The lens and PUVA therapy

C.C. STERK, C.A. GELDOF and H.G. TEN-JET-FOEI

Ophthalmological Department, Academic Hospital Leiden, Leiden, The Netherlands

Key words: PUVA therapy, cataract

Abstract. A study was made of patients, who were receiving PUVA therapy for psoriasis, to see if lens abnormalities occurred which could be due to the PUVA treatment. In a group of 42 patients there was only one eye of one patient, in which a very slight opacity was found which might possibly have developed during the therapy.

Introduction

PUVA therapy is a form of phototherapy for dermatological conditions by means of irradiation with long-wave ultraviolet light, after the oral administration of a so-called 'sensitizer', 8-methoxy-psoralen or 8-MOP. The effect is probably due to the activation of 8-MOP by ultraviolet light, in particular UV-A light; it can then combine in various ways with DNA strands, forming 'interstrand crosslinkings'. In this way the cell division is slowed down (Pathak et al., 1974). PUVA therapy is used in psoriasis, a condition in which there is excessive cell division in the epidermis.

From the UV-spectrum it is mainly UV-A light which reaches the lens. UV-B (wave-length 287–319 nm) is, up to 300 nm, absorbed by the cornea; from 300 to 320 nm the light passes partially through the cornea and is completely absorbed by the lens. 80% of the UV-A light (wave-length 320–400 nm) passes through the cornea, and 90% of this light is absorbed by the lens.

The purpose of our study was to ascertain whether lens abnormalities occurred in patients who were being treated with PUVA for psoriasis.

Method

PUVA therapy has been given to patients with intractable psoriasis in Leiden since 1975. Two hours after the oral administration of 30–50 mg 8-MOP (0.45–0.6 mg/kg) the patient is irradiated with UV-A light. Four irradiations per week are given until the maximum improvement in the skin lesions is obtained. After this initial treatment the frequency is gradually reduced to a maintenance dose of 1 irradiation per 2 or 3 weeks. If there is a recurrence the frequency is increased again. The duration of the irradiation is determined

Documenta Ophthalmologica 55, 149–152 (1983).

individually by trial illumination of small areas of skin (Suurmond and Schothorst, 1976; Suurmond et al., 1978). The eyes are covered before, during and after the PUVA treatment in order to prevent harmful effects. After taking 8-MOP the patient should wear spectacles for the rest of the day which do not allow UV-A light to pass through; side flaps must prevent light from entering from the side. These spectacles must also be worn in the house as UV-A light passes through normal window glass. During the UV-A irradiation the patient wears red plastic spectacles which prevent the passage of UV light (Lerman et al., 1980; Wennersten, 1978).

The patients were referred to the ophthalmologist about once a year to have the eyes checked; however, not all the patients did actually go to the ophthalmologist.

We selected from the patients, who came for their eye check to our department, patients who were not older than 46 years of age at the onset of therapy. They had started PUVA therapy at least $2\frac{1}{2}$ years before and their last ophthalmological check-up had been at least $2\frac{1}{2}$ years after the start of the PUVA therapy. Patients were excluded who had ever been treated with radiotherapy, who had diabetes mellitus, who had outdoor work, and who had ever had an inflammatory eye condition. All patients had, to a greater or lesser extent, had local corticosteroid treatment for the skin lesions.

Results

The group of patients consisted of 42 persons: 21 men and 21 women. The average age was 33.9 years, the range was from 17 to 49 years. One patient had a visual acuity of 0.6 in one eye due to amblyopia. All the other eyes had a visual acuity of 0.8 or more.

In 8 patients lens abnormalities were found; this group consisted of 7 women and 1 man with an average age of 32.5 years. These 8 patients with lens abnormalities all had a visual acuity between 1.0 and 1.2 at their last eye examination. Seven of them had had an ophthalmological examination at least once before; as compared with the first examination the visual acuity had not changed.

The lens abnormality found in 3 patients was a coronary cataract. One of these patients was only seen once, in the 2 other cases the picture did not change as compared with the first examination. One patient had a cataracta coerulea, which also remained unchanged. Slight sclerosis was described in a 35-year-old woman. In a 33-year-old woman a few central opacities were seen at the beginning of the PUVA therapy, which remained unchanged. In a 40-year-old woman slight opacities in the posterior capsule were seen at the first examination, after 118 irradiations. In the 2 following annual check-ups these remained unchanged. In a 31-year-old patient a very small opaque spot was seen in the right lens after 94 irradiations, which had not been described at an earlier examination after 74 irradiations.

Table 1. Survey of 8 patients with lens abnormalities

Nr.	Age	Type of opacity	Progression	VOD	VOS
1	26	coronary	no	1.2	1.0
2	39	coronary	?	1.0	1.2
3	41	coerulea	no	1.0	1.0
4	31	unilateral spot	dubious	1.0	1.0
5	40	posterior capsule	no	1.0	1.0
6	18	coronary	no	1.0	1.0
7	33	central opacity	no	1.0	1.0
8	35	'sclerosis'	no	1.0	1.0

Discussion

After oral administration 8-MOP enters the bloodstream and spreads through the whole body. The maximum light sensitivity of the skin is achieved after 2 to 3 hours. After 24 hours more than 90% of the 8-MOP has been evacuated from the body. 8-MOP had been demonstrated in the lens of the enucleated eye of a patient who was given 0.75 mg 8-MOP per kg body weight 12 hours before the enucleation (Lerman et al., 1980). Lerman has also found 8-MOP in the lens in rats and seals (Lerman et al., 1981); this was possible up to 24 hours after administration. If the animals were also exposed to UV-A light, 8-MOP was still demonstrable in the lens 3 weeks later. This suggests that 8-MOP may become attached to the lens under the influence of UV-A light.

Cloud was able to induce cataract in albino mice by means of very high doses of 8-MOP – 40 times the therapeutic dose – and intensive UV-A irradiation; these cataracts developed within 5 months (Cloud et al., 1961). Freeman and Troll administered 8-MOP to albino guinea-pigs in therapeutic dosage (0.5 mg per kg body weight). They found no cataract in these animals after 13 months of PUVA therapy (Freeman & Troll, 1969).

Parrish (1976) and Fitzpatrick et al. (1966) note that there are no publications about cataract in vitiligo patients who have been treated by photochemotherapy with 8-MOP.

In our 8 patients with lens opacities, in 6 cases there was no suggestion of progression. In one patient with a coronary cataract we do not know whether there was progression or not, as she was only examined on one occasion. In one patient only a very slight opaque spot in one eye was described after 94 irradiations, which had not been described on examination after 74 irradiations. Visual acuity of this eye remained unchanged 1.0. There were no lens abnormalities in the other eye. In view of the small size of the opacity it is possible that it was overlooked at the first examination. If this was not so, a connection with the PUVA therapy is still uncertain, particularly as the other lens of the patient remained clear.

The findings in our 42 patients make it seem improbable that PUVA therapy, when due precautions for the protection of the eyes are taken, is manifestly cataractogenous. A slight long-term cataractogenous effect,

however, cannot be completely ruled out. It is therefore still advisable for PUVA patients to have an ophthalmological check-up once a year.

The authors thank the Dermatology Department (Prof. D. Suurmond) for their access to the dermatological particulars of the patients who were receiving PUVA therapy, and for the help they received during this study.

References

Cloud Th M, Hakim R and Griffin CA (1961) Photosensitization of the eye with methoxsalen II chronic effects. Arch Ophthal 66:689–694

Fitzpatrick ThB, Arndt KA, El Mofty AM and Pathak MA (1966) Hydroquinone and psoralens in the therapy of hypermelanosis and vitiligo. Arch Derm 93:589–599

Freeman RG and Troll D (1969) Photosensitization of the eye by 8 methoxypsoralen. J Invest Derm 53:449–462

Lerman S, Megaw JPhD and Willis I (1980) Potential ocular complications from PUVA therapy and their prevention. J Invest Derm 74:197–199

Lerman S, Megaw JM, Gardner K, Takei Y and Willis I (1981) Localization of 8 methoxypsoralen in ocular tissues. Ophthal Res 13:106–116

Parrish JA (1976) Photochemotherapy of psoriasis. Arch Derm 112:35–36

Pathak MAD, Krämer DM and Fitzpatrick Th.B (1974) Photobiology and photochemistry of furocoumarines (psoralens). In: Sunlight and man, ed.: Th.B Fitzpatrick, Tokyo, p. 335

Suurmond D and Schothorst AA (1976) De behandeling van psoriasis met 8 methoxypsoraleen per os en langgolvig ultraviolet licht. Ned. T. Geneesk 120:1216–1218

Suurmond D, Burger PM, Schothorst AA, Smit AFD, van Vloten WA and Polano MK (1978) Ervaringen met de fotochemotherapie met 8 methoxypsoraleen per os en langgolvig ultraviolet licht (PUVA behandeling) bij psoriasis. Ned T Geneesk 122: 69–75

Wennersten G (1978) Photoprotection of the eye in PUVA therapy. Brit J Derm 98: 137–139