

SKIN COLOUR CHANGES IN PSORIASIS RESPONDING TO TREATMENT WITH BETAMETHASONE-17-VALERATE UNDER OCCLUSION

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Abstract. The change in colour of psoriatic skin during treatment with betamethasone-17-valerate applied under occlusion was measured with a spectrophotometer. Only male patients were included in the investigation and skin colour of psoriasis was compared with a matched area of normal skin. Errors due to specular reflection were avoided. Initially there was a loss of hue and this corresponded closely to the clinical improvement of the disease. However, colour change differences were detectable 12 days after treatment began and these changes persisted invariably longer even though clinically there was no demonstrable evidence of psoriasis remaining and the skin once more appeared normal. This report provides some evidence which suggests that psoriasis may have stigmata which may be detected and characterised by spectrophotometric techniques.

The colour of human skin is thought to be a characteristic endowed by four principal pigments, melanin, melanoid, haemoglobin and carotin (4). The dominant role appears to be exerted by melanin, whose formation and distribution is determined genetically (1, 5).

Variations in skin colour within any one population are very small (7) but it is well recognised that specific variations in skin colour do occur in special sites. These specific variations are usually produced as a consequence of hormonal changes during sexual development, or ageing, or disease (11, 12).

Besides the four principal pigments, other factors contributing to skin colour are the vasculature of the skin and the scattering of incident light produced by a variously thickened and uneven stratum corneum. Both these factors feature prominently in psoriasis and are characterised histologically by an increased rate of epidermal cell turnover (10) and clinically by the excessive production of scale (18).

Skin colour may be measured objectively and repeatedly with a spectrophotometer. The full spectrophotometric curve provides the greatest detail of the colour of the skin sample, so that any increase in the height of the curve indicates a lightening, and a flattening of the curve results from a loss of hue (19). If two samples of skin differ in colour their curve variation indicates the region of the spectrum in which their differences occur.

In this investigation colour changes in psoriatic skin were measured repeatedly with a spectrophotometer during a course of treatment with betamethasone-17-valerate applied under occlusion. Comparisons were made with the colour of the patient's clinically unaffected skin.

MATERIALS AND METHODS

Patients and their treatment

Ten male patients admitted into hospital for treatment of confirmed psoriasis were included in this investigation. At the time of admission the psoriasis was untreated. Spectrophotometric measurements of skin colour were made on the day of admission and daily thereafter during the course of treatment. An application of an ointment containing 0.2% betamethasone-17-valerate in soft paraffin was made twice daily to the affected skin and the treated area covered with an occlusive dressing at night. This regime was maintained for 8-12 (mean 10.1) days.

Skin colour measurement

Measurements of skin colour were made using a reflectance spectrophotometer.¹ This instrument facilitates measurement of the intensity of light in an extremely narrow band of the spectrum at a known wavelength. The skin surface was illuminated (at 45° to the surface) with a parallel beam of light of known wavelength and the

¹ E.E.L. Unigalvo Type 200.

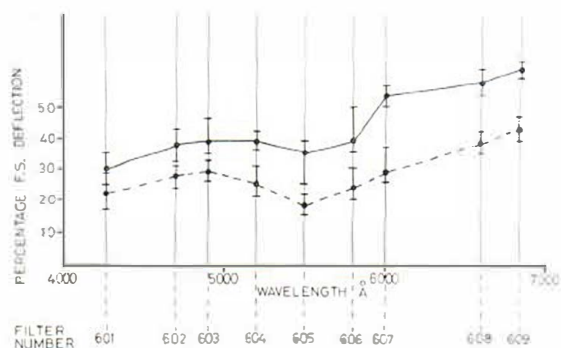


Fig. 1. Pre-treatment. Spectrophotometric curves for psoriatic and unaffected skin. Average of measurements. —, clinically normal unaffected skin; ---, psoriatic skin.

spectrophotometer used to measure the light reflected from the surface. The reflected light was measured normal to the surface to avoid errors due to specular reflection. Patches of psoriasis were selected which could be matched with non-psoriatic areas of skin on the same patient for colour difference measurement. The sites selected were confined to the trunk and medial aspect of the arm, since these areas would not normally be exposed to UV light which would distort the colour response. The selected sites were gently wiped with dry gauze before spectrophotometric measurements were made. Measurements were made up to 12 days after commencement of treatment.

RESULTS

Measurements of skin colour differences between psoriasis and clinically unaffected skin were made at corresponding sites on the same patient. Marked variations of colour were observed be-

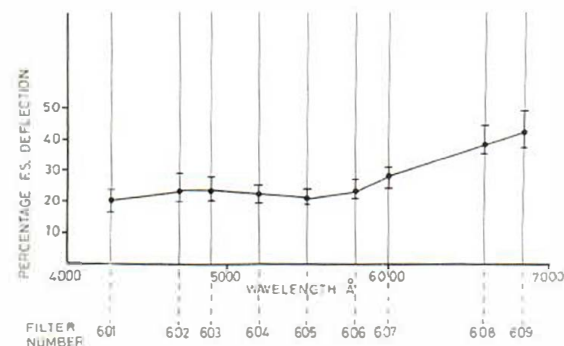


Fig. 2. Response of psoriasis to treatment. Average of measurements. Flattening of spectrophotometric curve 24–36 hours after application of 0.2% betamethasone-17-valerate under polythene occlusion.

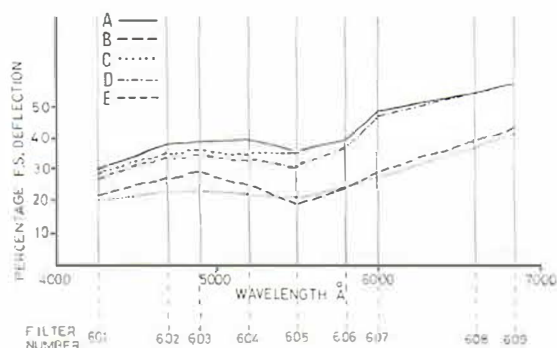


Fig. 3. Spectrophotometric curves showing response of psoriasis to betamethasone-17-valerate. Average of measurements. A, Unaffected skin. B, Pre-treatment psoriasis. C, Psoriasis 24–36 hours after treatment. D, Psoriasis 7 days after treatment. E, Psoriasis 10 days after treatment.

tween affected and unaffected skin. The psoriatic skin showed an early peak at 603 (blue) filter and a deflection at 604 (green) filter (Fig. 1). Individual differences in colour pattern of clinically normal skin remained within the limits of normal population variation (Fig. 1). At 24–36 hours after treatment with betamethasone-17-valerate applied under polythene occlusion the spectrophotometric curve for psoriatic skin became flattened, indicating a loss of hue. The greatest initial response occurred corresponding to 603–604 (blue-green) filters (Fig. 2). There was a reversal during the initial 24–36 hours of treatment to a spectrophotometric curve which was almost parallel to a normal curve (Fig. 3).

Skin colour measurements were made daily during the ten (approx. mean) day course of treatment. During the first 7 days when the clinical improvement was easily detectable the spectrophotometric curve showed changes corresponding to 606–609 (orange-red) filters. By the 7th or 8th day this range had reverted to within normal variation limits (Fig. 3) but differences corresponding to 601–605 filters persisted until 12–16 days after treatment, even though the skin appeared clinically normal and the site of the psoriasis could not be determined by a neutral observer.

DISCUSSION

Changes in skin colour seen in psoriasis may be measured objectively by spectrophotometry. Clinically affected skin shows a colour curve which

differs from that of the patient's unaffected skin (Fig. 1). However, the colour of unaffected skin in patients with psoriasis remains within the normal variation pattern after taking into account the skin sample site and the patient's racial grouping.

It appears likely that three factors contribute to these colour changes: an increased pigment formation, an altered vascular arrangement, and specular reflection produced by the uneven and thickened stratum corneum of the psoriatic plaque. Errors due to specular reflection have here been avoided by measuring reflected light normal to the skin surface and it is therefore considered that increased pigment formation and an altered microvascular pattern play the dominant role in the production of the erythema of psoriasis.

Ryan & Kurban (15) have demonstrated that the papillary vessels show changes in relation to psoriasis becoming elongated and tortuous. Evidence has also accumulated that the proliferation and control of the skin's microcirculation is significantly influenced by melanocytes (3, 6, 8), thus protracting the debate about possible differences in pigmented skin and vitiligo with respect to microcirculatory function (2).

A distinction has been made between functional and organic vascular changes in psoriasis. Illig & Holtz (9) assert that residual erythema is due to a dilation of the subpapillary veins. However, there is a tendency to vascular atrophy whenever there is an increase in pigmentation (16) emphasising the close relationship that exists between the skin's pigmentation and microcirculation. This relationship may be affected by any disease process.

Topical cortico steroids are widely used for the treatment of various dermatological disorders. Recently Thune (17) has observed that, in psoriasis, application of betamethasone-17-valerate under occlusion brought about a rapid and pronounced reduction in the vascularisation of the lesion within a week of commencing daily treatment. The present investigation shows a reduction in the hue (featured by a flattening of the spectrophotometric curve; see Fig. 2) of psoriatic skin 24-36 hours after the initial application of betamethasone-17-valerate under an occlusive dressing. This early change, although not maintained, may presumably be related to the reduction of oedema of the epidermis and decongestion of the

papillary vessels (14). Daily application of betamethasone-17-valerate enables the pulsating blood flow to be normalised within a week (17) but differences in colour, as measured by spectrophotometry, persist for up to 12 days after the conclusion of occlusive dressing therapy. This finding suggests that the initial loss of hue induced by betamethasone-17-valerate may indicate a functional reduction in vascularisation and the continuing colour difference represents the combined effect of abnormal capillaries (13) and altered pigment formation. The persistence of the colour difference beyond the period of clinical involvement is a peculiar feature which cannot at present be satisfactorily explained.

The technique of spectrophotometry also makes possible an objective comparison between different treatment regimes and facilitates the detection of colour differences which cannot be detected clinically by other means.

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