

Contact sensitivities in palmar plantar pustulosis (acropustulosis)

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Acropustulosis, or chronic palmar plantar pustulosis (PPP), is a phenomenon of recurrent sterile pustules, erythema, and scaling affecting the palms and soles. Its pathogenesis is unclear, and it is difficult to treat. The purpose of this study was to elucidate further the factors involved in causing PPP, thereby enhancing the ability to manage this disease. All cases of PPP seen at Mayo Clinic Scottsdale from 1987 to 1993 were reviewed. 21 patients with PPP were identified, 15 of whom had been patch tested. 9 of the 15 patients (60%) showed positive patch test results. Fragrance was the most common sensitivity, but nickel, formaldehyde, para-phenylenediamine, thiuram, neomycin, mercury, balsam of Peru, and cinnamic aldehyde sensitivities were demonstrated. Less important factors included atopy, fungal and bacterial infections, and irritation. Although the mechanism of this sterile pustulosis response does not depend solely on delayed hypersensitivity mechanisms, we believe that we have demonstrated such a large number of positive patch tests in this chronic pustular dermatosis that patch testing should be considered in the routine work-up of these patients.

Key words: acropustulosis; contact dermatitis; palmar plantar pustulosis; psoriasis; fragrance; para-phenylenediamine. © Munksgaard, 1998.

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The pathogenesis of chronic palmar plantar pustulosis (PPP) is obscure. We use the term “acropustulosis” synonymously with chronic PPP to denote a phenomenon of recurrent sterile pustules, erythema, and scaling that affect primarily the mid-palms and thenar eminences of the hands as well as the heels and insteps of the feet. Some authors only use the term “acropustulosis” to identify a process that shows pustules at the distal tips of the fingers and toes, with likely nail involvement (1–3). Potential correlations that have been considered in terms of the causation of the disorder include an association with psoriasis, infection (4–6), genetic disorders (1, 7–9), glucose intolerance (10), exposure to lithium (11), thyroid disorders (12, 13), smoking (14–18), and dermatitis (5, 19, 20). We believe that contact sensitivities could have some role in chronic acropustulosis; therefore, we retrospectively reviewed the cases of our patients with this disorder and demonstrated a number of positive patch test results.

Materials and Methods

Cases were gathered by reviewing all dermatopathology specimens collected at Mayo Clinic Scotts-

dale from 1987 through 1993. Since PPP can be clinically confused with entities such as eczema, tinea, or psoriasis, only patients with biopsy-confirmed PPP were included in the study. 21 patients were identified, and their medical records were reviewed. The following data were extracted: distribution and duration of eruption; clinical appearance; and past medical history, including history of infections, atopy, and other types of dermatitis. Smoking was specifically assessed by the patients' historical responses. Additionally, medications and all laboratory test results were reviewed. Specific tests relevant to dermatology included the results of skin biopsy, patch tests (Chemotechnique, distributed by Dormer Laboratories; Pointe Claire, Quebec; and Trolab, distributed by Omniderm; Montreal, Quebec), and bacterial and fungal cultures.

Results

Of the 21 patients (mean age, 61 years; range, 28 to 79 years) with the diagnosis of PPP, 16 were women and 5 were men. The mean duration of the disease was 8.9 years (range, 10 months to 50 years). There was a clinical history of atopy in 6



Fig. 1. Left and right. Characteristic changes of palmar plantar pustulosis include grouped pustules, erythema, scale, and post-inflammatory hyperpigmentation.

of the 21 patients; this was manifested by symptoms that included allergic rhinitis (3 patients) and a history of childhood flexural dermatitis (1 patient). Hobbies included gardening (4 patients) and sewing (1 patient); 1 patient was a silversmith. None had employment that exposed them to chemicals. 7 of the patients were active smokers, and a history of smoking was obtained from 10 patients. 4 patients were non-smokers. 1 patient noted an exacerbation of skin symptoms with development of an upper respiratory tract infection, and another noted worsening of symptoms with the advent of a tooth abscess. The medical history

of these patients included diagnoses of hypertension (5 patients), coronary artery disease (1 patient), diabetes mellitus (2 patients), hypothyroidism (1 patient), and giant cell arteritis and polymyalgia syndrome (1 patient). The status of these disorders did not seem to correlate with severity of disease. The patients were taking various oral medications, but only 2 were taking β -blockers (1 was taking an ophthalmic β -blocker). No clear correlation was noted in terms of exacerbation of skin disease with the use of these medications. 1 of the patients had a family history positive for psoriasis, but no patient gave a family history of atopy.

All the patients described groups of pustules within areas of scaling erythema. 12 patients had disease that affected the hands and feet. The disease was restricted to the feet in 6 patients and to the hands alone in 3 patients. Typical areas of hand involvement included the mid-palms and thenar eminences, whereas the heels and instep of the feet were typically involved, often with extension onto the weight-bearing lateral portion of the foot (Fig. 1). No blisters were noted on the sides of the fingers. The nails were uninvolved except in a patient with onychomycosis (*Aspergillus niger*, *Candida albicans*). The distal tips of the skin of the fingers and toes were similarly uninvolved. There was no evidence of psoriasis on examination of the rest of the skin, except for mild gluteal cleft pinkening in 1 patient and mild erythema and scale at the elbow in 1 patient.

Microscopically, intraepidermal pustules with neutrophils were present; some cases showed mild spongiosis.

9 of the 15 patients tested showed positive patch test results. Positive reactions included: fragrance mix, balsam of Peru, or cinnamon in 6 patients; para-phenylenediamine in 2 patients; and numerous other contactants, as listed in Table 1. 7 pa-

Table 1. Patch test results in patients with palmar plantar pustulosis

Contactant	Sensitivity, no. of patients			
	1+	2+	3+	4+
fragrance mix		4 ^{a) b) c)}		
balsam of Peru	1 ^{d)}			
cinnamic aldehyde			1 ^{a)}	
para-phenylenediamine (PPD)		2 ^{d) e)}		
formaldehyde	1 ^{f)}			
neomycin	1 ^{f)}			
nickel			1 ^{b)}	
lanolin	1 ^{d)}			
thiram				1 ^{g)}
zinc diethyldithiocarbamate (ZDC)	1 ^{g)}			
thimerosal			1 ^{f)}	
dichlorophen	1 ^{a)}			
potassium dichromate		1 ^{c)}		

^{a)} Patient with fragrance, cinnamic aldehyde, and dichlorophen sensitivities.

^{b)} Patient with fragrance and nickel sensitivities.

^{c)} Patient with potassium dichromate and fragrance sensitivities.

^{d)} Patient with PPD, lanolin, and balsam of Peru sensitivities.

^{e)} Patient with PPD and cobalt sensitivities.

^{f)} Patient with formaldehyde, neomycin, and thimerosal sensitivities.

^{g)} Patient with thiram and ZDC sensitivities.

tients showed multiple positive patch test reactions and only two showed single positive reactions.

Prick tests performed on 1 atopic patient showed marked reactions to dust mite, *Alternaria*, Bermuda grass, Johnson grass, and Kentucky bluegrass.

In 1 patient, a culture performed of the affected skin showed bacterial infection with *Corynebacterium*, coagulase-negative staphylococcus, and *Streptococcus viridans*. This patient had a negative cutaneous fungal culture.

Fungal cultures of the skin were performed on 11 of the 21 patients. In 3 patients, these cultures were positive for *Exophiala jeanselmei*, *Penicillium* species, or *Trichophyton rubrum*. Potassium hydroxide examinations were performed on another 2 patients, and the results were negative. Nail cultures were performed on 5 other patients, and 1 showed infection with both *Aspergillus niger* and *Candida albicans*. Antistreptococcal antibody titers were performed on 5 patients, and all were normal. Immunoglobulin E levels were normal in 3 patients.

The most commonly used treatments included topical corticosteroids and topical tar preparations. 7 patients received treatment with either oral antibiotics or oral antifungal agents. Ultraviolet light therapy was required in 3 patients. Etretnate (Tegison) was used in 1 patient and intramuscular corticosteroids in 1 patient.

Discussion

3 previous studies mentioned contact sensitivities in association with PPP. Ashhurst (5) noted that of 43 patients with PPP, 1 had an unspecified history of eczema and another had a known history of nickel sensitivity. Thomsen & Osterbye (19) described positive patch test reactions in 6 of 40 patients, including reactions to cobalt (2 patients), nickel (1 patient), neomycin (1 patient), formalin (1 patient), and benzyl salicylate (1 patient). Fransson et al. (20) performed patch tests on 47 patients with psoriasis affecting the body, including the palms and soles. 5 of these patients had clinical lesions of PPP (and psoriasis elsewhere on the body). Only 1 of the 5 showed a positive patch test reaction to perfume and had a history confirming contact allergy. We believe that PPP represents a process distinct from psoriasis; therefore, it is not surprising that patients with psoriasis, as in Fransson and associates' study, showed a small percentage of positive patch reactions.

Of 15 patients, 9 (60%) had positive patch test reactions in our study. The most common contact sensitivity that we identified was that of fragrance allergy. 4 of the patients reacted to fragrance mix;

2 others reacted to cinnamic aldehyde or balsam of Peru. Several other contact allergens were identified (Table 1). 7 of the 9 patients with positive patch test reactions noted further improvement (described as moderate to complete clearing) with avoidance of the identified allergen. However, 1 of our patients, who had a nickel allergy, was not able to identify specific improvement with allergen avoidance; however, she did not attempt a nickel-free diet. Another patient with para-phenylenediamine, lanolin, and balsam of Peru sensitivities did not note significant improvement after 1 month of allergen avoidance. The 7 patients who noted improvement had intermittent exacerbations requiring ongoing traditional treatment of PPP. Allergen-free shoes were not dispensed to any of the patients.

We were impressed by the number and diversity of positive patch test results in our patients. Single positive test reactions were seen in only 2 patients (1 to nickel and 1 to fragrance). Most of the patients (7) showed multiple sensitivities (Table 1).

7 (33%) of our patients were active smokers, and 10 (48%) had stopped smoking more than 1 year before being examined in our department. Thus, 81% of the patients had a past or present history of smoking. 2 patients quit smoking during the course of their skin eruptions but did not note any change in the eruptions. These findings are similar to those of other authors who attempted to link PPP to smoking (14–18).

Earlier studies occasionally identified a significant background of atopy or eczema in patients with PPP (3, 21–24). 28% of our patients had an atopic history.

We believe that contact sensitivities are not the primary cause of PPP, but, similar to patients with stasis dermatitis and contact allergies, elimination of known allergens may contribute significantly to patient management (25). We found that the performance of patch tests helped in the treatment and control of PPP. Specifically, the patient with a marked bacterial suprainfection noted some improvement with antibacterial treatment and even greater improvement after the proven allergies of a 4+ sensitivity to thiram and a 1+ sensitivity to zinc diethyldithiocarbamate had been addressed. Similarly, the patient who had a documented skin fungal infection with *Exophiala jeanselmei* showed some improvement with antifungal therapy and further improvement with avoidance of the identified allergens, i.e., potassium dichromate and fragrance (both 2+ sensitivities). The patient with *Trichophyton rubrum* affecting the skin showed some improvement with treatment of the fungus but, again, improvement was greater with avoidance of a proven contact allergen (fragrance). The

situation is not as clear in the patient who had a toenail infection with *Aspergillus* and *Candida*. This patient had a 3+ sensitivity to nickel. However, avoidance of nickel and treatment of the fungal infection with ketoconazole (Nizoral) taken orally produced only moderate benefit.

Clearly, many skin eruptions such as atopic dermatitis, stasis dermatitis, psoriasis, and PPP can be aggravated by exposures to contact allergens or irritants through occupational or avocational activities. We believe that PPP is not caused solely by delayed hypersensitivities. However, any reaction that promotes inflammation will likely perpetuate the signs and symptoms of PPP, if not induce the conditions that permit its development. We believe that the treatment of PPP requires the consideration of a possible background of dermatitis and that patch testing should be performed even when other potential modulating factors affecting PPP have been considered.

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