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Contribution ID: **14** Type: **Pillar 1: Therapeutic Innovations**

From functional imgaging to new traetment approaches in radaition oncology

Tuesday 8 July 2025 14:15 (15 minutes)

Tumor hypoxia and high cell density are a well-documented phenomenon in tumours and are key factors contributing to radioresistance. Consequently, overcoming these factors are a major challenge in modern radiation oncology.

Functional imaging using F-MISO-, FDG-PET-CT and multiparametric MRT provide non-invasive methods for detecting and quantifying tumor hypoxia and cellularity at a macroscopic level.
In a prospective, exploratory analysis conducted by us, we were able to determine the spatial distribution, intensity and progression of tumour hypoxia and cell density using sequential imaging in cancers of head and neck

In cooperation with the Karolinska Institutet we developed a model for calculating expected tumor control probability (TCP). This model forms the basis for the creation of individualized radiation plans that achieve TCPs of (theoretically) 80%/90%/95% considering the biological and visible properties of the tumour cells The planned (intratumoral) dose escalation should be delivered as precisely as possible (in terms of spatial localization regarding hypoxia dynamics) and ideally as effective as possible in restoring normoxia. For this reason, dose escalation in our project is planned as an initial "boost"at the beginning of radiochemotherapy as proposed from validated simulation models.

We are presenting the outlines of the Phase-I HIBERNATE-trial (Hypoxia and cell density imaging based boost for enhanced radiation therapy in head and neck affecting tumors)
In this trial we individualize radiation treatment based on biological properties visible through functional imaging comparable to molecular precision oncology. This is a fundamental change in radio oncological treatment approaches and will therefore have visionary character.

Preferred type of presentation

Primary authors: GROSU, Anca-L. (Department of Radiation Oncology, Medical Centre - University of Freiburg, Faculty of Medicine, University of Freiburg, Germany); Prof. BALTAS, Dimos; SCHÄFER, Henning (Medical Center University Freiburg)