

P-22 – Dr. Lajos Balogh, et al - Oncological and non-oncological applications of electromagnetic hyperthermia (Oncothermia®) in the veterinary clinics – 2 years of experience

Oncological and non-oncological applications of electromagnetic hyperthermia (Oncothermia®) in the veterinary clinics 2 years of experience.



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Introduction

Loco-regional hyperthermia in oncology has ambivalence discretion in the medical community. The extremely long history of the method as well as the supposed universal ability to complement all the existing traditional methods is not enough to prove its efficacy. The central point of the non univocal acceptance and the mixed feelings is the some-times unsuccessful selective heat-delivery into the deep-seated tumors. The selectivity could be enhanced by electric field. Theoretical considerations showed the problem of the temperature dose-concept, and it is shown, that the thermal energy does not limit the electromagnetic effects through the membranes. Advantageous thermal and induced non-thermal effects of electromagnetic hyperthermia (EHT, Oncothermia®) in human medicine is in use for decades. Surprisingly there are much less references about the veterinary utilities.

Our objective was to check the clinical utility of electromagnetic hyperthermia as a single modality and in combinations in veterinary patients.

Materials and Methods

Dogs and cats affected by either primary or recurrent neoplasias referred to the National "F.J.C." Research Institute for Radiobiology and Radiohygiene (NRIRR) from April 2008 to June 2010, were included. Initial work-up consisted of a physical examination, hematology and serum biochemical profile. The diagnosis was confirmed, if not properly performed before referral, through a core biopsy or a cytological evaluation of the lesion and, if enlarged, of the regional lymph nodes. Eligibility criteria included the following: non-resectable, measurable tumors (measured by digital caliper, x-ray or ultrasonography, or scintigraphy, or CT, or PET/CT) and the surviving expectation of at least 1 month, no other antitumoral or corticosteroid or non-steroidal antiinflammatory treatments or surgery within 2 weeks of entry to trial, malignant primary tumor, with or without metastases to the regional lymph nodes, and without macroscopically evident (x-ray, or ultrasound, or scintigraphy, or CT or PET/CT) distant metastasis and/or other life-threatening metabolic diseases. We applied EHT with capacitive coupled modulated 13.56 MHz radiofrequency method (oncothermia OT). OT was provided for different canine and feline oncological patients (altogether more than 64 cases) as a single treatment (6/64), and in a combination with fractionated Cobalt irradiation (51/64) or with medical treatments (7/64). Dog patients suffering in other chronic diseases (4 osteoarthroses, 2 heart insufficiencies, 2 epileptic, 2 non-healing skin abscesses) were also co-treated with local (or regional) OT so that the original, non-eligible medical treatments were not changed.



Results

Single OT in oncological diseases resulted significant tumor size decrease 2 out of 6 cases, 3 stable disease and 1 progression of disease. Cobalt irradiation followed by OT resulted 5/51 tumor-free status, 42/51 partial remissions, 3/51 stable disease, and progression of disease in 1 case. Chemotherapy boosted with OT resulted 2/7 partial remission, 3/7 stable disease, and 2/7 progression of disease in late stage, metastatic cases. Side effects eg.: erythema (2 cases), necroses (2 cases) occurred at the learning phase of technique, later on we could prevent this side effects with the constant superficial and deep temperature control in or patients. OT proved to be useful in all the non-oncological diseases and no side effects, contraindications were remarked.

Summarized results of treatments

| Treatment (methods) | Tumor free status | Partial response | Stable disease | Progression of disease |
|----------------------------------|-------------------|------------------|----------------|------------------------|
| Oncothermia alone | 0/6 | 2/6 | 3/6 | 1/6 |
| Oncothermia + Cobalt irradiation | 5/51 | 42/51 | 3/51 | 1/51 |
| Oncothermia + chemotherapy | 0/7 | 2/7 | 3/7 | 2/7 |

*In other non-oncological chronic diseases (4 osteoarthroses, 2 heart insufficiencies, 2 epileptic, 2 non-healing skin abscesses) oncothermia boosted medical treatment showed improvement in clinical symptoms on the base of owner's and handling veterinarian's observations.

Case I., a complete response

Animal:
 name Perdi
 sex spayed female
 colour black
 age 10 years
 Dg. Recidiving mammary carcinoma merged with axillary ln metastases

Before treatment: 24x16x8 cm huge, cystic tumor mass in the axillary region

Treatment:
 6 x 30 minutes local oncothermia followed by immediate 6 x 4.5 Gray Cobalt irradiation Monday Wednesday Friday schedule, 2 weeks

After treatment:
 No visible/palpable tumor mass only scarr tissue (ditologically proven) is seen in the dog. The dog has been considered tumor free 6 months after completing the therapy

Case II., a complete response

Animal:
 name Tomi
 rass Mxbreed
 sex male
 colour yellow
 age 7 years
 Dg. Mastocytoma Grade III in the elbow region

Before treatment:
 2x3 cm (in diameter) large primary skin tumor

Treatment:
 6 x 30 minutes local oncothermia followed by immediate 6 x 5 Gray Cobalt irradiation Monday Wednesday Friday schedule, 2 weeks

After treatment:
 No visible/palpable tumor mass only mild side effects of non controlled oncothermia is seen in the dog. The dog has been considered tumor free 6 months after completing the therapy

Case III., a partial response

Animal:
 name Mukli
 rass Mxbreed
 sex male
 colour yellow
 age 8 years
 Dg. oral (non pigmented) melanoma

Before treatment: 6 x 6 x 5 x 3 cm locally invasive, ulcerating malignancy in the mouth

Treatment:
 6 x 30 minutes local oncothermia followed by immediate 6 x 5 Gray Cobalt irradiation Monday Wednesday Friday schedule, 2 weeks

After treatment:
 Considerably smaller (28% of pretreatment tumor volume) has been detected after completing the treatment. The dog is however not tumor free but living a normal life 3 months after completing the therapy

Case IV., a non-responding patient

Animal:
 name Angie
 rass Breston spaniel
 sex spayed female
 colour brown white
 age 9 years
 Dg. pancreatic exocrin carcinoma with multiple abdominal metastases

Before treatment: Primary tumor is a 2x3x3 cm lexocrin pancreas carcinoma with multiplex abdominal metastases

Treatment:
 6 x 30 minutes local oncothermia followed by carboplatin infusion and doxorubicin injection, 10 days

After treatment:
 The dog was initiated for oncothermia + chemotherapy carboplatin and doxorubicin based protocol but 10 days after she was euthanized on the request of owner and because of progression in symptoms. Many small multiplex metastases was found all around the surfaces of intraabdominal organs

Conclusion

We concluded that local and regional OT could be a useful tool as a single antitumoral modality but even more clinical utilities could be reached in a combination with radiotherapy or with chemotherapy. OT could be advantageous in the treatment of a variety other chronic diseases too. Further pro- and retrospective clinical studies needed to implement this novel technique into veterinary medicine.

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