Observations

ON

THE ETIOLOGY AND TREATMENT OF
WAR NEUROSES.

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ETIOLOGY.

ALTHOUGH it would require a very exceptional nervous system to pass unscathed through twelve months or more of war under modern conditions, uncomplicated neurasthenia due to prolonged physical strain, the utter nervous exhaustion caused by pure physical fatigue, has been comparatively rare since the battle of the Marne. But there were many cases after the retreat from Mons, and it says much for the spirit and discipline of the original Expeditionary Force that there were no more.

Life in the trenches is always accompanied by a state of nervous tension. Danger is ever present, and during periods of activity the night may only bring increased responsibility and anxiety instead of rest. Although most men become gradually accustomed to the sights and sounds, which at first frighten all but the few who do not know what fear is, the nervous system does not wear well, and unless regular periods of rest from the mental strain are given, the majority of men gradually become irritable, restless, and unable to perform their duties satisfactorily.

The sanitation of the army in France has been so efficient that the second great cause of neurasthenia—acute and chronic infections—has been less prominent than in any previous campaign. But comparatively slight toxæmia, such as that due to diarrhoea, trench fever, or influenza, which is not sufficiently severe to make a man go sick, may cause nervous exhaustion, which would have been prevented if sufficient rest had been taken.

The armies in other parts of the world have, unfortunately, not shared the immunity from serious epidemics with the army in France. Few men remained at Gallipoli for more than a month without suffering from chronic diarrhoea or falling victims to dysentery, paratyphoid fever, or epidemic jaundice, and often to more than one of these infections at the same time; added to this was the impossibility of withdrawing the troops from the shell-swept area, for every corner on the peninsula was exposed to hostile fire. In Salonica conditions were more favourable, except during the summer of 1916, when the hot weather and the virulent form of malaria for which the Struma Valley has always borne an unenviable reputation were the chief causes of many cases of neurasthenia. The effect of the numerous infections rife in Mesopotamia and East Africa has been aggravated by the great heat, and at times by the insufficient supply of food. During the autumn of 1916 the majority of uncomplicated cases of neurasthenia reaching England came from Mesopotamia; in several cases there was a history of actual heat-stroke.

The pain, toxæmia, and loss of blood which may result from severe septic wounds often cause neurasthenia, especially if the soldier is already over-fatigued from mental and physical strain.

Mental and physical strain, severe pain, and acute and chronic infections lead to exhaustion by their direct action upon the nervous system, and indirectly by their action upon the suprarenal glands, together with the liver and probably the thyroid. Prolonged muscular exertion and great emotions, especially fear and anger, have been shown to produce chromatolysis of the brain cells, together with definite changes in the suprarenal glands and liver.

SYMPTOMS.

The symptoms of neurasthenia in soldiers do not differ from those of the neurasthenia of civil life. Headache, rapid fatigue on mental and physical effort, and difficulty in concentration are always present. The appetite often remains excellent and the digestion good, but constipation is common. The symptoms described under the name of

"soldier's heart" may be prominent. In most cases the blood pressure is low, corresponding with the fact that the blood pressure of the average tired soldier in front line trenches is slightly subnormal.

TREATMENT.

Complete physical and mental rest are at first essential. The patient must be kept in bed until he no longer feels tired. In slight cases a week or fortnight may be enough, and it is rarely necessary to continue the complete rest for more than three weeks, though in severe cases two or three months may be required, especially after severe infections. In most cases a small dose of bromide, such as gr. v, is given two or three times a day. Opium must be avoided, as it often aggravates the symptoms and increases the excitability and restlessness of the patient. No alcohol should be allowed; it is very badly tolerated by almost all patients suffering from war neuroses, and especially from true shell shock. A quantity which formerly produced no ill effect is often sufficient to intoxicate. Recovery is greatly accelerated by combating insomnia, as the exhaustion cannot disappear so long as the patient sleeps no more than three or four out of the twenty-four hours. I have found sodium diethyl-barbiturate (medinal) with acetyl salicylic acid (aspirin) gr. xv the best combination. The dose of the former should be between 10 and 15 grains the first two nights, after which it should be reduced by 1 grain every other night until only the latter is given, and the dose of this can then be gradually reduced. In intractable cases, especially if nightmares are present, suggestion under hypnosis is very effective.

As soon as the patient is well enough to get up he should begin to help in the ward, and a few days later he should be given light employment out of doors, for

The cure for this ill is not to sit still
And frown at with a book by the fire;
But to take a large hoe, and a shovel also,
And dig till you gently perspire.

The amount of exercise should be gradually increased, and the patient should not be discharged from hospital until he can do moderately heavy work, such as digging, without undue fatigue.

II.—EMOTIONS RESULTING IN STUPOR AND AMNESIA,
PSYCHASTHENIA, HYSTERIA, HYPERADRENAL-
ISM AND HYPERTHYROIDISM, AND EXAGGER-
ATED DEFENSIVE REFLEXES.

The emotion produced by a very horrible incident, such as seeing a friend killed whilst talking with him, is sometimes sufficient to give rise to nervous symptoms. More commonly, however, such an event is only the culmination of a long series of emotional storms. In most cases, indeed, the final breakdown is not due to a definite incident, but is the result of the cumulative effect of fear, which gives rise to symptoms sooner or later or not at all, according to the temperament and the physical condition of the individual. It is often impossible to obtain an accurate history of the onset until the patient is convalescent, as in the early stages of his illness he is generally unwilling to talk about his experiences. Even after complete recovery, a horrible incident which was the exciting cause may remain obliterated from the memory, although it may have returned in dreams, or its nature may have been elicited from the patient during hypnosis.

(a) STUPOR AND AMNESIA.

The stress and strain of active service not infrequently result in a condition of mild confusion, which may merge into deep stupor. The onset is often gradual. A man who has hitherto been alert and efficient becomes more and more dull, slow, and silent, until finally—often after an incident which has caused unusually great terror or horror—he becomes too confused to carry on, and he may wander away from his unit in a condition of stupor with more or less complete amnesia. Exactly the same condition may follow actual shell shock, but many cases which on reaching hospital without any history are at first diagnosed as shell shock later prove to be simply the result of emotion. It may also follow simple exhaustion, or it may represent an epileptic attack. In severe cases the man remains for a time entirely unconscious of his surroundings. He appears not to see or hear, he cannot be induced to speak, and pinching his skin produces no response. The reaction of the pupils to light is impaired or lost. He does

not ask for food, but chews and swallows whatever is given him. He lies inert, and involuntary micturition and defaecation are frequently present during the first few hours. Complete insensibility is often followed by a dazed condition, in which automatic complex acts may be performed. A man may be found several miles away from his unit, but he will never recall how he covered the distance.

The duration of stupor varies from a few minutes to several days, but it rarely lasts more than a week. It may suddenly pass away, the patient having no recollection of what occurred between the onset and the moment of recovery. More frequently improvement is gradual.

(b) PSYCHASTHENIA.

Prolonged mental strain may give rise to the purely mental symptoms, which can be most conveniently grouped together under the name of psychasthenia. The most important and common of these are nightmares and day-dreams; obsessions and phobias are less common; tics are curiously rare. Nightmares are very common, and many men live through their most terrifying experiences night after night in their dreams. In some cases the dream is forgotten, the patient only recollecting that he woke with a start and found himself in a cold sweat. The disturbed nights caused by war-dreams almost invariably result in headache, which is worse in the morning and only disappears towards evening. Many patients resist the desire to sleep during the day, as they fear a recurrence of their dreams, or they think that sleeping in the daytime will make their nights still less restful. A condition of profound exhaustion may ensue, and the patient loses his appetite and feels intensely depressed. In severe cases the dreams may recur during the day whilst the patient is apparently awake.

Unaccustomed responsibility may give rise to obsessions or phobias in men whose resistance has been lowered by the strain of prolonged service at the front, or who are predisposed by having had a mental breakdown, or by having a family history of mental disorder.

I have seen a few cases in which tics have developed during active service; in most instances they have been associated with hysterical symptoms, and the patients have often previously suffered from tics. One man developed a side-to-side movement of his head, the original object of which had been to relieve the pain caused by concussion of his cervical spine. He could only control it for two or three seconds, and it persisted during light hypnosis, but not during sleep.

Treatment.

The general treatment of a man suffering from psychasthenia is identical with the treatment for neurasthenia. In slight cases nothing more is required, but special treatment is generally necessary for the more prominent psychasthenic symptoms.

In some cases a nightly dose of acetyl salicylic acid with medicinal, the dose of which is gradually reduced, as described in the treatment of neurasthenia, will lead to the cessation of nightmares. But when a dream has persisted for any length of time, nothing but hypnotism will remove it. This should, if possible, be practised at night, so that the patient can pass from the hypnotic state into natural sleep, the suggestion being repeatedly made that he will not dream. A single treatment is often sufficient, and it is rarely necessary to repeat it more than five or six times.

Phobias and obsessions sometimes disappear after rest and "therapeutic conversations," in which the cause of the symptoms is explained to the patient, and he is encouraged to hope that they will quickly disappear as his general condition improves. It is of the utmost importance that his confidence should be gained, and that he should feel that he can discuss his troubles with perfect freedom and without any fear of being misunderstood. In severe cases, and especially when the phobia or obsession is of a very distressing character, suggestion under hypnosis should be employed without delay. The result is generally very satisfactory, and improvement often occurs with remarkable rapidity.

Tics are more resistant to treatment, as they tend to persist after the other symptoms have disappeared, and though they rarely continue during hypnosis, suggestion has comparatively little effect upon them. Re-education is the most valuable treatment. Regular exercises are

given for the affected muscles, and in order that complete control may be regained over them the patient is made to inhibit the movements several times every day by an effort of will for a certain period, the duration of which should be slowly increased. I have seen several soldiers with aerophagy and eructation tics, who were cured by clenching a stick between the teeth whenever the desire to eructate was felt.

(c) HYSTERICAL SYMPTOMS.

Hysterical symptoms may develop as the immediate result of a strong emotion, the physical results of which become perpetuated and exaggerated by auto-suggestion. Sudden extreme terror causes inhibition of activity instead of the physical preparation for flight, which is produced by the sympathetic and suprarenal stimulation following more prolonged but less excessive fear. The knees give way, the breath is held, and the "tongue cleaves to the roof of the mouth," rendering speech impossible. These are perhaps manifestations of the instinct to hide, as, when flight is impossible, recourse must be taken to concealment.

The inability to move or speak under these conditions is in most cases only momentary. But a man whose nervous system is already suffering from the strain of active service may be so suggestible that the incapacity is perpetuated and exaggerated, when he realizes that he is physically unable to escape from his terrifying surroundings or call for help, and the possibility that this inability may be permanent and not merely a thing of the moment flashes through his mind. True hysterical paraplegia or mutism is the result.

It is much more common for an interval to elapse between the incidents which gave rise to the emotion and the onset of symptoms. It is thus very rare for hysterical symptoms to develop actually in the trenches. They are comparatively common in casualty clearing stations, and still more so at base hospitals. Not infrequently the hysterical symptoms only appear after the patient has arrived in England. In the dazed condition which results from prolonged mental strain a man is abnormally suggestible; his critical faculties are lost and initiative is diminished. As he gradually comes to himself he tends to exaggerate and perpetuate the difficulties he experiences in the performance of the various functions of his body. The absence of movement due to absence of initiative leads to the suggestion of paralysis, the silence due to absence of any desire to speak in his confused mental condition suggests mutism, and the inattention which prevents him hearing what is said to him suggests deafness. Under these conditions hysterical symptoms may be caused by circumstances which rarely if ever lead to them in civil life. Thus I have twice seen hysterical paraplegia follow an operation for acute appendicitis which had developed in the trenches, and develop after an attack of malaria and of cerebrospinal meningitis, and in several cases after muscular rheumatism. Hysterical paralysis of a leg followed trench fever in one case and paratyphoid arthritis of the hip in another, and hysterical hemiplegia which lasted for two years followed an attack of sunstroke. In these conditions the temporary incapacity caused by the pain or the weakness associated with the primary illness was sufficient to give rise to the idea of paralysis.

In their chief characteristics there is nothing peculiar about the hysterical symptoms which occur in soldiers, whether as a sequel of an emotion, true shell shock, an injury due to a wound, or some acute illness. But they are so common that in two years I have seen more cases among soldiers than I had seen in men, women, and children in the previous ten years. It is not surprising, therefore, that hysterical manifestations are occasionally seen in soldiers which differ from anything which one has seen or heard of in civilians, but the one invariable feature of all cases, both in peace and in war, is their production by suggestion, and their curability by suggestion or persuasion.

Treatment.

Hysterical symptoms in soldiers have proved very amenable to treatment. Some cases sooner or later recover spontaneously, but others show no tendency to improve if left to themselves, and I have seen several cases of hysterical paraplegia, dumbness, blindness, and deafness,

which had persisted for many months, sometimes for over a year, and which would almost certainly have remained permanent if vigorous treatment had not at last been instituted. As it is impossible to tell when the patient is first seen whether spontaneous recovery will take place, active treatment should be given immediately. Thus large numbers of men can be sent back to the firing line within a few days of the onset of symptoms if treated at casualty clearing stations, and hysterical symptoms should rarely persist for more than twenty-four or forty-eight hours after admission to a hospital in England. The longer hysterical symptoms are allowed to remain the more difficult they are to cure. Although immediate improvement generally results from correct treatment, even in cases of very long standing, complete recovery is less easy to obtain; a man who recovers from hysterical paraplegia within two or three weeks of the onset often walks normally within an hour of the commencement of treatment, but his gait may remain abnormal and require careful re-education for many weeks if the paraplegia has been present for a longer period. Similarly early treatment of mutism is followed by rapid and complete recovery, but if left too late the patient whispers or stammers when he regains his power of speech, and often needs prolonged re-education before he can talk normally.

It is essential for success in treatment that the medical officer should feel convinced that the patient's symptoms are not organic, or are at most only in part organic. It is sometimes impossible to distinguish with certainty between hysteria and malingering; but the distinction is of no great importance if, when malingering seems possible, the statement is made in the man's hearing that "nervous" cases are cured by the treatment to be adopted, but that "skrimshankers" are not.

Whatever treatment is employed, the encouragement produced by the presence of cured patients in the same ward is most helpful. I have found that deaf-mutism rarely lasts for more than twenty-four hours after a patient's admission to my section, even if he has been in this condition for many months and many forms of treatment have been tried in vain, as there is always a cured deaf-mute present, who at once tells the new-comer by writing or by the deaf and dumb language how he was quickly cured after being unable to hear or speak for five or six or even twelve months, so that his mind is prepared for the treatment which he is told he will have on the following day.

The patient is also made to understand that there is nothing unusual about his case. The extreme interest and sympathy with which he had been surrounded accounted for the numerous cases in which hysterical symptoms had persisted for many months spent in some luxurious auxiliary hospital. He is made to realize that many others have had similar symptoms before and have rapidly recovered, and that his early recovery is regarded as a matter of course.

Hysterical symptoms being invariably due to suggestion, can be invariably cured by suggestion or simple persuasion, and to diagnose a symptom as hysterical can only be justified if the next step is to cause it to disappear.

Simple persuasion, followed, when necessary, by re-education, is all that is required to cure most cases of hysterical paralysis and abnormal gaits, whether associated or not with contractures. Massage is only of use in neglected cases, in which muscular atrophy has resulted from prolonged disuse, and then only as an adjuvant to persuasion and re-education. Electricity is quite useless unless employed solely as a means of suggestion; strong faradism applied with the wire brush over paralysed muscles can be used to convince a sceptical patient that the muscles are capable of strong contraction, and the pain produced acts as a powerful means of persuasion for the fortunately rare type of man who appears to prefer to remain paralysed to recovering. On the other hand, massage and electricity employed regularly by sympathetic nurses only help to confirm the patient in the belief that he is suffering from serious paralysis.

A paraplegic man is first helped to move his legs whilst he lies in bed, and he is then made to move them without help. He is told that the movements of his legs are now so strong when he is in bed that there can be no doubt he will walk if he summons up sufficient courage to try.

Without any delay he is made to sit up in bed, then stand up and walk; both hands are held for a moment, then one hand, and then his coat is lightly held, and, finally, he is made to walk alone without a stick; in most cases the whole process takes less than five minutes.

In long-standing cases the patient generally assumes a stiff unsteady gait on first learning to walk; this only disappears as a result of re-education, the patient being made to walk, perform exercises whilst lying and sitting, and swing his legs whilst sitting on a table or holding a chair for at least a quarter of an hour three times a day. Exercise on a rowing machine or tricycle is also useful.

Some cases of long-standing hysterical paraplegia improve to a certain extent with persuasion and re-education, but then become stationary. This is generally due to the occurrence of clonic spasms, when an effort is made to move the legs on lying down or even when they are passively moved; a false ankle-clonus is very easily produced, and its occurrence directly the foot touches the ground produces a permanent tremor on sitting, and a very unsteady gait on attempting to walk. We performed spinal anaesthesia on a man with this condition who had shown no improvement for many weeks. As its effects passed off we carried out passive movements of his legs, which had become flaccid for the first time, and then encouraged him to perform similar active movements, and by the evening he was walking normally. We have repeated the treatment in several similar cases; with one exception improvement followed, but not often so rapidly.

When a mute or aphonic man has been told that he will recover so convincingly that he himself feels no doubt about it, it is immaterial what form of treatment is applied so long as it has not already been tried on the patient unsuccessfully. In many cases the introduction of an intralaryngeal electrode is sufficient, but it should previously be connected with a faradic battery in case speech does not return within a few seconds, as the more powerful suggestion caused by the pain and contraction of the muscles of the throat will then succeed. In cases in which electricity has already been used, but has failed owing to being unaccompanied by sufficiently vigorous suggestion, the patient should be given ether so rapidly that he quickly becomes very excited; he almost always talks spontaneously, but an electrode may be introduced into the larynx if there is any delay. He is then made to talk continuously until he has completely recovered from the anaesthetic.

If stammering is treated the moment it develops in the course of recovery from mutism it can often be quickly cured. It is rarely a primary symptom, but often persists for long periods after mutism has disappeared spontaneously or as a result of treatment. Suggestion with the aid of electricity, etherization, or under hypnosis, occasionally produces rapid recovery, but more frequently improvement occurs very slowly as a result of re-education, lessons in breathing and talking being given regularly every day.

Hysterical fits are quite common in soldiers. They can be diagnosed from true epilepsy by inducing one by suggestion under hypnosis, if the history leaves any doubt and no fits have been observed by the physician himself. I always combine this method of diagnosis with treatment by telling the patient before, during, and after the fit that this one will be the last he will ever have. The treatment has proved most successful, as several men, who had been having numerous fits every day in spite of large doses of bromide, have had no more after their hysterical nature had been proved and their repetition contra-suggested in this way, though bromide was discontinued.

In three cases of absolute hysterical deafness seen with Captain E. A. Peters, in whom all simpler treatment had failed, we advised the patients to undergo an "operation," which we told them was quite certain to cure them. They were given enough ether to make them excited, and two small cuts were then made behind one ear; a hammer was banged on a sheet of iron during the "operation," and the moment after the incision had been made the patient jumped off the table with his hearing restored, although in one case he had been deaf for over nine months. The joy shown by the patients on their recovery whilst in the theatre and on return to the ward was so obviously genuine that there could be no possible doubt about the genuineness of the deafness. Moreover, it had been found impossible to

wake them at night by means of the loudest noises, and the auditory motor reflexes were absent in two of the cases.

Six cases of hysterical blindness I saw with Major A. W. Ormond were cured by hypnotic suggestion when all other treatment had failed.

(d) HYPERADRENALISM AND HYPERTHYROIDISM.

Strenuous action is normally rendered possible by the sympathetic nervous system, which is stimulated to great activity by the emotions of fear and anger under conditions which imperil the safety of the individual. Impulses reaching the suprarenal glands by their sympathetic nervous supply stimulate them to secrete adrenalin. It has been shown experimentally that both the injection of adrenalin and the increased secretory activity of the suprarenal glands which occurs in times of stress give rise to all the effects produced by stimulation of the sympathetic nerves. Suprarenal activity thus powerfully reinforces the direct action of the sympathetic nervous system, which enables the individual to respond to the emotions of fear and anger by strenuous action. There are no constrictor fibres to the cerebral and pulmonary arteries, and the sympathetic fibres to the coronary vessels produce dilatation instead of constriction, so that the vaso-constriction produced by adrenalin is confined to the splanchnic system; the blood pressure is thus raised, and the blood is driven to the heart, lungs, brain, and muscles from the abdominal viscera, the activity of which is simultaneously suspended by the inhibitory influence of the sympathetic nerves. At the same time, the heart is stimulated to beat more rapidly and vigorously. The skeletal muscles not only receive an increased supply of blood, but also of the sugar required for their activity, as adrenalin augments the stimulating action of the sympathetic on the production of sugar from the glycogen in the liver. The products of muscular activity, the accumulation of which leads to exhaustion, are neutralized or destroyed by adrenalin independently of any sympathetic action. The central nervous system, the heart, and the muscles of the limbs and trunk, are thus prepared for great activity. The evaporation of sweat, the secretion of which is increased, prevents the rise of temperature, which would otherwise occur with excessive muscular activity, and the deep respiration and the relaxation of the bronchioles allow more oxygen to enter the lungs and excess of carbon dioxide to escape.

Adrenalin acts very rapidly, but for a short period, as it is quickly oxidized. It is consequently of special importance when an emotion calls for sudden activity. When more prolonged activity is required, the internal secretion of the thyroid gland probably helps to maintain the activity initiated by adrenalin, as it acts after a longer latent period, and its action is more prolonged.

The physiological effects of the fury and excitement of battle enable the born soldier to perform feats of strength and endurance which may be in striking contrast to his comparatively feeble physique. But the changes which accompany fear and anger are entirely useless if the emotions are not followed by the associated instinctive activity. So fixed, however, is the primitive association of anger with fight and fear with flight, that when the natural sequels of these emotions are restrained they continue to give rise to suprarenal and thyroid activity. Thus the ceaseless fear felt by the constitutionally timid when exposed to the horrors of war results in constant over-secretion of the suprarenal and thyroid glands, the physiological results of which are not followed by the muscular activity of flight for which they are the preparation. The unexpended energy may be so extreme that the soldier is incapacitated by it. On reaching the safety of a base hospital the hyperactivity of the suprarenal and thyroid glands and the signs and symptoms to which they give rise often disappear. But they may be perpetuated by war-dreams, and in severe cases the mind is absorbed by day as well as by night by pictures of the horrors which the individual has witnessed; every sound reminds him of shells, and every movement suggests the approach of danger. The activity of the suprarenal and thyroid glands is consequently maintained, and the patient presents a picture suggestive of Graves's disease, although hyperactivity of the suprarenal glands is probably of more importance, though less easily recognized, than that of the

thyroid. The pulse is rapid, especially on the slightest exertion, and the heart may be slightly enlarged. The blood pressure of the average soldier in the front line trenches is slightly subnormal, but in these cases it is always raised, and is often still 150 mm. of mercury or more on arrival in England.

I have observed a very characteristic cutaneous reaction in these cases, which is present in no other condition. On moving the finger over the skin of the chest so lightly that in normal individuals no local reaction would occur, a pilomotor reflex is almost instantaneously produced; goose skin is obvious and occasionally the hair can actually be seen to stand on end over the area touched by the finger and for some distance on each side. After about five seconds the pilomotor reflex fades away and is at once replaced by a vaso dilator reflex; the blush, which may have a white border on each side, often lasts for several minutes. As improvement occurs the vasomotor reflex disappears, but the pilomotor reflex generally persists for a few weeks longer. The circulatory symptoms may be so prominent that the case is often diagnosed as "disordered action of the heart." The condition may then be described as the "hormonic type of soldier's heart." Excessive sweating often occurs, sometimes in paroxysms, especially over the palms of the hands and soles of the feet, and the patient loses weight. The hands and occasionally the eyelids are tremulous, and the patient is highly nervous and excitable. The eyes are often slightly prominent, and von Graefe's sign may be obtained. The thyroid gland, though over-active, is generally not obviously enlarged, but in some cases moderate enlargement is present.

Treatment.

The patient must be isolated at first from the other patients in the ward by screens, and should only see such visitors as he believes will allay rather than increase his nervous irritability. He should be protected from any chance of being reminded of what he has passed through by thoughtless conversations or illustrated papers.

Mental activity and restlessness are lessened by small doses of opium, this being the only war neurosis in which this drug can be safely employed, and also by suggestion, especially when nightmares or some special sources of worry are present. The thyroid and adrenal secretion are kept in check by belladonna. The blood pressure rapidly falls to normal and all symptoms gradually disappear. X-ray applications to the thyroid gland have been used with success in some cases, but it is impossible to regulate the destructive action of the rays with sufficient accuracy for perfect safety, and the other ductless glands are not dealt with.

(e) EXAGGERATED DEFENSIVE REFLEXES.

The "flinch reflex," which is caused by the sight or danger* approaching, consists in the assumption of a crouching attitude; the arm is raised in front of the face and the eyes blink; it has the object of hiding the individual and defending him from attack. The "jump reflex" consists of a sudden movement of the limbs and trunk, and is associated with blinking of the eyes and dilatation of the pupils; it is caused by sudden sounds, and is really the preparation for the immediate activity which would be displayed if the individual obeyed his instinctive desire to save himself by flight. These responses are true defensive reflexes and have their centres in the mid-brain.

The common exaggeration of the jump reflex in soldiers suffering from certain war neuroses is not therefore correctly described as hyperacusis, for the sense of hearing may be no sharper than normal, and actual hearing need not occur at all, as the reflex occurs when they are asleep and hypnotized as well as in some cases of hysterical deafness. It is simply a part of the general exaggeration of the defensive reflexes, which is a characteristic feature of those war neuroses which are due rather to emotions such as prolonged fear than to the actual concussion of pure shell shock. In one severe case true hyperacusis was present, and Captain E. A. Peters estimated that the patient heard sixteen times more acutely than the average normal individual. It was possible to carry on a conversation with him by whispering in one corner of the ward when he was lying in the opposite corner, although men

with normal hearing who were standing half-way between in the centre of the room could not hear a word of what was whispered. The hyperacusis and exaggerated defence reflexes were quite uninfluenced by the administration of 100 grains of bromide a day.

In severe cases the patient appears to be in extreme terror; he jumps violently, and trembles from head to foot at the slightest sound; he raises his arm as if to protect his face from a blow and hides his head under the bed-clothes when anybody approaches him. After all trace of terror has disappeared as a result of suggestion under hypnosis, and the patient no longer thinks or dreams of the horrors of war, the appearance of terror may continue unabated, the intense emotions to which the patient has been subjected having led to such an increase in the excitability of the central nervous system that the exaggerated jump and flinch reflexes persist after the cause of their exaggeration has disappeared.

Treatment.

Complete physical and mental rest are essential. No visitors should be allowed, and frequent changes of nurses are most undesirable. Severe cases should be kept in bed and isolated until considerable improvement has occurred. The patient should not talk about his experiences, but should try to forget the scenes he has passed through. Nightmares and day-dreams should be treated by hypnosis. Bromides have very little effect, except in mild cases, but medinal and aspirin often helps to produce sleep. When true hyperacusis is present the ears should be plugged with wool, and in severe cases, in which this has little or no effect, large woollen pads should be tied over the ears at night or during a thunderstorm.

III.—SHELL SHOCK.

The term "shell shock" should be reserved for the condition which follows exposure to the forces generated by the explosion of powerful shells in the absence of any visible injury to the head or spine. In all cases there is an organic basis, which consists of the more or less evanescent changes in the central nervous system resulting from the concussion caused by aerial compression, to which is often added concussion of the head or spine caused by the sandbags of a falling parapet, or by the patient being blown into the air and falling heavily on to his head or back. On this organic basis hysterical or psychasthenic symptoms are often superposed.

Post-mortem examinations on men who have died without regaining consciousness after being blown up by high explosive shells in the absence of any external injury, have shown multiple punctate haemorrhages in the white matter of the brain and the nerve cells show chromatolysis with eccentric nuclei. Mott has pointed out that if a man is buried under sandbags in a heavily shelled trench or dug-out, or if for any other reason he is confined in a small space in which the carbon monoxide produced by an explosion collects without being able to diffuse rapidly away, he will be rendered unconscious, if he is not already unconscious as a result of concussion. The continued inhalation of the gas will cause him to suffer from the effects of carbon monoxide poisoning, although he will not have realized during his period of consciousness that he was inhaling a poison, as the gas is odourless. The pathological changes produced are identical with those found in fatal cases of shell shock, so that carbon monoxide poisoning may perhaps be responsible for some of the symptoms in a small proportion of cases.

Several French observers have found that if a lumbar puncture is performed in a case of shell shock within a few hours of the onset of symptoms the cerebro-spinal fluid is generally under increased pressure, and contains albumin, blood, and slight excess of lymphocytes. If the examination is repeated in forty-eight hours the abnormalities are no longer present. This accounts for the fact that the cerebro-spinal fluid is almost invariably normal when the lumbar puncture is performed at a base hospital.

In such cases it is clear that organic changes have occurred in the central nervous system, which are, however, so slight—consisting probably of minute capillary haemorrhages and chromatolysis of nerve cells—that they rapidly and completely disappear.

Symptoms.

Two groups of cases may be recognized. In the first the symptoms are due entirely to concussion of the brain and spinal cord; in the second hysterical manifestations are grafted on to this organic basis.

1. PURE CONCUSSION.

(a) Cerebral Concussion.

The symptoms of uncomplicated shell shock are identical with those of concussion in civil life. The immediate effect of a high explosive shell is to render a man unconscious. In the severest cases the patient's breathing is stertorous and he may die after an interval of a few hours or days without regaining consciousness. In the more serious of the cases in which recovery ultimately takes place the patient passes into a condition of stupor, which is indistinguishable from that already described as resulting from emotional strain without actual concussion. As a rule the patient soon recovers his memory up to the time of the explosion, and may even recollect that he heard the sound of the shell coming, but from this moment his mind is a blank. Less frequently the memory is perfect up to a certain date, such as the day of arrival at the front, but all subsequent events are forgotten; the patient appears to live over some of the forgotten events—especially those of a terrifying nature—in his dreams, but on waking he remembers nothing of them. In severe cases more or less complete retrograde amnesia may be present. Headache is a constant symptom. It is increased by the smallest mental effort, and is often worse at night, when it may prevent sleep. Lumbar puncture often shows that the pressure is raised, and the removal of cerebro-spinal fluid then relieves the headache, but rarely for longer than a few hours. It is greatly aggravated by nightmares and the recollection of horrors through which the patient has passed. For many months after the severe headache has disappeared, a heavy, full sensation may still be caused by mental concentration or excitement, and sustained attention is impossible, because of the sense of weariness it causes. Mental irritability is a common early symptom and often continues after the patient is otherwise well. He loses his temper for trivial causes and may get himself into trouble for insubordination.

One officer was greatly worried on account of seminal emissions, which had occurred three or four times every night since he was blown up by a shell a month before I saw him. They were always accompanied by war dreams, and disappeared permanently after suggestion under hypnosis on a single occasion.

(b) Spinal Concussion.

Spinal concussion may occur as a result of a blow on the back, but it is more often due to an explosion in which the patient is buried under earth or sandbags. The skin and muscles over the spine may be bruised, but often no sign of injury can be found. I have seen several cases in which concussion has resulted from an actual wound, in which the missile passed near the spine without actually injuring it.

Roselle and Oberthur examined a number of men suffering from spinal concussion whilst still in the trenches within a few minutes of their injury. They found that the tendon reflexes were exaggerated and the cutaneous reflexes were absent, except the plantar reflex, which was extensor; extreme hypotonus of all muscles was present.

In slight cases the hypotonus passes off in a few hours, often whilst the patient is still unconscious, the legs becoming slightly spastic with normal or exaggerated knee-jerks, and the plantar reflex is now absent or flexor. In more severe cases the muscular tone is diminished for a longer period, and an extreme degree of flaccidity may be present; the knee and ankle jerks are then weak or unobtainable; in the course of time the tone returns, the jerks become normal, and the paralysis disappears.

When, however, more profound changes have been produced in the cord the flaccidity is replaced by increasing spasticity with increased jerks, ankle-clonus, and extensor plantar reflexes. In most cases complete recovery with disappearance of all abnormal physical signs occurs, but in some cases slight spasticity with exaggerated jerks and occasionally extensor reflexes persists, the concussion having resulted in some permanent lesion of the spinal cord. In most cases the spine is tender; there may be some rigidity, and pain occurs on bending or twisting. A

x-ray examination shows that there is no actual injury to the spine.

In many cases faeces and urine are at first passed involuntarily. The initial incontinence does not last more than a few hours. It may then be replaced by retention for twenty-four hours, and this is sometimes followed by difficulty in micturition for two or three days, but the condition of the bladder is generally normal by the time the patient reaches England.

2. HYSTERICAL SYMPTOMS GRAFTED ON TO ORGANIC BASIS OF CEREBRAL OR SPINAL CONCUSSION.

In the confused mental condition which follows shell shock a man is abnormally suggestible, particularly if he is already exhausted owing to the stress and strain of active service. The organic paraplegia which is the result of transient structural changes in the spinal cord produced by concussion disappears with the return of the cord to its normal condition; it is then often replaced by hysterical paraplegia. Finding that he is unable to move his legs when he first regains consciousness, a man becomes convinced that he is paralysed and makes no further efforts; the paralysis thus produced by auto-suggestion can be removed by persuasion or a counter-suggestion. In the same way, when one side of the brain has been chiefly affected by the concussion, an initially organic hemiplegia merges into hysterical hemiplegia. I have watched several cases, in which all the physical signs of organic paraplegia or hemiplegia were at first present, but have gradually disappeared in the course of a few days or weeks, although the paralysis has remained, until by suggestion or persuasion it has been cured in a few minutes. Sometimes, however, some organic signs remain, and suggestion then can only produce an incomplete cure, a slightly spastic gait or some slowness and lack of accuracy in the first movements of a limb being left as the permanent result of the shell shock.

As complete or almost complete recovery from the organic symptoms occurs in the vast majority of cases, the prognosis can be regarded as good, and an attempt should be made as soon as the initial stupor has passed away to persuade the patient to walk. It is extremely difficult so long as any organic signs persist to judge to what extent the symptoms are organic in origin, but experience has shown that some physical signs of organic disease, such as an extensor plantar reflex, greatly exaggerated knee-jerks and true ankle-clonus, and unilateral absence of the abdominal reflex, may still be present when the character of the gait and its rapid improvement with persuasion and re-education show that the symptoms are almost entirely hysterical.

Apart from the hysterical manifestations which result from the perpetuation of symptoms produced by transient organic lesions of the central nervous system, others may be produced by auto-suggestion without any primary organic condition. These hysterical manifestations are very varied, and it is at first difficult to explain why one man should become blind, another deaf and dumb, and another hemiplegic under apparently identical conditions. From careful inquiry into the history of numerous cases I have come to the conclusion that the variability of the symptoms can best be explained in the following way. As a result of the various factors which give rise to shell shock all the functions of the body are in abeyance for a period which varies in different cases; the patient cannot see or hear or feel, he cannot talk, he cannot move, and his mind is a complete blank. In many cases all these lost functions gradually return in the course of a few hours, though some come back more rapidly than others; the patient is then in much the same condition as a man who has been concussed by falling on his head, with a number of symptoms, such as headache, difficulty in concentration, and lack of energy, but there is no paralysis nor loss of any of the special senses. In other cases, as consciousness returns, the patient's mind becomes fixed on some part of his body which is painful, the pain being the first impression powerful enough to attract his awakening attention; or the temporary inability to see or hear or speak, which generally remains unnoticed when consciousness first returns because of the absence of any desire to see or hear or speak, is suddenly realized owing to a special call being made on one of these functions. The patient's dawning intelligence becomes fixed upon this single missing function, and he suggests to himself that the disability will be

permanent. The fact that the other functions are missing remains unnoticed, and after a time they spontaneously return. The persistent localized loss of function is thus due to auto-suggestion leading to the perpetuation of what would otherwise be a very temporary incapacity; it can thus correctly be described as hysterical.

Less frequently the impressions received by the patient between the moment the explosion occurs and the moment when consciousness is lost give the key to the symptoms. The first thought of a man on regaining consciousness after being deafened by the noise or "struck dumb" with terror when the explosion took place may result in the suggestion of deafness or dumbness.

Treatment.

Rest in bed is required for the symptoms of shell shock which are the result of actual concussion. In civil practice it is a common event to see patients suffering from chronic headache after cerebral concussion, and chronic backache after spinal concussion, both of which might have been prevented by sufficient rest immediately after the injury. The same is true after shell shock and burial, and many men, who pass from one hospital to another for many months receiving all sorts of expensive treatment with little or no benefit, could have been rapidly cured by simple rest immediately after the injury. On the other hand, the rest must not be too prolonged, and it requires considerable experience to judge the right moment when such patients should be allowed to get up. If kept in bed too long, they are very liable to lose their power of standing and walking, as the care taken to keep them at rest may give them the idea that they are severely injured, and hysterical astasia-abasia or paraplegia develops. In order to prevent this, the patient should be made to get up to go to the lavatory and to have a bath from the first day, except when severe stupor is present, in which case he should get up as soon as it has sufficiently diminished. When the patient no longer complains of pain in the head or back, he should be encouraged to take exercise, the amount of which should be steadily increased. Massage often aggravates the pain, and it tends to increase the tendency to introspection.

The associated hysterical symptoms should be treated in the manner already described.

AN INVESTIGATION OF TRENCH NEPHRITIS BY MEANS OF PHENOLSULPHONEPHTHALEIN.

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It is not always a very easy task to exhibit faithfully in tablet form work which has extended over twenty months. Nevertheless, the attempt has been made in this paper without, if possible, rendering the picture incomplete. For many facilities in connexion with the investigation I have to thank the officer in charge, Lieut.-Colonel J. Harley Brooks, M.D., R.A.M.C.

To American workers we are specially indebted for the advances in biochemistry relating to the renal functions which have been a feature of the past six or seven years, Folin and Denis, and Van Slyke, in particular, have done pioneer work, and produced indispensable tests for the various non-protein waste products of the blood and urine. A voluminous literature has already accumulated round this subject, which is steadily being pursued with excellent promise. One of the most fruitful means of investigation was undoubtedly supplied by the introduction of phenolsulphonephthalein as an index of renal function by Rowntree and Geraghty in 1910.¹

The technique of the test may be studied in the original; suffice it to say here that it consists in the subcutaneous injection of an alkaline solution of 6 mg. phthalein after preparation of the patient. The urine is collected after one hour and after two hours. A few drops of 25 per cent. NaHO solution is added to it, and the resulting pink colour, after dilution of all the urine with water up to a litre, or the equivalent of this dilution of a small quantity, is read off in the colorimeter, or against tubes containing