99% for the Coolibar umbrella alone, higher than 90% for black, and lower than 90% for the various nonblack colors.

Comment. The Coolibar HU clearly outperformed the other HUs. However, the poorest performing umbrella still blocked an average of 77% of UVR. All of the black umbrellas blocked at least 90%, and most blocked more than 95%. Other colors, especially white, did not perform as well. It remains to be determined if the HU can be a socially acceptable form of sun protection in the United States. For those who are willing, our data suggest that the average rain HU is a useful adjunct, and black may be a preferable color. To our knowledge, no prior study has assessed UVR sun protection by HU, only by beach umbrellas and other larger shading devices. A limitation was small sample size. Also it is unclear how much reflective UVR a person may receive that was not picked up by the UV meter. Larger studies with other types of HUs are needed.

Josette R. McMichael, MD
Emir Veledar, PhD
Suephy C. Chen, MD, MS

Accepted for Publication: October 23, 2012.
Published Online: March 20, 2013. doi:10.1001/jamadermatol.2013.2519

Author Affiliations: Departments of Dermatology (Drs McMichael and Chen) and Medicine (Dr Veledar), Emory University School of Medicine, Atlanta, Georgia; and the Division of Dermatology, Atlanta Veterans Affairs Medical Center, Decatur, Georgia (Dr Chen).

Correspondence: Dr Chen, Department of Dermatology, Emory University School of Medicine, 1525 Clifton Rd NE, Third Floor, Atlanta, GA 30322 (schen2@emory.edu)

Author Contributions: All authors 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 analyses. Study concept and design: McMichael and Chen. Acquisition of data: McMichael. Analysis and interpretation of data: McMichael, Veledar, and Chen. Drafting of the manuscript: McMichael. Critical revision of the manuscript for important intellectual content: McMichael, Veledar, and Chen. Statistical analysis: Veledar. Administrative, technical, and material support: McMichael and Chen. Study supervision: Chen.

Conflict of Interest Disclosures: Dr Chen has held consultancies with Primus and Astellas and collects royalty payments for the following evaluative products: ItchyQoL, RosaQoL, and Scalpdex.


Oral Minocycline in Treatment of Cutaneous Sarcoidosis

Currently, therapeutic techniques used to treat cutaneous sarcoidosis rely on limited data from evidenced-based research.1,2 Bachelez et al conducted a prospective study in which 10 of 12 patients showed improvement after minocycline therapy, and Antonovich and Callen* reported the case of 1 woman who was successfully treated with doxycycline. On the basis of these encouraging reports, our clinic began to use minocycline, a commonly used anti-inflammatory acne therapy that does not require laboratory monitoring, as a first-line treatment for cutaneous sarcoidosis. The present retrospective study sought to evaluate our experience with minocycline treatment and to compare its effectiveness across sex and race.

See Practice Gaps at end of letter

Methods. This retrospective study was approved by our institutional review board. The primary data sources were paper and electronic medical records of patients with cutaneous sarcoidosis treated with minocycline at the University of Pittsburgh Department of Dermatology in the UPMC Falk Dermatology Clinic between 2005 and 2012. The data obtained from medical records included the pa-
tient's age, race, sex, extent of skin disease, systemic involvement, prior therapies, duration of minocycline use, and the outcome of this therapy. The outcomes were categorized into 3 groups based on the percentage of body surface area (BSA) that showed remission of lesions: complete remission indicated resolution across 100% of the affected BSA; partial remission indicated 50% BSA resolution; and no remission indicated 0% BSA resolution.

Patients met inclusion criteria if they sought treatment for disfiguring, biopsy-proven cutaneous sarcoidosis lesions that were extensive enough to require oral therapy. The outcome of oral therapy was recorded after at least 2 months of use, unless adverse events caused premature discontinuation. In addition, these patients were required to undergo and adhere to the regimen of minocycline treatment as prescribed by a UPMC dermatologist (J.C.E.).

Statistical analysis (significance, \( P < .05 \)) included the 1-proportion \( z \) test to evaluate difference in response to therapy across ages, the Mann-Whitney \( U \) test with a null probability of 50% to determine if more patients responded to therapy than not, and the Fisher exact test to determine all other differences, such as differences in response across race and sex.

Results. Twenty-seven patients met the inclusion criteria. Twenty-five had moderately extensive lesions (maculopapular, nodular, or plaque lesions on the face, torso, and/or extremities), and 2 had severe ulcerative lesions (scalp); no patients had classic lupus pernio (infiltrative and/or indurated plaquelike lesions). The average age of the patients at time of diagnosis of cutaneous sarcoidosis was 43 years. There were 14 men and 13 women; 17 were black, and 10 were white. Seven patients experienced lesions on the skin only; 17 had pulmonary and skin involvement; and 1 had ocular, pulmonary, and skin involvement. Sinus, muscle, and parotid involvement occurred with skin disease individually once as well. At the time of presentation, 2 patients were undergoing steroid treatment for pulmonary sarcoidosis and had persistent cutaneous lesions prior to minocycline therapy, and they continued prednisone treatment to preserve lung function. Minocycline was prescribed as first-line treatment in 18 patients and as second-line treatment in the remaining 9 (for 8 of these 9 patients, hydroxychloroquine treatment had failed, and prednisone had failed for 1 with skin-only disease). Owing to the extent of granuloma load in the skin, topical and intralesional steroids were not used during oral treatment. The average length of time until the initial therapy was assessed was 4.1 months.

Of 27 patients, 6 (22%) had complete remission; 14 (52%) had partial remission; and 7 (26%) had no remission. Of the 2 severe ulcerative cases, 1 achieved a partial remission and 1 no remission. In total, 20 of 27 (74%) patients showed response to the therapy, and the proportion of those who responded was significantly greater than those who did not respond (\( P = .02 \)) (Figures 1 and 2). There was no difference in the response of minocycline across age, race, or sex.

Adverse events often included dizziness, nausea, and blue skin hyperpigmentation. Six patients experienced hyperpigmentation, limited in 4 of these cases to the site of the lesion. White patients were significantly more likely to experience an adverse event than black patients (\( P = .04 \)), but there was no significant difference across sex.

Discussion. As a whole, this study is limited by its retrospective nature, but it appears that minocycline therapy is a promising option for treating moderate cutaneous sarcoidosis. In total, 20 of 27 patients responded to therapy (74%), and significantly more patients responded than those who did not respond. After reviewing the current literature, our clinic chooses to treat cutaneous sarcoidosis using a monotherapeutic ladder in which minocycline is prescribed as first-line therapy, followed by hydroxychloroquine, methotrexate, thalidomide, and biological agents. Randomized controlled trials are needed to further establish and compare the effectiveness of minocycline as well as all other treatments.

Talora Steen, BS
Joseph C. English III, MD

Accepted for Publication: November 22, 2012.

Author Affiliations: School of Medicine (Ms Steen) and

Figure 1. Outcomes of minocycline therapy in the present study (\( P = .02 \)). CR indicates complete remission; NR, no remission; PR, partial remission.

Figure 2. Pretreatment (A) and posttreatment (B) views of a patient with cutaneous sarcoidosis with minocycline.
Sarcoidosis is an uncommon inflammatory disorder of unknown cause defined by characteristic granulomas involving the skin in 25% to 30% of patients. Thus, dermatologists may play a role in initial diagnosis or long-term disease management. Unfortunately, there exists no standardized algorithm for managing cutaneous sarcoidosis. In their article, Steen and Ms Steen had full access to all of the data in the study and took responsibility for the integrity of the data and the accuracy of the data analysis. 

**Author Contributions:** Dr English and Ms Steen had full access to all of 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:** English. **Acquisition of data:** Steen. **Analysis and interpretation of data:** Steen and English. **Drafting of the manuscript:** Steen and English. **Critical revision of the manuscript for important intellectual content:** English. **Obtained funding:** Steen. **Administrative, technical, or material support:** English. **Study supervision:** English.

**Conflict of Interest Disclosures:** None reported.

**Funding/Support:** Ms Steen received a stipend from the University of Pittsburgh Medical School, Dean’s Summer Research Program, for her contribution.

**Role of the Sponsors:** The sponsors had no role in the design and conduct of the study; in the collection, analysis, and interpretation of data; or in the preparation, review, or approval of the manuscript.

**Additional Contributions:** We are indebted to statisticians Dan Winger, MS, and Li Wang, MS, who are supported by National Institutes of Health grants UL1 RR024153 and UL1TR000005.


**PRACTICE GAPS**

**The Dermatologist’s Role in Sarcoidosis**

Sarcoidosis is an uncommon inflammatory disorder of unknown cause defined by characteristic granulomas involving the skin in 25% to 30% of patients. Thus, dermatologists may play a role in initial diagnosis or long-term disease management. Unfortunately, there exists no standardized algorithm for managing cutaneous sarcoidosis. In their article, Steen and English present minocycline as a potential addition to the therapeutic armamentarium. Minocycline offers potential benefits for dermatologists. First, dermatologists are familiar with minocycline, including how to counsel patients and monitor for adverse effects. Second, minocycline is a nonimmunosuppressive antigranulomatous drug, allowing dermatologists to potentially avoid initial immunosuppressive agents. When dermatologists encounter cutaneous granulomatous inflammation, the differential diagnosis often includes infectious causes, such as mycobacterial infections, which in some cases minocycline may partially treat. Third, immunomodulatory or anti-inflammatory drugs such as hydroxychloroquine and minocycline may be an attractive addition to the treatment regimen for patients with persistent cutaneous sarcoidosis despite concomitant immunosuppressive therapy for extracutaneous disease. Finally, generic minocycline is often an affordable option. The low cost and lack of required laboratory monitoring make it a particularly attractive treatment in some settings.

The paucity of comparative studies and large controlled trials for cutaneous sarcoidosis treatment represents another practice gap. A pulmonology-based sarcoidosis treatment paradigm suggests treating cutaneous disease with localized therapy for limited disease (topical or intralesional agents) or hydroxychloroquine for more widespread cutaneous involvement, progressing to prednisone, methotrexate, and tumor necrosis factor inhibitors. Other treatment options include alternate antimalarial agents, thalidomide, mycophenolate, azathioprine, pentoxifylline, aminopterin, and a range of therapies with single case reports or small series, including laser and photodynamic therapy. Standardizing metrics to evaluate patients with sarcoidosis and conducting comparative studies are important to determine best treatment options for patients with cutaneous sarcoidosis. To narrow the practice gap, dermatologists should work with our colleagues in pulmonary medicine and participate in clinical trials evaluating therapeutic options for cutaneous granulomatous involvement.

Given the multisystem nature of sarcoidosis, and since cutaneous manifestations may be both prominent and persistent, dermatologists should be aware of screening recommendations. A detailed history looking at exposures and symptoms to identify extracutaneous organ system involvement is essential. A thorough physical examination including lymph node palpation and evaluation of scars and tattoos is essential. This should be coupled with ophthalmological screening and a thorough lung evaluation, often including a referral to a pulmonologist, where chest imaging and pulmonary function testing are performed. Everyone with sarcoidosis should have a cardiac evaluation, starting with an electrocardiogram. If there is a history of palpitations or any conduction abnormalities, further imaging, including dedicated cardiac magnetic resonance imaging or positron-emission tomography imaging, may be indicated. Laboratory testing should include a complete blood cell count and a comprehensive metabolic panel including liver function tests and assays for creatinine and calcium levels. Vitamin D levels may be abnormal in patients with sarcoidosis. Because the granulomas may be metabolically active, patients should have both the vitamin D25 levels and vitamin D1,25 levels checked. When patients have a history of nephrolithiasis, urine studies for hypercalciuria may be important. Sarcoidosis may coexist with other diseases as well, and a thorough workup driven by symptoms, physical examination findings, and laboratory test results is reasonable.

Sarcoidosis is an uncommon disease with frequent cutaneous involvement. Dermatologists should be prepared to recognize this entity and help guide the workup.