achieving HiSCR-75 and HiSCR-100 at weeks 12 and 24 (Figure 1a).

Brodalumab administration weekly over 24 weeks in a pilot cohort of 10 participants with HS did not identify significant safety concerns. A 100% HiSCR response was observed at week 4. In contrast to E2W dosing,[2] no cyclical disease suppression or recurrence was observed. Weekly dosing has a more rapid onset of disease suppression as measured by HiSCR; however, these differences were largely negligible by week 24 (Figure 1a).

Limitations include the small cohort (n = 10), lack of a placebo arm and limited timeframe of assessments (24 weeks). Given that other studies have excluded participants with more than 20 draining tunnels, this cohort gives a unique insight into the effect of brodalumab on a largely excluded patient population. Given the uncertainty regarding the natural variation in disease activity in HS, further placebo-controlled studies are necessary to validate the observed improvements.

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## Quantification of skin sensitivity to ultraviolet radiation using ultrawideband optoacoustic mesoscopy

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Dear Editor, Phototesting is used to assess individual sensitivity to ultraviolet (UV) radiation in order to determine adequate UV dosage for phototherapy.[1] Under the standard procedure, small skin areas are exposed to increasing doses of UV radiation. The lowest UV dose that induces a delineated erythema at 24 ± 2 h after UV exposure defines the minimal erythema dose (MED).[2] Visual assessment is the gold standard for MED determination; however, this is prone to observer variability.[3] Optical methods have been considered to quantify the magnitude of erythema response. However, these methods are limited by light scattering and therefore high-resolution imaging is restricted to depths of < 200 μm, resulting in unreliable measurements.[4,5]

Ideally, a quantitative method should offer a comprehensive observation of the skin and its microvascular structure, the latter exhibiting considerable inter- and intraindividual variations likely influencing the visual appearance of erythema formation.[6] In addition, it would ensure that precisely the same skin region of interest (ROI) is measured before and after UV-induced erythema development. Also, this method should disentangle the effect of the melanin layer from the effect of the haemoglobin.

Optoacoustic techniques enable high-resolution imaging at a deeper level than purely optical methods by resolving optical contrast at ultrasonic resolutions. They work by illuminating the ROI with short laser pulses, stimulating the tissue to emit acoustic waves, which are detected by an ultrasound detector. Mathematical processing of the detected waves yields three-dimensional imaging of light-absorbing structures, such as blood vessels. Ultrawideband raster scan optoacoustic mesoscopy (UWB-RSOM) in particular, is an optoacoustic imaging modality that allows visualization of skin structures and dermal microvasculature at depths of up to 1·5 mm, reaching resolutions of up to 7 μm (axial) and 30 μm (lateral).[7,8] This process allows for the detection and quantification of microvascular features typical of inflammatory skin diseases, such as psoriasis and eczema, which are inaccessible using other methods. We wanted to investigate whether UWB-RSOM could provide high-resolution objective assessments of standard phototesting through comprehensive analysis of shallow and deep microvascular responses.

Seven healthy volunteers participated in the study, one of whom was treated as a nonirradiated control. Six skin areas measuring 2·8 × 2·5 cm in each of the six participants (one woman, five men; age range 27–66 years; Fitzpatrick skin types II–III) were exposed to increasing doses of UVB-rich radiation (wavelength 275–365 nm). The control participant did not receive UV radiation. After 24 ± 2 h an experienced

clinician determined the MED of each volunteer based on visual assessment. Before UV irradiation and at the time of clinical evaluation, the same sections of dermal microvasculature were assessed with UWB-RSOM by means of a protocol based on ink fiducial markers (Figure 1a, b). UV-induced changes in dermal total blood volume (dermal blood fraction) were quantified from identical parts of the dermal microvasculature. The ROIs were defined using microvascular bifurcations as reference from the *en face* cross-sectional images. Six nonirradiated skin areas in the control participant were imaged and quantified likewise at 0 h and 24 h.

UWB-RSOM cross-sectional views reveal the effect of the erythematous skin reaction on the whole microvascular structure after exposure to the MED (Figure 1a). As expected, the effect is more pronounced for higher doses (Figure 1a). UWB-RSOM shows UV-induced recruitment of vessels that were not previously perfused. The images also reveal vasodilation, visible as an increase in vessel diameter at different depths. Smaller microvessels and capillaries, which emit higher-frequency ultrasound signals, are shown in green; larger microvessels emitting lower-frequency signals are shown in red.

Figure 1(c) shows that the blood fraction, as measured by UWB-RSOM, increased approximately linearly as a function of UV dose. The UV dose of 25 mJ $cm^{-2}$ below the visual MED triggered an average increase in blood fraction of 5·1% (± 5·3%) and the highest dose produced an average increase of 49·6% (± 25·4%). The control measurement showed a negligible average change in blood fraction of −1·6% (± 5·6%).

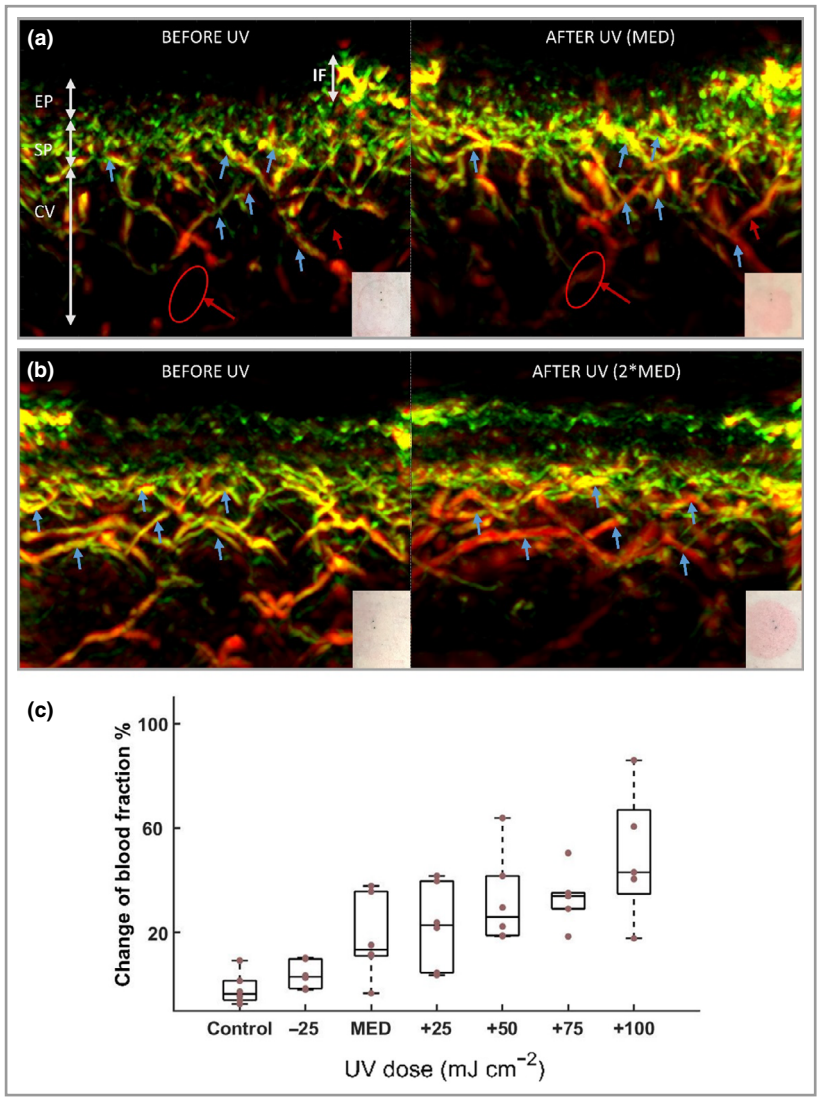


**Figure 1** (a) The same section of the dermal vasculature before and 24 h after ulatraviolet (UV) irradiation using the minimal erythema dose (MED). Vasodilation (blue arrows) and vessel recruitment (red arrows) can be observed. Clinical images are shown in the insets. (b) The same process as described in (a) with exposure increased to 2·5-fold MED. (c) Change in blood fraction corresponding to all participants irradiated with UV radiation and the nonirradiated control participant after 24 h. Doses are expressed relative to the individual MED. EP, epidermis; SP, subepidermal plexus; CV, connecting vessels; IF, ink fiducial marker.

Individual vessel diameters show a similar trend (data not shown).

Our results demonstrate that UWB-RSOM allows direct monitoring and quantification of UV-induced erythema in phototesting with unprecedented spatial precision. We imaged and quantified the effect of increasing doses of UV radiation on identical microvascular regions through the entire depth of the skin, directly observing vasodilation and vessel recruitment as a function of macroscopic erythema. Moreover, the results indicate that UWB-RSOM could be a useful tool to detect the suberythemal response of the skin to UV radiation, which may increase the sensitivity of phototesting. The UWB-RSOM prototype has certain technical limitations including motion artefacts and slight variations in laser energy, which may explain changes in blood volume in only five of six phototested skin areas exposed to the MED. However, our findings suggest that UWB-RSOM holds potential to improve the accuracy of phototesting.

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## Intralesional rituximab in the treatment of indolent primary cutaneous B-cell lymphoma

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Dear Editor, Primary cutaneous B-cell lymphomas (PCBCLs) are a heterogeneous group of extranodal lymphomas.[1] Primary cutaneous marginal zone lymphoma (MZL) and follicle centre lymphoma (FCL), the most prevalent PCBCLs, are typically indolent.

Various treatments are available for MZL and FCL, including intralesional (IL) rituximab, a chimeric monoclonal IgG antibody against CD20, a major B-cell marker.[2] However, there remain few reports of IL rituximab in PCBCL, and its ideal administration schedule remains undefined.[3–5] In this study, we evaluated the efficacy, safety and tolerability of IL rituximab in PCBCL, including the use of weekly injections – a schedule not previously described.

We reviewed the charts of adult patients diagnosed with MZL/FCL and treated with IL rituximab at McGill University's Jewish General Hospital between January 2014 and December 2018. Rituximab was prepared daily as a 3-mL aliquot of the stock 10 mg $mL^{-1}$ solution. It was injected intralesionally until the lesion blanched, for a maximum of 30 mg per session, without premedication. In the case of relapse, salvage therapy was determined accounting for patient preference of repeat IL rituximab vs. radiotherapy. We noted: age, sex, PCBCL type, tumour–nodes–metastasis stage,[2] previous treatments, number and location of lesions, rituximab dose, frequency and number of injections, treatment response, toxicity, and patient satisfaction. Treatment efficacy was evaluated by assessing clinical response according to the standardized cutaneous lymphoma criteria.[6] Response was used to compute objective response rates, i.e. the proportion of patients with either complete or partial response. This review was approved by the institutional research ethics committee.

Twelve patients were included in this series (Table 1). None had extracutaneous involvement. The median patient age was 49 years (range 19–80). Patients had local/regional disease on scalp/face, trunk, and/or extremities. Median duration of follow-up was 3·2 years (range 1·9–6·1). The median number of prior treatments was one (range 0–2). Radiotherapy was the most common prior treatment (n = 7). Only one