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Lymphovascular Invasion, Tumor Growth Pattern and Fibrosis in Pancreatic Neuroendocrine Tumors: Qualitative Imaging Correlates on Preoperative CT/MRI in a Series of 136 Cases

Motoyo Yano[1]; Nikolaos Trikalinos[1]; Greg Williams[1]; Amber Salter[1]; Samantha Lancia[1]; Chet Hammill[1]; William Hawkins[1]; Deyali Chatterjee[1]

[1]Washington University School of Medicine

BACKGROUND: Lymphovascular invasion (LVI), infiltrative growth pattern, and fibrosis in resected pancreatic neuroendocrine tumors (NET) are some of the pathologic risk factors for tumor recurrence and decreased survival. The goal was to determine if these pathological variables have qualitative imaging correlates on preoperative imaging.

METHODS: In this single institution retrospective study, a surgical database of resected pancreatic NET was queried and those cases with preoperative contrast enhanced CT and/or MRI were included. Pathological assessment of LVI, growth pattern (circumscribed or infiltrative), and intratumoral fibrosis (classified into no significant fibrosis, predominantly collagenous/mature fibrosis, or active fibroblastic stromal response/immature fibrosis) was performed. Radiological assessment for tumor enhancement (homo- or heterogeneous enhancement; hyper, hypo, or isoenhancement; progressive enhancement), tumor contour (round, lobulated, ill-defined), ductal dilatation, calcification, cystic components, tumor thrombus, vascular occlusion, and upstream atrophy was performed. Chi-square/Fisher's exact tests were performed to evaluate for associations.

RESULTS: One hundred thirty six tumors were included. LVI was present in 56 of 133 cases. Circumscribed growth pattern was seen in 98 of 124 cases. No

substantial fibrosis was present in 68 cases, mature fibrosis was present in 38 cases, and immature fibrosis was present in 18 cases. LVI was associated with round contours and absence of LVI was associated with lobulated contours (62.5% vs 42.1% and 51.3% vs 28.6%, p=0.032). An infiltrative, rather than circumscribed, growth pattern on pathology was associated with ill-defined contours on imaging (19.2% vs 5.1%, p=0.048. No/mature fibrosis, rather than immature fibrosis, was associated with calcifications (24.3% vs 0%, p=0.038). No significant associations were found with other qualitative variables.

CONCLUSION: Tumor contour on preoperative imaging is associated with LVI and growth pattern. Presence of calcifications indicates absence of immature fibrosis.