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Mass Spectrometry Imaging in the diagnosis of difficult Atypical Spitzoid Neoplasms

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Background: Previously using Mass Spectrometry Imaging (MSI) we discovered proteomic differences between benign Spitz nevus (SN) and Spitzoid malignant melanoma (SMM).

Objective: To investigate whether Mass Spectrometry Imaging can help in the diagnosis of difficult Atypical Spitzoid Neoplasms (ASN); to correlate the results with clinical behavior; and to compare to histopathologic diagnosis.

Methods: We conducted a retrospective collaborative study involving centers from 11 countries and 10 institutions in the US. One hundred and four ASNs were analyzed by Mass Spectrometry Imaging. We divided the patients into 4 clinical groups with Groups 1 to 4 representing best to worst clinical behavior. We then correlated the clinical outcome with the Mass Spectrometry Imaging and histopathologic diagnosis.

Results: Statistical analyses revealed a very strong association between the diagnosis of SMM by Mass Spectrometry Imaging and clinical category when clinical Group 1 was compared to Groups 2, 3 and 4 with a $p < 0.0001$. We also compared different melanoma prognostic factors: age, gender, location, depth, ulceration status and mitotic rate. Of those only older age and greater depth were strongly associated with clinically aggressive behavior and poorer outcome ($p = 0.01$).

Conclusions: In this study Mass Spectrometry Imaging diagnosis of ASN showed stronger association with clinical outcome than did histopathologic diagnosis. Diagnosis of Spitzoid malignant melanoma by Mass Spectrometry Imaging was statistically strongly associated with aggressive clinical behavior. Mass Spectrometry Imaging analysis using a proteomic signature can provide reliable diagnosis as well as clinically useful and statistically significant risk assessment for Atypical Spitzoid Neoplasms.

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