Spontaneous Cancers in Canines as Clinical Models for the Initial Non-Invasive and Invasive Evaluation of PET Tracers

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Non-invasive imaging of the tumor microenvironment has become an increasingly important tool for diagnostic and therapeutic evaluation of cancer patients. New radiotracers are constantly being developed, which increases the need for pre-clinical and clinical evaluation. The journey of new radiotracers from preclinical experiments to the clinic is laborious and expensive and only few tracers complete the journey to become implemented in clinical use. As for novel drugs a promising evaluation in experimental models, including cell lines and xenografts, is not equal to a similar performance in human patients. Considering the expenses and workload associated with these problems, makes the earlier implementation of spontaneous large animal clinical models of human cancers in preclinical investigations appealing.

Cancers in dogs share several of the features with their human counterparts, including spontaneous development, genetic background, a syngeneic tumor microenvironment and histological characteristics. Tumors in dogs will therefore offer a unique possibility to serve as spontaneous clinical models in cancer research for the investigation of tumor behavior, microenvironment and therapeutic response [1, 2].

In the development and evaluation of radiotracers for nuclear medical imaging inclusion of tumor-bearing dogs as clinical models hold an obvious potential. Studies of tracers with an accumulation or uptake mechanisms directly related to metabolic characteristics, including glucose metabolism and amino acid transporters can be translated from tumors in dogs to human counterparts [3-5]. However, tracers depending on the binding to specific receptors may be species specific and binding affinity must be evaluated and included in the evaluation of images obtained.

The therapeutic interventions available for dogs with cancer are all adapted and adjusted from human oncology. The treatment of dogs is therefore based on surgery, radiotherapy and chemotherapy. There is no gold standard of cancer treatment for dogs, and novel therapeutic interventions and imaging modalities can therefore be performed on less heavily pretreated populations compared to early clinical trails in human cancer patients. However, treatment and imaging studies must always be conducted with the interest, benefit and well being of the dog as an absolute central objective [1, 2].

We are currently conducting a number of studies evaluating PET radiotracers in tumor-bearing dogs. These include multi-tracer studies comparing the intratumoral distribution of Cu-ATSM, FDG and FLT before, during, and after radiotherapy. Most of the studies allows for the acquisition of tumor biopsies during the study, thus providing the possibility to evaluate the non-invasive imaging with invasive features.

References

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