AbstractID: 10819 Title: Quantification of tumor proliferation and hypoxia with PET/CT imaging of HNSCC patients receiving VEGF-targeted therapy.

Purpose: While the integration of anti-angiogenic therapies into standard chemoradiotherapy regimens has improved patient outcome in clinical trials, effective methods for early response assessment are lacking. This study quantifies tumor response to a VEGF-targeted agent through PET imaging of proliferation and hypoxia.

Method and Materials: Patients with head and neck squamous cell carcinoma (HNSCC) received monotherapy with bevacizumab, an agent targeting VEGF-A (vascular endothelial growth factor-A). After three weeks, patients received standard chemoradiotherapy regimens in addition to continued anti-angiogenic therapy. PET images were acquired utilizing [^{18}F]FLT (a proliferation marker) and [^{61}Cu]Cu-ATSM (a hypoxia marker) at baseline, after VEGF-targeted monotherapy, and after two weeks of combined therapy. Images were co-registered by bony anatomy, then PET images were normalized by injected dose and body weight (SUV) and muscle uptake (T/M ratio) and evaluated in tumor and nodal regions.

Results: Inhibition of tumor proliferation (measured by FLT PET) was statistically significant in a paired t-test. Cumulative SUV decreased from 1900 ± 300 to 1300 ± 200 ($p=0.003$) after VEGF-targeted monotherapy and 1300 ± 200 to 850 ± 120 ($p<0\ .0001$) after combined therapy. Similar trends were found with maximum SUV and T/M ratio. Tumor hypoxia (measured by Cu-ATSM PET) did not show statistically significant trends after bevacizumab monotherapy or combined chemoradiotherapy.

Conclusion: This pilot study indicates anti-proliferative effects from VEGF-targeted monotherapy as well as combined VEGF-targeted and chemoradiotherapy in patients with HNSCC. Preliminary results did not indicate a statistically significant trend in tumor hypoxia from SUV and T/M analysis; further correlation with biological information may be required to evaluate hypoxic response. Ultimately, quantification of proliferative and hypoxic response may prove essential to early response assessment and the optimization of anti-angiogenic therapies into patient treatment regimens.

Conflict of Interest (only if applicable):