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The Orientation, Application and Efficacy Evaluation of Hyperthermia in Integrative Natural Therapies of Cancer

Clifford L.K. Pang, Professor, MD, PhD[1]
(1) President (2013) of ICHS, President of WFCMS-SCNT, President of Clifford Hospital

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Abstract

This report introduces the overview and main mechanism of hyperthermia and summarizes the clinical application of hyperthermia in integrative natural therapies of cancer. According to the clinical experiences of the author, through statistical analysis, this report explains the orientation, application, and efficacy evaluation of hyperthermia in integrative natural therapies of cancer, as well as the understanding of the author.

Key Words

Hyperthermia, Orientation, Application, Integrative Natural Therapies of Cancer, Efficacy Evaluation

Introduction

Hyperthermia, Orientation, Application, Integrative Natural Therapies of Cancer, Efficacy Evaluation

China is one of the earliest countries applying hyperthermia for disease control and treatment. Up to now, hyperthermia and its integrative treatment techniques have been widely applied clinically and have become the fifth main systemic therapy means after surgery, chemotherapy, radiotherapy, and biotherapy. Hyperthermia has thorough and significant lethal effects on cancer and has synergistic effects when integrated with multiple cancer treatments. Modern medicine emphasizes patient-oriented treatment and strives for non-toxic, safe, and reliable therapies. Integrative natural therapies of cancer have unique advantages and curative effects [1]. Hyperthermia has not only inherited the characteristics and advantages of traditional natural therapies, but has also contributed great anticancer effects in combination with modern non-toxic integrative cancer treatments, such as chelation and detoxification therapy, medical ozone therapy, cyto-biological therapy [2].

Based on the significant effect of hyperthermia in the treatment and prevention of cancer, and according to my clinical practice experiences, this report introduces an overview, the main mechanism, the clinical application, integrative natural therapies, and clinical research data of hyperthermia, and presents the orientation, application and efficacy evaluation of hyperthermia in integrative natural therapies of cancer.

1. Overview

Hyperthermia is one of the physiotherapies that use various thermal sources to spread heat throughout an organism for therapeutic purposes. In traditional medicine, hyperthermia is an external therapy of Chinese medicine and includes the use of stone needles, burning acupuncture, medical fumigation, medicated bath, hot wax therapy, moxibustion, etc. In modem medicine, hyperthermia makes use of not only various media to transfer heat to the organism through transmission modes, such as conduction, convection, and radiation, but also the electromagnetism principle, which states that an organism can absorb energy from the electromagnetic field and convert it into thermal energy. Hyperthermia in oncology is a technology and an approach by which the biological tissues are heated to exterminate cancer cells through physical methods.

Making use of the characteristics of the tumor tissue itself, such as distemperedness, slower thermolysis than that of normal tissues during heating, and sensitivity of malignant tumor cells to hyperpyrexia, hyperthermia generates hyperpyrexia through such modes as high-frequency diathermy, radiant heat, and conductive heat, thus killing tumor cells or letting them die out gradually, while normal tissues remain intact.

2. Orientation

2.1. Indications

Indications of hyperthermia include: ①Primary cancer, metastases, recurrent cancer, subclinical lesions, pleural and ascetic fluid, cancer pain, synergistic effects of radiotherapy and chemotherapy, et al. ②Degression of immunity, chronic fatigue or pain, chronic inflammation, all kinds of primary immunologically mediated disease (such as asthma, chronic bronchitis, arthritis, et al.), local tissue edema, local tissue hypofunction, local pain, muscular spasm, regional circulation hypofunction, endocrine system hypofunction, chronic and refractory wounds, recovery phase of injury, insomnia, and health maintenance of genital system or other organs and tissues.

2.2. Clinical Applicable Stage

Hyperthermia is used through the entire treatment process, which fits for all stages and types of patients with wide application. Hyperthermia can lower the rate of infection and other complications, raise resection rate, kill cancer cells, prevent recurrence, eliminate residual disease, exfoliative cancer cells, contribute synergistic effects for radiotherapy and chemotherapy, et al., when it is used during surgery. Hyperthermia is also used on post-treatment patients with recurrence or drug resistance. It can raise the tolerance and compliance of patients, guaranteeing the continuity and integrity of the therapeutic regimen.

Hyperthermia's integration with therapies of Traditional Chinese Medicine such as Chinese medicine, acupuncture, massage moxibustion, and medical Qigong, is of great innovation in cancer treatment. It also eases the treatment process, by improving immune function and preventing the complications and adverse effects of radiotherapy and chemotherapy.

2.3. Application of Hyperthermia in Integrative Natural Therapies of Cancer

The connotation, connection, and application of hyperthermia in oncology and natural therapies are expatiated in my book Hyperthermia in Oncology, so I won't spend more time for explanation at this time. Cancer is a kind of whole body disease. Anti-cancer treatments should not just target cancer lesions, and one single therapy for cancer cannot have ideal effects in the clinic. Through clinical practice, integrative cancer treatments have gradually changed from the original passive therapies to predictable ones, especially when the "integrated treatments" concept, "treatments for triple factors (the patient, place and time)," and "patient-oriented" principle of TCM have been introduced into modem cancer therapies. The theory emphasizes mostly improvement of organism functions and stabilization of internal environment. It focuses on controlling both primary cancer and micrometastases, curing in combination with preventing, and prolonging survival time based on the quality of life. Hyperthermia's addition to integrative cancer treatments, as a "non-toxic treatment," has made a great change in the old theory of simply killing cancer cells, emphasizing both killing cancer cells and activating the internal ability of the human body to prevent or treat cancer by improving the immune system.

Hyperthermia inherits two principles of traditional natural therapy: patient-orientation and strengthening of the body's resistance to encourage elimination of pathogens. It develops from natural therapy and originates with TCM. Hyperthermia also blends well with modern treatments. In the development of non-toxic integrative cancer treatments, hyperthermia takes over from the

past and sets a new course for the future, thoroughly cooperating with various cancer treatments with synergistic effect. With great cohesion, it plays an important role in modern and non-toxic integrative cancer treatments.

3. Clinical Application

3.1. Hyperthermia Combined with Surgery

Surgery is a preferred therapy for various tumors. It plays an important therapeutic role. Hyperthermia can destroy tumor blood vessels and depress the invasion and metastasis of tumors, [3], [4], [5]. It can damage the microcirculation of tumor tissues and result in the necrosis of tumors. Hyperthermia strengthens the functions of immune cells and controls the growth and restoration of tumor cells [6]. At the same time, hyperthermia generates heat shock protein through heat stress and causes immune response that kills tumor cells. With the ability to restrain cell reproduction of cancer cells, damage the normal functions of cell membranes, restrict the respiration of cancer cells, and strengthen lysosomal activity, hyperthermia can kill cancer cells directly, [7], [8].

The adjunctive therapies with hyperthermia in sugery include: ① preoperative hyperthermia: preoperative single hyperthermia, preoperative hyperthermic chemotherapy, preoperative hyperthemal perfusion, preoperative hyperthermia combining radiotherapy and chemotherapy, etc,; ② intraoperative hyperthermia: focusing on regional hyperthermia, common intraperitoneal chemo hyperthermia, intraoperative electrotome burning foci, etc.; ③ postoperative hyperthermia: for any patient who does not require radiotherapy or chemotherapy, single hyperthermia combined with other comprehensive therapies can be applied to prevent any reoccurrence or metastasis.

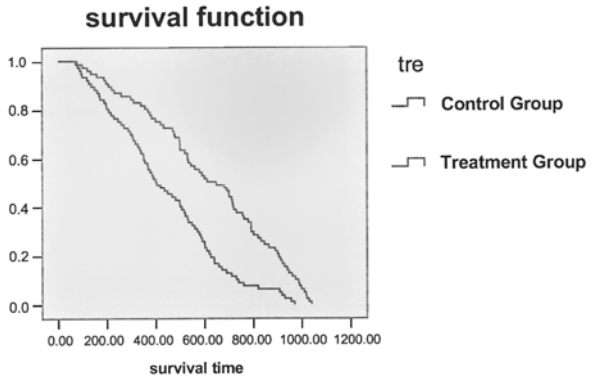
3.2. Hyperthermia Combined with Chemotherapy

Hyperthermia has synergistic effects when combined with chemotherapy [9]. Chemotherapy can be combined with local hyperthermia or whole body hyperthermia. Each deep radiofrequency hyperthermia lasts for an hour, once every 2~3 days. Each whole body hyperthermia lasts for 6-8 hours, with its therapeutic temperature maintained at 39.5~41.8·^{o}C for 180 minutes at the minimum, once every 10~14 days. If local hyperthermia is combined with whole body hyperthermia, it can be conducted in the interval between two treatments of whole body hyperthermia. If chemotherapy is combined with local hyperthermia, the local hyperthermia can be conducted after the therapeutic drug administration. If chemotherapy is combined with whole body hyperthermia, the chemotherapeutic drug can be infused during whole-body hyperthermia which is conducted on the first drug administration of each chemotherapy period. A local hyperthermia can be conducted every other day in the interval between two chemotherapies. During the therapy, routine allopathic supporting therapies are conducted to prevent and cure any adverse reactions. Intracavitary chemotherapy is mostly combined with local hyperthermia and includes intraperitoneal hyperthermic chemo perfusion, intrapleural hyperthermic chemo perfusion, and intravesical hyperthermic chemo perfusion.

154 patients diagnosed with epithelial ovarian cancer metastases in the abdominal cavity were randomly divided into 2 groups (Treatment Group and Control Group). The Treatment Group (consisting of 77 patients) was treated by RF local thermotherapy in combination with IHCP. The Control Group (consisting of 77 patients) was treated by normal chemotherapy trough intravenous injection. Both groups were followed up for 2 years. The tumor control rate, decrease in tumor markers, improvement in quality of life, and extension of survival time in Treatment Group was superior to Control Group (Table 1, Chart 1).

	Tumor Controlling Rate	CA125 decrease >50%	Controlling Rate of Pain	KPS Increase >10 分	progression free-time>1 year
Treatment Group	87.0%	43 cases	73.5%	52 cases	40 cases
Control Group	64.9%	26 cases	36.5%	31 cases	25 cases
	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01

Table 1. Research Results of RF Local Thermotherapy in Combination with IHCP



Integer Comparison

	卡方	df	Sia.
Log Rank (Mantel-Cox)	21.574	1	.000
Breslow (Generalized Wilcoxon)	17.442	1	.000
Tarone-Ware	19.863	1	.000

Tre of different level test of survival distribution equivalence

Chart 1. Survival Curves of 2 Groups

In another research study, 156 patients who finished 1 course of Local hyperthermia and a 3-month follow-up were selected as a Treatment Group. The tumor types of the patients are as follows (Chart 2).

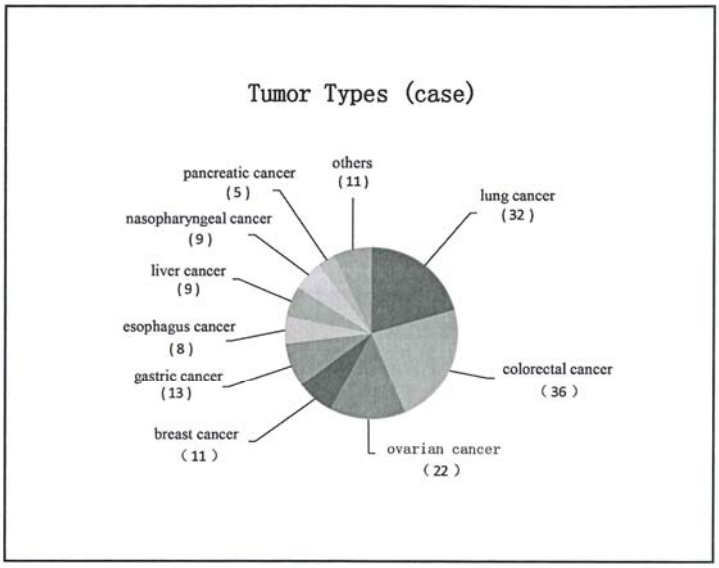


Chart 2. Tumor types

Others included renal carcinoma, osteosarcoma, lymphoma, cervical cancer, rhabdomyosarcoma, and tongue cancer. All patients were diagnosed by pathologic and imaging diagnosis combined with clinical definitions according to the cancer diagnostic criteria of WHO (World Health Organization). They were at Stage III/IV or with recurrence after surgery (Table 2). Meanwhile,

another 150 cases were selected randomly from the patients with advanced tumors who didn't receive hyperthermia at the same period in hospital (Table 3). They were observed as the Control Group. After follow-up and observation, the effectiveness of the therapies of Treatment Group is superior to those of Control Group. The therapeutic regimens of both groups are as follows (Table 2, 3 and 4).

Treatments	Cases	CR	PR	NR	Effective Power
Local hyperthermia	75	5	43	20	64.0%
Local hyperthermia + Whole Body Chemotherapy	14	2	9	4	78.6%
Local hyperthermia + Intraperitoneal Hyperthermic Chemo Perfusion	42	3	23	11	61.9%
Local hyperthermia + Intravesical Hyperthermic Chemo Perfusion	13	1	7	4	61.5%
Local hyperthermia + Radiotherapy	12	1	8	2	75.0%
Total	**156**	**13**	**90**	**41**	**66.0%**

Table 2. Therapeutic Effect of 156 Patients in Treatment Group

Treatments	Cases	CR	PR	NR	Effective Power
Whole Body Chemotherapy	51	4	31	8	68.6%
Intraperitoneal Hyperthermic Chemo Perfusion	45	1	18	11	42.2%
Intravesical Hyperthermic Chemo Perfusion	24	0	12	3	50.0%
Radiotherapy	30	1	15	5	53.3%
Total	**150**	**6**	**76**	**27**	**54.7%**

Table 3. Therapeutic Effect of 150 Patients in Control Group

	Treatment Group	Control Group	x^2	P
Cases	156	150		
CR+PR	103	82	4.13	0.01<P<0.05
Effective Power	66.0%	54.7%	4.08	0.01<P<0.05

Table 4. Therapeutic Effect Comparison of 2 Groups

3.3. Hyperthermia Combined with Radiotherapy

Hyperthermia has synergistic effects when combined with radiotherapy [10], [11], [12]. For patients targeted with radiotherapy indication or those without hyperthermia contraindication, radiotherapy and hyperthermia are conducted simultaneously. As for local hyperthermia combined with radiotherapy, the local hyperthermia is conducted every other day after the radiotherapy. As for whole body hyperthermia combined with radiotherapy, whole body hyperthermia is conducted once every 10~14 days after radiotherapy. During the period between two treatments of whole body hyperthermia, local hyperthermia is conducted every other day, also right after radiotherapy. During the therapy, routine allopathic supporting therapies are conducted to prevent and mitigate any adverse reaction.

Wu Jingbo [13] et al. have implemented controlled clinical studies on cavity microwave hyperthermia combined with emission treatment, and the results have shown that the thermoradiotherapy group had a higher rate of CR compared with the single radiotherapy group. Liu Shixi [14], et al. have reported that with the implementation of hyperthermia when conducting the conventional irradiation DT40Gy, the rate and extent of tumor regression in the thermoradiotherapy group were superior to the single radiotherapy group. Clinical studies of Margin, RL [15], et al. have shown that combination with local hyperthermia can improve local efficacy of radiotherapy. Studies of Manning, MK [16], et al. also have confirmed that single microwave hyperthermia could not only have anti-tumor effects, but could also increase the sensitivity of tumor cells to radiation. Combination treatment of nasopharyngeal carcinoma and cervical lymph node metastasis had significant effect.

3.4. Hyperthermia Combined with TCM Therapies

Hyperthermia combined with TCM therapies shows typical characteristics of natural therapy. It expresses the principles of non-toxic integrative cancer treatments which I have been practicing and making successful progression.

3.4.1. Hyperthermia Combined with Orally-taken Chinese Medicine

According to the tumor symptoms of Qi stagnation, blood stasis, abdominal mass, and cold stagnation, TCM is applied to drive out cancer toxins and regulate immunity, and it can be combined with cancer hyperthermia. Each local hyperthermia lasts for an hour, 5~10 treatments every 2~3 days. Whole body hyperthermia lasts for 6~8 hours with its therapeutic temperature maintained at 39.5~41.8 ^{0}C for no less than 180 minutes, once every 10 ~ 14 days. If the local hyperthermia is combined with whole body hyperthermia, it can be conducted every other day in the interval between two treatments of whole body hyperthermia. TCM taken orally is used for treatment based on syndrome differentiation in accordance with the specific conditions of a patient, one dose a day to be divided for consumption in morning and evening. Due to the restriction on eating and drinking the day before whole body hyperthermia, a dose of TCM should be strongly decocted and taken orally after the completion of whole body hyperthermia.
In one research study of mine, 157 patients with colorectal cancer in Clifford Hospital from May, 2005, to June, 2008, were divided randomly into 3 groups [17], (Table 5).

Groups	Patients	Therapeutic Regimens
Treatment Group	53	Local hyperthermia + Clifford Guben Xiaoliu Decoction (Chinese medicine, taken orally)
Control Group A	50	Local hyperthermia
Control Group B	54	Clifford Guben Xiaoliu Decoction (Chinese medicine, taken orally)

Table 5. Therapeutic Regiments of 3 Groups

All patients were followed up for 2 years. Comparing the therapeutic effect, improvement in quality of life, and survival time of the 3 groups, the results for Treatment Group were superior to both Control Group A and B.

Groups	CR+PR+NC	KPS	VAS	Survival Time
Treatment Group	42	71.67 ± 30.36	3.755 ± 2.841	709.47 ± 14.21
Control Group A	31	50.68 ± 36.44	5.22 ± 3.00	661.18 ± 21.14
Control Group B	28	53.76 ± 37.60	4.80 ± 2.77	662.64 ± 20.03
P	<0.05	<0.05	<0.05	<0.05

Table 6. Results of 3 Groups

In the researchers of Ge Guoxin [18], Chen Liwei [19], et al. on Local hyperthermia combined with orally-taken Chinese medicine, the progression of tumors was well controlled with improvement in quality of life, extension of survival time, increase of survival rate, and decrease of tumor markers. No adverse reaction was observed, and the result was superior to routine chemotherapy.

3.4.2. Hyperthermia Combined with Chinese Medicine Infused in Body Cavity and Lumens

TCM directly touching or close to the diseased region is combined with deep heating to increase the therapeutic effect, once per 2- 3 days, for one hour each time, with 10 times as a course of treatment. It is applied to various tumors, of which colon cancer (descending colon cancer, sigmoid colon cancer, and rectal cancer) and prostatic cancer are the easiest to administer using TCM.

Some researchers used Rabdosia liquid for intravesical hyperthermic perfusion on patients with bladder cancer. After treatments, the increase of CD4+ and CD4+/CD8+ and the decrease of SIL-2R implied that the immune functions of patients was improved. Li Dengbao [20], et al. conducted research on 28 patients with bladder cancer. After surgeries, Rabdosia liquid intravesical hyperthermic perfusion was given. The changes of T lymphocyte subsets and SIL-2R in serum were recorded and compared with healthy people in the control group. As a result, the immune functions of these patients were improved.

3.4.3. Hyperthermia Combined with External Application of Chinese Medicine

External application is a main method of TCM. It adopts easily through skin administration and attains the healing purpose through drug potency which is infiltrated into the local area. It is then transferred throughout the viscera to dredge Qi movement and strengthen vital Qi so as to dispel pathogenic factors. The means of absorption approaches of these drugs through the skin mainly include: arterial passage, hydration, surfactant effect, and auxoaction of the aromatic drugs. How to improve the permeability of drugs through the skin is a key to obvious therapeutic effects. The epidermis must be softened to accelerate drug infiltration, and heat stimulation of the skin surface is an effective means for softening the epidermis.

Method: Herbal drugs are prescribed for treatment based on syndrome differentiation. Then the drugs are powdered and mixed with alcohol, vinegar, or honey to form a paste, which is applied to the surface of the pathological areas with dressing. External application is conducted after deep or whole-body hyperthermia.

Local hyperthermia lasts for an hour each time, once every 2~3 days, with 10~15 times as a course. Whole body hyperthermia lasts for 6~8 hours each time with the therapeutic temperature maintained at 39.5~41.8 ^{o}C for 180 minutes at the minimum, once every 10~14 days. If Local hyperthermia is combined with whole body hyperthermia, it can be conducted every other day in the interval between two treatments of whole-body hyperthermia. Herbal drugs are powdered and packed into specially-made vests and bellybands to wrap around the patient, and then medium and low temperature hyperthermia is conducted, once a week, for 2~3 hours each time, at a temperature of 38~40 ^{o}C, with five times as a course. It is mainly used for benign diseases.

Mo Dingqun [21], et al. consider that microwaves can destroy the stability of the cellular membrane and promote the penetration and absorption of herbs. Besides, microwave hyperthermia can strengthen the activity of herbs and significantly raise therapeutic effects. In their clinical practice, microwave hyperthermia combined with external application of Chinese medicine to treat cancer pain in the liver area of 20 patients with liver cancer; 11 patients were totally relieved from pain, and 9 patients were able to reduce their dose of pain killer.

The therapeutic effect was observed in all patients.

3.4.4. Hyperthermia Combined with TCM Technologies (Acupunture, Moxibustion, Massage, Cupping Therapy, Bee Venom Therapy, Auricular Point, etc.)

During anticancer therapy, TCM technologies, such as acupuncture, moxibustion, massage, cupping therapy, bee venom therapy, and auricular point, can strengthen the vital Qi to eliminate pathological factors, strengthen immunity, regulate the energy balance of the human body, improve the functions of the organism, and so on. TCM technologies are especially characterized by simplicity, convenience, cheapness, efficacy without side effects or toxicities, and are real "green therapies". Both single and combined applications play important roles during cancer therapies.

3.4.5. Hyperthermia Combined with Medical Qigong

Medical Qigong has been practiced for over a thousand year. Medical Qigong is a non-medicated health-building therapy through the physiological and psychological processes of exercises such as

regulating the body, breathing and mental activities, relaxing limbs, adjusting respiration, and stabilizing spirit consciousness, etc, so as to regulate the balance of Yin and Yang in the human body. The combination of hyperthermia with medical Qigong is an innovation in the field of tumor therapy, which is beneficial to the improvement of symptoms and long-term therapy on tumors.

3.5. Hyperthermia Combined with Integrative Natural Therapies of Cancer

Cancer treatments should be whole-person oriented and focus on entirety and individuality, which require integrative treatments. According to clinical observations and summaries in integrative natural therapies, hyperthermia plays an important part in controlling tumors, relieving symptoms, improving quality of life and so on. Besides hyperthermia, non-toxic integrative cancer treatments also include medical ozone, chelation therapy, enema therapy, systemic biofeedback therapy, nutritional therapy, Chinese herbal medicine diet, medical Qigong, cell therapy, constitutional alkalinization therapy, TCM, etc. We have observed 210 patients with Stage IV cancer in Clifford Hospital (Chart 3), and studied the different effects of non-toxic integrative cancer treatments, simple integrative natural therapies and routine anticancer and allopathic supporting therapies on control rate of tumor, symptoms, and quality of life.

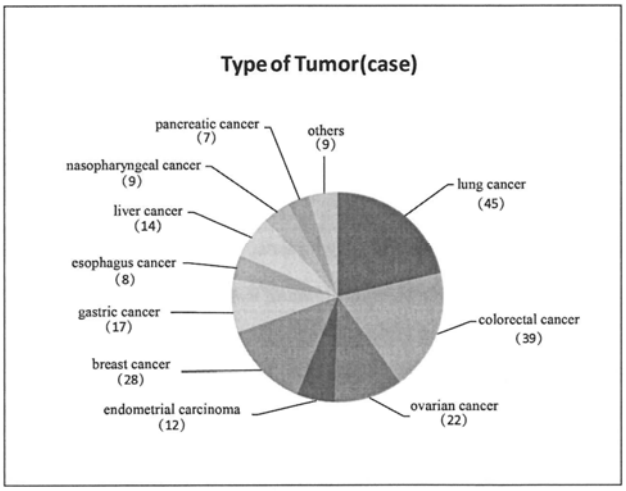


Chart 3. Tumor Types

Other tumors include renal carcinoma, lymphoma, cervical cancer, etc. Patients were divided into 3 groups randomly: Group A received non-toxic integrative cancer treatments with hyperthermia as the main treatment. Group B received simple integrative natural therapies. Group C received routine anticancer therapies (radiotherapy, chemotherapy, targeted therapy, etc.) and allopathic supporting therapy. The therapeutic regimen of non-toxic integrative cancer treatments in Group A were formulated by a group of oncology experts in Clifford Hospital according to the body condition and clinical examination results of patients. Evaluation of symptomatic relief: the feelings of nausea, bad appetite, fatigue, dizziness, abdominal distension, chest distress, and fever are relieved, and the decrement of drug dosage for allopathic supporting therapy is more than 50%. Evaluation of pain control: Excellence: Without pain after treatments of the dose of pain killers reduced to 1/3 of the dose before treatments. Utility: The dose of pain killers reduced to 1/3~2/3 of the dose before treatments. Nullity: No relief of pain, or tiny relief, but the necessary dose of pain killers is still more than 2/3 of before. The required time of excellence or utility evaluation should last more than 3 days. Evaluation of performance status is based on the Karnofsky Performance Status (KPS). Significant improvement: KPS increases more than 20 points after treatments. Improvement: KPS increases 10~19 points after treatments. No Improvement: KPS increases less than 10 points after treatments. After 4 courses of treatments, therapeutic results were as follows (Table 7, 8, 9 and 10):

3.5.1. Tumor Control of 3 Groups

	CR	PR	NC	PD	Rate of Tumor control (CR+PR+NC)
Group A	3	24	25	18	74.3%
Group B	1	17	22	30	57.1%▲
Group C	0	12	17	41	41.4%••*

Table 7. Tumor Control of 3 Groups

3.5.2. Symptomatic Relief of 3 Groups

	Total Cases	Cases with Symptomatic Relief	Rate of Symptomatic Relief
Group A	70	54	77.1%
Group B	70	43	61.4%▲
Group C	70	26	37.1%••**

*A&B: ◢P<0.05, ◢◢P<0.01; A&C: •P<0.05, ••P<0.01; B&C: *P<0.05, **P<0.01*

Table 8. Symptomatic Relief of 3 Groups

3.5.3. Pain Control of 3 Groups

	Cases with Pain	Excellence	Utility	Nullity
Group A	49	13	26	10
Group B	52	9	15	28
Group C	48	3	8	37

Table 9. Pain Control of 3 Groups

After treatments, pain control rates were compared between Group A and B, A and C, B and C trough $\chi 2$ test, and there were significant differences ($P<0.05$). The control rate of Group A was superior to Group B and C. The control rate of Group B was superior to Group C.

3.5.4. Performance Status of 3 Groups

	Total Cases	Significant Improvement	Improvement	No Improvement
Group A	70	10	39	21
Group B	70	5	22	43
Group C	70	1	13	56

Table 10. Performance Status of 3 Groups

After treatment, performance status were compared between Group A and B, A and C, B and C trough x2 test, and there were significant differences ($P<0.05$). The performance status of Group A was superior to Group Band C. The control rate of Group B was superior to Group C. This research indicated that non-toxic integrative cancer treatments with hyperthermia as the main treatment were superior to simple integrative natural therapies for tumor control, symptom relief, and improvement of quality of life, and were superior to routine anticancer therapies (radiotherapy, chemotherapy, targeted therapy, etc.) and allopathic supporting therapy for these applications as well while treating patients with advanced cancer.

Besides, through clinical observation of patients with advanced cancer, hyperthermia combined with chelation therapy were significantly superior for symptom relief and improvement of quality of life.

I have observed 57 patients with advanced cancer in 2009-2011. The patients received hyperthermia combined with chelation and detoxification therapy, with allopathic supporting therapy. Compared with another 62 patients who received palliative therapy, hyperthermia combined with chelation and detoxification therapy was significantly superior on symptom relief and improvement in quality of life. Satoh [22], et al. discovered that during the process of

hyperthermia, the degradation of vitamin C and vitamin C-sodium hydride was strengthened, and generated more free radicals of vitamin C. The increase of free radicals strengthened the anticancer effect of hyperthermia, which explained why hyperthermia combined with vitamin C had stronger anticancer effects. Hyperthermia can also be combined with physical therapies such as recovery therapy, external application therapy, cryotherapy, electrotherapy and electromagnetic therapy. Each combination will improve therapeutic effects on malignant diseases and their complications, such as cancer pain.

In summary, I have practiced hyperthermia combined with the therapies above with creativity and exploration. The effects of these combinations are for the purpose of improving the functions of the human body, which is called "strengthening body resistance" in TCM. By increasing permeability of cell membranes, raising drug concentration and reaction speed, increasing oxygen content of the cells around tumors, and starting the antigen antibody systems in the body, hyperthermia combined with these therapies introduced above can improve the self compensation and balancing ability of the human body to inhibit the replication of cancer cells; this is called "strengthening healthy Qi to eliminate pathogens" in TCM. Additive or synergistic effects have been obtained in the practice of integrative therapies, which is a creative work. Hyperthermia's integration into modern medicine still requires further research.

4. Efficacy Evaluation and Analysis

According to the therapeutic effect evaluation criterion of the World Health Organization (WHO), through my studies and practices, hyperthermia combined with palliative routine anticancer therapies such as radiotherapy, chemotherapy through intravenous injection, and intracavitary chemotherapy approached the rate of 60% of tumor control in both randomized controlled study and concurrent control study, and was superior to routine anticancer therapies and allopathic supporting therapy, with statistical significance. When combined with integrative natural therapies, especially TCM, hyperthermia not only shows unique therapeutic effects, but also provides new ideas and methods to patients with recurrence, metastases, or drug resistance. It brings a new hope to the patients who have already lost the chance of surgery, radiotherapy or chemotherapy.

In my practices, the effects of improving immune functions, removing the cause of disease, controlling tumor progression, improving quality of life, prolonging survival time, raising survival rate, and decreasing cancer markers without adverse reactions was proved when hyperthermia was combined with integrative natural therapies for cancer on different types of cancer, especially the advanced ones. The rate of tumor control and symptom relief even reached 70% in some research. The advantage is significant in both common treatments and alleviative treatments. Referring to some other reports, hyperthermia combined with integrative natural therapies has consistency with the anticancer therapeutic results of the author. Hyperthermia is an indispensable part of integrative natural therapies for cancer, and makes them more scientific, reasonable, and effective.

Therefore, clinical researches and records prove that hyperthermia is safe and reliable in treating cancer. It inherits the characteristics of traditional natural therapies and can integrate with modern anticancer techniques through development. Hyperthermia can be used at all stages of cancer. It is an irreplaceable part of integrative natural therapies of cancer, as well as a wonderful element of TCM.

5. Conclusion

Our clinical practices have proved that hyperthermia in combination with integrative natural therapies can kill cancer cells by effectively removing the cause of disease, detoxifying human body, and improving immune system and the self-healing capacity of the human body. It obtains the purpose of treating both manifestation and root cause of disease, so as to prolong survival time of patients and improve the quality of life.

6. Prospect

In my opinion, based on the systematic principle of “nature-human integration", with the transformation of the medical model from biomedical model to bio-psycho-social medical model, tumor therapy is no longer a single treatment for diseases, but is the best mode which stresses participation of a variety of means and disciplines and is patient-oriented. It not only focuses on tumor control and prolonging survival, but also pays more attention to the patient's overall quality of life by adopting measures suitable to the patient, place, and time. It emphasizes a combination of treatment methods customized for the patient and strives to obtain comprehensiveness of diagnosis and treatment of tumor diseases. Non-toxic integrative cancer treatment with hyperthermia as a main part has become the trend and advantage in cancer treatment development.
I have achieved gratifying results after clinical practice by combining hyperthermia with conventional cancer treatments and have put forward the concept of "Integrated Green Therapy of Tumor." This concept requires physicians to discuss and design optimized antineoplastic protocols based on the disease itself and, with the consideration of the patient's individual genetic background, physical condition, living environment, psychology, and other factors, fully participate in the implementation and revision of treatments to ensure standardization and internationalization of treatments and management. As shown in clinical validations, the combination of different subjects, the mixture of multiple traditional natural therapies, and the practice of modern non-toxic treatments have brought new hope to innumerable cancer patients, especially those with medium to advanced cancers. It embodies dialectics of scientific treatments for cancer and ensures the most appropriate combined therapy in order to achieve the purpose of controlling tumors, extending survival time, and improving the quality of life of the patients.

7. Appendix

Appendix 1: Assessment on Curative Effect

Curative effect is evaluated according to the WHO criteria.

7.1. Evaluation of measurable lesions

Complete Remission (CR): all measurable lesions completely disappear for more than 4 weeks.
Partial Remission (PR): decrease in tumor volume being more than 50% for more than 4 weeks, serum tumor indicators significantly declined with statistical significance.
No Change (NC): increase in tumor volume being less than 25% or decrease less than 50% for more than 4 weeks.
Progress and Development (PD): tumor not able to be controlled and increase in tumor volume being more than 25%, or new lesions present, or blood tumor indicators significantly increased with statistical significance.

7.2. Evaluation of lesions which cannot be measured

Complete Remission (CR): all visible lesions disappeared, and this situation maintained at least for more than 4 weeks.
Partial Remission (PR): decrease in entire tumor estimated to be more than 50%, and this situation maintained for more than 4 weeks.
No Remission (NR): lesion has no significant change at least 6 weeks after treatment, the increase in the tumor estimated to be less than 25%, or the decrease in the tumor estimated to be less than 50%.
Progress and Development (PD): new lesions present, or the increase in original lesions estimated to be more than 50%.

7.3. Evaluation of Quality of Life

Comprehensive evaluation is made according to KPS and VAS scores.

7.3.1. KPS score

Karnofsky (100-point method) Performance Status (Appendix Table 1)

Performance Status	Scores
Normal, no signs and symptoms	100
Capable of normal activities; mild signs and symptoms	90
Barely capable of normal activities; some signs or symptoms	80
Capable of self care; but inability to maintain normal life and work	70
Capable of self care in most cases; but occasionally need help	60
Always need care	50
Incapable of self care; need special care and assistance	40
Incapable of self care to a serious extent in the life	30
Seriously ill; need to be hospitalized and active support treatment	20
Critical illness; close to death	10
Death	0

Appendix Table 1. KPS

7.3.2. Pain Evaluation

VAS (Visual Analogue Scale) pain evaluation: The pain level is represented by 0 to 10, a total of 11 numbers. 0 represents painless, 10 most painful. Patients choose one of these 11 numbers according to their pain level.

Level of Pain	Scores
No pain	0
Mild pain that can be tolerated	<3
Pain that affect sleep but can still be tolerated. The pain should be clinically relieved	4~6
More intense pain that can not be tolerated	7~10

Appendix Table 2. VAS

Regarding the evaluation of integrative natural therapies, the TCM diagnostic performance (collected by look, smell, ask, touch), nutritional assessment, and psychological assessment should be considered as well in the general conditional evaluation of patients. This makes the physical and psychological evaluation more comprehensive. It also helps to make scientific, comprehensive, humanized, and individualized therapeutic regiments with objective and practical efficacy.

Appendix 2: Common Methods of Hyperthermia

Tumor Location	Therapeutic method
Malignant tumors (except brain tumor) without contraindications	Whole-body hyperthermia or whole-body hyperthermia combining other therapies
Depth of superficial tumors < 3 cm	915 MHZ common microwave radiator ultrasound
Depth of superficial tumors < 3 cm	Focused radiator microwave, intraoperative multi-head ultrasound
Brain tumor	Interstitial hyperthermia, extracorporeal deep radiofrequency hyperthermia Ultrasound after craniotomy, low power radiofrequency

Metastasis of nasopharyngeal carcinoma carotid < 3 cm	Intracavitary microwave, ultrasound, extracorporeal deep radiofrequency hyperthermia
Esophagus cancer	Intracavitary microwave, intracavitary radiofrequency, extracorporeal deep radiofrequency hyperthermia
Lung cancer	Whole body hyperthermia, extracorporeal deep radiofrequency hyperthermia
Lung cancer	Intraoperative hyperthermia, extracorporeal deep radiofrequency hyperthermia
Pancreatic cancer, gastric cancer, ovarian cancer	Intraoperative interstitial hyperthermia, endoscopic interstitial and regional hyperthermia Extracorporeal deep radiofrequency hyperthermia
Rectal cancer	Intraoperative hyperthermia, intrapeitoneal chemohyperthermia Extracorporeal deep radiofrequency hyperthermia
Bladder cancer	Intracavitary hyperthermia, regional hyperthermia, hyperthermal perfusion Extracorporeal deep radiofrequency hyperthermia
Uterine neck, cervical cancer	Regional hyperthermia, hyperthermic perfusion, radiofrequency, ultrasound, focused ultrasound
Prostatic cancer	Intracavitary hyperthermia, regional hyperthermia, extracorporeal deep radiofrequency hyperthermia
Limb osteosarcoma	Interstitial heating, regional hyperthermia, extracorporeal deep radiofrequency hyperthermia Intraoperative hyperthermia, isolative perfusion, ring induction heating

Appendix Table 3. Commonly Used Hyperthermia Treatments

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