NUTRITIONAL AMBLYOPIA AMONG TUBERCULOUS PATIENTS*†‡

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THE role of malnutrition, climate, and toxicity in the aetiology of amblyopia has been discussed extensively in the literature. Most of the studies were based on the influence of these factors on prisoners of war.

Livingston (1946), who examined 3,000 prisoners of war returning from Japanese camps, found that in 15 per cent. of them the main positive features in the fundus were as follows:

- (1) Silver-grey appearance of the macula.
- (2) An ill-defined macula with pavement-like appearance.
- (3) Scattered white or grey dots and pigmentary disturbances at the macula.

He observed that sometimes the retinal vessels presented a greyish veiling and the optic disc showed temporal pallor. Retrobulbar neuritis was considered to be the cause of the amblyopia, which was usually bilateral, the visual loss varying from 6/9 to 2/60. Furthermore, in Livingston's series, as well as in that of Ridley (1945), many of the patients presented kerato-conjunctival abnormalities, *e.g.* corneal vascularization. All these ocular changes were attributable to avitaminosis of B₁ and B₂.

Dekking (1947), examining prisoners of war in South East Asia, stressed that the main changes in "camp eyes" were seen in the macula; these he described thus: small pigment shifts; a breaking-up of the macular yellow; honeycomb or foam structure of the macula; abnormal or absent macular reflex. He attributed them to vitamin B deficiency and the influence of the tropical climate.

Beam (1947), studying American prisoners of war in Asia, made no note of macular disturbances, and pointed out that optic atrophy and central scotomata were present, with resulting visual deterioration within 4½ to 8 months. The disease could not be related to toxic or infectious influences.

Moore (1934), who worked in Southern Nigeria, did not describe fundus changes, but found chronic retrobulbar neuritis with central scotoma in 300 cases. Those affected lived mainly on a diet of casava.

Siegert (1956), studying returned German prisoners of war, emphasized that only those who had lived in tropical or sub-tropical camps were affected. The fundus changes comprised macular oedema and depigmentation of the macular area.

Most of these papers deal with amblyopia in prisoners of war in tropical and sub-tropical countries where poor dietetic conditions prevailed. Piper (1952) stressed that, in prisoners of war returned from Russian camps, no eye diseases could be considered as due to malnutrition.

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We have found no reports of malnutrition due to chronic tuberculosis resulting in fundus changes similar to those described as nutritional amblyopia. During our work in a tropical country, Tanganyika, we had the opportunity of examining the in-patients of a tuberculosis department, most of whom showed the malnutrition associated with the advanced stages of the disease. It seemed worth while to search for evidences of ocular defect in this combination of malnutrition and a tropical climate.

Material and Methods

Eighty patients, 53 males and 27 females, aged from 14 to 70 years (Table I) suffering from long-standing chronic pulmonary tuberculosis and showing marked malnutrition were examined. All of the tuberculous patients were being treated with courses of streptomycin, isoniazid, and para-amino salicylic acid. The examination included:

- (1) Visual acuity.
- (2) Slit-lamp examination of the anterior segment of the eye.
- (3) Fundus examination.
- (4) Examination of central visual fields if good patient-cooperation could be obtained. This was too rarely achieved to be of diagnostic help.

All these examinations were performed by each of us separately and the results compared at the end of each examining session.

A group of 409 control patients, 277 males and 132 females, aged from 13 to 65 years (Table I) was collected at random amongst clinic out-patients in the eye department of the same hospital. They were in a satisfactory nutritional condition, and most of them were attending because of errors of refraction. These patients were examined as in the first group.

TABLE I
TUBERCULAR AND CONTROL GROUPS ACCORDING TO AGE

Age (yrs)		11-20	21-30	31-40	41-50	51-60	60+	Total
Group	Tubercular	8	26	16	12	14	4	80
	Control	12	34	182	122	44	17	409

Results

Bilateral macular changes accompanied by visual deterioration in both eyes to various degrees were used as criteria. Pallor of the disc and other changes were practically absent.

Amongst the eighty tuberculosis patients, in 62 the visual acuity was or could be corrected up to 6/6 or 6/7.5. In seven patients opacities in the media impaired the vision to some extent and these were therefore not included among the amblyopic cases. In eleven patients the examination revealed varying degrees of diminished visual acuity (Table II, opposite). All these eleven patients had bilateral pigmentary changes in the macula.

Amongst the 409 cases of the control group, in 372 the vision could be corrected up to 6/6 or 6/7.5, and 34 proved to have opacities in the media impairing vision, and were therefore excluded. There remained three patients with a visual acuity lower than 6/9, which could not be thus explained. Of these three patients, one presented bilateral pigmentary changes in the macula, while the other two had normal maculae.

TABLE II
OCULAR FINDINGS IN ELEVEN TUBERCULAR CASES WITH SEVERE MALNUTRITION

Case No.	Sex	Age	Visual Acuity with Correction		Fundus Examination	
			Right	Left	Right	Left
1	F	25	6/12	6/12	PCM	PCM
2	M	27	6/12	6/12	PCM	PCM
3	M	35	F.C.	6/9	PCM Macular cyst	PCM
4	M	44	6/12	6/18	PCM	PCM
5	M	50	6/18	6/18	PCM No macular reflex	PCM No macular reflex
6	M	55	6/12	6/9	PCM	PCM
7	M	60	6/60	6/60	PCM	PCM
8	F	60	6/12	6/18	PCM	PCM
9	M	60	6/24	3/60	PCM	PCM
10	M	65	6/18	6/12	PCM	PCM
11	M	66	6/36	6/36	PCM	PCM

PCM = Pigmentary changes in macula

Thus, if cases with disturbances of the ocular media are excluded, eleven out of 73 tuberculous patients showed macular pigmentation with loss of vision, while only one out of 375 control cases showed these findings.

In diagnosing pigmentary changes in our African patients of both groups, we ignored those with mild changes which bordered on the normal. Experience in this differentiation was gained by having had the opportunity of examining many thousands of African fundi. Positive cases with pigmentary changes presented a mixture of fine and coarse black stippling confined to the macular area, which lacked its normal reflex including the foveal reflex (Figure).

FIGURE.—Macular area in affected case.

Pigmentary changes in the macula were seen in some cases in which amblyopia was not present, but these were not considered to be positive cases.

Considering abnormal macular pigmentation without visual loss, there was a definite difference between the tubercular and control groups. These changes were found in thirteen patients of the tubercular group, eight whom were under the age of 30; and in six of the control group of whom only one was under 30.

Inflammatory changes were seldom found. Three cases in the tubercular group showed a few keratic precipitates or a healed peripheral choroiditis and one case in the control group presented a healed peripheral choroiditis. None of these showed macular pigmentation or loss of vision.

Comment

The difference in both groups with respect to the prevalence of macular pigmentary changes with visual loss appears to be significant. The findings in our series are partly in agreement with those of Livingston (1946) and Dekking (1947) as described in prisoners of war in tropical areas. Both these authors emphasized macular changes, but in our patients only the pigmentary changes were found. We did not observe optic atrophy amongst our patients, as reported by Beam (1947), and none of our cases presented corneal changes that could be attributed to avitaminosis as in the series of Ridley and Livingston.

There remain to be considered the possibility that the differences in the macular changes between the groups are due to age, infection, or iatrogeny.

The age factor can be eliminated, because 41 per cent. of the tubercular group and 39 per cent. of the control group were over 40 years of age, the non-assessable cases with disturbances of the media being omitted from each group. There was no case of senile macular degeneration in the control group.

Active choroiditis, which is known to be rare in patients with active tuberculosis in the lungs (Ballantyne and Michaelson, 1962), was not found in any of our cases. There is no evidence in the literature that changes such as those seen in our cases might be due to infection.

Streptomycin is not known to cause the condition under consideration, although a nerve fibre type of scotoma and optic neuritis have been described (Thomas, 1950; Walker, 1961).

It appears reasonable to assume that the macular pigmentation and visual loss is due to malnutrition appearing in the tubercular patients. The absence of similar reports in the literature may be ascribed to the primary importance of the solar effect. There were no cases of visual loss without pigmentation in the tubercular group, although there were thirteen cases of pigmentary changes without visual loss. It may be assumed that the pigmentary changes precede the loss of vision.

Summary

Among eighty Tanganyikan patients with malnutrition associated with active chronic pulmonary tuberculosis, eleven were found to have bilateral pigmentary changes in the macula and amblyopia.

Among a control group consisting of 409 patients, only one had similar changes. The possible roles of age, infection, and iatrogeny have been considered and found irrelevant.

The evidence suggests that the macular changes and amblyopia are due to malnutrition and solar radiation.

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