson, 1995). Scissors are also well suited to sharp and blunt dissection of loose areolar tissue and often enables surgeon to identify vessels before transection (Soderstrom, 1995).

Post operative complications are minimized by prompt electrocoagulation and ligation of blood vessels (Fortner, 1993; Nogueras and Jagelman, 1993; Withrow, 2001). Poroper use of the scalpel will reduce tissue trauma and preserve vascular supply. When performing dissection, the incised tissues are placed under moderate tension. This allows fine dissection, decreases the amount of tissue damage and hemorrhage and enables the surgeon to better identify tumor margins and normal tissue planes and vascular and lymphatic vessels (Karakousis, 1982).

Additional methods of tissue excision or ablation include electrosurgery, laser surgery and cryosurgery (Fucci and Elkins, 1991; Klause and Roberts, 1990). Proper tissue handling decreases wound healing complications and strict adherence to Halstead's principles is important. Meticulous technique is especially important when dealing with large wounds, cachetic patients and cytotoxic perioperative adjuvant therapies (Soderstrom, 1995). Tissue trauma is minimized by gentle handling and decreased exposure time. Tissues are thoroughly debrided and foreign bodies and blood clots are removed. Dead space is minimized by anatomic closure and the judicious use of drains (Soderstrom, 1995). Suture materials and patterns are chosen to minimize tissue reactions and stress on wound edges.

Post Surgical Care

The patient should be monitored to help in early detection of recurrence or metastatic disease. The surgeon should palpate the surgical site 1 to 2 months post surgery to evaluate the post surgical scar. The methods and intervals of monitoring are dictated by the stage and expected behaviour of the original tumor.

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