Quantification of granuloma volume and response to treatment in cutaneous sarcoidosis using 3-dimensional high-frequency ultrasound scan

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Cutaneous involvement occurs in 25% to 30% of patients with sarcoidosis. 1 Effective treatment of the disease has historically been challenging given a lack of an objective, reproducible marker of disease activity. Here we present a case using 3-dimensional high-frequency ultrasound (3D HFU) to quantify cutaneous granuloma volume as a measure of disease activity.

REPORT OF A CASE

The Cutaneous Sarcoidosis Activity and Morphology Instrument (CSAMI) is a visual measure of disease activity and damage previously validated by dermatologists, pulmonologists, and rheumatologists. 2,3 Noe et al 4 report that HFU shows a strong correlation with both the CSAMI clinical score and histopathologic measurements of granuloma volume, suggesting this tool may serve as an objective, noninvasive modality for measuring cutaneous granuloma burden.

A woman in her 40s with a history of pulmonary and cutaneous sarcoidosis underwent clinical and 3D HFU assessments of cutaneous sarcoid disease activity of a left dorsal forearm lesion (Fig 1, A) as part of a study at the University of Pennsylvania, using the parameters outlined in a previous study. 4 The imaging was performed by a broadband 40-MHz transducer (MS-55D; Visualsonics 2100, Toronto, CA). At her initial visit, the patient’s clinical lesional CSAMI was 7 (of 15). The 3D HFU images were analyzed through granuloma mapping using a semiautomated wire mesh overlay to outline the granulomatous inflammation visualized on the ultrasound images, and calculated granuloma volume measured 27.50 mm 3 (Fig 1, B). The patient was treated with intralesional triamcinolone (10 mg/mL, 0.5 mL total) to this site during this visit.

At an 8-week follow-up appointment, the clinical (Fig 1, C) and 3D HFU assessments of cutaneous sarcoid disease activity of the patient’s left dorsal forearm lesion were repeated (video available at http://www.jaadcasereports.org). The patient’s clinical lesional CSAMI was now 3. 3D HFU volume reconstruction of the lesion of interest was now found to measure 0 mm 3. Given there was still some clinically evident erythema, it is possible that the dermal granulomas resolved after injection, with residual epidermal thickening and pink postinflammatory erythema remaining, or that there were persistent small granulomas unable to be measured.

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via this modality. Her disease has remained clinically stable after 15 months.

DISCUSSION

Given the high prevalence of pulmonary involvement in patients with sarcoidosis, measures of active lung disease are typically used to monitor an individual’s response to treatment. In the lungs, active granulomas can be difficult to differentiate from residual scarring; therefore, lungs may not be sensitive to changes associated with treatment. The skin, however, represents the ideal organ to monitor response to change because it is easily assessable, and active granulomas can be differentiated from scarring, as demonstrated here. This case further supports the potential utility of HFU as a means of assessing disease activity in cutaneous sarcoidosis, capturing change over time and measuring response to treatment. High-frequency ultrasound systems that operate at 40 MHz are now becoming increasingly available for clinical applications. As opposed to other imaging modalities, such as positron emission tomography/computed tomography (PET/CT), 3D HFU is real-time, less expensive, and without the radiation exposure risks that accompany PET/CT. Previous reports found that HFU assessment of cutaneous granulomas correlates with clinical assessment (CSAMI) and histopathologic measures of granuloma infiltration. The noninvasive nature and low risks of ultrasonography make this tool a promising instrument to assess granulomatous inflammation over time. The use of 3D HFU seen in this case shows promise for more comprehensive evaluation of granuloma volume and disease activity; further studies are necessary to see if improvements in skin granuloma burden correlate with improvements in systemic disease activity.

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