

# A Double-blind Study of Ultraviolet Phototherapy in the Prophylaxis of Chilblains

J. A. A. LANGTRY and B. L. DIFFEY

*Departments of Dermatology and Medical Physics, Dryburn Hospital, Durham, Great Britain*

**A randomized, double-blind study was carried out to assess the prophylactic value of ultraviolet irradiation in the autumn as a means of preventing the development of chilblains on the toes and fingers during the course of the winter. Placebo irradiation was achieved by means of an optical filter which absorbed all ultraviolet radiation from the lamps but allowed the visible light component to be transmitted, thus giving patients the impression that both limbs were being treated. Patients were reviewed at monthly intervals during the winter. The response between patients was variable; some patients developed chilblains whilst others remained symptom free. However, in no patient did the ultraviolet treated limb differ from the untreated limb. We conclude that the ultraviolet phototherapy is of no value in the prophylaxis of chilblains. Key words: Fingers; Toes; Optical filter; Weather.**

(Accepted February 28, 1989.)

Acta Derm Venereol (Stockh) 1989; 69: 320-322.

Dr B. L. Diffey, Dryburn Hospital, Durham DH1 5TW, Great Britain.

Chilblains, or pernio, are inflammatory lesions commonly occurring in susceptible individuals as an abnormal reaction to cold. Humidity is thought to play a role by increasing the thermal conductivity of air, although the exact mechanism of causation is still unknown (1). The lesions are erythematous, mauve or purplish swellings which give rise to throbbing, pain and itch, usually occurring at the onset of cold spells in the winter and lasting two to three weeks. The conditions is usually a mild self limiting one, with only the more symptomatic or persistent cases presenting to the medical practitioner. Treatment should be directed primarily towards avoidance of cold, and the use of sensible clothing and footwear.

The use of local and general ultraviolet irradiation has long been recommended for the prophylaxis and treatment of active chilblains (2). It has been claimed that the effects of prophylactic therapy are longstanding and afford patients protection throughout the winter (2). Among the many treatment options advo-

cated in the past prophylactic ultraviolet irradiation remains a popularly cited paregoric (1), yet there have been no double- or single-blind studies to support claims of efficacy.

## METHOD

### *Subjects*

Nine female patients (age range 11 to 75 years) who were commonly affected with chilblains of the hands and/or feet were studied. Four patients had a family history of chilblains and three a personal history of Raynaud's phenomenon. Ethical committee approval was obtained as well as signed consent from each individual.

### *Irradiation apparatus and radiation dosimetry*

The hands and/or feet of the patients were irradiated in a specially-constructed solarium which incorporated ten UVB fluorescent lamps (Philips TL20W/12) arranged so that both surfaces of the digits could be irradiated simultaneously. The patients' hands (or feet) rested on an ultraviolet-transmitting acrylic platform (ICI perspex type OXO2; 2 mm thick). The solarium was divided into two chambers by an ultraviolet-opaque barrier. Placebo treatment was achieved by lining the acrylic platform in one chamber with an ultraviolet-absorbing, visible light-transmitting, clear plastic sheet (Martin type Llummar NR-90PS4; 0.14 mm thick). The visual appearance of the lamps in each chamber was the same and so patients believed that both limbs were being treated. The plastic sheet was an effective ultraviolet-absorber; the erythemally-effective irradiance in the placebo chamber was less than 0.002% of that in the treatment chamber.

The spectral irradiance in each chamber, measured using a high-quality spectroradiometer, is shown in Fig. 1. It may be seen that there is virtually no ultraviolet radiation at wavelengths less than 400 nm in the placebo chamber, yet in the visible region (400-600 nm) the spectral irradiances in both chambers are very similar. The unweighted ultraviolet irradiance in the treatment chamber was 1.8 mW/cm<sup>2</sup>.

### *Patient irradiation*

The treatment hand and/or foot of each patient was allocated randomly by one of us (BLD) to receive UVB irradiation, and was unknown to the assessment clinician (JAAL). Patients were irradiated three times a week for two weeks during October 1987. The initial treatment was 3 min (UV dose of 0.324 J/cm<sup>2</sup>). This was increased at each visit to allow for acclimatization such that on the last irradiation day the treat-

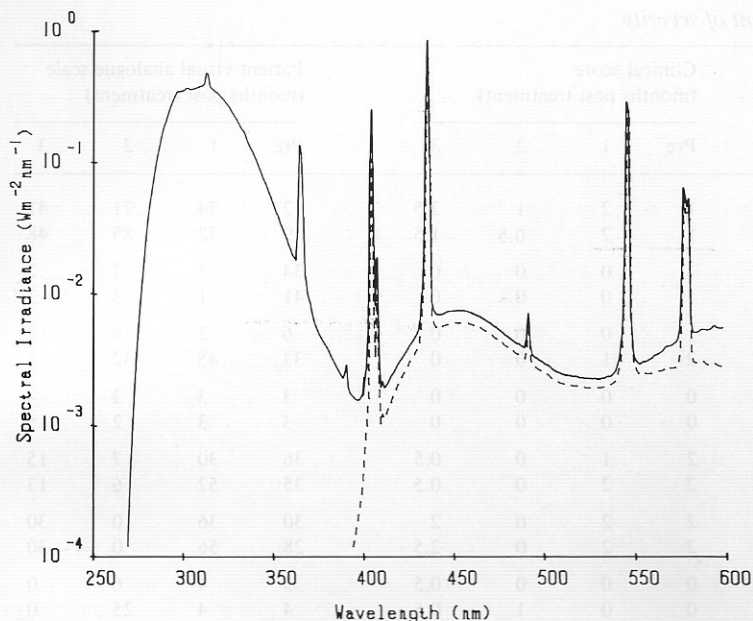


Fig. 1. Spectral irradiance at the skin surface in the phototherapy unit. —, ultraviolet treatment chamber; ---, placebo chamber.

ment time was 20–30 min (UV dose of 2.16–3.24 J/cm<sup>2</sup>). An open-ended 'sock' was worn on both hands and/or feet during irradiation to prevent erythema of the dorsal surfaces. The object of the irradiation was to maintain a brisk erythema on the treatment fingers and/or toes.

#### Clinical assessment

Clinical assessment was carried out immediately before treatment, four weeks after the completion of treatment, and thereafter at monthly intervals for the next two months.

On each assessment occasion a clinical appraisal of severity at each site was carried out using the following ordinal scale: 0—nil; 1—mild; 2—moderate; 3—severe; 4—ulcerated. Patients were also asked to indicate their own assessment of symptoms using a 100 mm visual analogue scale.

#### RESULTS

A summary of the clinical and patient appraisal of severity is given in Table I. There was a high degree of direct association between the severity score assessed clinically and the patients' own assessment of their symptoms ( $p < 0.001$ ; Spearman coefficient of rank correlation). These data indicate that patients 3, 5 and 6 were not troubled by chilblains on either foot at the start of the treatment or throughout the winter. Patients 2, 4 and 7 had chilblains present at the start of the trial but these resolved equally on both the

treated and placebo toes and fingers during the winter. In the remaining patients (1, 8 and 9) the chilblains became worse following treatment, again equally so on both treated and placebo toes and fingers.

#### DISCUSSION

The results of this study do not support the common belief that ultraviolet irradiation of toes and fingers is an effective prophylactic treatment for chilblains. Neither do they indicate that UV irradiation aggravates chilblains, as has been reported (1).

The observation that the inter-patient response was varied (chilblains worse; no change; chilblains improved), but that in a given patient the response on both limbs appeared to be unaffected by ultraviolet irradiation, shows the importance of carrying out a controlled trial.

The intention was for the clinical assessor to be unaware of the treatment limb. Unfortunately this proved not to be the case since the pigmentation that developed in many patients on dorsal surfaces between the end of the protective 'sock' and the digits was still apparent by the time of the first post-treatment assessment. During treatment these sites be-

Table I. Clinical and patient assessment of severity

Patient	Site	Limb (bold=UV treated)	Clinical score (months post treatment)				Patient visual analogue scale (months post treatment)			
			Pre	1	2	3	Pre	1	2	3
1	Toes	<b>R</b>	1	2	1	2.5	12	74	71	81
		<b>L</b>	1	2	0.5	1.5	9	72	85	48
2	Toes	<b>R</b>	1	0	0	0	34	7	7	2
		<b>L</b>	1	0	0	0	41	1	8	3
2	Fingers	<b>R</b>	1	0	0	0	6	2	6	2
		<b>L</b>	2	1	0	0	33	45	32	7
3	Toes	<b>R</b>	0	0	0	0	3	3	2	4
		<b>L</b>	0	0	0	0	3	3	2	5
4	Toes	<b>R</b>	2	1	0	0.5	36	30	7	15
		<b>L</b>	2	2	0	0.5	35	52	6	13
4	Fingers	<b>R</b>	2	2	0	2	30	36	0	30
		<b>L</b>	2	2	0	2.5	28	56	0	30
5	Toes	<b>R</b>	0	0	0	0.5	3	4	6	0
		<b>L</b>	0	0	1	0.5	4	4	25	0
6	Toes	<b>R</b>	0	0	0	0	2	2	2	1
		<b>L</b>	0	0	0	0	3	1	4	1
7	Toes	<b>R</b>	1	0	0	0	12	15	3	0
		<b>L</b>	1	1	0	1	25	24	3	3
8	Toes	<b>R</b>	0	1	0	3	0	10	7	86
		<b>L</b>	0	2	1	3	0	31	14	92
8	Fingers	<b>R</b>	0	1	0	3	0	0	0	86
		<b>L</b>	0	2	0	3	0	2	2	90
9	Toes	<b>R</b>	1	0	-	1.5	16	0	-	42
		<b>L</b>	1	0	-	1	12	0	-	36

came erythematous yet patients did not associate this unilateral reddening with differences in irradiation.

It is well known that prevailing meteorological conditions are important in the aetiology of chilblains. During the period of study (October 1987 to March 1988) the climate was milder and sunnier than normally experienced in Durham and this may have had an influence on why 6 of the 9 patients experienced no real discomfort during the course of the study. In fact, had we carried out an uncontrolled trial we would have concluded that ultraviolet irradiation was an effective prophylactic in six out of the nine patients. This was clearly not the case, and we conclude that, on the basis of these results, ultraviolet phototherapy is of no value in the prophylaxis of chilblains.

It remains to be demonstrated whether ultraviolet irradiation is effective in the treatment of active chilblains.

#### ACKNOWLEDGEMENT

We are grateful to Dr F. A. Ive for his support.

#### REFERENCES

1. Champion RH. Cutaneous reactions to cold. In: Rook AJ, Wilkinson DS, Ebling FJG, Champion RH, Burton JL, eds. Textbook of Dermatology, 4th ed. Vol. 1. Oxford: Blackwell Scientific Publications, 1986: 625.
2. Holti G, Ingram JT. Physiotherapy in dermatology. Lancet 1963: 141-143.