PIGMENTATION OF THE SOLE OF THE FOOT IN RHODESIAN AFRICANS*

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Malignant melanoma is extremely common upon the sole of the foot in the African patients seen at Harari Hospital. Lewis[1] pointed out the relationship between pigmentation and malignant melanoma on the sole of the foot of the African in Uganda. He postulated the reason for malignant melanoma being common on the sole of the foot as being the high incidence of ectopic potentially unstable collections of melanocytes seen in this area and that this may be genetically determined. Malignant melanoma may arise in a junctional or in a compound naevus. Lewis quotes a figure of less than 50% arising in a previous naevus while Becker[2] quotes a figure of less than 25%. Butterworth and Klauder[3] published the following distribution of figures for malignant melanoma known to have arisen in a previous naevus: head 16·5%, neck 7·7%, trunk 15·5%, genitals 2·7%, and foot 52·5%.

Lewis in Uganda adopted as his criteria the following grading of pigmentations of the sole of the African foot:

Grade I — No pigmentation (Fig. 1).

Grade II — Areas of light brown to dark brown pigment of various sizes and often with an irregular outline (Fig. 2).

Grade III — Discrete small black areas of pigmentation with clear-cut margins (Figs. 3 and 4).

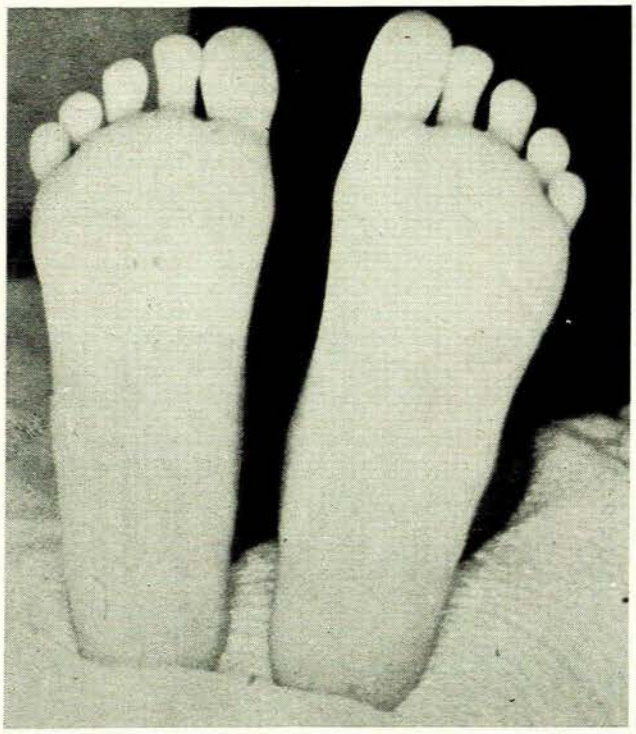

Fig. 1. Grade I. No pigmentation of the sole of the foot.

*Date received: 1 September 1970.

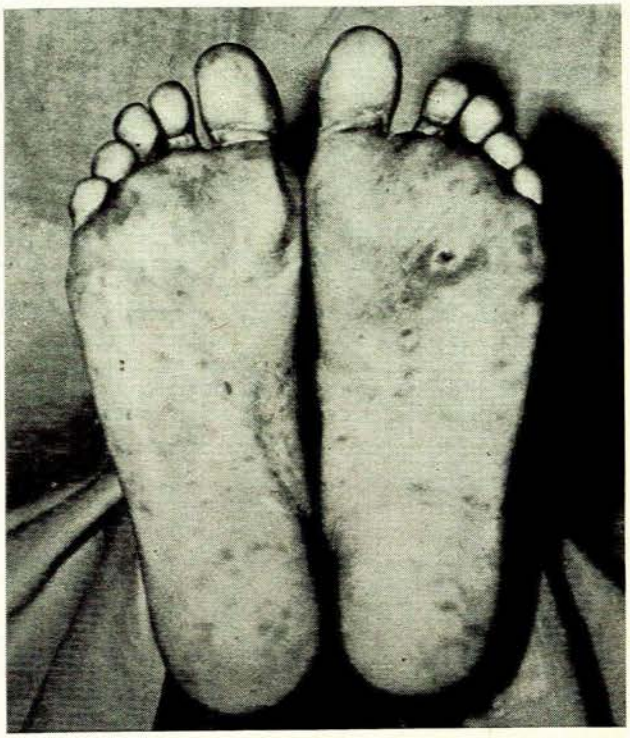

Fig. 2. Grade II. Brown patches of melanosis with ill-defined edges. Note also the plantar wart on the sole of the patient's left foot.

We examined the pigmentation of the sole of the foot in the hospital population of Harari Hospital in order to determine the relationship to the studies carried out in Uganda. The same criteria were adopted as in Uganda and a survey of all the patients in the general wards of this hospital was carried out over a period of 2 days. Only the feet of the 554 patients were examined; the hands were not examined. The patients were divided up into age-groups 0 - 9 years, 10 - 19 years and over 20 years of age. This age-grouping was chosen to try to determine the point at which pigmentation of the sole of the foot became apparent.

RESULTS

The total number of patients included in the survey was 554. The total number of cases in the grade I group were 218 (39·3%); 302 cases (54·5%) had grade II pigmentation; and 34 cases (6·1%) had grade III lesions. This was the percentage for all stages in all age-groups examined. Since there were very few pigmented feet in the age-group 0 - 9 years a further subdivision was made for the three groups in the age-group 10 years and over and again in a subgroup of 20 years and over (Table I).

Sex Incidence

The 338 Mashona were the largest tribal group and for

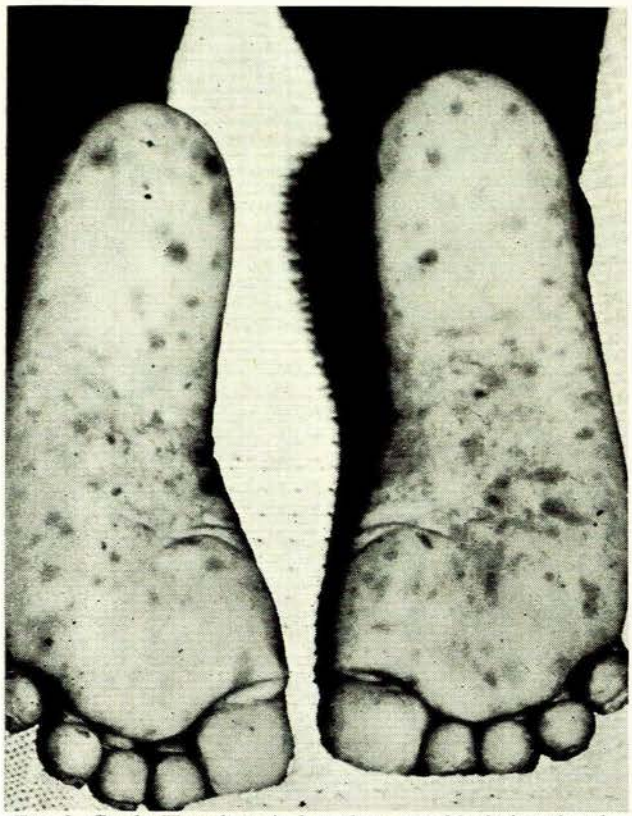

Fig. 3. Grade II melanosis but there are black junctional naevi with well-defined edges. Thus the pigmentation must be classified as grade III.

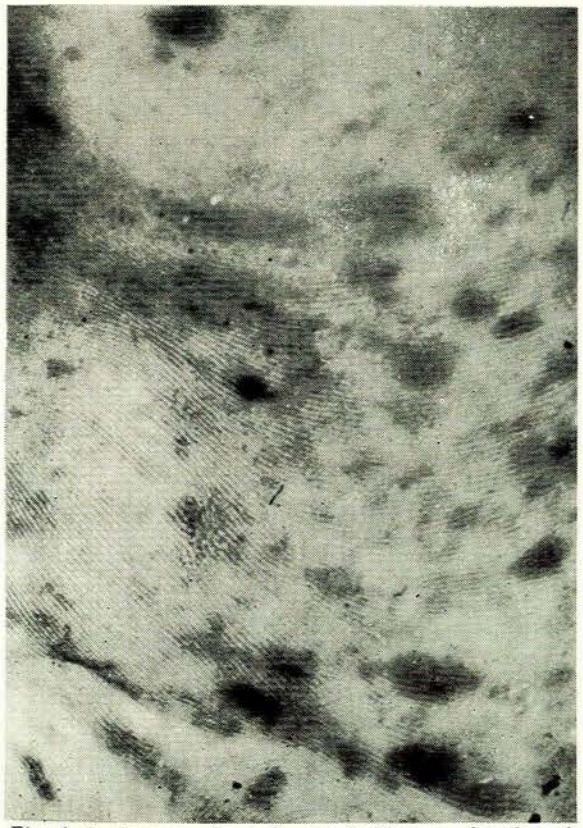

Fig. 4. A close-up view of a grade II type of melanosis with a single grade III pigmentation area in the midst of the melanosis.

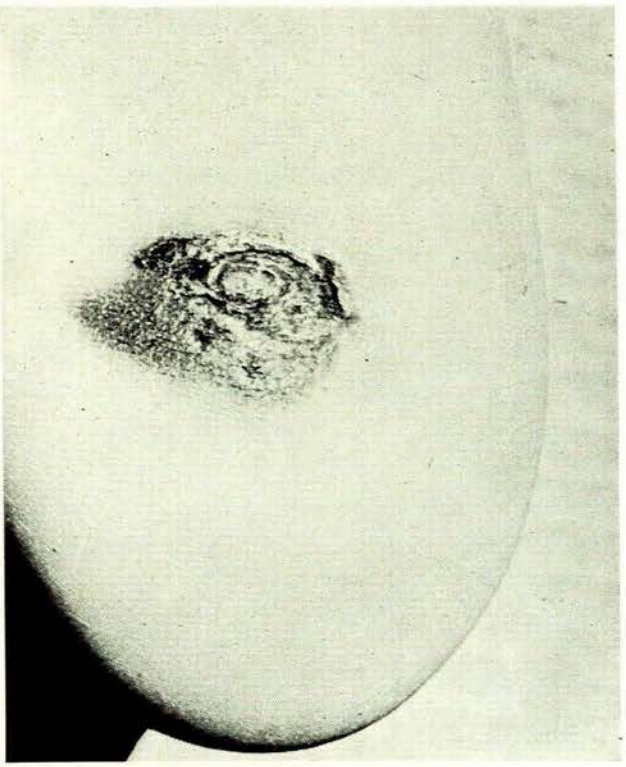

Fig. 5. An 'early' malignant melanoma on the heel of an African female. It is an 'early case' by our standards but late by European standards.

Fig. 6. A typical malignant melanoma on the heel. Note the very mild grade II melanosis of the rest of the sole of the foot.

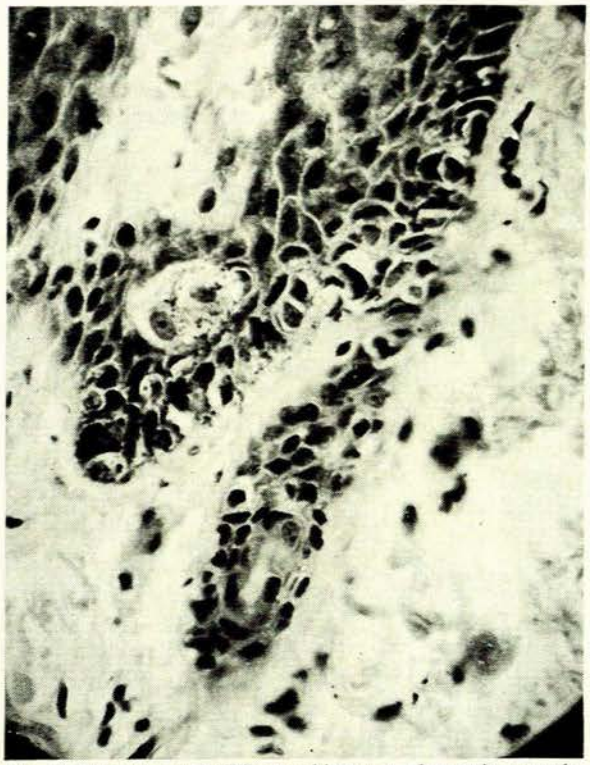

Fig. 7. From a grade III area biopsy a photomicrograph of the base of a rete peg showing proliferated pigment cells with two large vacuolated 'clear' cells above the basal layer. (Photo by courtesy of Dr C. M. D. Ross.)

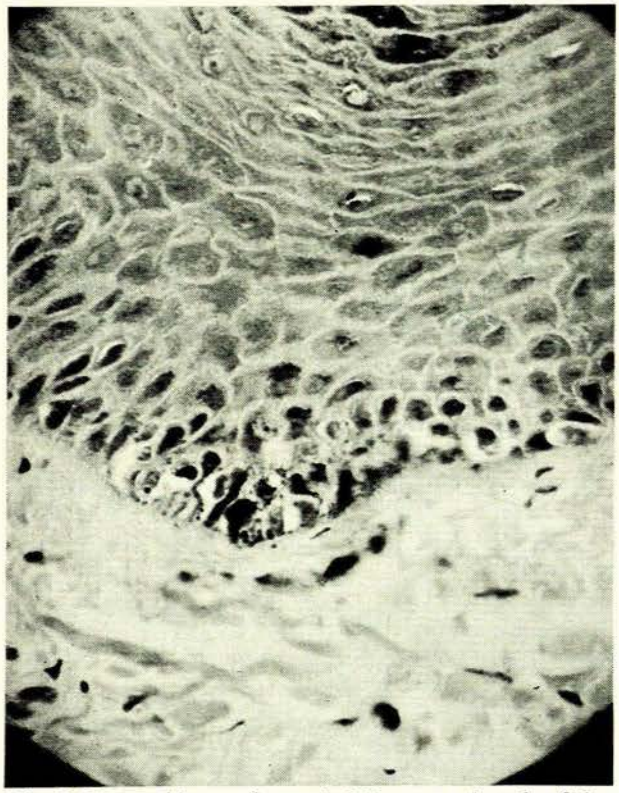

Fig. 8. From a biopsy of a grade III area on the sole of the foot a section shows, apart from proliferated melanocytes in the basal layer, isolated pigmented cells extending through the stratum malpighii to the stratum granulosum above it. (Photo by courtesy of Dr C. M. D. Ross.)

TABLE I. INCIDENCE OF VARIOUS GRADES OF PIGMENTATION

	% incidence in patients 10 years and over	*% incidence in patients 20 years and over*
Grade I	17·1	14·1
Grade II	73·8	75·4
Grade III	9·1	10·5

this reason we examined the group from a point of view of sex incidence. It was found that there was relative correspondence between incidence of pigmentation in the sole of the foot in the two sexes.

TABLE II. SEX INCIDENCE OF PIGMENTATION AMONG THE MASHONA

	0 - 9 yr	*10 - 19 yr*	*20+ yr*	*Total*
Females				
Grade I	39	5	14	42%
Grade II	10	9	57	54%
Grade III	1	0	4	4%
Total	50	14	75	100%
Males				
Grade I	57	7	8	37%
Grade II	9	15	88	56%
Grade III	0	2	13	7%
Total	66	24	109	100%

Points of Interest Arising from the Survey

There were only 2 cases of proved malignant melanoma in the hospital at the time of the survey. One occurred in a male and one in a female. In both cases the melanoma was surrounded by grade III pigmentation with well-defined edges and dark pigment but the rest of the pigmentation of the foot appeared to be that of the *café-au-lait* patches of grade II pigmentation.

DISCUSSION

Lewis in his paper gives the following incidence for the grades of pigmentation: grade I 54%, grade II 46%, and grade III 10%.

In this survey the criteria adopted by Lewis were applied as far as possible to all the patients. A grade I foot showed no pigmentation upon the sole whatsoever. A grade II foot showed brownish to fairly dark black patches. In general, children between 0 and 10 years of age were grade I. It was to be noted that there was one probable grade III pigmentation in a child of under one year and 30 children in the group 0 - 9 years showed early grade II pigmentation. The pigmentation noted by Lewis appeared to show a steady rise to grade II from the age of 0 to 15 years. This was consistent with our findings in this hospital. Grade III is said to appear between the ages of 18 and 20. Once again this was borne out by our findings. Grade III can appear in a grade I foot without any other pigmentation whatsoever, but in the main in this survey grade III pigmentation was found in close association with grade II pigmentation and difficulty was experienced in defining borderline cases. If there was a single, dark, very well defined patch it was assigned to Grade III.

Grade III is suggested to be the dangerous form of melanosis. Grade II, on the other hand, is thought to be a simple melanosis with no association between it and the development of melanomas. There appears to be no junctional activity in grade II melanomata. Whether a grade II melanosis may convert to a grade III is as yet undetermined. In our cases other than those in this

survey it would appear that the melanotic lesion plus the melanotic blush was often surrounded by grade II pigmentation.

In the present survey it would appear that there is a higher incidence of pigmentation of the sole of the foot in the African patients seen at Harari Hospital but that the incidence of grade III corresponds closely to that found by Lewis. This is particularly true of the age-group of 10 years and over and certainly if only the age-group 20 years and over is examined.

The fact that malignant melanoma occurs more commonly on the sole of the foot in Uganda and Rhodesia has been variously ascribed to trauma, to hot iron instruments used on the sole of the foot, to exposure within smoky huts over many years, to crab yaws and even to possible action of ultraviolet light. Certainly trauma in those people who do not wear shoes particularly in youth and adolescence would appear to be a factor in production of malignant melanoma. The lesion, however, usually appears after the age of 30 and is most common in the age-group 40 years and over. The incidence of malignant melanoma in relation to other cancers as given by Ross[4] is 2·9% of all tumours. He also states that it is 14·3% of all skin tumours on the sole of the foot and 3·6% of all skin tumours at other sites. Various figures may be quoted in comparison, such as the South West of England Cancer Registry where there is an incidence of 1·7/100 000 and Uganda where the incidence is 1·4/100 000, but in certain regions this may rise to 3·8/100 000. There is said to be a female predominance of 52% to 48% male. Figures of the sex incidence in Rhodesia are not available but it would appear that it is in fact predominant in the male.

SUMMARY

The incidence of pigmentation of the sole of the African foot as seen at Harari Hospital, Rhodesia, is studied. There is a higher incidence of pigmentation in the African foot compared with the figures given in Uganda but there is a close relationship between the grade III pigmentation as quoted by Lewis and as observed in the present survey. The occurrence of malignant melanoma in a foot with grade II pigmentation is noted and the relative lack of pigmentation in the feet of young children is confirmed. It was, however, noted that there was one foot with grade III pigmentation in an infant under one year of age. Possible causative factors are examined and it would appear that, whatever the initiating factors might be, Lewis's postulate of ectopic, potentially unstable collections of melanocytes seen in the sole of the foot may be the basic reason for the incidence of malignant melanoma in this site.

We wish to thank the Secretary for Health for permission to publish this paper; and the Consultant Staff, Harari Hospital, for permission to examine their cases.

REFERENCES

1. Lewis, M. G. (1967): Brit. J. Cancer, **21**, 483.
2. Becker, quoted by Lewis, M. J. (1948): Ann. N.Y. Acad. Sci., **4**, 82.
3. Butterworth, T. and Klauder, J. (1934): J. Amer. Med. Assoc., **102**, 739.
4. Ross, C. M. D. (1967): Cent. Afr. J. Med., **13**, 107 and 139.