



DERMOSCOPY AND SKIN IMAGING

ARTIFICIAL INTELLIGENCE FOR THE OBJECTIVE ASSESSMENT OF ACNE GRADING IN CLINICAL TRIALS

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Introduction: The evaluation of Acne using ordinal scales reflects the clinical perception of severity but it has shown low reproducibility both intra- and inter-rater. Existing assessment methods do not provide a reliable estimate of acne severity, which in turn impedes their application in clinical trials.

Objective: To investigate if Artificial Intelligence (AI) trained on images of Acne patients can perform acne grading with reliabilities superior to those of expert physicians.

Methods: 479 patients with acne grading ranging from clear to severe and sampled from three ethnic groups (White-Caucasian, Black-African, Asian) participated in this study. Multi-polarization images of facial skin of each patient were acquired from five different angles using the visible spectrum. An AI was trained using the acquired images to output automatically a measure of Acne severity in the 0-4 numerical range (IGA). The images of each patient were fed to a Multilayer Perceptron Network together with the IGA classification of the same patient performed by dermatologists (ground truth). As a result of the training process, the AI "learned" to build up its own rules to determine which combination of the input features was relevant for evaluating the IGA grading.

Results: The AI recognized the IGA of a patient with an accuracy of 0.854 and a correlation between manual and automatized evaluation of $r=0.958$ ($p<.001$).

Discussion: In this work we obtained a remarkable result for three reasons. In fact, this is the first time that an AI was able to directly classify acne patients according to an IGA ordinal scale with no human intervention and no need to count lesions. Second, the accuracy observed is comparable to those reported for skilled physicians. Third, the algorithm was tested on a large dataset comprising subjects belonging to three different ethnic groups, suggesting that the observed results have a high generalizability.

