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Correlation of image analysis features and visual morphology in melanocytic skin tumours using in vivo confocal laser scanning microscopy.

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ABSTRACT

BACKGROUND/PURPOSE: In vivo confocal laser scanning microscopy (CLSM) represents a novel imaging tool that allows the non-invasive examination of skin cancer morphology at a quasi histological resolution without biopsy. Previous studies dealt with the search for diagnostic, but subjective visual criteria. In this study we examined the correlation between objectively reproducible image-analysis features und visual morphology in melanocytic skin tumours using CLSM.

METHODS: Eight hundred and fifty-seven CLSM tumour images including 408 benign nevi and 449 melanoma images were evaluated. Image analysis was based on features of the wavelet transform and classification tree analysis (CART) was used for classification purposes. In a second step, morphologic details of CLSM images, which have turned out to be of diagnostic significance by the classification algorithm were evaluated.

RESULTS: CART analysis of the whole set of CLSM images correctly classified 97.55% of all melanoma images and 96.32% of all nevi images. Seven classification tree nodes seemed to indicate benign nevi, whereas six nodes were suggestive for melanoma morphology. The visual examination of selected nodes demonstrated that monomorphic melanocytic cells and melanocytic cell nests are characteristic for benign nevi whereas polymorphic melanocytic cells, disarray of melanocytic architecture and poorly defined or absent keratinocyte cell borders are characteristic for melanoma.

CONCLUSION: Well-known, but subjective CLSM criteria could be objectively reproduced by image analysis features and classification tree analysis. Moreover, features not accessible to the human eye seem to contribute to classification success.