

EVALUATION OF PERFUSION CHANGES INDUCED BY HYPERTHERMIA USING DCE-MRI

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Background

During hyperthermia various physiological parameters in the tumor and surroundings can vary, which are important for the effects of the heat treatment. One of these parameters is the perfusion. Perfusion is of importance by various reasons, e.g. it controls the supply with chemotherapeutics and oxygen, and vascular changes are known due to a thermotherapy. It is important to measure the perfusion or its changes during treatment or shortly after. The use of a hybrid system with MRI control gives the opportunity for short time differences between heating and measurement.

Material and Methods

Before a planned hyperthermia treatment and directly after power-off of hyperthermia we made T1-weighted images with a high time-resolution of the tumor bearing region. From the temporal course of the signal enhancement in the dynamic contrast enhanced magnetic resonance imaging (DCE-MRI) a perfusion-index was estimated for the tumor, the tumor's rim and other regions of interest (ROIs). The changes of these perfusion-indices (basal conditions versus hyperthermia induced) were determined for five patients.

Results

The rim of the tumor has a higher perfusion than the tumor core. On average the tumor perfusions are reduced during the heat treatments. The first heat treatments show a higher reduction than the later. The normal tissues such as various muscle regions (ROIs) show a notably increase of the perfusion-index during heat treatment.

Conclusion

Hyperthermia induces changes of the perfusion in tumors and in normal tissues. This behaviour of tumor perfusion might be an important prognostic factor. Especially the first heat treatment seems to be the most important and a determinant for the outcome. Further investigations in this direction are justified.