**Demodex Folliculitis Mimicking Acute Graft-vs-Host Disease**

Jonathan Cotliar, MD; Olga Frankfurt, MD

**IMPORTANCE** Acute graft-vs-host disease (GVHD) typically requires high-dose systemic steroids as first-line treatment. Like drug eruptions, viral exanthema, and toxic erythema of chemotherapy, *Demodex* folliculitis is a clinical mimicker of acute GVHD and requires nonimmunosuppressive therapy. This case of *Demodex* folliculitis mimicking acute GVHD highlights the need for skin biopsy in patients who have undergone a stem cell transplant with eruptions on the head and neck.

**OBSERVATIONS** A 46-year-old white woman with a history of Fms-like tyrosine kinase 3 acute myeloid leukemia presented to the dermatology clinic with a 5-day history of a nonpruritic eruption on her face and neck 28 days after undergoing a double umbilical cord blood hematopoietic stem cell transplant (HSCT). Findings from the skin biopsy demonstrated a deep dermal lymphocytic infiltrate adjacent to follicular units along with an abundance of *Demodex* mites noted within the hair follicles consistent with *Demodex* folliculitis. Oral ivermectin, 12 mg, was given, and the eruption cleared within 24 hours.

**CONCLUSIONS AND RELEVANCE** To our knowledge, this is only the fifth reported case of *Demodex* folliculitis following HSCT, but the first ever reported to be successfully treated with ivermectin. *Demodex* folliculitis should be added to the differential diagnosis of skin eruptions that arise after HSCT.

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**Case Report/Case Series**

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**Report of a Case**

A 46-year-old white woman with a history of Fms-like tyrosine kinase 3 acute myeloid leukemia presented to the dermatology clinic with a 5-day history of a nonpruritic eruption on her face and neck 28 days after undergoing a double umbilical cord blood hematopoietic stem cell transplant (HSCT) following conditioning with fludarabine, cyclophosphamide, thiopeta, and total-body irradiation. Immunosuppressive medications included mycophenolate mofetil, 750 mg twice daily, and cyclosporine, 200 mg twice daily. There had been no recent change to these medications, and the erythematous eruption was not accompanied by cough, shortness of breath, fevers, nausea, diarrhea, abdominal pain, or rhinorrhea.

The physical examination was notable for findings of patchy and confluent erythema of the face and neck (Figure 1A) without ocular, oral, or genital lesions. The rest of the patient’s skin was clear.

Laboratory evaluation revealed a white blood cell count of 2900/μL (reference range, 3500-10 500/μL), a hemoglobin level of 10.3 g/dL (reference range, 11.6-15.4 g/dL), a platelet count of 53 × 10^3/μL (reference range, 140 × 10^3/μL to 390 × 10^3/μL), and an absolute neutrophil count of 19 000/μL (reference range, 1500-8000/μL). (To convert white blood cell count to grams per liter, multiply by 10.0.) Results from serum chemical analyses were all within normal range.

Based on the timing of onset, distribution, and morphologic characteristics of the eruption, clinical grade I acute cutaneous graft-vs-host disease (GVHD) was suspected. A skin biopsy performed to confirm this suspicion, however, revealed an unremarkable epidermis with a deep dermal lymphocytic infiltrate adjacent to follicular units along with an abundance of *Demodex* mites noted within the hair follicles (Figure 2). A diagnosis of *Demodex* folliculitis was rendered. The patient was given a single oral dose of ivermectin, 12 mg, which resulted in complete resolution of her skin lesions within 24 hours, and her skin remained clear at her follow-up visit 2 weeks later (Figure 1B).

**Discussion**

The role of *Demodex* mites, regular inhabitants of the human pilosebaceous unit, in the pathogenesis of skin disease is somewhat controversial; argument exists as to whether these para-

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sites comprise normal skin flora and do not directly contribute to the development of inflammatory skin eruptions or whether they can be directly implicated as opportunistic pathogens, able to induce dermatoses of the head and neck with clinical variability. The evidence for demodicosis in papulopustular rosacea, granulomatous-like rosacea, and blepharitis is compelling, at least in subsets of patients with these conditions. Both the degree of Demodex mite infestation and serum immunoreactivity to Demodex-associated proteins have been demonstrated in patients with rosacea. Most recently, Demodex mite colonization has been determined to be increased in patients with cancer who are taking epidermal growth factor receptor inhibitors as well as in an annular facial eruption in an otherwise healthy female.

Our case is the fifth reported case of Demodex folliculitis mimicking acute cutaneous GVHD in patients following HSCT. In the 4 cases described herein, all Demodex-associated eruptions were presumed to be acute GVHD as well. Lotze et al noted a 42-year-old woman with myelofibrosis who developed confluent erythema of the face and neck on day 24 following a matched unrelated HSCT. Skin biopsy findings showed dense perifollicular inflammation with Demodex mites surrounding the hair follicles. Repeated application of hexachlorocyclohexane lotion was able to clear the eruption over the course of 3 weeks. Aisa et al reported 2 female patients with chronic myelogenous leukemia who developed pruritic eruptions on the cheeks and jawline on day 110 after undergoing HSCT. Both eruptions were also presumed to be acute GVHD, but skin biopsy results revealed Demodex folliculorum. Both patients’ skin cleared in 3 to 4 weeks with topical sulfur. Román-Curto et al reported the most recent case of demodicidosis mimicking acute GVHD in a 33-year-old woman with acute lymphoblastic leukemia who developed a desquamative facial eruption on day 197 following a matched unrelated HSCT. Skin biopsy results confirmed the presence of Demodex folliculitis, and the lesions cleared with permethrin, 5% ointment, and the combination of topical and oral metronidazole given over 2 months.

Like the aforementioned cases, the present one highlights the need to perform routine skin biopsies in patients after undergoing HSCT who develop eruptions on the head and neck, even when there is a high suspicion of acute GVHD. While more common mimickers of acute GVHD, such as drug eruptions, viral exanthema, toxic erythema of chemotherapy, drug-induced photosensitivity, or photodermatitis are more routinely misdiagnosed as acute GVHD in this patient population, Demodex-associated folliculitis must also be included in the differential diagnosis. Although the presence of Demodex mites within the epidermis does not always demonstrate pathogenicity, skin scraping with use of potassium hydroxide staining for microscopic examination may have precluded skin biopsy, in this case if a high density of mites was observed. Although ours is the fifth reported case of Demodex folliculorum in a post-HSCT...
patient, to our knowledge it is the first to be treated successfully with oral ivermectin. The rapid clearance of lesions in our patient following the single dose of ivermectin suggests that this modality may be more efficacious than the protracted courses of topicals and other oral agents given to patients in the 4 previous cases noted.

ARTICLE INFORMATION

Author Contributions: Both authors 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: Cotliar, Frankfurt.
Acquisition of data: Both authors.
Analysis and interpretation of data: Both authors.
Drafting of the manuscript: Both authors.
Critical revision of the manuscript for important intellectual content: Both authors.
Administrative, technical, or material support: Both authors.
Study supervision: Cotliar.
Conflict of Interest Disclosures: Dr Cotliar serves on the advisory board of Therakos Inc and has received honoraria. No other disclosures are reported.

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REFERENCES

NOTABLE NOTES

What’s in a Name?
Goeckerman Therapy

Meredith L. Orseth, BS, BA; Thomas G. Cropley, MD

In 1925, William H. Goeckerman of the Mayo Clinic reported the successful use of broad-spectrum UV radiation and topical crude coal tar in the treatment of psoriasis. Patients were hospitalized, and “White’s crude coal tar ointment” was applied to psoriasis patches for a period of 24 hours before removal with olive oil. The patient was then exposed to UV quartz light, and following a soap and water or “oatmeal and soda bath,” the tar was reapplied and the process repeated daily. In his article, Goeckerman stated, “If the therapist is thoroughly acquainted with the effectiveness of his lamp and handles it deftly, it should be possible to remove all patches of psoriasis, in practically all cases, in from three to four weeks.”

Now referred to as any regimen involving the application of tar products and subsequent exposure to UV radiation, Goeckerman therapy continues to be used, albeit less frequently than in the past, as an efficacious and relatively safe treatment for severe and refractory psoriasis. Almost immediately after appearing in the literature, the regimen became so utilized that Goeckerman himself expressed surprise at its widespread popularity.

Nicknamed “Unna” by fellow medical students for his passion for dermatology, Goeckerman made many contributions to the specialty beyond revolutionizing the treatment of psoriasis. As John Stokes’s first resident in the newly formed Department of Dermatology at the Mayo Clinic, and later as a faculty member, Goeckerman published original articles on an array of diseases, including lupus erythematosus, syphilis, lymphoblastoma, and epidermophytoposes. He had a unique interest in the interplay between the psyche and dermatologic conditions, and in 1930 described his hypotheses in “The Relationship of Emotions and Cutaneous Interactions” in Medical Clinics of North America. That same year, with colleagues Louis Brunsting and Paul O’Leary, he gained the distinction of being the first to describe and characterize pyoderma (eczthyma) gangrenosum in the literature. 3

Goeckerman’s classmates could not have known how apt their nickname would be: like the famous German dermatology pioneer, Paul Gerson Unna, Goeckerman has earned a place in the pantheon of dermatology greats.

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