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Discrimination of malignant melanoma from malignant melanoma suspicious nevi by non invasive in-vivo NIR-FT Raman spectroscopy

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Background:

There is a need for new methods for non-invasive, preoperative diagnosis of malignant melanoma (MM).

Methods:

We investigated the chemical structure of the skin melanin, proteins and lipids using Raman spectroscopy. Raman spectra were recorded from 0 - 3500 cm^{-1} (wavenumbers), and analyzed in the fingerprint region normally dominated by protein and lipid bands from 1100 to 1800 cm^{-1} , and above 2600 cm^{-1} for water content.

We obtained Raman spectra of 46 pigmented lesions, which clinically and dermoscopically had been classified as suspected for MM. All lesions were excised and histopathologically diagnosed.

Results:

26 lesions were histopathologically diagnosed as MM whereas 20 represented benign nevi (NV). Comparing MM spectra with NV and normal skin, presented novel peaks at 1605 cm^{-1} and at 1550 cm^{-1} . Additionally we detected peak shifts from 1255 cm^{-1} to wavenumbers around 1300 to 1340 cm^{-1} . The peaks at 1550 cm^{-1} and 1605 cm^{-1} are likely to arise from increased amount of melanin and hemoglobin in the lesions.

Discussion:

The diagnosis of MM versus clinically suspicious NV can be performed with a sensitivity of 81% (21/26) and a specificity of 70% (14/20), with peak intensity at 1550 cm^{-1} and intensity ratio 1310 cm^{-1} /1255 cm^{-1} as significant parameters in the binary logistic regression. In addition, using linear regression, we found a high correlation ($r^2=0.85$, $p<0.0001$) between the thickness of the MM lesions and; intensity of the peaks at 1550 cm^{-1} and 1605 cm^{-1} , intensity ratio 1310 cm^{-1} /1255 cm^{-1} and skin water content (wide peak around 3250 cm^{-1}).