Conclusions | Future studies of MTD could benefit from targeting partner-assisted SSEs, increasing the number of SSEs to generate more lesions submitted for telediagnosis, assessing the effect of dermatologists’ feedback between SSE rounds, and submitting lesion location photographs. The process of lesion selection decision making using MTD or other lesion selection aids merits further investigation.


Perniosis is a local inflammatory disorder caused by protracted exposure to nonfreezing cold.1 The pathogenesis of this disorder is not fully understood but is likely of microvascular origin.2

We describe a novel method to evaluate cutaneous blood flow in a typical patient with perniosis, a woman in her 20s who was referred to the dermatology clinic with a 10-day history of painful purple discoloration on her toes that began shortly after running in cold weather. She had no lesions on her fingers and no systemic symptoms except for fatigue. Her family history was negative for autoimmune disease. The results of a workup that included complete blood cell count, antinuclear antibody cryoglobulins, and cold agglutinins were negative except for a slightly decreased white blood cell count and 8% atypical lymphocytes, which later normalized. She was placed on a regimen of nifedipine (10 mg twice daily). Her skin symptoms resolved during 3 months but recurred when exposed to cold and when stopping nifedipine.

Methods | This study was approved by The Pennsylvania State University institutional review board. Both written consent and verbal consent were obtained from the participants. Measurements were obtained weekly for 4 weeks during the course of treatment. The protocol was repeated in a healthy age- and sex-matched individual.

The patient donned a water-perfused suit that covered the entire body and was instrumented with thermocouples on the dorsomedial, lateral, and mid-right foot for measurement of skin temperature. A laser Doppler flowmetry probe in a local heater was placed on the left foot in an area unaffected by ulcerations. Blood pressure was measured continuously throughout the protocol.

First, 33°C water was perfused through the suit for thermoneutral measurements, and then 48°C water was perfused to increase the mean skin temperature and stimulate cutaneous vasodilation. A laser-speckle contrast image (LSCI) (mooFLPI; Moor Instruments) was obtained of the right foot to visualize cutaneous blood flow throughout the protocol. The patient was returned to thermoneutral, and the local heater on the left foot was increased to 42°C to induce local endothelial nitric oxide synthase—dependent vasodilation.4 Laser Doppler flux under the local heater was measured throughout local heating. Cutaneous vascular conductance (CVC) was calculated as an index of skin blood flow using the following equation: CVC = Flux/MAP, where MAP indicates the mean arterial pressure.

Results | Figure 1 shows an LSCI and the mean skin temperature of the right foot of a healthy control subject (left pan-
els) and the patient with perniosis at baseline (middle panels) and following 4 weeks of nifedipine treatment (right panels) during thermoneutral (A) and warming (B) conditions. No appreciable differences were observed between the patient and the control subject at thermoneutral. The patient had reduced cutaneous vasodilation and lower skin temperature in her foot during whole-body warming. 

Figure 2. Cutaneous Blood Flow Response to Local Heating

Representative tracing of cutaneous blood flow (cutaneous vascular conductance [CVC]) response to local heating (A) and plateau in CVC due to local heat data from the left foot of a healthy control subject and the patient with perniosis at baseline and following 4 weeks of nifedipine treatment (B). The patient had a lower cutaneous vasodilation response to local heating at baseline. Cutaneous vasodilation responses were increased following 4 weeks of treatment. CVC is given as laser Doppler flux divided by the mean arterial pressure. Time is in minutes, with each hash mark on the x-axis representing 10 minutes.

Discussion | This case highlights the LSCI as a novel method for assessment of cutaneous blood flow in patients with cold-related disorders. In the patient with perniosis, cutaneous blood flow of the foot assessed with an LSCI was reduced, and microvascular reactivity to an endothelial nitric oxide syn-
Use of a Mobile Application to Characterize a Remote and Global Population of Acne Patients and to Disseminate Peer-Reviewed Acne-Related Health Education

Acne is estimated to affect 85% of all people at some point in their lives and has been associated with psychosocial morbidity. Education is an integral component to the treatment of acne, and it is recognized that many patients receive educational information about acne from sources other than health care professionals. Mobile applications (apps) have seen explosive growth since the introduction of smartphones, with annual download projections for health apps reaching as many as 142 million by 2016. The field of mobile health apps, still in its early stages, has been scrutinized for lack of comprehensive regulation and rigorous expert oversight. Despite the challenging start, well-designed apps remain promising tools for collection of data from large populations and for dissemination of health information, particularly the predominantly adolescent and young adult acne population that increasingly uses smartphones.

Methods | Based on observations of patients inquiring about dietary influence on acne, but lacking an accessible and credible mobile reference, we created a mobile app that systematically reviews current medical evidence on the topic. English language publications available online prior to March 15, 2013, were identified via PubMed literature search using search terms diet and acne and diet and nutrition. The peer-reviewed literature was systemically formulated into a mobile app, which was made available in English for download free of charge via the iTunes app store (Apple Inc) under the title “diet & acne.” After the app was made available, the institutional review board (IRB) at Northwestern University approved it along with a link within the app that takes users aged 18 years or older to a voluntary, anonymous survey. Survey items were developed to assess patient characteristics and patient interaction with the app. Data regarding app downloads and survey responses were collected via iTunes and Web Survey Creator, respectively, for a 5-month period starting April 1, 2013, and ending August 31, 2013.

Results | The diet & acne app was newly downloaded to 5507 devices in 98 different countries. Updates to the IRB-approved version of the app from the previously downloaded version totaled 2233. A total of 110 people who downloaded the app completed the survey. Self-reported characteristics of survey respondents are summarized in Table 1. Forty-one respondents (37.3%) reported that they had not seen a physician for their acne, and 96 (87.3%) reported acne duration greater than 1 year. A total of 105 respondents (96.3%) found the app by searching the iTunes app store with varied terms, the most common being diet and nutrition. Additional respondents (96.3%) found the app by searching the iTunes app store with varied terms, the most common being diet and nutrition.

Conflict of Interest Disclosures: None reported.

Additional Contributions: Jane M. Pierzga, MS, Department of Kinesiology, The Pennsylvania State University, provided technical assistance. We thank the participants for their cooperation in this case study.

Author Contributions: Ms Stanhewicz and Dr Alexander had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Stanhewicz, Bruning, Alexander.

Acquisition of data: Stanhewicz, Bruning.

Analysis and interpretation of data: All authors.

Drafting of the manuscript: All authors.

Clinical revision of the manuscript for important intellectual content: Stanhewicz, Ferguson, Alexander.

Administrative, technical, or material support: All authors.

Study supervision: All authors.

Additional Contributions: Jane M. Pierzga, MS, Department of Kinesiology, The Pennsylvania State University, provided technical assistance. We thank the participants for their cooperation in this case study.


Letters