



ORIGINAL ARTICLE

Recurrent Furunculosis in Returning Travelers: Newly Defined Entity

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Background. Bacterial skin infection is a common dermatologic problem in travelers, which usually resolves without sequelae. In contrast, post-travel recurrent furunculosis (PTRF) is a new unique entity of a sequential occurrence of many furuncles seen after returning home from a trip to the Tropics.

Objective. The objective of this study was to characterize the disease course and possible causes of PTRF.

Methods. A retrospective study was conducted on a group of young, healthy individuals (16 males and 5 females), who presented with PTRF after returning from tropical countries.

Results. In all patients, the first furuncle appeared toward the end of the trip and continued for several months after returning home. The average duration of disease was 8.4 months with an average of 4.2 recurrences. Along the disease course, subsequent recurrences became shorter and milder with longer inter-recurrence intervals. Bacterial cultures most commonly grew methicillin-sensitive *Staphylococcus aureus* (MSSA, 76.5%). Nasal colonization was demonstrated in 47% of patients. There were neither companion travelers nor family members experiencing furuncles.

Conclusions. PTRF should be defined as a clinical entity with prolonged travel to the Tropics being its major risk factor. In the author's opinion, a transient immune change in a subpopulation of travelers ignites a series of recurrent furuncles, resolving upon restoration of normal immunity.

Dermatologic conditions are common among returning travelers and account for 18% of all doctor visits of ill returning travelers.¹ Traveling to a tropical or subtropical region poses a high risk of skin and soft tissue infections (SSTIs)² which are considered an increasing problem³ and the leading cause of cutaneous problems among travelers.⁴ Returnees mostly contract nonrecurrent SSTIs due to *Staphylococcus aureus*, which resolves spontaneously or with antibiotics. In the last few years we have noticed an upward trend of returning travelers with recurrent furunculosis (RF) that had begun during their trip to a tropical region and continued for several months after returning home. To date post-travel recurrent furunculosis (PTRF) has not been defined as a clinical entity in literature.

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Methods

This is a retrospective hospital-based study of all patients evaluated between January 1, 2007, and December 31, 2011, with the diagnosis of PTRF. All patients had a history of a visit to a tropical country and developed furuncles during their trip and continued after returning home. Recurrence was defined as the development of two or more furuncles after returning home. Data was collected from a review of patient charts and telephone interviews. Specific data collected were age, sex, past medical history, travel itinerary, similar manifestations in traveling companions, possible triggering factors, course of disease, ancillary tests, treatments, and outcomes.

Exclusion criteria included: immunosuppression, systemic disease, and the use of immunosuppressive medications. Of note, immigrants were not included in the study.

The study was approved by the ethical committee of the Sheba Medical Center.

Table 1 Patients' epidemiology

	Number of patients suffering from RF	Mean age	Sex (male: female)	Mean duration of travel (months)	Average number of visited countries
East Asia	12	31.08	9:03	3.83	1.66
Latin America	9	26.66	7:02	4.44	3.22
All patients	21	29.19	16:05	4.04	2.33

RF= recurrent furunculosis.

Results

From January 1, 2007, to December 31, 2011, there were a total of 2,948 visits to our post-travel clinic, of which 658 (22%) were due to a dermatologic condition. Among the dermatological cases there were 26 patients (3.9%) diagnosed with RF and a history of recent travel to a tropical region. Two patients were excluded from the study due to the use of immunosuppressive drugs (prednisone and salazopirine), two patients were excluded due to a known chronic illness (diabetes mellitus and Crohn's disease) and one patient reported his first furuncle before traveling. Twenty-one patients met the inclusion and exclusion criteria and thus their data were analyzed.

Patient characteristics are shown in Table 1. All patients were Israeli backpackers with an average age of 29 years (range: 20–44). Out of 21 patients, 16 (76%) were males and 5 (24%) were females. All the itineraries included travel to Asian countries (India, Laos, Thailand, Vietnam, China, and Sri Lanka) or Latin American countries (Haiti, Peru, Bolivia, Brazil, Argentina, Chile, Mexico, Guatemala, Costa Rica, Panama, and Nicaragua). Each patient visited an average of two countries (range: 1–5); of note, patients traveling to Latin America, on average, visited more countries. There were no patients seen after returning from travel to African countries.

The duration of the patients' travel to a tropical region ranged from 1 to 12 months (average 4 months). Patients who visited Latin American countries had traveled for longer periods (4.4 vs 3.8 months in those who traveled to Asia).

The first furuncle (Figure 1) appeared during the last part of the trip, independent of trip duration. Four of the

21 (19%) patients experienced a second furuncle before returning home, and 17 out of 21 (81%) experienced a second furuncle after returning home. The duration of the disease (time from first episode to the resolution of the last furuncle) was between 2 and 16 months (average 8.4 months). In both groups, the total disease course included between three and seven episodes of furuncles (average 4.2 recurrences). All furuncles appeared on healthy skin. The recurrence episodes were not at the original site of the first furuncle, but rather in different parts of the body. The first episodes were longer (5–42 days, average 16 days). Patients traveling to Latin America had longer first episodes and more recurrences (17 days and four episodes as compared with 13 days and three recurrences in patients traveling to Asia). However, these differences were not statistically significant. The first interval between recurrences was shortest and lasted between 0.5 and 7 weeks (average 2.6 weeks). As the disease course progressed, subsequent recurrences became shorter and milder with longer inter-episodic intervals. Disease course features are shown in Table 2.

Possible contributing clinical factors were reported by only 11 patients (52%) and included poor hygiene (33.33%), sleeping in close proximity to a water source (38%), and insect bites (38%). The other 10 patients could not recall any contributing factors prior to the appearance of first furuncle.

Bacterial cultures were taken in 17 of 21 patients. Methicillin-sensitive *Staphylococcus aureus* (MSSA) was isolated in 13 patients (76.5%), methicillin-resistant *Staphylococcus aureus* (MRSA) in 2 patients (11.7%) and *Citrobacter* in 1 patient (0.6%). Three patients' cultures showed no growth (17.6%). This is shown in Figure 2. Nasal colonization was found in 8 of 17 patients (47%). All patients were healthy travelers with negative HIV status and with normal immunoglobulin levels.

All together, the 21 patients had a total of 90 episodes of furuncles. In eight episodes, at least one of the skin lesions had developed into skin abscess (a complication of a furuncle) and thus, was treated by surgical intervention (ie, incision and drainage), 38 required systemic antibiotics and most of the episodes (86 out of 90) were treated with topical antibiotics. The first episodes were more severe, requiring more often surgical intervention and/or oral antibiotics (amoxicillin/clavulanic acid or cefamizone) while applying topical antibiotics (mupirocin or fucidic acid) was sufficient in the later

Table 2 Disease course

	Appearance of first boil (average number of months after departure/average travel duration)	Mean course of disease (months)	Number of recurrences	Duration of first recurrence (days)	First interval between recurrences (weeks)	Last interval between recurrences (weeks)
East Asia	2.66/3.83	8.33	3.83	13.88	2.66	4.25
Latin America	3.11/4.44	8.44	4.77	17.83	2.55	4.44
All patients	2.83/4.04	8.38	4.23	16.14	2.69	4.33

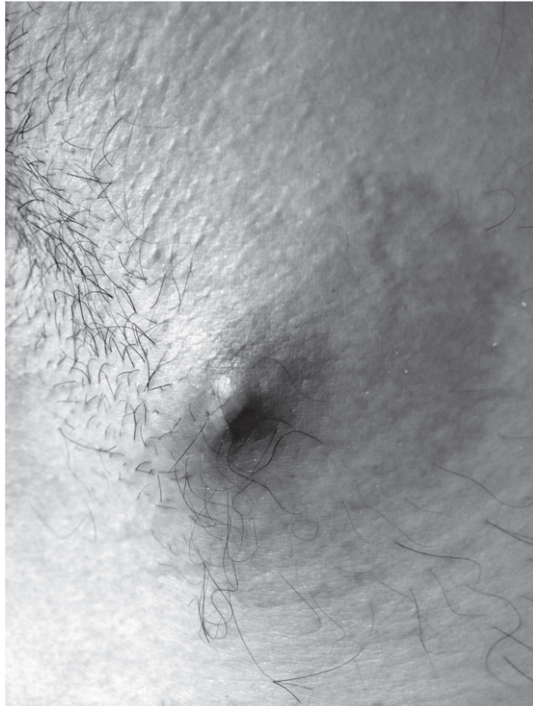


Figure 1 A classic furuncle.

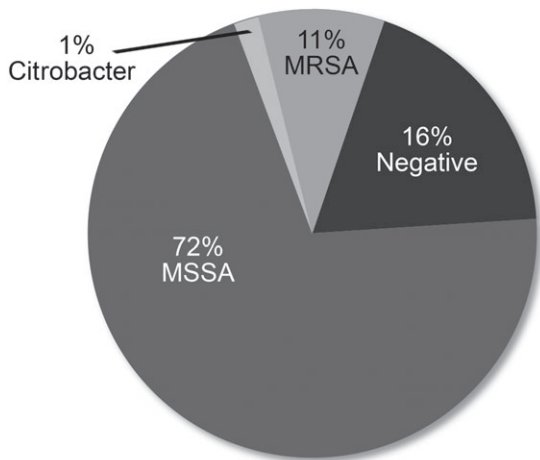


Figure 2 Post-travel recurrent furunculosis: bacterial cultures.

episodes (Figure 3). Nasal carriage was treated by Mupirocin. No companion travelers were diagnosed with furunculosis and upon returning home no family members were infected by the returnees.

Discussion

This study represents an observational study on returning travelers with PTRF. This phenomenon has been described in small case series in the past, usually in the context of Panton–Valentine leukocidin (PVL) bearing

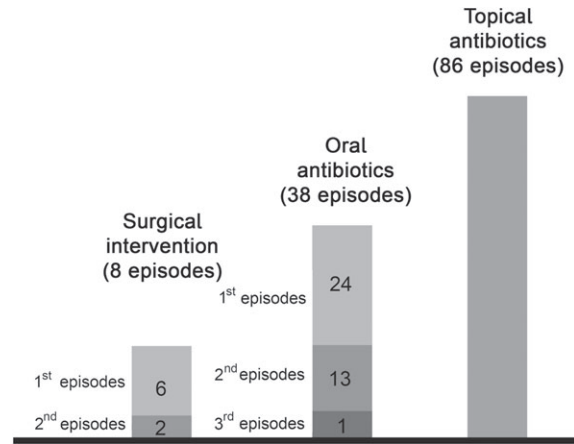


Figure 3 Post-travel recurrent furunculosis: treatment summary of the total 90 episodes of furunculosis.

MRSA with its ability to infect close contacts.^{2,5,18} However, PTRF has not been defined hitherto as a clinical entity in literature and furthermore prolonged travel to the Tropics was not considered as a risk factor by itself for PTRF.

Furunculosis is a deep infection of the hair follicles, caused usually by coagulase positive *S. aureus*.^{6,7} Its incidence is increasing, with the greatest increase occurring among patients <18 years of age.⁸ Furuncles in healthy young adults usually resolve without sequelae.⁷ A subset of patients develops recurrences over a period of months to years. The propensity for certain individuals to develop RF is not fully understood.⁹ The most important independent predictors of RF described in the literature to date are a positive family history and presence of *S. aureus* in the anterior nares or perineum.¹⁰ Other host factors include underlying systemic diseases (anemia, iron deficiency, diabetes mellitus, other dermatoses, hematologic disorders, and HIV infection), personal neglect (obesity, poor personal hygiene, alcoholism, and malnutrition), and previous antibiotic therapy or hospitalization.^{7,9–11} A guideline for the management of RF was published recently.¹²

We describe a subset of young and healthy Israeli backpackers, mostly male, with no history of furunculosis prior to their travel, who were diagnosed with PTRF. The time duration between departure and the first episode was 2.83 months on an average (out of average travel duration of 4.04 months) and recurred for several months after returning back to high hygiene standards at home. The first episode was more severe, lasted longer and often required surgical intervention and/or systemic antibiotics. The intervals between recurrences got progressively longer. In 72% of patients, MSSA was cultured from their skin lesion and only 47% of them were carriers. Neither companion travelers nor family members were reported to experience furuncles.

Continued exposure to an infectious source⁷ and nasal carriage of *S. aureus*^{13,14} are two well-described factors associated with RF. However, in our study group,

RF occurred after leaving the contagious environment and only 47% of patients were nasal carriers. As previously described in the literature,¹⁵ in our study, nasal carriers demonstrated continued recurrences despite a nasal antibacterial treatment.

Another possible pathogenic factor for post-travel RF is an endemic or epidemic virulent strain of *S. aureus* acquired during travel.² This strain might encode a virulence factor called PVL^{16,17} that stimulates progression from a single event superficial folliculitis, to a deeper, recurrent, and protracted disease.^{2,7} PVL-positive strains, which are mainly described in association with MRSA and in <5% of MSSA strains, are frequently transmitted to close contacts or nontraveling family members.^{5,18} PVL as the virulence factor in *S. aureus* infection is currently under debate in literature.¹⁹ Our study was retrospective and thus tests for PVL were not done routinely. However, the high percentage of MSSA among our study patients and the absence of RF in companion travelers and family members (exposed to the similar virulent infectious agent) further question its role in PTRF.

Travel conditions (ie, unsanitary living, bathing conditions, overcrowded common sleeping quarters, extremes of temperature, and humidity), prolonged travel (including expatriates), and skin integrity factors (ie, insect bites, hyperhidrosis, and occlusion by tight clothing) are other possible risk factors contributing to RF in travelers.^{20–22} However, all of these factors can explain a single or recurrent infection while in the Tropics but cannot explain the appearance of furuncles in other different sites after returning home.

We believe that travelers undergo a transient immune change that allows the entry or colonization of bacteria. This ignites a series of RF, the first episode of which is the longest and most severe. The immune system returns to normal over the following months, corresponding to recurrences of furuncles that are milder and farther apart temporally. The condition subsides upon restoration of normal immunity. Different immunodeficiency states have been described in literature in association with FR.^{19,20} However, all of our patients were absolutely healthy prior to travel, were HIV negative, and had normal immunoglobulin levels after their return home. It has been recently shown that leukocytes in patients with RF have dysfunctional formation of major bactericidal factors (nitric oxide and reactive oxygen species),¹¹ resulting in an abnormal neutrophil chemotaxis or function.¹¹ This might explain the propensity of travelers to acquire the disease and to demonstrate the unique clinical picture described above. Future prospective studies will be needed to define the possible temporary immune change and its cause in returning travelers with RF.

Conclusions

PTRF is a new unique entity of a sequential occurrence of many furuncles seen after returning home from a trip

to the Tropics. All our patients had a similar unique disease course. In the authors' opinion, a transient immune change in a subpopulation of travelers ignites a series of recurrent furuncles, resolving upon restoration of normal immunity.

Declaration of Interests

The authors state they have no conflicts of interest to declare.

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