Conference Paper

Oncothermia Application for Various Malignant Diseases

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Oncothermia was introduced to our hospital in 2010. Our objective is to report results of 277 patients treated by oncothermia during 20 months. We present some characteristic cases and statistical study of the overall results. We concluded by stating the feasibility of oncothermia to treat high variety of malignant diseases also in their very advanced (T4N3M1) stages.

1. Background

Hyperthermia is a long-time used treatment in oncology, having debates about its applicability and working mechanisms. There are numerous technical solutions [1, 2] but the results are mostly controversial like the cervix studies (the positive [3] and the opposite effects [4] of hyperthermia were published). The basic problem is the missing control, due to the simple fact of the focusing possibilities. The sophisticated technologies are concentrating the localized and focused energy on the target; however the temperature is distributed from any sharply focused volume, naturally trying to be equalized in its neighborhood. The smearing of the temperature is accelerated by the physiologic feedback to cool down the specially heated volume by the extra blood flow in the heated part of the body [5, 6]. The extra blood flow naturally supports the tumor by nutrients (mainly glucose) and increases the risk of dissemination. The focusing and heating mechanisms are certainly different in various kinds of technical solutions, which reflects the problem of the standardization; no reference point exists [7].

2. Method

Avoiding the controversies, oncothermia was used in our study. Oncothermia has realized the root of the problem: impossibility to localize the temperature in the desired volume. The solution was the nanoheating technology.

Oncothermia selects and heats up very locally (in nanoscopic range) the membrane of the malignant tumors, [8]. This effect excites important pathologic pathways to promote apoptosis [9] and overcome the main problem of the technical challenge by large energy intake but on a very well-localized place. It needs 60 min to reach the general temperature equilibrium, which is the time of the active oncothermia session. The oncothermia in this line is working permanently by thermal nonequilibrium conditions.

We collected all patients ($n = 277$) who had at least one oncothermia treatment in time interval November 2010–July 2013 (20 months). The patient group had $n_M = 125$ males and $n_F = 152$ females. Average age was 53 y (7–84 y). The various diseases and the number of patients involved in the study were heterogeneous (see Figure 1) aiming to check the efficacy on the wide range of diseases and stages.

Major target areas were lung 53, stomach 33, breast 30, and colon 25. We assume the reason why lung cancer was the highest number. It is not only because lung cancer is the most common cancer in Republic of Korea but also other area's cancers easily metastasize to lung.

The treatment had step-up heating protocol (60 W → 150 W), using 20 cm and 30 cm diameter electrodes. The step-up grades were fit by personalization, with careful control of the actual patient. Oncothermia was applied 1~4 times a week (Figure 2). 47.9% of the patients got 3 times a week and the cases of 4 treatments a week was on multiple locations.

FIGURE 1: Diseases and the patients' number who were involved in the present study.

FIGURE 2: Distribution of the frequency of the oncothermia treatment.

Oncothermia was applied in complementary combination with various chemo-radiotherapies and trimodal (chemo-radiothermo) application was also used. A certain part of the patients, where standard therapies were not applicable due to various reasons, had oncothermia monotherapy (Figure 3), 38.3% of patients who received oncothermia were concurrently treated with immune therapy or orthomolecular medicine within the same hospital. 45.5% received chemotherapy, 5.8% received radiation therapy, and 10.5% were treated with both chemo- and radiation therapy. Oncothermia as monotherapy was applied to patients who were not in good condition to get other therapies.

Distribution of the cumulative treatment numbers was heterogenic. 49% of the patients received less than 12 times, 24% less than 24 times, 14% less than 36 times, and 13% more than 36 times. The highest number was more than 200 times in a year, handling the fatal disease as chronic.

3. Case Reports

We show some characteristic case reports which are well demonstrating the forceful feasibility of oncothermia applications.

3.1. Small Cell Lung Cancer. A 66-year-old male patient was diagnosed with small cell lung cancer on June 15, 2011 (Figure 6). He received chemotherapy EPS number 2 and

FIGURE 3: Oncothermia complementary to standard treatments. (CTx: chemotherapy, various kind; RTx: radiotherapy, various kind; CCRT: concurrent chemo-radiotherapy, various kind; Alone: oncothermia monotherapy).

FIGURE 4: Clinical response for all the patients who were treated with oncothermia at least one time.

FIGURE 5: Clinical response of the evaluated patients ($n = 142$).

FIGURE 6: Before the complex therapy with oncothermia.

FIGURE 7: After the complex therapy with oncothermia.

FIGURE 8

FIGURE 9

FIGURE 10

oncothermia twice a week in one cycle. On September 14, 2011, good partial remission (PR) was observed (Figure 7).

3.2. Nonsmall Cell Lung Cancer. Nonsmall cell lung cancer was diagnosed on July 13, 2011, at the 40-year-old male patient. He was treated with chemotherapy Iresa from August

2, 2011 and with oncothermia twice a week (10 times). Good partial remission (PR) was diagnosed on September 14, 2011 (Figure 8).

3.3. Advanced Nonsmall Cell Lung Cancer. The 68-year-old female patient was diagnosed with stage IV nonsmall cell

(a) Chest PA before therapy (January 25, 2012)

(b) Chest CT before therapy (February 8, 2012)

FIGURE 11

(a) Chest PA after therapy (June 4, 2012)

(b) Chest CT after therapy (June 4, 2012)

FIGURE 12

lung cancer. Stage cT4N2M1a, pleural seeding (Figure 9). She received chemotherapy 15th CTx (paclitaxel and cisplatin) from March 2, 2011 to February 15, 2012. She also received 4 cycles of oncothermia. Good partial remission (PR) was observed on May 9, 2012 (Figure 10).

3.4. Advanced Adenocarcinoma of Lung. 48-year-old male was diagnosed with adenocarcinoma, stage IV lung cancer (cT4N3M1b) (Figure 11). He received chemotherapy S/P 8th CTx - [vinorelbine + cisplatin] (July 7, 2011 ~ February 1, 2012) and oncothermia complementary. Posttreatment Tarceva is being taken; also it is applied currently. Good partial remission (PR) was observed on June 4, 2012 (Figure 12).

4. Study Results

The half of the patients who were treated, were not evaluated, because the therapy is in progress. The clinical response for all the patients ($n = 277$) is shown in Figure 4.

The clinical response of the evaluated patients ($n = 142$) shows that more than half of the patients responded (Figure 5). We analyzed the oncothermia treatment results

based on the CT images taken after the treatments. But only 52% of the entire group was subjected to result analysis. 48% was not traceable. The result of the 52% was 21.5% PR, 36% SD, 28.9% PD, and 12.6% exitus. So 58.5% of the patients showed either stable disease or partial remission. Given that this was applied for end-stage patients, this is very encouraging result.

No adverse effects were observed during the study.

5. Conclusion

As a conclusion, despite of small number group and relatively not long period, it seems that oncothermia is feasible good therapeutic modality for the patients with end stages, who can no longer receive standard therapies.

Moreover, apart from the end-stage patients, we observed improvement of the quality of life of the treated patients and we expect that oncothermia will show good result for general condition, pathological stage on early-stage patients too. We expect increase of QoL, enhancement of the clinical remission rate, and reduction of the frequency of recurrence and metastases.

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