

POLYMORPHOUS LIGHT ERUPTION: A COMMON REACTION UNCOMMONLY RECOGNIZED

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Abstract. Polymorphous light eruption (PMLE) is usually considered to be an uncommon complaint, although the prevalence in the general population has not been studied. In a survey of 271 apparently healthy subjects, 10% gave a history consistent with a diagnosis of PMLE. The clinical characteristics in the survey cases of PMLE were similar in most respects to those of patients presenting to a clinic with this disorder. However, there was one notable exception, in that there was a striking difference between the clinic and survey cases in the amount of sunlight required to trigger the eruption. Clinic patients required a mean exposure of 30 min as compared with over 3 h in the survey cases. These findings suggest that PMLE is a common disorder but that many individuals have a high threshold of response to sunlight exposure.

Key words: Polymorphous light eruption (PMLE); Sunlight; Survey

Polymorphous light eruption (PMLE) is an idiopathic disorder characterized by a delayed, abnormal response to electromagnetic radiation, usually sunlight, with a varied morphology of papules, plaques and vesicles on exposed areas of skin. In each patient, a single morphology predominates and remains constant (3). Many investigators have explored the possibility of an immunologic basis for the disorder because of the delay in onset after exposure, the lymphocytic infiltration found in the skin and the occasional association with solar urticaria (3); however, the pathogenesis of PMLE remains unknown.

PMLE is a rarely presenting complaint in dermatologic practice. Fewer than 20 new cases are seen each year in the Photosensitivity Clinic at the Massachusetts General Hospital, which is a referral clinic for most of New England. In these few patients, the skin eruption is usually triggered by brief exposure to sunlight, and the disorder greatly restricts their outdoor activities. However, colleagues and acquaintances have often approached

us in a social setting to discuss their "sun problem". In most cases, the problem was consistent with a diagnosis of PMLE. In contrast to the clinic patients, these "cocktail party" cases usually have a high threshold response and can tolerate long exposure to sun without developing an eruption. These observations suggested that the response labelled as PMLE may afflict many people, but that individual susceptibility may vary over a wide range. Since there have been no published studies on the prevalence of PMLE or other types of photosensitivity in the general population, we undertook a survey to explore PMLE prevalence in a population of apparently normal people.

METHODS

Survey population

We interviewed consecutive entrants to a medical library about their response to sunlight exposure. When more than two people entered simultaneously, the first two entrants who cleared the identity check were interviewed; less than 2% refused to participate. In an 8-hour period, 271 people were interviewed.

Two questionnaires were used. The first, a screening questionnaire, recorded age, sex, color of hair, skin and eyes, proneness to sunburn, ability to tan and history of a rash after exposure to sun or sunlamp. Each person was categorized by skin type (5), using the classification outlined in Table I.

Individuals who reported a rash or abnormal reaction after exposure to sun or artificial sources of non-ionizing radiation filled out a second questionnaire which asked about the age at onset and frequency of the reaction, its nature and relation to sun exposure, the extent of involvement of exposed and non-exposed areas of the skin, family history of similar reaction, medication history, consultation with physicians and response to sunscreens or other treatment. The interviewer then made a tentative diagnosis. All cases were subsequently reviewed by both investigators, and a diagnosis of probable PMLE was only made when the investigators agreed.

Table I. Skin type of surveyed population based on history of tanning and sunburn or skin pigmentation^a

Skin type		Percent distribution	
		PMLE (%)	No light reaction (%)
1	Always burn, ^b never tan	8	7
2	Always burn, then slight tan	50	40
3	Sometimes burn, ^c always tan	27	26
4	Never burn, always tan	15	15
5	Light pigmentation (Chinese, Mediterranean, Indian, etc.)	0	6
6	Dark pigmentation (Blacks)	0	5

^a Determined by physical examination.

^b After 30 min of midday summer sun exposure to previously unexposed skin.

^c After prolonged sun exposure.

The diagnosis of PMLE was based on a history of the subject having developed a discontinuous eruption, most commonly papular, appearing minutes to days after sun exposure and persisting for days or sometimes a week or more. These criteria exclude sunburn, chemical phototoxicity and contact photoallergy as they are uniform eruptions on exposed areas. Solar urticaria can be excluded because it persists for hours rather than days. The only condition that cannot be reliably excluded on the basis of history is lupus erythematosus. However, the eruption in that condition is usually associated with or followed by other symptoms and it was established that all subjects with a probable history of PMLE were otherwise well.

Clinic population

The records of patients seen in the Photosensitivity Clinic at the Massachusetts General Hospital over a 3-year period were reviewed. Thirty-eight patients had been diagnosed as having PMLE during that period. The diagnosis was based on the history as outlined above, dermatologic examination of active lesions and histologic examination of a skin biopsy to show the characteristic perivascular lymphocytic infiltrate. The clinical characteristics of these patients were compared with observations in the probable cases of PMLE from the survey population.

Statistical analysis

We used the χ^2 -test to determine significance in differences in proportions and the *t*-test for unpaired data to compare sample means. We calculated 95% confidence intervals based on the binomial distribution (4).

RESULTS

Population survey

Thirty-five (13%) of the 271 subjects surveyed had experienced a rash or other adverse reaction, apart from ordinary sunburn, after exposure to sun. Of these 35 individuals, 26 (74%) gave a history that was consistent with a diagnosis of PMLE (hereafter referred to as subjects with PMLE); this represents a prevalence of 10% (95% confidence interval 7% to 14%). For the other 9 individuals, probable diagnoses were solar urticaria in 2 people, sun-exacerbated eczema in one, miliaria in 3, and phototoxic reactions, possibly due to exogenous agents, in 3 subjects. These 9 subjects were excluded from further analyses.

The mean age of subjects with a history of PMLE (30.6 ± 8.2 years) was not significantly different than the mean age of unaffected subjects (32.0 ± 10 years). The mean age of onset of PMLE was 23.0 ± 7.5 years.

Sixty-two percent of the subjects with PMLE were female. The prevalence of PMLE was higher in females than in males (7% vs. 14%; $\chi^2=4.3$; $p \leq 0.05$). After adjustment for the excess number of males in our survey population (58%), we estimated that females account for 71% of cases in the general population.

No cases of PMLE were diagnosed in the 29 subjects with skin types 5 and 6 ($p \leq 0.05$; Fisher exact test). The distribution of other skin types was similar among affected and unaffected subjects (Table I).

Comparison of survey and clinic cases of PMLE

Table II compares characteristics of survey and clinic cases. Sex, age at onset, prevalence of skin type, family history and nature of the eruption were similar for both groups. However, there was a striking difference in the duration of sun exposure required to trigger an eruption: a mean of 3.1 hours for survey cases and a mean of 30 min for clinic cases, with 79% of the clinic cases requiring 30 min or less ($p \leq 0.01$) as a trigger. Only 2 clinic cases could tolerate extensive sun exposure: one patient with skin type 1 required 3 hours of exposure to trigger PMLE, and one patient with skin type 2 required 2 hours of exposure. In contrast, 77% of survey cases required what we arbitrarily defined as a stressful sun exposure, viz. more than 2 hours of exposure in skin type 1 and 2 subjects, more than 3

Table II. Comparison of survey and clinic patients with PMLE

Population characteristics	Survey cases (N=26)	Clinic cases (N=38)
Percentage of men	38% (29%) ^a	24%
Age at onset	23±7.5 yrs	24.8±8.4 yrs
Percentage of skin types 1 and 2	58%	64%
Positive family history	32%	23%
Papular eruption	74%	69%
Duration of sun exposure required to trigger PMLE	31 h ^b	30 min ^b

^a Adjusted for male predominance in survey population.

^b $p \leq 0.01$; *t*-test.

hours in skin type 3 subjects, the first long exposure of summer or a long exposure in the tropics.

Medical management of survey cases of PMLE

Only 4 subjects (15%) whom we diagnosed as having PMLE had consulted a physician regarding their problem. In one case sun poisoning was diagnosed by the physician, in one case no diagnosis was offered, and in 2 cases contact allergy to *p*-aminobenzoic acid in a sunscreen was suggested—an unlikely diagnosis since both subjects subsequently manifested the eruption without prior application of a sunscreen. Fifteen subjects (58%) had used sunscreens in an attempt to avoid developing a rash. Four (27%) of these had no recurrence after using sunscreens, and an additional 4 were able to tolerate longer exposure without developing a reaction. The remaining 7 (46%) reported no difference with the use of a sunscreen.

DISCUSSION

The results of this study suggest that PMLE is a common response to sunlight exposure. Unadjusted prevalence in our apparently normal population was 10%, but this percentage is likely to be an underestimate. After adjustment for the overrepresentation of males in our study, we estimate an overall population prevalence of 11%. The survey population does not represent a cross-section of the population at large, as a rather select group of individuals tends to enter a medical library. However, there is no reason to believe that the factors underlying this selection would

influence the incidence of photosensitivity among these subjects.

Characteristics of the disorder in survey and clinic patients were similar except for the striking differences in doses of sunlight required to trigger PMLE. Clinic patients only required low exposure doses of radiation to trigger their eruption. In contrast, most subjects in the survey required high exposure doses of sunlight before developing PMLE. For example, one woman in the survey population only developed an eruption when hiking for more than 4 hours at altitudes above 10 000 feet; one man required at least 8 hours of exposure in the Caribbean.

These observations suggest that there is a spectrum of sensitivity in persons who develop PMLE. At one extreme are those people who consult a dermatologist or other physician because their sensitivity to solar radiation severely limits their lifestyle; this severe form of PMLE is probably uncommon. At the other end of the spectrum are those people who only develop a rash after a very high dose of solar radiation, and, because such an exposure is seldom encountered, they may have only one or two episodes in a lifetime. Between these two extremes there is probably a continuum of sensitivity.

The findings of this study can be interpreted in another way. It is possible that PMLE is not a disease but a "normal" response to solar radiation. Just as most people will sunburn, given enough sun exposure, most people may develop PMLE after sufficient doses of non-ionizing radiation. Two reasons may explain why most people do not report having had PMLE: previous "desensitization" by small doses of radiation, resulting in a sub-clinical reaction, and insufficient exposure. Many clinic patients diagnosed as having PMLE show an increasing ability to tolerate sunlight with repeated sun exposure, and as a result of that observation deliberate "desensitization" by exposure to increasing doses of ultraviolet radiation has been successfully used to treat this condition (1, 2). In our survey, 5 patients said they only developed PMLE after the first exposure of summer and were subsequently tolerant to sun exposure, presumably because they tanned or were desensitized. Furthermore, it is quite possible that many people in the general population receive exposures to solar radiation that are too small or infrequent to elicit PMLE.

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