Photosensitivity testing in children

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Background: Phototesting is an important diagnostic tool to objectify light-related symptoms. Data on phototesting procedures in children are scarce.

Objective: The aim of this study was to evaluate phototest results in photosensitivity disorders in children.

Methods: The phototest procedures are described. All children phototested in our department between 1995 and 2007 were included in this retrospective study. Children given the diagnosis of polymorphic light eruption (PLE) were selected for follow-up.

Results: A total of 92 children (39 boys and 53 girls, age range 4-16 years) were successfully phototested. A photosensitivity disorder was confirmed in 56 children (61%, 24 boys and 32 girls). PLE was diagnosed in 39%, photosensitivity associated with atopic dermatitis in 23%, and erythropoietic protoporphyria in 23%. Other diagnoses were less common. Ten children with PLE were followed up for at least 5 years. Seven reported their photosensitivity had not changed over time, in two cases it had diminished, and in one patient the photosensitivity had disappeared.

Limitations: Retrospective study design is a limitation.

Conclusion: Phototesting in children is feasible when performed in a case- and child-dependent manner. PLE was the most prevalent diagnosis in our series followed by photosensitivity in atopic dermatitis. (J Am Acad Dermatol 2010;63:1019-25.)

Key words: children; photodermatosis; photosensitivity; phototest; ultraviolet A; ultraviolet B; visible light.

Photosensitivity disorders in children can be classified into 4 groups: (1) idiopathic, (2) secondary to endogenous agents, (3) photoexacerbated dermatoses, and (4) secondary to exogenous agents (Table I).[1]

Polymorphic light eruption (PLE) is the most common photodermatosis.[2,3] Early onset of photosensitivity is often the clue to identifying a rare genetic or metabolic disease.[4]

Abbreviations used:

AD:	atopic dermatitis
AP:	actinic prurigo
EPP:	erythropoietic protoporphyria
MED:	minimal erythema dose
PhAD:	photosensitive atopic dermatitis
PLE:	polymorphic light eruption
UV:	ultraviolet
VL:	visible light

A diagnosis of a photosensitivity disorder can usually be made based on the history and clinical examination. Phototesting is necessary in only a minority of cases.[5] It is indicated if there is clinical uncertainty or if a child has persistent symptoms despite adequate sun protection and topical treatment.

It is performed to objectify photosensitivity and/or to clarify the diagnosis. Phototests can also determine the specific eliciting wavelengths for the photodermatosis,[6-9] establish the extent of photosensitivity, evaluate the effects of treatment, and monitor the photosensitivity over time.[10-12]

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Descriptions of phototesting procedures in children are scarce and limited.[3,10]

METHODS

All children younger than 16 years who underwent diagnostic phototests in our department between 1995 and 2007 were included in the study. Their diagnoses and accompanying phototests were analyzed.

Children given the diagnosis of PLE with a minimum 5-year follow-up period were contacted about their current disease status.

The study was approved by the medical ethics committee of our university medical center.

Phototesting procedures

Phototesting in children was performed with ultraviolet (UV)B, UVA, and visible light (VL). The wavelengths included in the test were chosen based on the patient's history and clinical features. Radiation sources and their emission spectrum, filters, the UV intensity measuring, and calibration have been described previously.[6-9,13,14]

The final diagnosis of a photosensitivity disorder was based on both the clinical features and the phototest results.

Minimal erythema dose

The minimal erythema dose (MED) is defined as the dose of UVB, UVA, or VL necessary to induce a just perceptible erythema with no marked borders. The MED for UVB and UVA was determined with a specially designed apparatus that simultaneously exposes a series of 9 areas of skin each measuring 3 × 10 mm to increasing UV doses (geometrically progressive with increments of 41% between successive skin fields).[6] The MED for VL was determined by sequential exposure of different skin fields to increasing doses of white light by doubling each step: 5, 10, 20, 40, and 80 J/cm^{-2}.[6] Irradiation was administered in the morning and the assessment was performed after 8 and 24 hours.

The normal MED for UVB is about 50 to 70 mJ/cm^{-2} (TL12/20W, Philips, Eindhoven, The Netherlands). The normal MED for UVA has a lower limit of about 25 J/cm^{-2} and an upper limit of 40 J/cm^{-2} (UVASUN 3000S, Mutzhas, Essen, Germany). The normal MED for VL is greater than 100 J/cm^{-2}.[6]

The normal MEDs for UVB, UVA, and VL are based on a series of healthy volunteers with Fitzpatrick sun-reactive skin type II and III.[15] The MED was considered decreased if the skin was at least 4 × more sensitive than normal.

CAPSULE SUMMARY

- Phototesting is an important diagnostic tool to objectify light-related symptoms in children.
- Phototesting can be successfully performed in children 4 to 16 years of age, if approached in a case- and child-dependent manner.
- Polymorphic light eruption was the most prevalent diagnosis in our series of patients, followed by photosensitivity in atopic dermatitis.

Photoprovocation

Photoprovocation by repeated exposures is a way to reproduce photosensitive skin lesions (Figs 1 and 2). Nonlesional skin was exposed daily to an increasing dose of UVB, UVA, or VL. Repeated irradiations were administered on skin areas measuring 60 cm^2, starting with 2 × MED to limit irritation and increasing daily by 20% to 40% depending on the skin reaction. If marked erythema, edema, or both developed, the same dose was given as on the previous day. If the previous exposure resulted in slight erythema, the next dose was increased by 40%. If there was hardly any visible reaction, the dose was doubled. Repeated exposures were mostly administered a maximum of 4 ×. The maximum summation dose with VL was 120 J/cm^{-2}. If an abnormal reaction was observed, exposure was stopped. Because of the high intensity of the light source in VL testing, the skin temperature of the VL test area was monitored to prevent thermic influences (DU-3, Ellab A/S, Copenhagen, Denmark).

As UVB and UVA are the main eliciting wavelengths in PLE, lupus erythematosus, actinic prurigo (AP), or photosensitivity in atopic dermatitis (AD), testing with UVA and UVB specific wavelengths was performed when one of these photodermatoses was suspected.

Solar urticaria can be elicited by all sorts of light or combinations of UV and VL. Erythema, swelling, and itching develop within minutes to half an hour and disappear within 1 or 2 hours. The skin was therefore directly observed for 60 minutes after single exposures with UVB, UVA, or VL.

To measure the extent of the photosensitivity, patients with erythropoietic protoporphyria (EPP) were sometimes phototested. The inciting wavelengths to produce a photodynamic reaction with the accumulated photosensitizing porphyrins in the skin in EPP are mainly purple (405 nm) and a minor degree of green (546 nm) light and there is no need