Advances in Radiation Oncology: What the Referring Veterinarian Needs to Know

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Radiation oncology is one of those things that meets the chopping block pretty early on in development of veterinary curricula. And so, it’s probably safe to say that most students would summarize their knowledge of the field as: (1) the equipment is too expensive and too complicated to have in a general practice, so unless you’re near a university or large private specialty center, access to such therapy is tough, (2) inconvenient treatment schedules also limit accessibility since many clients cannot take time off work to bring their pet to the hospital 5 days a week for 3 or 4 weeks, (3) the cost of RT is unaffordable for most clients, and 4) even if location and/or price aren’t an issue, the side effects are too unbearable to make treatment worthwhile.

In some situations, some or all of the above might be true. However, the past decade has witnessed a tremendous advance in radiation therapy techniques. Resultant rapid change in radiation oncology practices have made this form of treatment more accessible to many pet owners. The goal of this lecture is to let you know what is relevant, and how these changes could have positive impact for your cancer patients!

Radiation therapy is a cytotoxic therapy. Its success hinges on the fact that it more effectively kills cancer cells than normal tissue cells. Radiation is given to the tumor and any nearby tissue that might harbor a microscopic tumor burden. Acute radiation injuries are typically self-limiting, but in order to maintain that therapeutic benefit, and minimize the risk of late radiation injuries (e.g., tissue fibrosis and/or necrosis), the dose is broken up such that a high total dose is accumulated by giving a series of small daily doses (fractions).

Several technological advances now allow the radiation dose to be more precisely sculpted around the target, and thus minimize the volume of tissue at risk for both acute and late radiation injuries. These new irradiation techniques are called IMRT and IGRT (which stand for intensity-modulated RT and image-guided RT, respectively). The specifics of how IMRT and IGRT work is complicated, and varies with the type of radiation therapy machine, but the important thing to know is that IMRT and IGRT are pretty remarkable, and have transformed how we treat a variety of neoplastic diseases. Gone are the days of severe skin “burns” and bad mucositis during nasal tumor irradiation, and we welcome you to an era where we can treat urinary bladder tumors effectively, and without intolerable gastrointestinal side effects.

Another important advance is called stereotactic radiation therapy (SRT). This has also been called SRS, SBRT, SABR, radiosurgery, CyberKnife® therapy and GammaKnife® therapy. The short story is that SRT uses a highly focused beam to deliver very high doses of radiation to tumors while shielding surrounding normal tissues. Its use is limited to gross/macroscopic tumors – it cannot be used in the adjuvant setting for treatment of microscopic disease burdens. As opposed to the conventional radiation prescriptions involving 15-20 daily treatment sessions, many brain tumors can now be treated with SRT in a single fraction. Many nasal tumors are now treated in 3 fractions, and similar to IMRT/IGRT, with few (if any) acute side effects. SRT can also be used as a limb-sparing and locally curative treatment alternative for canine appendicular osteosarcoma. In addition to these scenarios where radiation is delivered with curative intent, there are also times when SRT can be used to provide durable palliation for diseases that are more difficult to manage (e.g., oral tumors and bulky soft tissue sarcomas).
SRT is also being used more commonly for treatment of unresectable massive hepatocellular carcinomas, primary lung tumors, and adrenal tumors.

With all of these advances, there are still some cases where conventional irradiation techniques are most rational. Additionally, while IMRT, IGRT and SRT are all becoming more commonplace, they are not yet available at all veterinary RT centers. The cost of these types of treatments varies a lot between institutions; as always, its best to call your local radiation oncologist with questions about case management, appropriateness of radiation therapy for a particular case, recommended protocols and approximate cost of the procedure.