Prospective phase II trial for recurrent high-grade malignant gliomas with capacitive coupled low radiofrequency (LRF) deep hyperthermia

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Background
Treatment of malignant gliomas is in spite of many new approaches still disappointing. Median survival time (MST) of pts. with glioblastoma multiforme (GBM) after diagnosis is 6 to 12 months.

Surgery is treatment of first choice, but in most cases healing is not possible. The aims of surgery are tumor debulking or decompression of the brain.

Radiation will double MST after surgery but high grade gliomas are not very radiosensitiveurvival.

Concomitant radiation with temozolomide could increase median survival time of pts with GM from 12.1 to 14.6 months

Rationale for Hyperthermia
• Lower thermal doses (mild to moderate T):
  - protein denaturation, esp. nuclear matrix
  - increased blood perfusion → tumor oxygenation
  - reduction of intratumoral pressure
  - reduction in DNA repair capacity
  - anti-cancer immunity, stimulation of innate and adaptive immune response
  - increase in uptake of drugs

• Higher thermal doses:
  - cytotoxic, increases tumor necrosis & apoptosis
  - vascular destruction & anti-angiogenic effects
  - synergistic response to RTx/CTx/Itx/geneTx

• Non-thermal effects:
  - electromagnetic coupling, interstitial heating

Methods & Technical
a) Technical Devices
  - radiative
  - capacitive
  - inductive

Technical Decision Making:
- radiative contraindicated (hot spots)
- capacitive indicated, selective heating and non-thermal effects
- inductive indicated with nanoparticles or liposomes containing Fe

b) Electromagnetic (13.56 MHz) vs heat

Case Report #:
Anaplastic Astrocytoma (WHO° III)

06/01 subl. resection
08/01 subl. of recur. 09-10/01 RTx (TD 60 Gy) 01-06/02 CTx (7xTemodal)
Since 06/02 LRF-DHT+ B.s.+Thal.+ELP

Primary Therapies:

Results:
Complete data where collected from all pts. and considered for evaluation if at least 1 cycle of LRF-DHT could be performed. The median follow-up time was for AA: # and GM # months. Median age: 43.9 yrs.

The overall survival times (MST) with confident intervals are listed in table 1 and the survival probabilities in table 2. Complete and partial remissions could be achieved in both groups by LRF-DHT alone.

Table 1: MST of patients with WHO° III & IV gliomas (Kaplan-Meier-Estimation)

Table 2: Survival probability (Kaplan-Meier-Estimation)

Quantifying the contributions of price, quality, and convenience to the consumer's decision-making process.