The Dynamics of Brain Metastasis in Non-Small Cell Lung Cancer

Kohli, Khushi (School: Olathe North High School)

Lung cancer is the leading cause of cancer mortality globally, made particularly deadly by asymptomatic metastasis in the early stages of cancer development. A solid understanding of the dynamics of non-small cell lung cancer (NSCLC) brain metastases over time may be valuable in more accurately evaluating the aggressiveness of cancer progression and guide more individualized treatment and prognosis, yet to date little remains known about their growth patterns and the extent of their impact on patient outcome. Here, we present a retrospective analysis of a large cohort of NSCLC patients with brain metastasis and demonstrate that tumor dynamics serve as an important predictive and prognostic factor at different treatment stages. By fitting exponential models of tumor growth to extract growth rate for each metastasis, we extrapolated the age of each metastasis, compared changes in tumor dynamics across treatment modalities, and evaluated the ability of tumor growth and appearance rate in predicting overall survival. It was found that metastasis dynamics accurately estimate time of metastasis establishment, suggest that metastasis size may not be significant in treatment decisions, and predict prognostic outcomes. Given their potential ability to predict metastasis progression, the incorporation of tumor dynamics as a predictive and prognostic factor in NSCLC treatment may inform development of better screening protocols for earlier metastasis detection, guide more individualized treatment plans, and provide more accurate prognoses of NSCLC patients with brain metastasis.

Awards Won: