ASSESSMENT OF SKIN PIGMENTATION BY SPECIAL DEFLECTION CURVE OF VITILIGO SKIN BEFORE AND AFTER TREATMENT

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The reflectance spectrophotometric method can be used for assessment of differences in colour of skin. The differences in skin pigmentation are mainly responsible for differences in colour. This method is used here in the investigation of vitiligo cases to obtain quantitatively the differences in colour between a patch of skin with vitiligo area during the course of treatment.

The reflectance spectrophotometer (Eel*) consists of two units, a Body and a movable Head. The Body (B in Fig. 1) contains a string galvanometer which reflects a light beam from a small projector lamp on to a spot in the scale (S) in the Body of the spectrophotometer. The movable Head (H in Fig. 1) focusses a beam of light through a small circular aperture on an area of skin on which the Head is placed. The light reflected from the skin falls in photoelectric cells in the Head. The cells generate a current which passes to the string galvanometer and deflects the spot of light focussed by the galvanometer on the scale. The amount of deflection of the spot of light is proportional to the current generated by the photoelectric cells and in turn to the amount of light reflected by the skin. The light reflected by the skin is compared with the amount of same light reflected by a standard white object. in this case, a block of Magnesium Carbonate (M in Fig. 1). A series of nine different coloured lights are used. A graph produced by joining the percentage of deflection of all the coloured lights from the spectral deflection curve of the skin.

METHOD

A wheel containing nine coloured filters (Fig. 2) numbered 601 (4260A), 602 (4700A), 603 (4900A), 604 (5200A), 605 (5500A), 606 (5800A), 607 (6000A), 608 (6600A), 609 (6850A), is placed in the spectrophotometer Head. The first filter is rotated under the beam of light in the Head. The Head is placed on the standard white objects and the deflection is adjusted to 100 in the scale. The Head is then

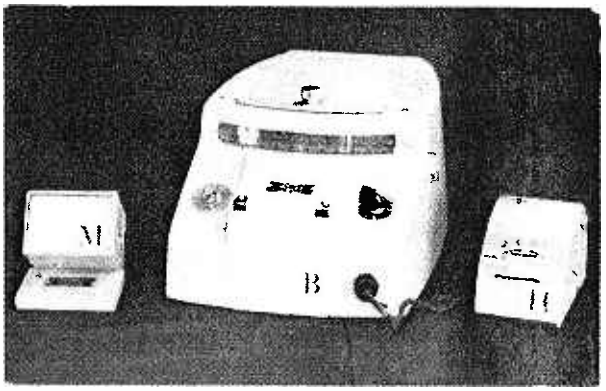

Fig. 1. Spectrophotometer (EEL)
B — Body S — Scale
H — Head M — Magnesium Carbonate Block

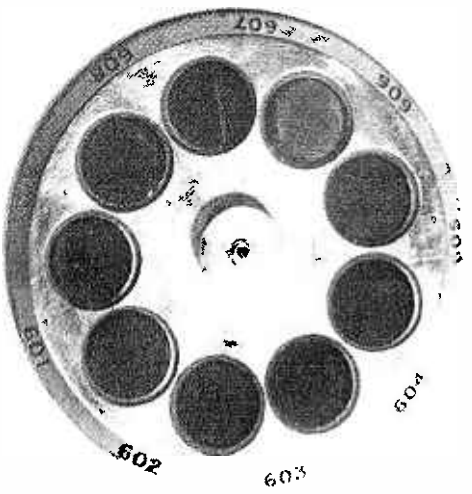

Fig. 2. Disc with coloured filters.

* The product of Evans Electroselenium Ltd.

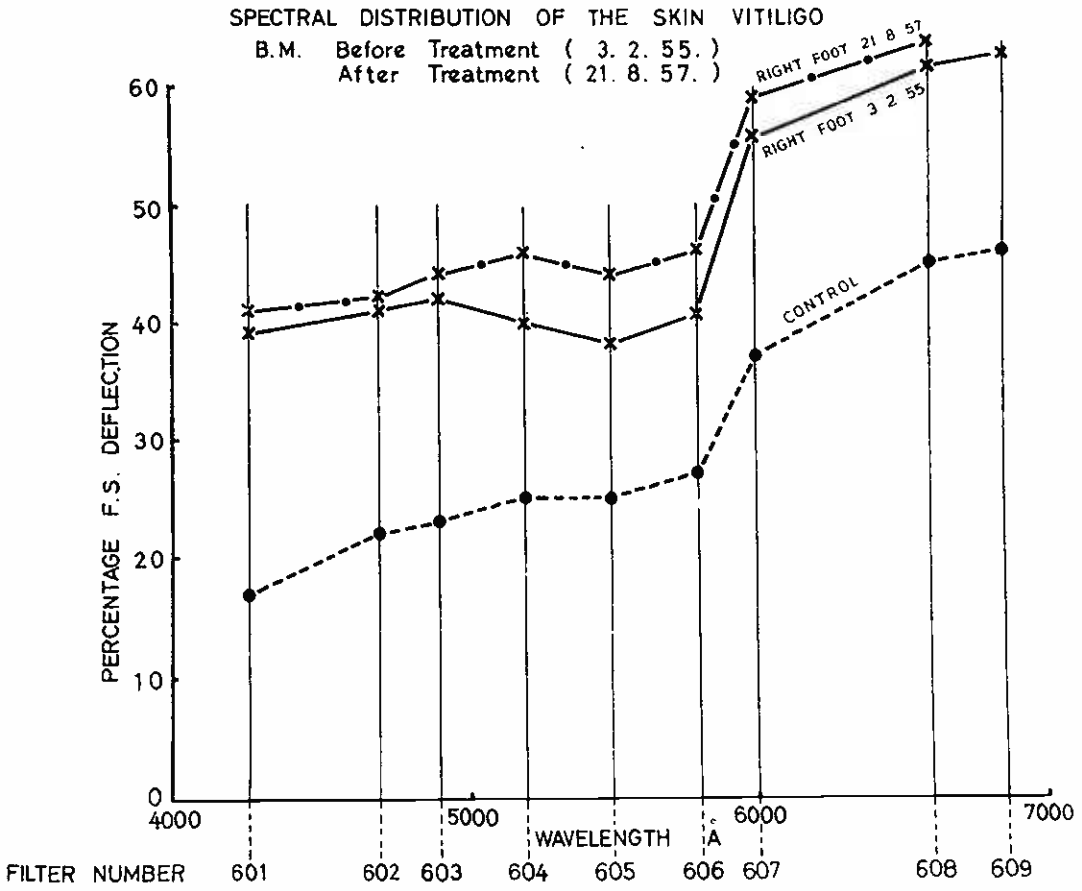

Fig. 3. Light Deflection curves of Vitiligo skin, right foot (Case 1) before and after treatment compared with that of normal (control) skin.

Fig. 4

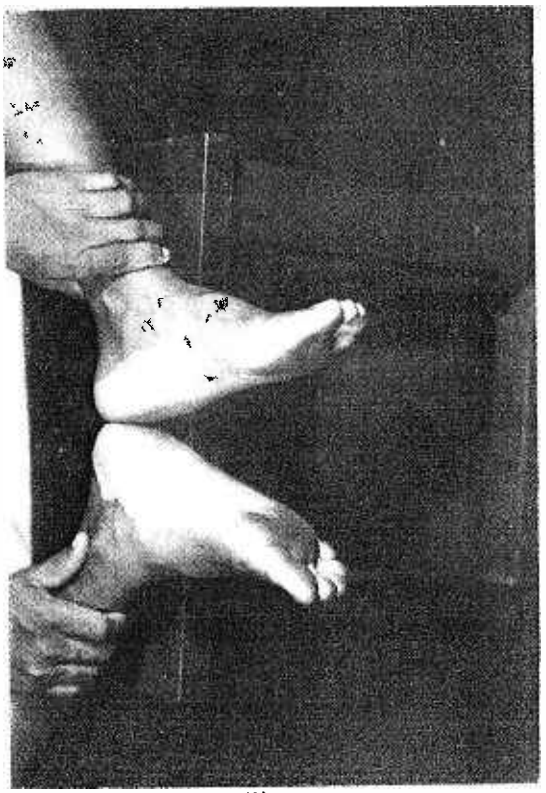

Fig. 5

Figs. 4 & 5. Photographs of Vitiligo areas of both feet (Case 1) before and after treatment.

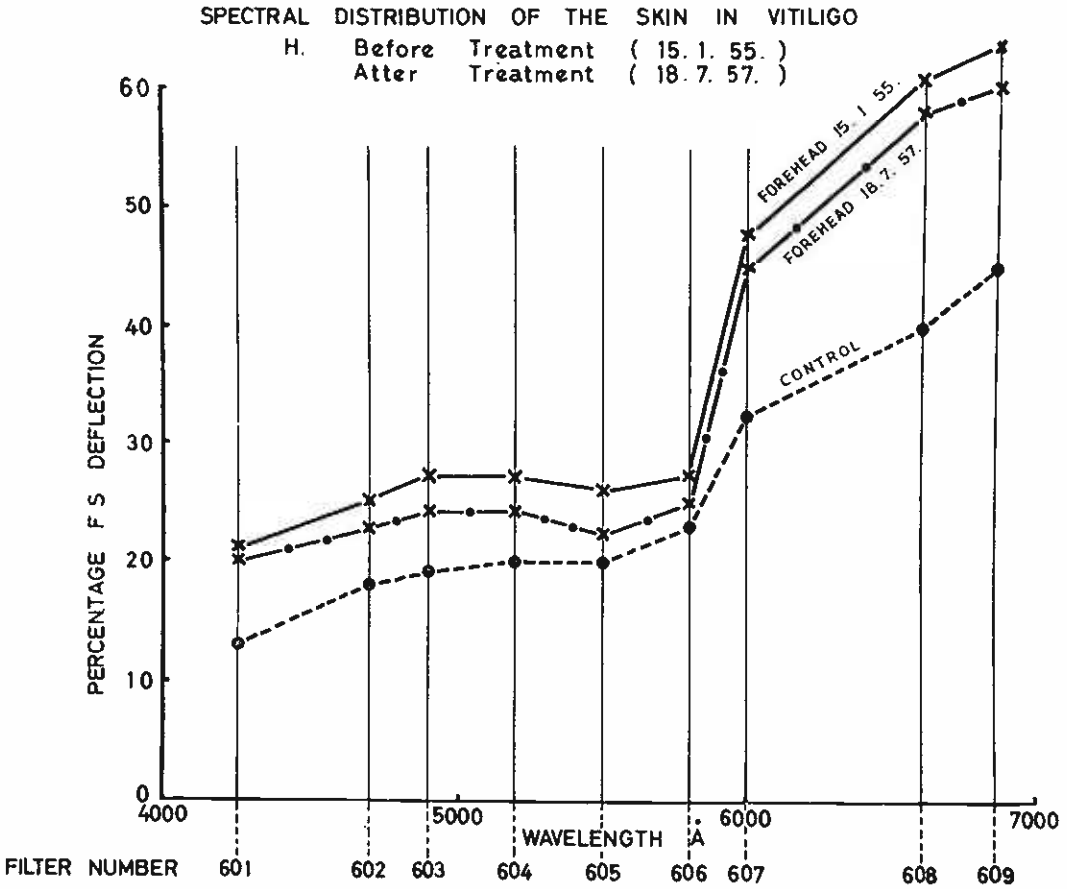

Fig. 6. Light Deflection curves of Vitiligo skin, forehead (Case 2) before and after treatment compared with normal control skin.

Fig. 7

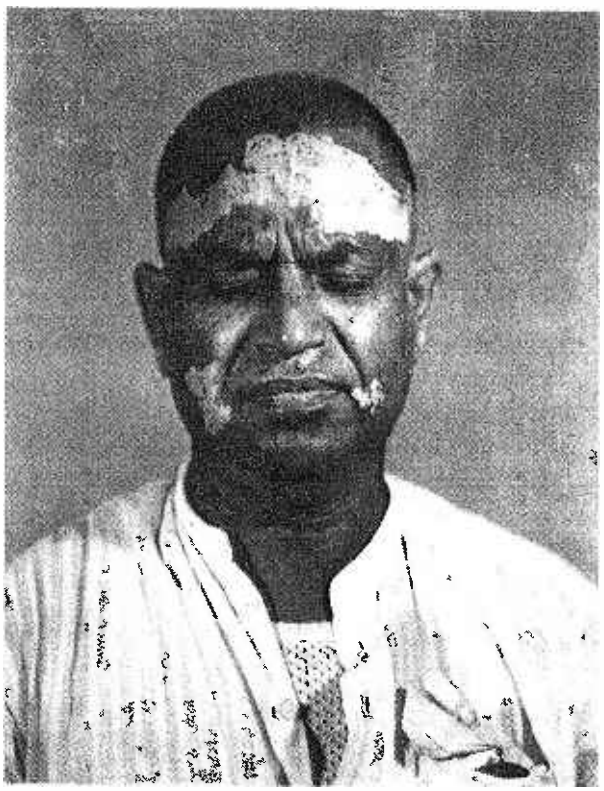

Fig. 8

Figs. 7 & 8. Photographs of Vitiligo areas, forehead (Case 2), before and after treatment.

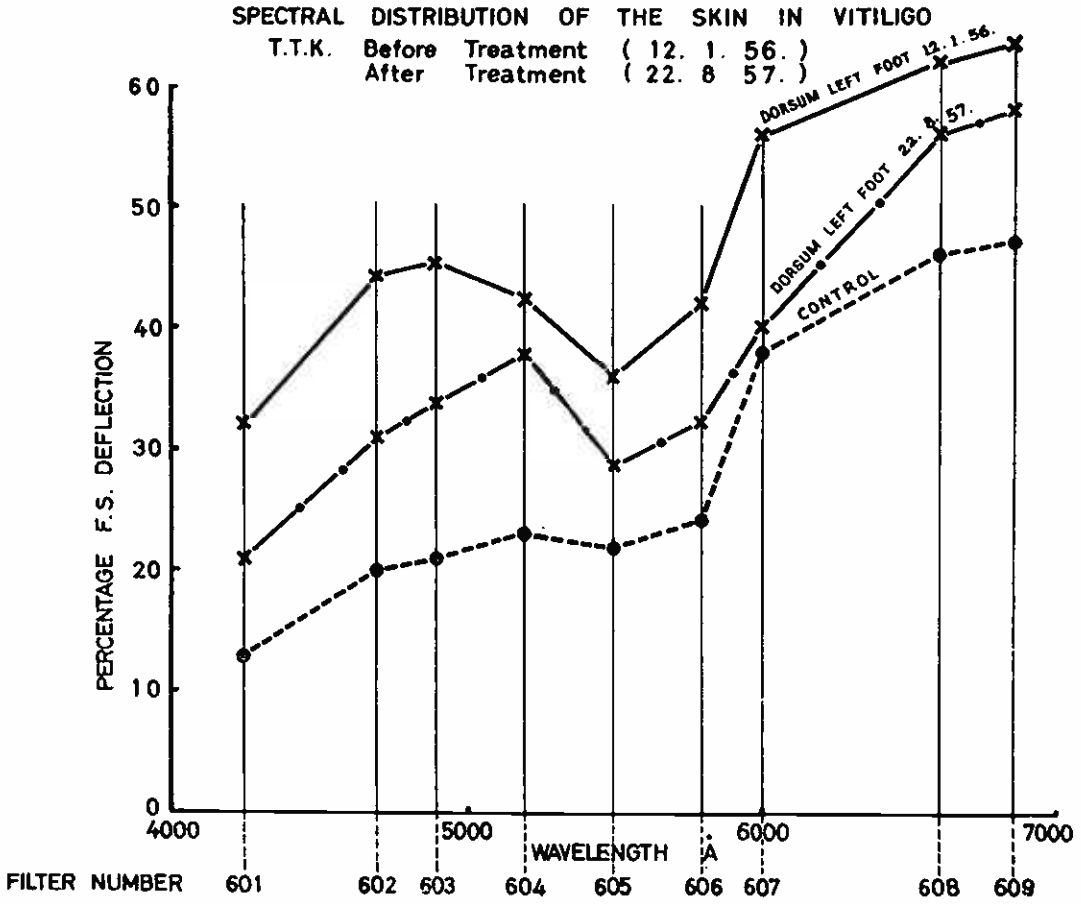

Fig. 9. Light Deflection curves of Vitiligo skin, left foot (Case 3), before and after treatment compared with that of normal (control) skin.

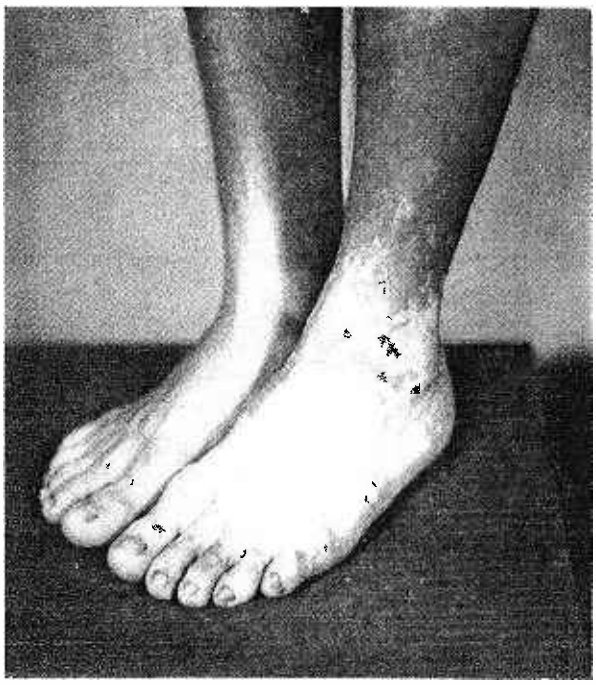

Fig. 10

Fig. 11

Figs. 10 & 11. Photographs of Vitiligo areas of left foot (Case 3) before and after treatment.

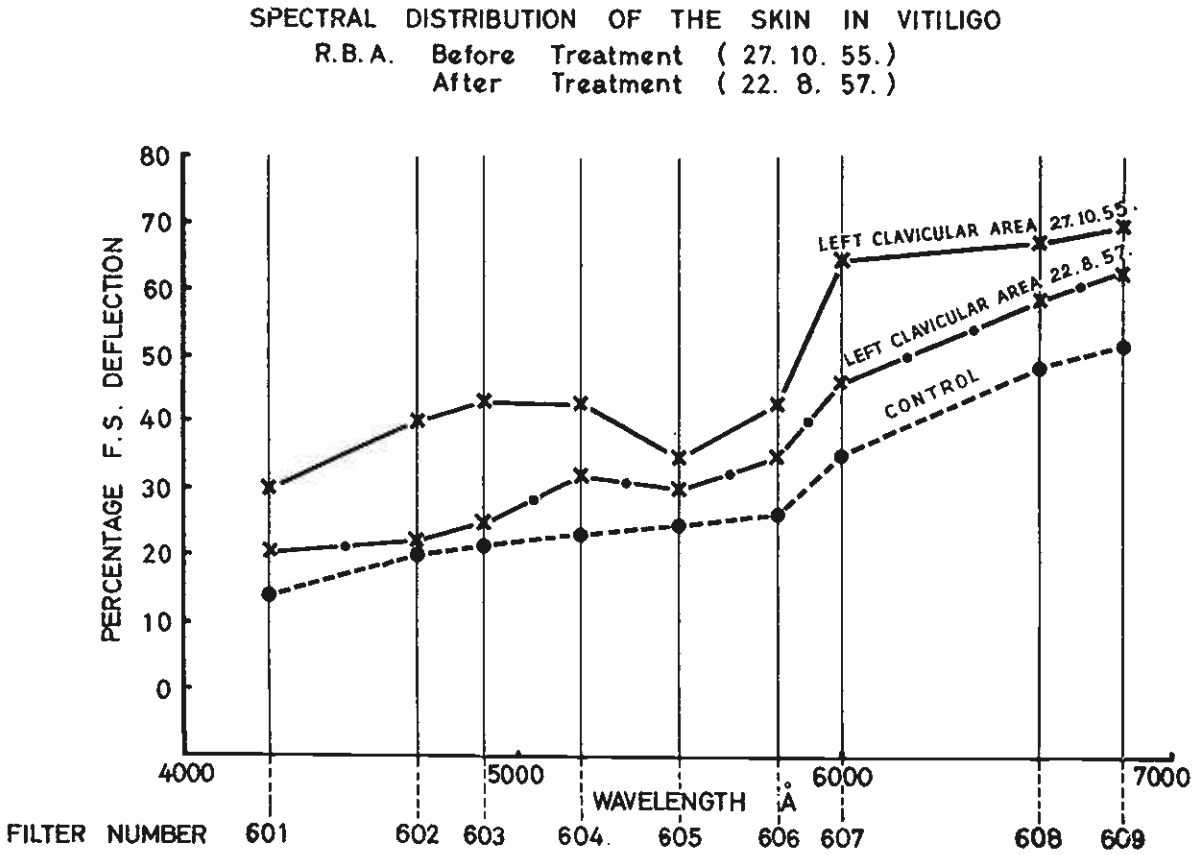

Fig. 12. Light Deflection curves of Vitiligo skin, left scapular area (Case 4), before and after treatment compared with that of normal (control) skin.

Fig. 13

Fig. 14

Figs. 13 & 14. Photographs of Vitiligo areas in left scapular (Case 4) before and after treatment.

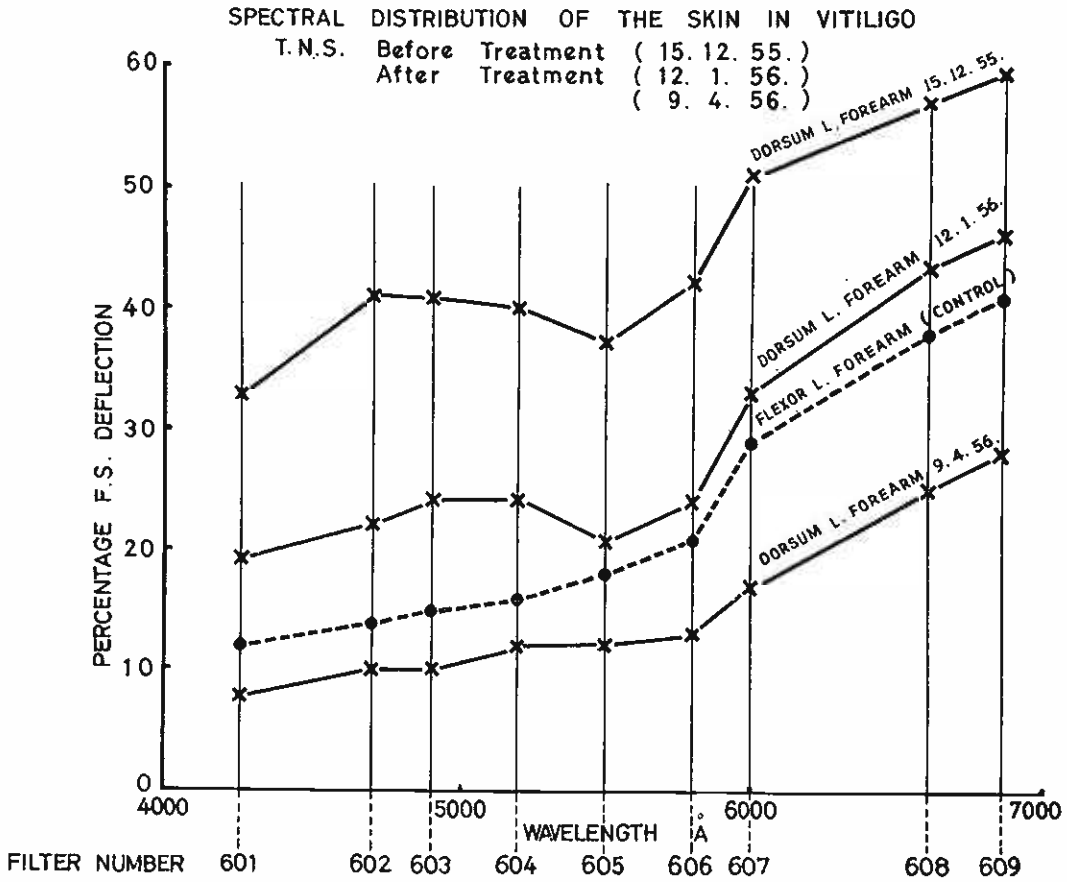

Fig. 15. Deflection curves of Vitiligo skin, left forearm (Case 5), before, during and after treatment compared with that of normal (control) skin.

Fig. 16. Photograph of Vitiligo areas of both forearms (Case 5) before treatment.

Fig. 17. Photograph of Vitiligo areas of both forearms (Case 5) during the course of treatment.

Fig. 18. Photograph of Vitiligo areas of both forearms (Case 5) after the course of treatment.

placed on the patch of skin to be examined and the deflection of the light spot of the scale is noted. This gives the percentage of the light reflected by the skin compared to that reflected by the standard white object. The procedure is repeated by rotating in turn each of the nine coloured filters under the beam of light in the Head.

The deflection curves for the vitiligo patch and for an adjacent area of normal skin, as control, are made.

CASES

Case 1.

B.M., Female child, Indian.

Vitiligo in both feet. Spectrophotometer records (Fig. 3) and photographs (Figs. 4 & 5) were taken on 3.2.55 and after a period of treatment on 21.8.57. There was very slight repigmentation, not easily noticeable in the photographs, but shown by the deflection curves in Fig. 3.

Case 2.

H., Male adult, Indian.

Vitiligo on forehead. Spectrophotometer records (Fig. 6) and photographs (Figs. 7 & 8) were taken on 15.1.55 and after a period of treatment on 18.7.57. There was a small amount of repigmentation on the forehead noticeable in the photograph (Fig. 8) and clearly shown by the deflection curves in Fig. 6.

Case 3.

T.T.K., Male adult, Chinese.

Vitiligo on dorsum left foot. Spectrophotometer records (Fig. 9) and photographs (Figs. 10 & 11) were taken on 12.1.56 and after a period of treatment on 22.8.57. There was marked repigmentation in the form of islands after treatment. The deflection curve taken after treatment on 22.8.57 show marked reduction in the percentage of light reflected from the vitiligo patch compared to that before treatment.

Case 4.

R.B.A., Female child, Malay.

Vitiligo left clavicular area. Spectrophotometer records (Fig. 12) and photographs (Figs. 13 & 14) were taken on 27.10.55 after treatment on 22.8.57. The deflection curve of the vitiligo area after treatment is nearly half-way between that of the vitiligo area before treatment and that of normal skin (control area). The photographs indicate that the repigmentation is centri-petal starting from the periphery. The central area appears to be as much devoid of pigmentation

after the period of treatment as was before it.

Case 5.

T.N.S., Female adult, Indian.

Vitiligo on dorsum on both forearms. Spectrophotometer records left forearm (Fig. 15) and photographs (Figs. 16, 17 & 18) were taken on 15.12.55, during the course of treatment on 12.1.56 and after a further period of treatment, on 9.4.56. The repigmentation was very rapid and the records (deflection curve and photograph) taken on 9.4.56 show hyperpigmentation in the vitiligo areas. This change is better illustrated by the deflection curve than by the photograph.

DISCUSSION

The deflection curve is an indicator of percentage of light reflected by the skin compared to that reflected by a standard white object. The amount of pigment in the skin has a linear bearing to the reciprocal of the amount of light reflected by the skin assuming that the scattering effects of the skin are always the same. The background effect (on which the scattering mainly depends), it was stated by Hanson & Owen (1956/57), remains constant at any wave length irrespective of the melanin concentration. It is not possible to make detailed analysis of skin pigments from the deflectance curve (Weiner, 1951). It is also difficult to determine the actual amount of melanin in the living individual. Thus the difference between two deflectance curves should be regarded as indicating the relative differences in the amount of skin pigments. It was noted by Edward and Dunttey (1938) that melanoids absorb strongly the violet part of the spectrum. Small differences in heavily pigmented skins show relatively larger deflection in the red end (over 6000Å), of the spectrum than in the violet end.

The deflectance produced for any one wave length is proportional to the light reflected by a constant area of skin on which the movable Head is placed. This area is the same as the area of the circular aperture in the Head. The deflectance curve is the only simple and suitable method by which quantitative difference in changes of pigmentation can be detected, but it cannot indicate whether the change within the area tested is even or uneven. For recording the nature of the change in pigmentation the deflectance curves must be supplemented by photographs. For the present series cases 2 and 3 show repigmentation in the form of islets and in case 4 the repigmentation is centripetal.

SUMMARY

Slight variation in pigmentation of skin can be assessed by means of the reflectance spectrophotometer.

The spectrometer is used here to assess quantitatively the changes in pigmentation in cases of vitiligo during and after treatment.

The deflectance curves are an index of the relative amounts of pigment present at the time of testing in the total area of the skin that reflects the beam of light from spectrometer Head. The curves, however, cannot indicate the nature of the change in pigmentation and this can only be shown by photographs.

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