throat of one only of these were haemolytic streptococci Group A again found.

In order to judge the significance of this occurrence—namely, that two of the five students who originally had Group A haemolytic streptococci in their throats were later absent on account of catarrh—it is essential to consider the frequency of illness in the whole group of 120 students.

Only 9 per cent. of the students were imperfect in their attendance at work on account of slight illness, and 7.5 per cent. of the total group had catarrh severe enough to lead to cessation of duty. An interesting finding is that 44 per cent. of these students did not have Group A haemolytic streptococci demonstrated in their throat swabs either before or during the attack of catarrh. Of the remaining students 60 per cent. had Group A streptococci during the attack of catarrh, although they had had none in their throats before starting their work in obstetrics. In 20 per cent., though Group A streptococci were demonstrated at the original examination, none were found in the throat during the attack of catarrh. The remaining 20 per cent. had the Group A streptococcus demonstrated before and on several occasions throughout their training. Two students were put off duty because they had been in contact with a patient in whom Group A haemolytic streptococci had been found, and haemolytic streptococci were demonstrated in their throats, but in only one of the students did these prove to belong to Group A.

Puerperal Pyrexia and Patients' Throats

It may be of interest to record that only on four occasions during these two years, when throat swabs were examined because a patient had developed puerperal pyrexia, were haemolytic streptococci found in the patient's throat, and in two cases these did not belong to Group A, B, C, or G; in one they belonged to Group B and in one to Group A. In this latter case the same strain of haemolytic streptococcus was isolated from the patient's cervix and also from the throats of a student and a nurse in contact. Only in one of the other cases was a student found to be a carrier.

Conclusions

As many as five carriers of Group A haemolytic streptococci were found in a group of 120 apparently healthy women of college age.

The importance of these findings appears to lie in the suggestion that greater facilities for the routine examination of throat swabs should be made available to the medical and nursing profession.

It would seem advisable, also, that the students' curriculum should be so arranged that under present conditions contact with children's diseases should not be made immediately before work in obstetrical wards, nor should it be made contemporaneous with such work.

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OPHTHALMIC SERVICES TO THE CIVIL POPULATION IN NATIONAL EMERGENCY*

BY

ARNOLD SORSBY, M.D., F.R.C.S.

Surgeon and Director, Research Unit, Royal Eye Hospital

Modern warfare carries the evil promise of two new principles—the terrorization of the civil population and the "Blitzkrieg"—the lightning war. The organization of the medical services to the civil population has thus passed beyond an errand of mercy into a primary weapon of defence, for a successful attempt on the morale of the civil population would inevitably be a major disaster. The role of organized medicine in any future war will therefore be of a different character from that in the past. In the Boer War there were more casualties from epidemics among the troops than from actual war injuries; in the great war medicine served in the dual function of tending the wounded and evolving a public health system which prevented the spread of epidemics, though not altogether successfully, as the influenza pandemic of 1918 showed. In a future war medicine will have to face the task of tending to a new type of casualty: civilians subjected to all the rigours of hostilities, for each individual home will be part of the battlefield.

To the established duties of military medicine in tending the maimed in the armed forces and maintaining public health services as a safeguard against epidemics in the civilian and military populations will thus be added the new obligation of evolving an organization to deal with civilian casualties. This situation is new in yet another sense, for the weapons of attack on the civil population are as yet largely untried and their potentialities are not fully known. In this welter of uncertainty one thing stands out: contrary to past experience, the first duties of medicine will not be on some limited battlefield amid the clash of armed forces but among the civil population, against whom the concentrated fury of modern agents of destruction will be unleashed. As the limitations of aerial warfare are still undetermined, and as the technique of the "Blitzkrieg" tactics involves the maximum possible damage to be inflicted at the very beginning, it is likely that every possible means of destruction will be used experimentally—poison gas and incendiary bombs, which are probably relatively inefficient weapons, no less than the various types of heavy explosives. Every possible kind of injury is thus to be expected. More stable conditions are likely as the momentum of the "Blitzkrieg"

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slackens, as inevitably it must from the terrific losses that will be suffered by the attackers and from the growing necessity of greater economy in effort. The intensive and "experimental" period will probably be short, but the most strenuous medical organization for this period is a vital necessity. Foresight, forewarning, and fore-arming are essential in facing the lurking unknown terrors. If the anti-aircraft gun is the first line of defence in A.R.P., the casualty station is the last, and the last line must be impregnable.

The General Casualty Service

The first essential is a service to collect the injured. So far as London is concerned, provision is being made for mobile units devoted to this task. These mobile units, in their ambulances, should be able to provide essential first aid and to take the injured to first-aid posts and to casualty stations, serving as temporary reception centres for base hospitals situated in the outlying areas. As injuries are likely to be multiple, the call for specialized services will probably be less urgent than for all-round competence—at any rate, for the personnel of the casualty stations. In the base hospitals a greater specialization will be possible and desirable.

Civilian Ophthalmic Patients

In any intensive and persistent bombardment much of the ordinary ophthalmic practice will cease automatically. The "chronics," the refraction patients, and the many patients with minor eye trouble are not likely to press for attention. The emergency acute glaucoma or other acute conditions of civil life will still require treatment. In London it is not anticipated that the eye hospitals will function fully, if only because the staffs will not be available for routine work, and it is probable that no new patients will be admitted. The patients with civilian emergency will, however, have access to the general hospitals, which will function as casualty clearing stations and should have some specialized talent. The civilian emergency will be dealt with in the same way as the victim of bombing, and where necessary he will be transferred to the base hospital.

Ophthalmic Air Raid Emergencies

Injuries confined to the eye are likely to be rare. Heavy explosives tend to kill or produce severe multiple wounds. During the last war, when fifty tons of high-explosive bombs were dropped on London in the air raids carried out between September, 1917, and May, 1918, out of the 1,415 casualties there were 435 deaths—that is, approximately one killed to two wounded. Recent experience in China and in Spain was on similar lines. In Barcelona during March, 1938, in successive raids over a period lasting three days there were approximately 1,000 killed and 3,000 wounded, and but very few slightly wounded. Of those trapped in collapsing buildings 10 per cent. died in spite of treatment, the mortality rate rising to 35 per cent. if those brought in dead at the hospital are included. Shrapnel wounds were even more serious: 25 per cent. of patients with traumatic amputations and 68 per cent. of patients with chest wounds died; the mortality among patients with compound fractures was 15.6 per cent., and among those with abdominal injuries requiring operation, 60 per cent. The general mortality of wounded admitted alive to all hospitals in Barcelona, taking together all lesions, from the slightest to the most serious, was 20 per cent. The total mortality was about 45 per cent. if those killed outright are included.

Ocular Injuries from "Gas"

So far as ocular injuries are concerned mustard gas and the allied lewisite are the only significant agents of chemical warfare. The lacrimators, of which chlorine gas is the classical example, result in nothing beyond alarming symptoms unless the eyes are splashed directly by the fluid which liberates the gas, when a corrosive burn is produced. The sensory irritants such as the arsenical compounds, and the asphyxiant gases such as phosgene, produce a transient conjunctivitis. In all cases, the rare direct corrosive burns from fluid lacrimators excepted, no treatment is necessary other than perhaps simple lavage.

The injuries produced by mustard gas during the Great War were chiefly of a minor and transient character. Approximately 75 per cent. of cases showed a mild conjunctivitis with no apparent damage to the cornea; in some 15 per cent. the conjunctivitis was more intense, and in the remaining 10 per cent. there was a corneal lesion. As the effect of mustard gas depends on the concentration that reaches the eye, and as the methods of distribution of the gas have been improved, the proportion of severe to mild injuries is likely to be higher in future.

In its gaseous or liquid state mustard gas is almost odourless, colourless, and devoid of any immediate irritant effect, except when the liquid is splashed into the eye. The immediate effect and the late results are therefore different, yet the action of this agent is instantaneous. If drops of liquid mustard gas are put on both corneas of an animal, and one eye is immediately thoroughly irrigated, the lesions in the two eyes on the following day are identical. Histologically, all the layers of the cornea are involved, and in severe cases the whole of the cornea is necrosed, exposing Bowman's membrane.

Mustard Gas Vapour.—After a latent period, which varies with the concentration of the vapour reaching the eyes—it was six to eight hours in the last war—pain and a feeling of grittiness under the lids develop, followed by photophobia, blepharospasm, and profuse lacrimation. The lids become oedematous and glued together. The conjunctiva, particularly in the interpalpebral area, is intensely engorged and swollen. Where the cornea is involved the photophobia and blepharospasm are more severe, and the patient may be unable to open his eyes, this leading to the fear that he has lost his sight. Though lacrimation is profuse there is no purulent discharge unless there is secondary infection. Where corneal involvement is present, that part of the cornea which is covered by the upper lid is generally unaffected. The exposed interpalpebral area loses its lustre; a turbid horizontal band is thus seen stretching across the clear cornea, to become confluent with the affected interpalpebral conjunctiva. The pupil is contracted. Abrasion, ulceration, and secondary infection may all occur, rendering the immediate prognosis more grave.

Mustard Gas Liquid.—Symptoms develop immediately. Within a few minutes there is intense lacrimation; marked injection of the conjunctiva occurs within half an hour, and progressive chemosis within an hour. Infiltrating ulceration involving the cornea, conjunctiva, and lids develops. The corneal lesion is similar to that of any severe caustic burn.

Treatment.—As the effect of mustard gas is instantaneous nothing can be done to counteract the damage from exposure to gas or liquid. Treatment therefore aims at the relief of symptoms, the control of the lesion, and the prevention of secondary infection and of complica-

tions. As an "anxiety state" from the fear of blindness arising out of the inability to open the eyes is a prominent feature, the patient has to be reassured about his sight by the simple procedure of gently separating his lids to convince him of his ability to see. Symptomatic treatment of conjunctivitis from vapour gas consists of irrigation with some bland lotion, such as sodium bicarbonate solution (ten grains to the ounce). Castor-oil drops or liquid paraffin drops may be helpful. Where the cornea is involved atropine drops, 1 per cent., should be instilled three times daily. A loosely fitting shade made of cardboard is useful, as are dark glasses, but the tight-fitting cellulose shades of commerce should not be used. On no account must the eyes be bandaged, for any persistent vapour is thus kept shut in and irritating discharge is pent up. Where secondary infection has occurred the usual treatment for acute conjunctivitis has to be carried out. The presence of corneal abrasion, corneal ulceration, and their complications calls for the special measures employed for these lesions in civil life.

Late Complications.—Recurrent corneal ulceration, coming on many years after mustard-gas conjunctivitis, makes the ultimate prognosis less satisfactory than is suggested by the immediate good result in many cases.

Ocular Injuries from Incendiary Bombs

Burns of the eye apart from general burns are unlikely. The lids may be involved in a facial burn, and the danger to the eye lies in remote sequelae rather than in immediate complications. Flying cinders may, however, cause a burn of the cornea.

Treatment.—Burns of the lids should be treated on general principles. The conjunctival sac should be irrigated. Reactionary chemosis of the conjunctiva requires fomentations or dry heat. Where corneal complications threaten or are present from exposure of the cornea, atropine should be instilled. A burn of the conjunctiva calls for special care to avoid shrinking and symblepharon. Gutt. ol. ricini and the frequent use of a glass rod to break down fresh adhesion are necessary.

Ocular Injuries from Explosives

Bullet wounds are less likely than wounds from flying shrapnel from bombs and anti-aircraft weapons. Immediate and remote effects of contusion injuries can generally be dealt with at leisure. The most common source of isolated eye injury is falling debris from collapsing houses. During the last war eyelid injuries were frequent, and were almost always accompanied by injuries of the eyeball. The lids became very oedematous and swollen, and it was found best not to put in sutures. Injuries to the globe were generally extensive, leading to the complete destruction of the eye—the sclera being torn to ribbons. There was usually profuse intra-orbital haemorrhage producing proptosis, and the tissues usually became oedematous and septic. As between the danger of meningitis from the removal of the eye in the presence of orbital sepsis and sympathetic ophthalmitis from delay in removing a dangerous eye, a cautious course had to be steered. The precaution of leaving a portion of the sclerotic around the optic nerve and thus avoiding opening the nerve sheaths was a helpful procedure.

Perforating wounds without immediate disorganization of the globe—other than those causing no more damage than prolapse of iris—carried a poor prognosis, even when a retained intra-ocular foreign body proved to be magnetic and was extracted. Occasionally a mark suggesting perforating wounds was seen on the cornea, and radio-

graphy failed to reveal any retained foreign body; such injuries were probably produced by grains of sand.

Treatment.—Probing of the orbit should be avoided for fear of carrying sepsis into the tissues, a particularly dangerous procedure if the injury to the orbit has opened the cranial cavity. Where a disorganized eye has to be removed, evisceration, leaving a stump of sclera, rather than excision, should be undertaken. In the presence of sepsis a drainage tube should be left in. Perforating wounds of the cornea with prolapse of the iris are treated in the same way as these injuries are dealt with in civil life.

Organization of a Treatment Service in Emergency

The special difficulties that will arise in the treatment of eye injuries in emergency lie in the great number of casualties that are to be expected, the improvised nature of many of the facilities that will be available, and the disorganization of the established ophthalmic services at the height of the emergency. First aid in eye injuries is of less importance than first aid given as a life-saving measure, so that first-aid parties and ambulance teams are unlikely to be able to render aid for eye injuries. The first-aid post and the casualty clearing station should, however, be equipped to deal with this. In case of gas injuries general decontamination will of course require attention. So far as the eyes are concerned, it should be unnecessary to do anything to patients who have worn suitable masks. Where a gas burn is suspected—and a vapour burn will not show itself symptomatically or objectively until after several hours—nothing beyond irrigation with bicarbonate lotion need be carried out, if at all. In an eye burn from liquid mustard gas the immediate and urgent symptoms call for attention. Irrigation with bicarbonate lotion and the instillation of atropine drops and gutt. ol. ricini should be carried out, and the patient supplied with a loosely fitting double shade. The danger of bandaging the eyes should be impressed upon the staff. All cases of eye burns, even those in which the cornea is apparently not involved, should be transferred to the base hospital.

Burns from incendiary bombs are unlikely to call for special eye treatment. Irrigation of the conjunctival sac by a bland lotion may occasionally be necessary. Where the cornea is involved atropine should be instilled at the casualty clearing station. In treating burns of the face the elementary precaution of avoiding the splashing of picric acid or tannic acid into the eyes should be observed.

Eye wounds from heavy explosives will require the specialized supervision planned to be available at the casualty clearing hospitals and the base hospitals. First aid in these cases will generally consist in bandaging the injured eye. Where there is an adequate staff the casualty clearing hospital should be equipped with the necessary apparatus for dealing with the occasional cases of an isolated prolapse of the iris, as this is an emergency operation.

Suggested Ophthalmic Equipment

The ophthalmic minimum equipment of the first-aid posts and the casualty clearing centres should therefore consist of a supply of bicarbonate lotion, castor-oil drops, atropine drops, double shades, and bandages. Ophthalmic instruments necessary for the urgent operation of abscission of prolapsed iris and the making of a conjunctival flap should be available at the casualty clearing hospitals.

The more leisurely work possible at the base hospital will allow of a wider range of activities, though the nature of the injuries will not give much scope for fine procedures. Mr. C. B. Goulden suggests the following equipment:

Hypodermic syringe.
 Needles—hypodermic: (a) 1½ inch exploring 24 P.W.G.
 (b) 2 cm. fine.
 Lang speculum.
 Fixation forceps—2 teeth into 3 teeth.
 Lister's conjunctival forceps.
 Squint scissors: (a) light; (b) heavy.
 Strabismus hook.
 Needle holder (Silcock).
 Iris forceps: (a) Lang's curved; (b) Barraquer's.
 De Wecker scissors with blunt points.
 Couper's capsule forceps.
 Iris retractor. Squint needles.
 Silk: No. 1, white; No. 0, black.
 A.C. wash-out nozzle.
 Rubber tubing to fit nozzle.
 Undines.
 Keratomes: (a) large straight; (b) small straight.
 Graefe knives. Daviel's spoon.
 Dissection needles. Scalpels.
 Other general surgical instruments from the general theatre.

To this list an evisceration scoop might usefully be added. This list does not include a magnet, as its author feels that opportunities for useful employment of the magnet will be strictly limited.

In London it is planned to have an ophthalmologist available at each casualty clearing hospital and at the base hospitals. In the nature of things their duties in emergency will not be purely ophthalmic, but the planned distribution of available talent should be valuable at the moment of crisis. It is assumed that the treatment of eye injuries will be carried out under conditions allowing the use of light and water. Provision is being made for alternative—and local—supply of light and water should the main supply of either be cut by enemy action or deliberately as a precautionary measure.

The organization that will emerge after the anticipated brief and intensive attack on the civil population cannot at present be foreseen. At its best there will be a rapid return to something like normality; at its worst a skeleton normal service will have to function besides the organization to deal with air raid casualties. The resilience of human nature and the resources of a civilization are things not easily worn down, as the martyrdom and heroism of the peoples of Spain and China in their struggles amply and nobly testify.

Summary

The home conditions likely to exist during the first few weeks after the outbreak of hostilities are discussed.

It is pointed out that organization for special ophthalmic services will be of limited value, but that it is planned to have ophthalmic talent widely distributed.

The effects of ocular injuries from gas are surveyed, together with their treatment.

The lesions from incendiary bombs and the damage from heavy explosives are discussed.

The scope of first aid and the possibilities of treatment at casualty clearing stations and at base hospitals are indicated.

My thanks are due to Dr. J. N. Dobbie of the Ministry of Health and Dr. R. C. Harkness of the London County Council for much of the information on organization contained in this paper. I am also indebted to Mr. C. B. Goulden for a similar service, for permission to use the list of equipment published here, and for kindly placing at my disposal his great knowledge of war injuries.

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SULPHANILAMIDE IN THE TREATMENT OF SCARLET FEVER*

BY

E. C. BENN, M.B., Ch.B., D.P.H.

Medical Superintendent, Seacroft Hospital, Leeds

During the last two years several reports have been made on the effect of sulphanilamide preparations in the treatment of scarlet fever. These show no unanimity in the conclusions of their authors. Proseptasine was used by Peters and Havard (1937) in the treatment of 150 cases of scarlet fever and was withheld from the same number of alternate cases which served as controls. The sum of the individual complications was the same in both groups, but they occurred in a smaller number of patients (35 per cent.) in the test series than in the control series (56 per cent.). The same preparation was used by Hogarth (1937) in a controlled series of 114 patients with scarlet fever, and he found it had no significant effect on the initial pyrexia, the initial toxæmia, or the incidence of complications. Sako, Dwan, and Platou (1938) treated 100 cases of scarlet fever with sulphanilamide, and controlled their test with a similar series of the same number which did not receive the drug. Their findings agree with those of Hogarth in that the toxic stage of the disease was not affected, but they report that complications occurred in eight of the sulphanilamide series against forty-one of the control series. Pfaffenbichler (1938) treated 150 scarlet fever patients with prontosil for eight days from the time of admission to hospital and used the same number of contemporaneous admissions as controls. Of the treated series 46.6 per cent. had an uncomplicated convalescence, whereas this occurred in only 26.6 per cent. of the control series. Cervical adenitis was seen in 14.6 per cent. of the test series against 20 per cent. of the controls, and otitis media in 6.6 per cent. of the test group and 11.3 per cent. of the controls. Scarlatinal rheumatism complicated seven of the control cases, but was absent in the test series.

Present Investigation

Starting in January, 1937, a number of cases of scarlet fever were treated with sulphanilamide (Bayer) and a similar series of control cases were simultaneously treated without the drug. Anti-scarlatinal serum was given to those patients in both groups who were thought to require it, irrespective of the giving of sulphanilamide. It had already been realized in this hospital that sulphanilamide had little or no effect in the acute febrile stage of scarlet fever, except perhaps in patients with a frankly septic type of the disease, and it was thought that the incidence of complications would probably give the best indication of the value of the drug. The test was therefore limited to children under the age of 10 years, as these would include the age groups which normally show the highest complication rates. Alternate patients, as admitted to certain particular wards, were allotted to test and control groups. No selection whatsoever was made in the distribution of cases. The general treatment of the patients in the two groups differed in no way; they were nursed together in the same wards, which contained approximately equal numbers of each group, and received the same nursing and medical attention and the same diet.

The test was continued for twelve months and was limited to three wards. Of the 576 patients, 287 fell into

* Based on a paper read before the Goole and Selby Division and the Leeds Division of the British Medical Association.