

# **AIRSTREAM: Artificial Intelligence (AI)-Based Lesion Kinetics Appraisal for the Selection of Therapeutic Targets for Focal Stereotactic Body Radiation Therapy (SBRT) in Patients with Oligoprogressive Metastatic Castration Resistant (mCRPC).**

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**BACKGROUND:** Metastasis directed therapy (MDT) is a novel treatment strategy for metastatic castration resistant prostate cancer (mCRPC) which aims to control disease by targeting each focus of prostate cancer. With emerging imaging and quantitative analysis strategies using artificial intelligence (AI), there may be opportunities to further optimize MDT.

**METHODS:** A previous study (clinicaltrials.gov: NCT01867333) conducted at the NCI enrolled patients with mCRPC and treated them with an enzalutamide-based regimen (i.e., enzalutamide with or without a therapeutic cancer vaccine, Prostavac). A subset of patients underwent serial <sup>18</sup>F-NaF PET/CTs with in parallel with conventional imaging (i.e., CT and <sup>99m</sup>Tc bone scintigraphy). In a post-hoc analysis, an automated, AI-based convolutional neural network was used to analyze longitudinal <sup>18</sup>F-NaF PET/CT imaging data for each patient.

**RESULTS:** Sixty-seven <sup>18</sup>F-NaF PET/CTs from 18 patients (median age 65 years old, min-max: 52-85) were evaluated. Four patients had stable disease, while the remainder (n=14) demonstrated progression on CT and bone scan. The post hoc analysis suggested when patients experience progression on <sup>99m</sup>Tc bone scintigraphy it occurred in a minority of lesions (i.e., oligoprogression). A single patient with a baseline PSA of 6.58 ng/ml enrolled on the study and had stable disease for 25 months with a nadir PSA of 0.89 ng/ml. Ultimately, he had mild back pain for which he received palliative radiation. At the time his PSA had risen to 37.8 ng/ml despite no progression on conventional imaging. Subsequently he had >90% PSA response from 37.8 ng/mL to 2.8 ng/mL after SBRT. This enabled the patient to continue enzalutamide-based therapy without treatment intensification, prolonging his progression free survival (PFS) by 23 months while sparing the toxicity of additional treatment. On retrospective review, he underwent radiotherapy to the sole focus of oligoprogression, which resulted in extension of biochemical progression free survival.

**CONCLUSION:** Utilizing AI-based targeted MDT with SBRT has the potential to prolong the durability of 1<sup>st</sup>-line standard therapy for patients with advanced prostate cancer. A planned study will prospectively evaluate the use of this AI-based MDT strategy in patients with mCRPC on 1<sup>st</sup>-line therapy utilizing serial PSMA-based imaging.

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