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CASE REPORT

Inflammation and immune evasion coexist in *Treponema pallidum*–infected skin

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Key words: penicillin; secondary syphilis; sexually transmitted disease; spirochete; *Treponema pallidum*.

INTRODUCTION

Syphilis is a systemic, multistage, sexually transmitted infection caused by the highly invasive spirochetal bacterium, *Treponema pallidum*, subspecies pallidum. In the United States, the annual rate of primary and secondary syphilis (SS) between 2002 and 2016 has increased from 2.1 to 8.7 cases per 100,000.1 Gestational and congenital syphilis cases have also increased in the last few years. There is no evidence of a change in *T pallidum* susceptibility to penicillin as an explanation for the significant increase in the number of syphils cases in the United States. It is more likely that changes in risk-taking behavior in the general population are responsible for this change.1 Although syphilis is easily treatable with penicillin, if left untreated up to one-third of syphilitic patients will go on to have the typical complications associated with tertiary syphilis.2 It is therefore critically important for clinicians to be well versed in the classic and not so classic dermatologic manifestations of the disease.

CASE PRESENTATION

We present a case of a 62-year-old man from Cali, Colombia, with a 20-day history of hyperpigmented annular macules and plaques on his palms and soles and annular psoriasiform plaques on his legs and the back of his neck (Figs 1 to 3). A few small painless cervical lymph nodes were noted. Serologic studies revealed a rapid plasma reagin titer of 1:64 dils, which was later confirmed by positive fluorescent treponemal antibody absorption. HIV antibodies were not detected. The erythrosedimentation rate was 88 mm. The patient was treated with a single dose of 2.4 million international units of benzathine penicillin G. The lesions healed and the rapid plasma reagin titer decreased to 1:8 dils at the 60-day follow-up visit.

*Tpallidum* DNA was detected in the blood and skin of this patient. A biopsy from one of the lesions on the neck found a superficial to mid-dermal perivascular and periadnexal inflammatory infiltrates, predominantly composed of lymphocytes and plasma cells with scattered melanophages (Fig 4). Overlying irregular epidermal acanthosis with focal lymphocyte exocytosis, hypergranulosis, hyperkeratosis, and focal parakeratosis were also observed (Fig 4). An immunohistochemical study for *T pallidum* was evidently positive (Fig 5). Immunofluorescence (IF) staining of paraffin-embedded tissue using a rabbit polyclonal

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Anti–*T. pallidum* antibody also found hundreds of wavy-shaped microorganisms consistent with spirochetes (Fig 6).

**CONCLUSIONS**

Secondary syphilitic lesions can sometimes be overlooked and misdiagnosed. The lesions on the neck of our patient could be confused with psoriatic lesions or scar tissue. On the other hand, the involvement of palms and soles suggest that this patient has SS (Figs 2 and 3). Silver stains and immunohistochemical analysis can highlight spirochetes in lesions of cutaneous SS, like the ones shown in Fig 1. Our findings by IF provide evidence that the spirochetal burden is probably greater than can be determined using traditional histologic techniques. These lesions have the capability of being extremely infectious, especially if the appropriate circumstances are present, such as intimate contact and skin laceration.2

*T. pallidum*, the etiologic agent of venereal syphilis, has been called “the stealth pathogen” because of its ability to evade host immune defenses and disseminate from the site of initial inoculation to other organs and tissues. Paradoxically, the bacterium also elicits robust tissue-based innate and adaptive immune responses.3 This case report demonstrates how *T. pallidum* provokes an intense inflammatory response in the skin. Despite this robust cellular and humoral immune response, when untreated, syphilis lesions take weeks to months before they resolve.4 *T. pallidum*’s ability to evade the immune system is not completely understood. The paucity of outer membrane antigenic targets and the potential for antigenic variation partially explain this phenomenon.3 Moreover, our recent work with an ex vivo *T. pallidum*-human macrophage model reinforces the notion that immune cells recognize and clear some spirochetes in the presence of opsonic antibodies, where as other spirochetes are able to
The IF findings shown above suggest that many spirochetes traverse into the epidermis, whereas only a limited number of inflammatory cells can be observed in the same location by H & E analysis. It seems conceivable that spirochetes are migrating into the epidermis to avoid recognition by dermal inflammatory cell. This migratory property may be triggered by the affinity of the spirochetes for cooler temperatures.

REFERENCES