Metabolic Tumor Volume as a Predictive Imaging Biomarker in Head and Neck Cancer – Pilot Results from RTOG 0522

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ABSTRACT

Purpose

To evaluate predictive capability of FDG PET/CT for head and neck chemoradiationtherapy outcomes in the cooperative group trial setting.

METHODS

RTOG 0522 randomized patients with locally advanced head and neck cancer to either radiation with concurrent cisplatin or arm B: radiation with concurrent cetuximab and carboplatin. Arm B: radiation with concurrent cetuximab and carboplatin. Arm A: radiation with concurrent cisplatin. Baseline SUV and MTV were measured with PET/CT and were compared with treatment outcomes. The primary tumor MTV defined as continuous variable with local-regional control as outcome. The correlation was significant for both arms (R² = 0.32, p < 0.01). Patients with primary tumor MTV > median had a 2.31 increased risk of local-regional failure (HR: 2.31, 95% CI: 1.02-5.19, p = 0.045).

RESULTS

CONCLUSIONS

This sub-study from RTOG 0522 suggests a strong inverse correlation between baseline primary tumor MTV and chemoradiation outcomes for locally advanced head and neck cancer. This finding remains preliminary and requires technical refinement and clinical validation in the cooperative group setting.

BACKGROUND

• Effective patient selection drives successful clinical cancer trial design. Tissue-based biomarkers have been used towards this end, but tumor collection to expose potential predictive measures is expensive and an alternative means to define disease phenotype and treatment outcomes.

• Some series suggest FDG-PET measures, such as maximum or peak standardized uptake value (SUVmax - SUVpeak) as imaging biomarkers for radiotherapeutic outcomes. However, other reports refute the predictive value of SUV and quantitative head and neck FDG-PET outcome measures remain untested in the cooperative group setting.

• RTOG 0522 subjects were eligible for baseline and post-treatment PET/CT imaging analysis. We evaluated SUV measurements and metabolic tumor volume outcomes from PET/CT images as candidate biomarkers for treatment outcomes.

OBJECTIVES

• Correlation of pre- and post-treatment PET/CT scan findings with progression-free survival, overall survival, and local-regional control in patients participating in the sub-study of the trial.

• This sub-study from RTOG 0522 suggests a strong inverse correlation between baseline primary tumor MTV and chemoradiation outcomes for locally advanced head and neck cancer. This finding remains preliminary and requires technical refinement and clinical validation in the cooperative group setting.

METHODS

• Patients enrolled in RTOG 0522 with nodal disease ≥ 3cm (N3-2) were eligible to participate in this optional PET/CT study.

• Patients who agreed to participate in the PET/CT study and for whom at least one PET image set was available for central review were included in its analysis.

• All centers participating in this imaging study had to provide one test case to the ACER PET Core Lab to credential their image transfer capabilities and image quality.

• SUV normalized by specific injected dose and patient weight was calculated on centralized review by two clinically specialized head and neck radiation oncologists (DSI and MY) employing commercial image analysis software (iMR Software, v.5.2, Cleveland, OH).

• Detection of primary and nodal disease by FDG-PET/CT was determined qualitatively as FDG uptake greater than surrounding normal soft tissue with a CT-detected anatomic primary disease or nodule.

• SUV peak for primary and nodal disease was automatically defined with a 10 mm-diameter circular (2-dimensional) region of interest (ROIpeak) centered on SUVmax. Primary and nodal MTV was defined as tumor volume above 40% SUVmax.

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