# C-48

## Venous Invasion in Resected Pancreatic Neuroendocrine Tumors Is Independently Associated with Disease Free Survival and Overall Survival

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**BACKGROUND:** Venous invasion (VI) is a well-established independent prognostic indicator in gastrointestinal malignancies; however, the frequency and prognostic significance of VI in resected pancreatic neuroendocrine tumors (PanNETs) is not well established.

**METHODS:** Institutional approval was obtained for this HIPAA-compliant study. Surgical Pathology Archives at Duke University Medical Center were searched for pancreatectomy specimens performed for PanNET between 01/10/2005 to 12/30/2019. Enucleation specimens of PanNET were excluded. One hundred and forty-five cases with slides available for review and at least one year follow-up were identified. Hematoxylin and Eosin (H&E) slides were reviewed for VI, and Movat's stain was performed when there was suspicious for VI. Pathology reports and electronic medical records were also reviewed.

**RESULTS:** VI was suspected when there was a circumscribed tumor nodule adjacent to a muscularized artery and was identified in 47 of 145 (32%) cases. While 17 of the 47 (36%) cases with VI showed partially intact venous walls lined by endothelial cells, which could be recognized on H&E stain, Movat's stain was necessary to confirm VI in most cases. VI was correlated with larger tumor size, higher WHO tumor grade, extra-pancreatic extension, lymph node metastasis and liver metastasis ($p<0.05$). In addition, VI was associated with a worse overall and disease-free survival ($p<0.001$). In univariate analyses, tumor grade ($p=0.02$), VI ($p<0.001$), T stage ($p=0.04$) and M stage ($p=0.008$) were associated with overall survival, whereas tumor grade, VI, T stage, N stage and M stage were all associated with disease-free survival ($p<0.0001$). In multivariate analyses, only VI was independently associated with both overall survival ($p=0.02$) and disease-

free survival (p=0.01).

**CONCLUSION:** VI in resected PanNETs is not uncommon, and is a poor prognosticator. Extra care should be taken to identify VI in pancreatectomies for PanNETs.

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