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A Predictive Nomogram for Small Intestine Neuroendocrine Tumors (NETS)

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BACKGROUND: Small Intestine NETs are concerning due to their high rate of metastasis and the associated poor survival with metastatic disease. Prognostication is challenging due to inconsistencies in currently available grading and staging systems. Nomograms and prognostic scores are being proposed to address these limitations. However, none is specific to the US population. This study aimed to develop a nomogram for small intestine NETs which includes a parsimonious inventory of routinely available prognostic factors and is developed using United States population based data.

METHODS: Patients diagnosed with small intestine NETs between 2004 and 2015 were selected from the Surveillance, Epidemiology, and End Results (SEER) database. The covariates analyzed were age, sex, race/ethnicity, tumor grade, primary tumor size, depth of invasion (T), regional lymph node (N) and distant metastasis (M). Cox regression was used to generate nomogram scores and calculate 5 and 10 year disease specific survival. Internal validation was done on a randomly selected subset of the data.

RESULTS: A total of 2,734 small intestine NET patients who underwent surgery were selected: 2,050 for nomogram development and 684 for internal validation. On multivariate analysis, age ($p<0.0001$), primary tumor size (>3 cm) ($p=0.0022$), tumor grade (I, II, III, IV) ($p<0.0001$), depth of invasion (≥T3- extends beyond the muscularis propria) ($p<0.0001$), and distant metastasis ($p=0.028$) were found to be statistically significant in regression analysis and were included in the nomogram. Nomogram scores ranges from 10-80 points with an AUC of 0.76 which remained consistent in internal validation (AUC =0.75).

CONCLUSION: This small intestine NET nomogram, developed using US population based data, contains a parsimonious list of routinely available prognostic factors and maintained high predictive accuracy during development and internal validation.