Interventional Oncology

William T.N. Culp, VMD

KEYWORDS

• Interventional radiology • Interventional oncology • Minimally invasive

KEY POINTS

- Interventional oncology (IO) has been established in veterinary medicine as a fourth major cancer treatment category along with surgery, chemotherapy, and radiation therapy.
- Locoregional therapies, such as intra-arterial chemotherapy, embolization/chemoembolization, and ablation, are used more regularly in veterinary patients and new treatments are emerging.
- Stenting of malignant obstructions has been described in several case series and initial results are promising.

OVERVIEW

The approach to the treatment of cancer in veterinary patients is constantly evolving. Whenever possible and practical, surgery is pursued because it provides the greatest opportunity for tumor control and, with certain tumor types, may result in a cure. Other cancer treatments, such as chemotherapy and radiation therapy, are commonplace in veterinary medicine, and the data outlining treatment regimens are growing rapidly. An absence of treatment options for veterinary cancer patients, however, has historically existed for some tumors. IO options, such as locoregional therapies or stenting of malignant obstructions, have opened the door to the potential for better therapeutic response and improved patient quality of life.

Prior to the use of IO techniques in veterinary medicine, tumors that were deemed nonresectable and chemotherapy resistant or radiation therapy resistant presented a therapeutic challenge. Although the evidence supporting the use of these treatments is scant in the veterinary literature, much has been accomplished in human medicine to suggest that IO options have efficacy. Additionally, for many nonresectable tumors, these techniques are the first-line therapy that is pursued. IO techniques that are emerging as possible primary treatment options, such as intra-arterial chemotherapy,

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Department of Surgical and Radiological Sciences, University of California-Davis, School of Veterinary Medicine, One Garrod Drive, Davis, CA 95616, USA
E-mail address: wculp@ucdavis.edu

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embolization/chemoembolization, and tumor ablation, mirror procedures that are actively and regularly performed in human medicine.

ANATOMY

A thorough knowledge of the anatomy is essential for performing IO procedures effectively and safely. Introduction of instrumentation into and navigation through luminal structures requires an excellent understanding of anatomic landmarks and organ interaction. Additionally, the blood supply to various organs should be understood when transcatheter locoregional therapies are considered so that normal blood supply can be identified from tumoral blood supply, and complications, such as nontarget embolization, can be avoided. Recently, the arterial blood supply of the abdominal organs was described as a guide for performing intra-abdominal transcatheter therapies.[1]

Currently, vascular access in the majority of locoregional therapies in veterinary patients is arterial (eg, carotid and femoral arteries). If vascular stenting is performed, the jugular or femoral vein may also be used. Venous approaches do not require vascular repair postprocedure due to the low pressure in the venous system; however, arterial approaches generally require vessel ligation or repair. In humans, closure of an arteriotomy site is often performed with a vascular closure device[2,3]; vascular closure devices are generally not utilized in veterinary patients due to expense and the need for minimized postprocedure patient activity and because femoral and carotid arteries can be ligated.[4–6]

IMAGING DIAGNOSTICS

The use of imaging modalities allows for IO procedures to be performed in a minimally invasive fashion and improves a clinician's ability to access certain organs or regions of the body. Fluoroscopy is utilized during the majority of IO procedures in companion animals. The instrumentation used during IO procedures is radiopaque and contrast agents are often injected intraluminally (**Fig. 1**) or intravascularly, making fluoroscopy an excellent modality for performing real-time interventions.

Ultrasonography is regularly used as a means of cancer staging, specifically in the abdomen; furthermore, ultrasound guidance can provide crucial assistance in obtaining tissue samples via fine-needle aspiration or biopsy. Ultrasound can also be used to locate blood vessels for percutaneous vascular catheterization and is the most common imaging modality to be used to perform percutaneous tumor ablation.

Similar to ultrasound, CT and MRI are essential components of patient staging and preprocedural planning in veterinary medicine. These advanced imaging modalities are often combined with fluoroscopic imaging in human medicine to allow for real-time evaluation and treatment of lesions.[7,8] CT angiography and magnetic resonance angiography are utilized in the evaluation of veterinary patients regularly, but intraprocedural use of these diagnostics remains less common.

PATIENT SELECTION

When possible and appropriate, IO techniques should be considered in addition to more traditional options, such as surgery, chemotherapy, and radiation therapy. Because most patients diagnosed with cancer are older, procedures that cause the least amount of morbidity are ideal. In many scenarios in which IO options are offered, these techniques are the only available options. The overall goal of treatment is to improve quality of life after recovery from one of these procedures, and the benefit