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OCULAR MANIFESTATIONS OF MALNUTRITION IN RELEASED PRISONERS OF WAR FROM THAILAND

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OPPORTUNITY has presented itself for the examination of the eyes of some 500 released allied prisoners of War and internees from Thailand who considered that their sight had deteriorated during captivity. Among these no less than 100 cases of amblyopia have been seen in 17 days, and many of those whose corrected vision is normal have subclinical vascular lesions of the eyes. The majority of these men are to be repatriated immediately and many will shortly be attending the ophthalmic clinics of the United Kingdom. In Rangoon it has been possible to examine large numbers who have as yet had no opportunity to improve, and the findings are a guide to the prominent features of syndrome which may be less evident by the time the men reach home.

The barbarity with which these men were treated caused the death of thousands from malnutrition and intercurrent disease. For the purpose of this report it is sufficient to record that the food was inadequate in quantity, especially in view of the heavy labour which had to be performed and that it was lacking in variety, being especially deficient in protein, fats and vitamins. Red Cross parcels were hardly ever distributed and drugs for the treatment of severe

illness were in short supply. The three daily meals were the same and consisted almost entirely of carbohydrates, chiefly rice usually polished but of poor quality and containing much grit. This was supplemented by vegetable stew containing pumpkin, yam, sweet potato, brinjal, Chinese radish and Chinese cabbage. Generally the food was boiled but sometimes a rice rissole fried in cocoanut oil which contains little vitamin A was available. The meat ration was variable though always small, and poor quality tea was supplied. Sometimes at base camps it was possible to purchase eggs and bananas. From October, 1942, to March, 1943, nearly everyone, even the sick, was forced to labour from dawn to dusk on building the Bangkok-Moulmein railway. The food was reduced to starvation level and for a time only rice and salt were supplied. It is not surprising that most visual disorders originated during or shortly after this period.

Among the 100 amblyopic patients visual failure occurred in 90 between October, 1942, and December, 1943, so that the sight has now been defective for two-and-half to three years. Acuity with correction varied between 1/60 and a partial 6/6, 9 read less than 6/60 with the better eye, 16, 6/60, 26, 6/36, 15, 6/24, 15, 6/18, 7, 6/12, 8, 6/9 and 4, 6/6. All those with scotomata and good acuity reported recovery from temporary severe amblyopia. In many cases the onset was sudden, maximum disability was reached within a single day, though in others it was gradual, taking months to develop. The first symptom was usually inability to recognise the faces of friends unless they were close, and those who had access to books found that they could not read. Some men were punished for failing to see the signals of their guards. One man described his defect as resembling that which follows prolonged gazing at an electric light. There was some degree of photophobia and sight was particularly defective in bright light. Rather surprisingly there were few complaints of hemeralopia, "we could see quite well by starlight" was the usual story, though some officers otherwise normal said that for a time they had difficulty in finding their way about at night.* Intercurrent infections tended to precipitate amblyopia, though in a number of cases this had an inverse effect, for patients removed to hospital received better food, including eggs. Many patients with amblyopia said that in addition to recurrent attacks of the common tropical infections they had suffered from pellagra, oedema of the legs, dry beri-beri, and from such minor lesions as sore tongue and perleche which usually accompany deficiency in the B group of vitamins. Quite a high proportion of the amblyopic have become nerve deaf, though other neurological disorders have so far seldom been found.

* Wing Commander A. G. Cross, R.A.F.V.R. has kindly examined amblyopic patients with the hexagon night vision apparatus and finds them all grossly defective. It is probable that this test is too stringent for clinical guidance in these cases.

On examination the presence of a scotoma is suggested by slight movements of the head when the patient attempts to discern a distant object, and by corresponding movements of the print when reading. In those with greatly reduced sight the pupils are dilated in comparison with those of normal individuals in the same illumination. In the fundus there may be no visible abnormalities even when the amblyopia is of long standing, though in many of the severe cases there is definite pathological pallor of the temporal half of the disc, the colour becoming grey rather than pure white. There were 48 cases of optic atrophy and 30 more were regarded as doubtful, though in some instances of severe and prolonged amblyopia the appearance of the disc was normal. Except in three cases of pseudo-papilloedema associated with hypermetropia there was nothing suggestive of past oedema of the nerve head, the edges of the disc being sharp and the physiological cup normally developed. The retinal vessels are not constricted and the macular area and its surrounding vessels generally appear normal, though in a few instances where temporal pallor is marked there appears to be some reduction in the calibre of the macular arterioles, a change probably secondary to retinal atrophy.

Campimetry revealed in 90 cases a small sharply demarcated central scotoma rarely extending more than 3° and sometimes only 1° from fixation, and often only 1° or less, though within this area in severe cases even a 40 mm. white object was invisible at 1 metre. The edges of the scotoma are abrupt, the isopters for large and small objects being almost identical; density of the scotoma rather than its size is the important variable. In the remaining 10 cases the core of the scotoma was para or pericentral and situated within the 3° circle, the fixation area showing less visual depression. In this type the affected area was usually more extensive and the peripheral margin especially was less abrupt and extended as far as the 5° circle. In four of these cases the scotoma appeared to be limited by the horizontal meridian on both sides of the fixation point. Some patients with this type of field say that some portion of a letter or some letters in a line are invisible and that objects tend to appear and disappear. In the majority of these cases there was a history of considerable improvement during captivity, which is in accordance with the shelving edge of the scotoma.

The charting of these fields is difficult, and to obtain fixation in the presence of a central scotoma the gaze is directed to the centre of a white ring 4 inches in diameter. Fixation of a negative point is difficult to achieve and it is found that patients rapidly fatigue and tend after a while from long practice to employ the paramacular retina. To minimise the effect of small movements and to increase the scale it was found advisable to place the screen 3 metres from the subject. The three worst cases could barely see the fixation

ring at this distance and allowing for somewhat wide individual variations, it was usual for a 40 mm. white object to be invisible at 3 metres when the acuity was less than 6/60, a 20 mm. corresponding to 6/60, 15 mm. to 6/36, 10 mm. to 6/24, 4 mm. to 6/18, while with higher degree of acuity the presence of even a 3 mm. white object might be appreciated though less clearly in the central than the paracentral area. With vision of 6/9 or better central fields were demonstrated by depression of the colour sense to a 10 mm. object. Peripheral fields were not charted but no defect was discovered by rough testing.

Practically all the released prisoners show some degree of kerato-conjunctival abnormality. There is no gross injection except occasionally in the interpalpebral area where the conjunctiva may be dull, thickened and opaque. No xerosis corneae or Bitot's spots have been seen and the only pterygium was of long standing. In 96 per cent. of the amblyopic and 91 per cent. of the other patients the fine capillary plexus at the limbus is increased in extent, and minute superficial vessels barely wide enough to pass corpuscles may extend as far as 2 mm. into the cornea. The vascularisation is accompanied by superficial opacification. Frequently the internal margins of capillary loops unite to form quite large circumferential vessels. The most striking feature of the limbal capillaries, however, is their variability in size which is often so great that aneurysms, both fusiform and saccular, appear. These are situated rather more frequently on the scleral than the corneal portion, and the larger ones are easily seen with the corneal loupe. They may at first be mistaken for haemorrhages, but under the high power of the slit-lamp (using 10 $\times$ oculars in place of the usual 5 $\times$) blood cells can be clearly seen passing through the lumen, and sometimes where the circulation is sluggish the aneurysms alternately fill up and then discharge their blood. Aneurysms were present in 65 per cent. of the scotomatous patients and in 48 per cent. of those with normal sight. No haemorrhages have been observed. In 18 per cent. some degree of arcus senilis was seen in the lower portion of the cornea, the grey area being separated from the limbal opacity by a band of clear cornea. In three instances interstitial keratitis accompanied by iritis developed during captivity and in these the Kahn test was negative.

When correcting refractive errors it was interesting to note how readily small changes, especially those of cylinder axis were appreciated in spite of a central scotoma. It was also observed that all ex-prisoners were unduly presbyopic, though it may well be that accommodation will improve along with general condition.

There seems little doubt that the lesions described are due primarily to malnutrition, though there may be other factors since only a small proportion of men living under the identical conditions were

affected. No series of cases has occurred in the civilised world until this war. No literature is at present available in Rangoon, but so far as can be recollected, the greatest number previously reported was fifteen in Chinese individuals in Hong Kong by Wilkinson and King in 1944. Stannus has attributed amblyopia with optic atrophy to deficiency of vitamin B and Fitzgerald Moore (1937) came to the same conclusion from work in Central Africa. It was noted, however, that whereas sore tongue, perleche and skin lesions due to avitaminosis responded in a few weeks to the administration of yeast the amblyopia was very slow to improve, little change being appreciable for several months. Cod liver oil and fruit juice had no effect on controls. Wilkinson and King reported improvement in some of their cases on yeast and nicotinic acid. The present series of European cases while providing vastly superior material for detailed examination of the visual fields does not permit the employment of controls for therapeutic tests. There is no doubt that the diet was deficient generally, especially in proteins and fats as well as in vitamins, and in the absence of direct evidence that avitaminosis unsupported by other factors is the cause it seems advisable to attribute the lesions to general malnutrition rather than to simple deficiency of the B group. Enzer and his co-workers investigating the sensitivity of the optic nerve to organic arsenic in the absence of an adequate diet found that some of their control rats which had been deprived of either vitamin A or vitamin B developed optic atrophy. The abnormal vascularity of the limbus closely resembles that described by Sydenstricker as a result of ariboflavinosis, and improvement may be expected from treatment. It is thought that vascularisation is a reaction to deficient oxidation of the cornea due to shortage of vitamin B2. Interstitial keratitis similar to the three cases reported above was also attributed to the same cause. It should be mentioned, however, that a number of healthy soldiers who have been in a tropical climate for some time have some increase in the limbal plexus, and that West Africans who had definite signs of B deficiency did not show these changes. The incidence of arcus senilis in young men is perhaps little in excess of normal, but suggests a derangement of fat metabolism.

It is uncertain whether the disturbance in the visual pathway originates in the retina or the optic nerve; nor is the mechanism whereby the neurones are affected understood. In view of the known abnormality of the conjunctival capillaries it is tempting to postulate a vascular origin, failure of the choriocapillaris to nourish the outer layers at the macula or, if the limitation of some fields by the horizontal meridian has any significance, failure of the macular branches of the superior or inferior divisions of the central artery to nourish the inner layers of the retina. There is, however, at present no concrete evidence to support such a theory and no more than a

suggestion is justifiable pending microscopical or biochemical evidence.

Treatment of the amblyopic patients has been undertaken by Major R. H. Girdwood, R.A.M.C. In addition to a full European diet supplementary vitamins are administered. Each man receives ten tablets of "Multivite," a preparation containing thiamin 1 mg., riboflavine 1 mg., ascorbic acid 25 mg. and nicotinic acid amide 10 mg., together with aneurin 6 mgs. daily, and at the start parenteral vitamins in the form of 8 c.c. of crude liver intramuscularly for 6 days. Severe cases also receive parenteral riboflavine which is in short supply. Yeast is not locally obtainable.

Amblyopic patients are still arriving at the rate of about 5 per day, and it would be serious if 1 per cent., and may be more, of the survivors from Japanese prison camps are to be permanently disabled by defective sight. So far there has been insufficient time to assess improvement, though after a fortnight about half the patients consider that they can see better especially when trying to read. In some cases acuity has improved by as much as two lines of the test type and in several the density of the scotoma is reduced. Some men in the early stages recovered during captivity when better food was supplied and it is to be hoped that even at this late stage all will improve to some degree in the course of months. Presumably those with established optic atrophy are the least favourable. Arrangements have been made to follow up all the cases, British, Australian and Dutch, and it is hoped to publish a full report at a later date.

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OCULAR GNATHOSTOMIASIS*

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PARASITES in the human eye are rare. Onchocerca is responsible for cases of blindness in certain regions of Africa and America. Undoubted cases of filaria bancrofti, doubtful cases of filaria loa

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