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The role and measurement of temperature in oncothermia

Dr. Oliver Szasz[1]

(1) CEO, Oncotherm GmbH, Troisdorf, Germany

Conclusion:
The combination of locoregional hyperthermia and chemotherapy in pretreated metastatic breast cancer patients showed a tolerable toxicity profile. Data concerning the final toxicity analysis are pending.

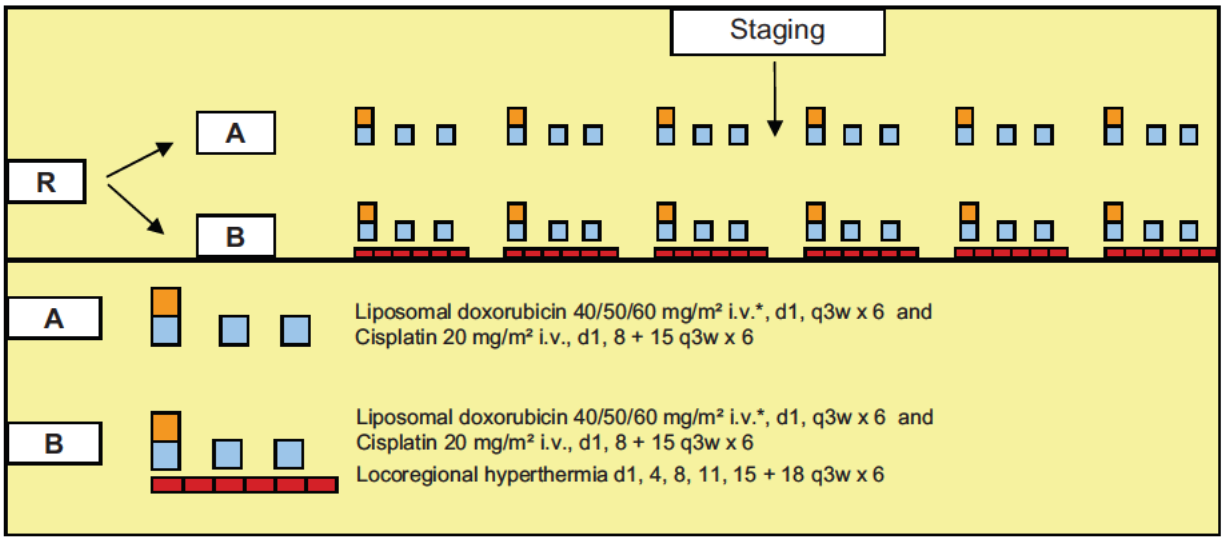

Figure 1: Design of the Mammatherm-trial, (phase I non randomized, pts. treated according to arm B)

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Sunday, November 13th, 2011
09:55-10:35

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Dr. Oliver Szasz[1]
(1) CEO, Oncotherm GmbH, Troisdorf, Germany

Temperature is always a critical issue in the hyperthermia treatment in oncology. There are intensive discussions about its role in the treatment, looking for controlling parameters and well defined treatment goals of clinical oncologic hyperthermia. The doubts about temperature have multiple origins.
Oncothermia is a hyperthermia method, using heat to reach the desired curative effect. The heat-induced processes are the basic of Oncotherm technologies [1], and oncothermia is definitely a kind of hyperthermia. The improvement is basically in the distribution of the heat: oncothermia applies the heat selectively in cellular level, reaching high temperature microscopically at the malignant cell membrane to destroy it.
Compare the different methods is not a simple task. The energy delivery does various changes in the complex living system, which makes the methods incomparable by an only single parameter. The identical energy exposition does not mean same heating efficacy. The heating efficacy depends on the actual conditions [2], [3], and on the organ to be heated [4] as well as the chosen frequency. The temperature is used in most of the cases as a "success parameter" in hyperthermia, trying to equalize it and declare as a measurement of the energy absorption. The temperature shows only the average kinetic energy of the particles and units in the measured target, but it tells nothing about the chemical and structural changes there. However, the aim of the therapy is to reach structural and chemical changes to stop the malignant processes. Nevertheless, the temperature and energy distribution is very different [5], it is not possible to fit the specific

absorption rate (SAR) and the developed temperature. The temperature is not enough to compare the methods, [6].
Oncotherm had taken huge attention in its research on the energy-distribution pumped into the body. Many in silico, in vitro, in vivo, preclinical and clinical experiments were performed by years, which I would like to show in my present talk. My definite objective to show how oncothermia uses the hyperthermia idea to destroy the malignant cells, and how effectively reaches those temperatures, which are usually need a very complicated technology and certainly much higher power (and parallel high risk) in other hyperthermia methods in oncology.
Oncothermia reaches higher temperatures in selected cell-membrane localizations, than any other hyperthermia method does. Due to the higly sophisticated selection, the absorbed energy is used very effectively. Oncothermia treatment had ~6^{o}C temperature increase with ~70 W during 60 min in the human sarcoma [7], and reaching 44 ^{o}C with 120 W in case of mammary tumor [8]. In veterinarian application, where the blistering threshold was of course higher in the anesthetized animal and the heated volume was much smaller than in human cases, the temperature increase was ~14^{o}C with ~25 W during 30 min [9].
I will show our systematic proofs on the selective temperature developments, our high-scale temperature measurements and proofs of oncothermia as a definite improvement of oncologic hyperthermia. Oncothermia is such kind of oncologic hyperthermia, which together with the better efficacy, safer and controllable than other heating methods.

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Bluttests für onkologische und immunologische Fragestellungen

Dr. Heiko Hofmann[1]
(1) Leiter Vertrieb und Marketing,, TAVARLIN AG, Darmstadt, Germany

In Tumor- und Krebszellen bilden sich durch molekulare und biochemische Änderungen Proteine, die für eine Diagnose und Charakterisierung von Tumoren genutzt werden können. Wenn das Immunsystem benigne oder maligne Tumorzellen (Krebszellen) erkennt, werden Abwehrmechanismen wie die Phagozytose ausgelöst. Dieses Erkennen und Eliminieren von unerwünschten Zellen wird hochspezifisch von Monozyten/Makrophagen durchgeführt, die anschließend wieder in das Blut zurückkehren und über eine einfache Blutentnahme isoliert werden können. Diese Eigenschaft des Immunsystems nutzt das EDIM-Testverfahren (Epitop Detektion in Monozyten), das mit Hilfe der Durchfluss-Zytometrie durchgeführt wird. Hierbei werden durch spezifische Antikörper Immunzellen im Blut markiert und detektiert und gleichzeitig die Präsenz von Proteinen in Makrophagen bestimmt.

Bislang werden mit Hilfe des Verfahrens zwei Proteinmarker bestimmt: Apo10 und TKTL1. Der Marker Apo10 wird unabhängig von der Tumorentität hochspezifisch in Tumorzellen exprimiert und bei einer gestörten Apoptose akkumuliert. Durch den Nachweis des Apo10-Antigens in Makrophagen ist es nun möglich, Störungen der Apoptose zu messen und hierüber einen frühzeitigen Hinweis auf proliferative Störungen und Tumoren zu erhalten. Tumoren können