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## Quantification of oxygen consumption in head and neck cancer using fluorescent sensor foil technology

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**Introduction:** Head and neck squamous cell carcinoma (HNSCC) patients suffer from frequent local recurrences that negatively impact on prognosis. Hence, distinguishing tumor and normal tissue is of clinical importance as it may improve the detection of residual tumor tissue in surgical resection margins and during imaging-based surgery planning. Differences in O<sub>2</sub> consumption (OC) can be used to this aim, as they provide options for improved surgical, image-guided approaches.

**Methods:** In the present study, the potential of a fluorescent sensor foil-based technology to quantify OC in HNSCC was evaluated in an in vitro 3D model and in situ in patients.

**Results:** In vitro measurements of OC using hypopharyngeal and esophageal cell lines allowed a specific detection of tumor cell spheroids embedded together with cancer-associated fibroblasts in type I collagen extracellular matrix down to a diameter of 440 μm. Pre-surgery in situ measurements were conducted with a handheld recording device and sensor foils with an oxygen permeable membrane and immobilized O<sub>2</sub>-reactive fluorescent dyes. Lateral tongue carcinoma and carcinoma of the floor of the mouth were chosen for analysis owing to their facilitated accessibility. OC was evaluated over a time span of 60 seconds and was significantly higher in tumor tissue compared to healthy mucosa in the vicinity of the tumor.

**Discussion:** Hence, OC quantification using fluorescent sensor foil-based technology is a relevant parameter for the differentiation of tumor tissue of the head and neck region and may support surgery planning.

Keywords: tumor hypoxia, HNSCC, tumor imaging, head and neck cancer, oxygen consumption