



PIGMENTATION

AUTOMATED SCORING OF VITILIGO USING SUPERPIXEL-GENERATED COMPUTERIZED DIGITAL IMAGE ANALYSIS OF CLINICAL PHOTOGRAPHS: A NOVEL AND CONSISTENT WAY TO SCORE VITILIGO

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Background: Vitiligo Area Scoring Index score (VASI) is a validated tool for assessing severity of vitiligo, but is subject to inter- and intra-observer variability.

Objectives: We aim to develop and validate a novel image analysis software designed to automatically calculate areas of depigmentation in vitiligo from computer image analysis of clinical photographs, thereby deriving automated VASI scores.

Materials and Methods: The automated algorithm was developed in collaboration with image analysis experts. The algorithm converts clinical photographs into superpixels using linear spectral clustering. Superpixels are used for feature extraction and classification of vitiligo versus non-vitiligo areas. Segmented vitiligo area is expressed as a percentage of the total body surface area (BSA). This is subsequently validated in a prospective clinical trial. 21 vitiligo patients undergoing narrowband UVB (NB-UVB) light therapy treatment for vitiligo were recruited. VASI scores were obtained during the clinical visits at baseline before treatment initiation, 3 and 7 months post treatment. Trunk photos were taken at each time point and sent for digital image analysis to determine percentage BSA involvement. Algorithm-derived percentage BSA were then compared with both VASI(c) score done during clinical visits and VASI(p) score of clinical photographs by dermatologists.

Results: Automated VASI (aVASI) scores from our computerized algorithm produced estimates of skin depigmentation that were correlated significantly with both VASI(p) and VASI(c) with correlation coefficients of above 0.7 and p-values less than 0.001. aVASI scores correlate better with VASI(p) ($r=0.97$) than VASI(c) ($r=0.71$) as there is much more variability in VASI score done during clinical visits.





Conclusions: This algorithm proposes a novel approach in scoring of vitiligo using digital image analysis which is consistent and reliable. It is a tool that would enable clinicians to standardize vitiligo severity scoring and outcome measures in an easy and reproducible manner, enabling different treatment options to be compared accurately.

