DERMATITIS DUE TO EXPLOSIVES USED
IN AIR RAIDS.

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IN the BRITISH MEDICAL JOURNAL of June 30th, p. 894, I called attention to a form of dermatitis caused by the handling of powder from high explosive bombs and aerial torpedoes used in the air raid on June 13th. Many bombs have been dropped in various parts on previous occasions, but there had been no dermatitis of this particular type. It is evident that some new substance is being used.

Since my note appeared in the JOURNAL cases have been reported by Dr. J. W. Tyson,¹ whose patients were soldiers engaged in digging out bombs; by Dr. H. G. Adamson,² who saw cases at St. Bartholomew's Hospital simultaneously with mine at the London Hospital; by Dr. J. M. H. MacLeod,³ and by Dr. G. W. Sequeira.⁴ I have also had private letters from practitioners who have met with instances.

I have now seen 59 cases of dermatitis, 35 males and 24 females, and they fall into two groups. The majority following the raid of June 13th first attended the London

FIG. 1.

Hospital during the week ending June 30th, with a few stragglers in the next week. The later group, due to the July 7th raid, began to attend for dermatitis on and after July 18th. Four of these patients, two of the first group and two of the second, were shown at the meeting of the Dermatological Section of the Royal Society of Medicine on July 18th.

The irritant comes into contact with the skin in several ways. The following are characteristic instances:

1. A large number of workpeople were in a cap factory when the place was wrecked by bomb. The interior of the building and the material and made-up articles were covered with a yellow powder. The employees began to clear up the place and to resume work on June 15th. Their hands, and particularly the palms, were stained an orange colour, and vesication began on the night of June 23rd.

2. A man and a boy were buried in debris from the wreck of an office. To extricate themselves they had to make their way through much rubbish mixed with the yellowish powder. Their hands were stained at once, and nine days later vesication was noticed.

3. A man who had seen an aerial torpedo fall in a street on June 13th went out into the thoroughfare to obtain a souvenir. He picked up some of the powder, put it in paper, and took it home. His hands were stained, and although he did not again touch the powder the dermatitis began on June 23rd, and he has suffered severely.

4. Two women who walked through streets where bombs had been dropped suffered from dermatitis of the feet from the irritation of powder which had invaded the shoes.

5. An official at the London Hospital who was assisting relatives to identify the dead in the mortuary, a process necessitating examination of papers and clothing, has suffered from dermatitis of the foot, some of the powder having entered his shoe.

6. A small house was wrecked, and a woman occupier suffered in the usual way. Her four children were at school, and as the house had been demolished they were sheltered by neighbours.

The mother went in to attend to them, and they have been affected.

7. A young girl was admitted to the ward with injuries of the foot caused by a bomb. As she fell her hands came in contact with the powder, and although admitted at once to hospital the dermatitis developed after the usual interval.

SYMPTOMS.

The clinical picture is distinct. The initial staining is nearly always of a distinct orange tint. It is especially well seen on the palms. After the lapse of nine days (as a rule) the patients complain of intense irritation and itching, which interferes with sleep. This is followed by the appearance of closely set discrete vesicles the size of hemp seeds (Fig. 1). These are on the palms and along the sides of the fingers and in the interdigital clefts. The backs of the hands are swollen, and there are occasionally small vesicles the size of millet seeds. There is not much redness of the parts. The eruption of vesicles increases, and in many cases huge confluent blebs form, some of these are as large as a hen's egg. From one bleb 20 c.cm. of clear serous fluid was obtained, and in another instance the fluid dripped copiously from a ruptured vesicle. On the feet the phenomena are similar (Fig. 2), but the vesicles are rarely larger than a pea. In a few instances the lesion rapidly became infected and pustules formed, and in another a widely spread erythema with purpura on the lower limbs. The eruption is at its height about the fourth or fifth day, and the epidermis gradually separates, leaving a raw rather dry red surface. In some cases seen early the vesicles dried up with desquamation. In a few instances the feet were affected after the hands, probably by contact. Occasionally the face has been involved, and in one instance a widely spread eczematous eruption formed. Most of the patients were in a nervous condition when first seen, and in others this developed later from loss of sleep. In a few instances relapses are continuing, but are

FIG. 2.

not so severe as the primary attack. Patients who wore gloves to clean up their houses suffered most severely.

Pyrexia.

Three patients were admitted to the ward on account of the severity of the symptoms. One case ran an apyretic course; in two others the temperature reached 100° F. on two evenings.

BACTERIOLOGICAL EXAMINATION.

Dr. Western examined fluid from three cases. In the early stage the serum in the bullae was sterile. In one *Staphylococcus epidermidis albus* was found, and in another, already suppurating, *Staphylococcus pyogenes aureus*.

BLOOD EXAMINATION.

Dr. Panton found eosinophilia in three cases examined. In one instance 11 per cent. of eosinophiles were found, and in another 6 per cent. This was to be expected, and compares with Dr. Panton's report on trinitrotoluene cases.⁵

TREATMENT.

Prophylactic Measures.

It is important to avoid touching the powder or materials impregnated with the powder. Its removal can be effected by moistening a surface with a weak alkaline solution (one teaspoonful of sodium bicarbonate to a quart of water). Brushes may be moistened with this solution. If the circumstances permit, a hose may be used to wash down an apartment or surface covered with the powder. It is better not to wear gloves, as they soon become impregnated with the powder, and moist perspiring surfaces appear to be more easily irritated. Rags wet with the alkaline solution may be used.

If the skin of the hands is stained, an endeavour may be made to remove as much of the stain as possible by pumice, and by washing with the alkaline solution.

Treatment of the Dermatitis.

When the eruption has developed, the parts should be washed as little as possible, but the alkaline solution may be used without risk. I have found that the best local application is a liniment of calamine (calamine 70 grains, lime water 1 oz., olive oil 1 oz.). This rarely fails to allay irritation and to promote healing. If the parts become septic, the usual remedies are of service, and in a very bad case I found that spraying the parts daily with a malachite-green sublimate solution was of great value. The solution, which we owe to McIntosh and Fildes, is made as follows: Malachite green 1 part, hydrarg. perchlor. 0.5 part, spirit. vin. rect. 100 parts.

CAUSATION.

The substance which is the cause of the dermatitis appears to be hexa-nitro-diphenyl-amine. The phenomena are identical with those caused by aurantia, an orange dye (ammonium hexanitrophenylamine) which has been used for the dyeing of cheap brown shoes and other leather articles. In Prosser White's *Occupational Diseases of the Skin*, p. 99, "aurantia, emperor's yellow," is described as "a basic aniline azo dye," which causes an abundant uniform-sized crop of vesicles, thickly crowded together all over the palm. Cases were recorded by Radcliffe Crocker,⁶ whose description of the phenomena of aurantia dermatitis on p. 417 of his textbook on *Diseases of the Skin* (third edition) tallies exactly with the appearance and symptoms which have been observed in the cases now described.

The use of the substance was prohibited in Germany, and it is not used on either silk or wool in this country. In Thorpe's *Dictionary of Applied Chemistry*, vol. i, p. 340, it is stated that, according to Gnehm (*Ber.*, pp. 1246, 1557) and Bayer and Co. (*W. J.*, 1877, 879), aurantia produces skin eruptions. Martius contends that this effect is due to idiosyncrasy, and quotes the opinion of Salkowski and Ziureck in support of his statement. The ministerial order of November 8th, 1877, prohibiting its manufacture was cancelled in June, 1880.

I understand that hexa-nitro-diphenyl-amine is recognized as an explosive substance, and that it is combined with trinitrotoluene in the bombs which have been used in the recent air raids in this country.

I hope to be able to report later on some experiments which are being made with the substances in question, and would gratefully acknowledge the assistance afforded me by the officials of the Ministry of Munitions and the Medical Research Committee.

REFERENCES.

- ¹ J. W. Tyson, *BRITISH MEDICAL JOURNAL*, July 14th, 1917, p. 45.
² H. G. Adamson, *ibid.*, p. 45. ³ J. M. H. MacLeod, *ibid.*, July 21st, p. 80. ⁴ G. W. Sequeira, *ibid.*, p. 80. ⁵ P. N. Pantou, *Lancet*, July 21st, 1917, p. 81. ⁶ Radcliffe Crocker, *ibid.*, 1903, vol. i, p. 491.

STATISTICS OF DEFECTIVE VISION OBTAINED AT A RECRUITING MEDICAL BOARD.

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THE medical examination of the adult males of the country who are of military age affords an opportunity for inquiring into the incidence of disease which has never previously been obtained. In particular the ophthalmic centres attached to the recruiting medical boards have given facilities for estimating the relative frequency of ophthalmic disabilities in the different areas, which may be of some general interest and which should be of value in determining the suitability of different candidates for military service.

The accompanying table, prepared from the statistics of one ophthalmic centre for a period of six months, from June to November, 1916, may now be considered. At the outset it may be stated that the region from which the men were drawn included thickly populated suburban districts, country towns, and extensive agricultural areas, together with a few of the smaller manufacturing centres.

Table showing 2,640 Cases of Defective Vision seen at an Ophthalmic Centre between June and November, 1916.

1. Myopia :			
(a) In categories B 1 and C 1	...	...	951
(b) In categories B 2, B 3, C 2, C 3	...	...	523
(c) Classed as unfit	...	...	73
2. Hypermetropia :			
(a) In categories B 1, C 1	...	...	123
(b) In categories B 2, B 3, C 2, C 3	...	...	153
(c) Classed as unfit	...	...	2
3. Amblyopia	...	...	354
4. Corneal opacities	...	...	141
5. Traumatic cataract	...	...	119
6. Congenital cataract	...	...	44
7. Enucleation of eyeball	...	...	76
8. Fundus defects :			
(a) Choroido-retinitis	...	...	20
(b) Detachment of retina	...	...	9
(c) Retinitis pigmentosa	...	...	6
(d) Progressive optic atrophy	...	...	11
9. Night blindness, without special fundus changes	...	...	3
10. Iritis	...	...	6
11. Nyctagmus	...	...	21
12. Miscellaneous :			
(a) Vitreous opacities	...	...	2
(b) Chronic glaucoma	...	...	1
(c) Ocular paralysis with diplopia, etc.	...	...	2
			2,640

The period is one of six months, and includes the time during which the men were called up who had been previously rejected for military service as being below the standard adopted in the British army for general military service. All the cases examined were those who were below this standard or who had been referred for ophthalmic examination on account of certain obvious defects. From this it will be seen that many cases of minor errors of refraction, or even some of graver eye troubles, may have been passed for general service if they possessed the visual acuity of R. $\frac{5}{24}$, L. $\frac{5}{60}$, which satisfied the military requirements for general service during the greater part of the period dealt with.

No attempt has been made to estimate the proportion of defective eye cases to the adult male population in general, for by far the larger part of healthy adult males had already been passed into the army, so that in these later months there has been a far larger proportion of defective cases, from whatever cause, many of these having been rejected in the earlier months of the war and being brought up again for examination and possible classification in some of the categories below that for general service. I will now discuss in detail some of the causes of disability which seem to be of greatest importance.

1. *Myopia*.—It will be seen that by far the most important question is that of myopia. Those who are affected by this refractive error are divided for convenience into three classes :

- Those whose defect can be corrected by glasses so as to fit them to shoot.
- Those who are below the standard for shooting but who might be fit for labour or sedentary work.
- Those who are unfit for any military service.

(a) The large number who are included under this head, nearly one-third of the total of cases of defective vision, indicates the importance of securing these men for service in the army. A considerable proportion of these could read $\frac{5}{6}$ with glasses, and the general standard adopted for this class was a visual acuity of not less than $\frac{1}{2}$ in the right eye after correction with less than -6 D. In the chief armies of the Continent these men would be accepted for the regular army.

(b) The next class includes those who could be corrected sufficiently with - glasses, such as were supplied during the period under review at Government expense (namely, a maximum of 6 D. spherical with + 4 D. cylindrical), if these would enable them to do labour or sedentary work. Some latitude has been granted recently to officers in charge of ophthalmic centres to order stronger glasses. No hard-and-fast standard was adopted in these cases, a decision being based largely upon the previous experience of the individual recruit. This class formed more than a fifth of the total, and if these are added to the total of the previous class the number of myopic cases