Principles of photodynamic therapy of cancer

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Abstract

Photodynamic therapy is one of the most promising therapeutic approaches in oncology. The therapeutic procedures are not complicated and in contrast to traditional chemotherapy without severe side-effects if applied correctly. The principle is the stimulation of a light sensitive substance which is injected into the bloodstream or directly into the tumor. After approx. 3 hours the photosensitizer will be integrated into cancer cells by endocytosis and leads to light sensitivity of those cells. By irradiation of laser light with wavelengths according to the absorption spectra of the photosensitizers the tumor cells will be destroyed by reactive singlet oxygen radicals.

The therapeutic effect can be enhanced by combination with intravenous or hyperbaric oxygen therapy or by hyperthermia. Today 4 different photosensitizers are used for PDT: Chlorin E6 with red laser stimulation, Hypericin (yellow laser) and Curcumin (blue laser). All substances are available for intravenous injection or infusion. The newest development is Indocyaningreen (ICG) in liposomal form which is the first photosensitizer stimulated by infrared light with much deeper tissue penetration (even through bones).

The stimulation can be performed intravenously, interstitially and intratumorally using a new fiber-optic catheter technology. A combination with low-dose chemotherapy using chemo drugs as photosensitizers can be used in metastasized cancers (combination of traditional chemotherapy with new photodynamic procedures). Basic principles and treatment results of different cancers will be presented. In contrast to chemotherapy PDT does not only destroy cancer cells but also initiates a lot of different reactions in the treated area with a stimulation of the immune system (PDT-immunization). The limitation of PDT for treatments only for external tumors can be overcome by the described new methods and opens up a comprehensive application of PDT in most human cancers.
Clinical photodynamic therapy on cancer pets

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Abstract

Photodynamic therapy combined with intravenous interstitial laser was performed in cancer-affected dogs. Six cancer dogs were subjected to photodynamic therapy in order to treatment, clinical follow up and improve health status. The dog No. 1 was 6-year-old Beagle dog presented with generalized skin mass and diagnoses as malignant cutaneous histiocytoma. The dog No. 2 was 10-year-old beagle dog presented with large mass at cervical area and diagnoses as salivary adenocarcinoma with pulmonary metastasis. The dog No. 3 was 14-year-old mixed breed dog presented with subcutaneous mass at inguinal and perivulva area and diagnoses as solid carcinoma of mammary gland. The dog No. 4 was 13-year-old mixed breed dog presented with recurrence mandibular mass and diagnoses as malignant melanoma with pulmonary metastasis. The dog No. 5 was 14-year-old cocker spaniel dog presented with recurrence axillary mass and large intraabdominal mass and diagnoses as malignant mammary tumor and granular cell tumor. The dog No. 6 was 5-year-old mixed breed presented with frontal bone mass and diagnoses as squamous cell carcinoma. Photosensitizers including curcumin, hypericin and chlorine were intravenously given before intravenously interstitial laser with different wavelength. Treatment follow up, clinical outcomes and contraindication were also discussed.