Hyperthermia in Clinical Oncology

Information Brochure for Patients
For Whom is Hyperthermia Suitable?

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 sarcoma
- 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 cases of pregnant patients
Local Superficial Hyperthermia

For tumors below the skin surface

Here a microwave applicator made of flexible silicone rubber membrane is gently placed on the skin above the tumor. It is positioned 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 at the throat, e.g. head and neck cancer.

More success in the treatment of cancer

The word „hyperthermia“ originates from the Greek language and means overheating. Hyperthermia treatment is used in the context of cancer treatment in combination with chemotherapy and/or radiotherapy. Experience has shown that the combination of these treatment modes improves the treatment results.

During the treatment the tumor tissue is heated for about an hour with the help of microwave radiation, to a temperature of 41 to 43°C. This radiation is precisely focused and the surrounding tissue is not damaged.

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 removed by surgery.
Regional Deep Hyperthermia

For tumors located deep within the body

For this treatment 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 powered individually under software control. 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 intrapelvine cancers which include 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 3D color-coded temperature images are created. This provides a non-invasive 3D temperature MR image during therapy. The heat is focused more precisely on the tumor tissue whereas the healthy tissue areas remain outside the heated zone and are not affected.
The Treatment

What is the procedure in hyperthermia treatment?

Technical preparations

We start with treatment planning using a software tool operating with CT or MRI images. This is done with the help of our computer-controlled planning system, which ensures that the heating effect is applied solely to the tumor tissue.

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

The treatment

The patient is positioned in a transparent cylindrical applicator surrounding the body. After a prewarming period of around 30 minutes the actual treatment begins. This lasts for about an hour. Radiotherapy is performed prior to hyperthermia whereas the chemotherapeutic infusion is given simultaneously with hyperthermia.

For our hyperthermia treatments the following devices are in use:

- 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. An engineer in the control room constantly monitors the treatment to ensure the correct temperature setting. The medical staff watches the patient during the treatment 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. Even relatives can be present during the treatment, if this is wanted.

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 patient’s 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 client’s university hospitals consists generally of radiation oncologists, physicists and engineers, nurses and medical technical assistants with years of experience in the field. 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 in keeping with the guidelines of the ESHO (European Society of Hyperthermic Oncology) and of IAH (Interdisziplinären Arbeitsgruppe Hyperthermie [Interdisciplinary Working Group for Hyperthermia]) of Deutsche Krebsgesellschaft [German Cancer Society]. The treatment is provided by hyperthermia devices with ultramodern features and software tested in practice.

Further information on technical support can be obtained by patients from the clinics providing the treatment.
Benefits of hyperthermia

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

The successes of hyperthermia treatment are:

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

Study results

<table>
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<tr>
<th>Indication</th>
<th>Patients</th>
<th>Comparisons</th>
<th>Rates of Improvement</th>
<th>Years</th>
<th>Publications</th>
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<tr>
<td>Surface-Near Tumors</td>
<td>109</td>
<td>HT* + RT versus RT only</td>
<td>66% versus 42%</td>
<td>5</td>
<td>Journal of Clinical Oncology (JCO), 2005 Jones, E. L. et al.</td>
</tr>
<tr>
<td>Tumors on Throat and Neck</td>
<td>41</td>
<td>HT + RT versus RT only</td>
<td>83% versus 41%</td>
<td>5</td>
<td>International Journal of Radiation Oncology, Biology, Physics (IJROBP), 1994, Valdagni, R. et al.</td>
</tr>
<tr>
<td>Malignant Skin Cancer</td>
<td>70</td>
<td>HT + RT versus RT only</td>
<td>62% versus 35%</td>
<td>5</td>
<td>International Journal of Hyperthermia (IJHT), 1995, Overgaard, J. et al.</td>
</tr>
<tr>
<td>Breast Cancer</td>
<td>316</td>
<td>HT + RT versus RT only</td>
<td>59% versus 41%</td>
<td>5</td>
<td>International Journal of Radiation Oncology, Biology, Physics (IJROBP), 1996, Vernon, C. C. et al.</td>
</tr>
<tr>
<td>Soft-Tissue Carcinoma</td>
<td>341</td>
<td>HT + RT versus RT only</td>
<td>29% versus 13%</td>
<td>2</td>
<td>Lancet Oncology, 2010 Issels, R. D. et al.</td>
</tr>
<tr>
<td>Tumors in the Area of the Pelvis</td>
<td>358</td>
<td>HT + RT versus RT only</td>
<td>73% versus 51%</td>
<td>3</td>
<td>The Lancet, 2000 Van der Zee, J. et al.</td>
</tr>
<tr>
<td>Cervical Carcinoma</td>
<td>114</td>
<td>HT + RT versus RT only</td>
<td>83% versus 57%</td>
<td>12</td>
<td>International Journal of Radiation Oncology, Biology, Physics (IJROBP), 2008, Franckena, M. et al.</td>
</tr>
</tbody>
</table>

* HT = hyperthermia; RT = radiotherapy; CT = chemotherapy
More information on the topic can be found on the Internet on the websites of the following institutions:

Deutsche Krebgesellschaft:
www.krebgesellschaft.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

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www.pyrexar.com

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