



Hyperthermia in Clinical Oncology



Information Brochure for Patients

Hyperthermia is used for the following types of tumors:

- ▶ cancer of the colon (i.e. the large bowel or intestine) that is locally advanced or has recurred
- ▶ recurring breast cancer on the chest wall
- ▶ cancer of the uterine cervix (cervical carcinoma)
- ▶ soft-tissue sarcomas
- ▶ recurring skin cancer (malignant melanoma)
- ▶ locally advanced head-neck tumors
- ▶ locally advanced or recurring bladder cancer
- ▶ cancer of the pancreas (pancreatic carcinoma)
- ▶ locally advanced or recurring anal carcinoma (cancer of the anus)

In the following cases hyperthermia should not be applied:

- ▶ for patients with serious heart disease or with a heart pacemaker
- ▶ when there are artificial joints in the area of treatment
- ▶ in pregnant patients

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More success in the treatment of cancer

The word “hyperthermia” comes from the Greek language and means overheating. Hyperthermia is used in the treatment of cancer in combination with chemotherapy and/or radiotherapy. Experience has shown that this treatment combination improves the overall results.

During the treatment, the tumor tissue is heated for about an hour, using microwave radiation, to a temperature of 41 to 43°C. This radiation is precisely focused so as not to damage the surrounding tissue.

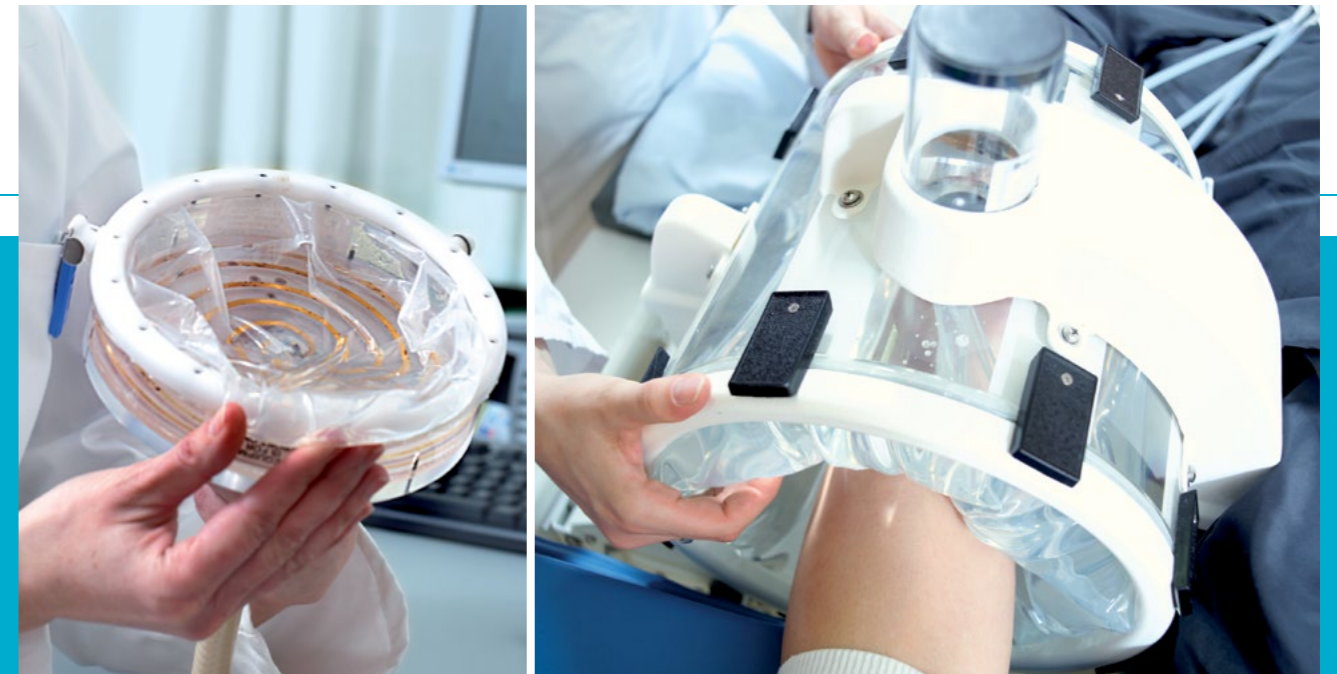
Hyperthermia is used primarily for tumors that have proven to be resistant to chemotherapy and radiotherapy, as well as for recurring tumors. Hyperthermia is also used to shrink the size of inoperable tumors so they can subsequently be surgically removed.



For tumors below the skin surface

A microwave applicator made of a flexible silicone rubber membrane is gently placed on the skin exactly at the point under which the tumor is located. The applicator contains spiral antennas that irradiate the affected area with microwaves. This heats the tumor tissue and improves the effectiveness of chemotherapy and radiotherapy.

This treatment mode is applied in cases of tumors that lie just below the skin, e.g. recurring breast cancer, melanoma and non-operable lymph nodes in the throat, e.g. head and neck cancer.



Regional Deep Hyperthermia

For tumors located deep within the body

The patient is positioned within a transparent ring applicator equipped with a water bolus. Microwave antennas are mounted on the inner wall of the applicator and are controlled individually by way of software. The microwave energy is focused precisely on the tumor where it leads to hyperthermic temperatures.

This treatment mode is suitable for all types of cancer that are located deep inside the body, such as abdominal and intrapelvic cancers, including pancreas cancer, bladder, cervical, rectal, anal and prostate cancer, as well as soft tissue sarcomas.



MR Hyperthermia

Deep hyperthermia with magnetic resonance imaging

This form of treatment, which is also referred to as MR hybrid hyperthermia, combines deep hyperthermia with magnetic resonance imaging (MRI).

During the hyperthermia treatment, color-coded temperature images are created, providing a 3D temperature MR image. The heat is focused more precisely on the tumor tissue whereas the healthy tissue remains outside the heated zone and is not affected.





What is the procedure in hyperthermia treatment?

Technical preparations

To begin with, the treatment is planned using a software tool operating with CT or MRI images. This is done with the help of a computer-controlled planning system, which ensures that the heat is applied solely to the tumor tissue.

To control the temperature during the heat treatment, measurement probes are positioned as close as possible to the tumor. For tumors located just below the skin, an external temperature measurement is used, while for tumors located deep inside the body, temperature probes are inserted into the natural orifices, such as vagina, rectum or bladder. In rare cases it may also be necessary to insert an invasive measurement probe transcutaneously under local anesthesia.

The treatment

The patient is placed in a transparent cylindrical applicator surrounding the body. After a pre-warming period of around 30 minutes the actual treatment begins, which in turn lasts for about an hour. Radiotherapy is performed prior to hyperthermia, whereas with chemotherapy the infusion is given at the same time as the hyperthermia.

The following devices are used for hyperthermia treatment:

- ▶ a hyperthermia device (Type BSD 2000 3D)
- ▶ a new hybrid hyperthermia MRI system (BSD 2000 3D and Philips Ingenia or General Electric Optima)
- ▶ the planning software (SigmaHyperPlan and SigmaVision Advanced for MR Hyperthermia)

Care provided during the treatment

Throughout the entire period of the hyperthermia treatment a highly professional team cares for the wellbeing of the patient. A technician in the control room constantly monitors the treatment to ensure the correct temperature setting, while the medical staff watches through a large window and regularly talks to the patient. The hyperthermia physician monitors the patient's heart rate, blood pressure and other vital

parameters, while a nurse looks after the patient's physical and emotional wellbeing. Relatives may also be present during the treatment, if this is desired.

Treatment frequency

The number of treatment sessions indicated depends on the diagnosis. In general, hyperthermia is applied once or twice a week leading up to a total of < 12 sessions during a complete oncological treatment cycle (radiotherapy and/or chemotherapy).

The treatment from the patients perspective

For most patients the hyperthermia treatment remains painless and non-stressful, particularly since in most cases there are no side effects. In rare cases hyperthermia can cause reddening of the skin, water retention in the tissues and fat necrosis; these side effects tend to heal without remaining late effects and are usually transitory.

Quality criteria and hyperthermia

A hyperthermia expert team in our clients' university hospitals is usually made up of radiation oncologists, physicists and engineers, nurses and medical technical assistants with years of experience in the field. This ensures that the high quality requirements of this sophisticated hyperthermia procedure are fully met. In addition, most hyperthermia treatments are documented and evaluated in studies.

The hyperthermia treatment is undertaken according to the guidelines of the ESHO (European Society of Hyperthermic Oncology) and of the IAH (Interdisziplinären Arbeitsgruppe Hyperthermie [Interdisciplinary Working Group for Hyperthermia]) of the Deutsche Krebsgesellschaft [German Cancer Society]. The treatment is provided by hyperthermia devices with the very latest features and software tested in practice.

Patients can obtain further information on technical support from the clinics providing the treatment.

Benefits of hyperthermia

Important national and international peer-reviewed studies have clearly proven the effectiveness of hyperthermia in combination with chemotherapy or radiotherapy.

The benefits of hyperthermia treatment are:

- ▶ Improvement and extension of medical tumor control
- ▶ Significantly higher success rates for treatment with chemotherapy and radiotherapy
- ▶ Reduction of the tumor size enable to removal by surgery
- ▶ Destruction of tumor cells, especially in cases of previously treatment-resistant tumors
- ▶ Increased remission rates and improvement to the quality of life
- ▶ Long-term improvement the course of the illness
- ▶ Reduced risk of metastases

Study results

Indication	Patients	Comparisons	Rates of Improvement	Years	Publications
Surface-Near Tumors	109	HT* + RT versus RT only	66% versus 42%	5	Journal of Clinical Oncology (JCO), 2005 Jones, E. L. et al.
Tumors on Throat and Neck	41	HT + RT versus RT only	83% versus 41%	5	International Journal of Radiation Oncology, Biology, Physics (IJROBP), 1994, Valdagni, R. et al.
Malignant Skin Cancer	70	HT + RT versus RT only	62% versus 35%	5	International Journal of Hyperthermia (IJHT), 1995, Overgaard, J. et al.
Breast Cancer	306	HT + RT versus RT only	59% versus 41%	5	International Journal of Radiation Oncology, Biology, Physics (IJROBP), 1996, Vernon, C. C. et al.
Soft-Tissue Carcinoma	341	HT + RT versus RT only	29% versus 13%	2	Lancet Oncology, 2010 Issels, R. D. et al.
Tumors in the Area of the Pelvis	358	HT + RT versus RT only	73% versus 51% (bladder)	3	The Lancet, 2000 Van der Zee, J. et al.
Cervical Carcinoma	114	HT + RT versus RT only	83% versus 57%	12	International Journal of Radiation Oncology, Biology, Physics (IJROBP), 2008, Franckena, M. et al.

* HT = hyperthermia; RT = radiotherapy; CT = chemotherapy

More information on the topic can be found on the websites of the following institutions:

Deutsche Krebsgesellschaft:

www.krebsgesellschaft.de/db_hyperthermie,10845.html

Krebsinformationsdienst (KID) des Deutschen Krebsforschungsinstituts:

www.krebsinformationsdienst.de

Internet-Lexikon Wikipedia:

http://de.wikipedia.org/wiki/Therapeutische_Hyperthermie

Atzelsberger Kreis

www.atzelsbergerkreis.de

ESHO – European Society of Hyperthermic Oncology

www.esho.info

Hyperthermia videos

www.hyperthermia-video.info

Pyrexar Medical

www.pyrexar.com

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