

## **MAGNETIC FLUID HYPERTHERMIA (MFH) AS AN ALTERNATIVE OPTION IN THE TREATMENT OF RECURRENT MALIGNANT GLIOMAS**

**Maier-Hauff K.\* , Jordan A., Nestler D., Scholz R., Feussner A., Gneveckow U., Wust P., Felix R.**

Bundeswehrkrankenhaus Berlin, Neurosurgery and Charité University Clinic Berlin,  
Radiation Medicine

### **Background:**

The prognosis of glioblastoma (GB) remains poor despite the better neuro-imaging modalities and neurosurgical techniques. The survival of patients (PTS) depends on local tumour control, which is not guaranteed by the actual standard therapy.

Magnetic fluid hyperthermia (MFH) in combination with external irradiation (RT) is a worldwide new method, which heats up selectively tumour tissue coupling a magnetic field to the applied magnetic fluid (MF).

### **Aim and Methods:**

In a phase I study with 16 PTS the applicability and tolerance of MFH combined with RT was evaluated.

We present our preliminary results in 16 PTS. Depending on the tumour volume we implanted navigated 1-4 ml MF in the tumour area. The MF consists of iron oxide nanoparticles coated with a MG-specific shell dispersed in water. When the particles are exposed to an externally applied AC magnetic field, intratumoral steady-state temperatures of 43-50°C or even higher for thermo ablation, were achieved during 60 minutes. The target temperature was measured continuously on-line by a 0.5 mm fibre optic invasive thermometry and controlled by the field strength of the AC magnetic field applicator. Four days after surgery irradiation was applied with 2 Gy / fraction 5 times a week plus 2 sessions of hyperthermia per week over 3 weeks. Because tumour power absorption was highly reproducible in each session, only the first six MFH treatments required thermometry. Further MFH applications were completely non-invasive.

### **Results:**

In 16 PTS 98 MFH therapies were done without side effects. In-vivo measured temperatures of 46 - 50°C were highly reproducible in the target volume. In 16 cases MFH has been completed. During actual 15 months follow-up, 10 PTS showed no tumour progress where as in five PTS the tumour volume increased. Five PTS died of non tumour related complications and two PTS of tumour progress.

### **Conclusions:**

The Magnetic Fluid Hyperthermia in combination with radiation is a useful method for an intensified local treatment of recurrent glioblastomas. Temperatures of 46-50 °C were tolerated well without side effects for at least 60 minutes. This study shows that the neuro-navigated MF-implantation, the AC magnetic field treatment and intratumoral heating is highly applicable and reproducible. Despite the small number of Patients treated the results are promising.