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WAR NEUROSIS A YEAR IN A NEUROPATHIC HOSPITAL

BY

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Diagnosis

Those of us who treated the psychoneuroses during the last war have been struck by the difference in the picture presented of the neuroses in hospitals in this war. The increase in the "psychosomatic" disorders was to be expected, for although it has for long been agreed that dyspepsia, cardiac, and other somatic conditions often had their origin in anxiety and other emotional causes, the extent of this was not generally realized, and only in recent years have they been recognized to constitute a distinct clinical entity. That there are more cases of mental backwardness is no doubt because the hospitals are now fed from the home base instead of obtaining their patients from abroad, as in the last war. The increase in the number of cases of "psychopathic personality" may be due to both these causes, to a clearer recognition of this group of disorders, and to the fact that we get so many patients who should never have passed the recruiting board. But the most striking change is the far greater proportion of anxiety states in this war, as against conversion hysteria (blindness, paralysis, etc.) in the last war. This is made clear in a table of diagnosis given below. Taking the psychoneuroses alone (577 cases), 64% were anxiety states and only 29% hysteria. The reason for this distinction is not yet clear, but there are probably several causes. In the first place there were far more traumatic cases in the last war; and traumatic experiences, owing to their physical accompaniments, are more likely to produce somatic symptoms of the hysterical type than are ordinary conditions of danger. Dunkirk, Norway, and air raids in this country have provided some, but they are negligible compared with the thousands of "shell-shocked" patients who returned from the Somme and other great battles of the last war.

But the larger proportion of anxiety cases compared with conversion hysteria may be due to another reason—namely, that in this war the soldier is much *nearer the home front*. This means, in the first place, that many chronic neurotics who should never have been recruited, and who in the last war would never have found their way to France, break down and are admitted to the neuropathic hospital, sometimes within two or three weeks of recruiting.

There were a few such cases in the hospitals in the last war, one instance of which comes to mind—that of a man who at 11 o'clock every morning developed a severe headache, which started when at that hour one morning it was announced that his regiment was to be drafted to France. But such "civilian" patients were the exception

rather than the rule, and the neurasthenic hospitals of the last war were usually filled with *true* war neuroses. In the 41st General (Neuropathic) Hospital the majority of patients have little to do with active service, and conform to the civilian type, and therefore to the civilian type of neurosis, which tends much more towards the anxiety than to the conversion group of neuroses.

Thirdly, the preponderance of anxiety states over hysterical may be partly due to the opposite fact—namely, that the air raids have brought us *nearer to the front line*; and the evidence goes to prove that the nearer the front line the greater the proportion of anxiety states compared with conversion hysteria.

If we had the figures from the casualty clearing stations in the last war we should probably find that the picture corresponded more closely with that at home in this war; indeed, Dr. Dillon's figures* from France showed that 70% were states of anxiety and only 20% conversion hysteria. But many of these conditions near the battle zone are cases of *ordinary* anxiety and panic—natural states due to an objective danger, in which there is no amnesia, no repression (in the technical sense), and no dissociation, and which must therefore be distinguished from anxiety *neurosis* such as we meet with in hospital, in which one or other of these mechanisms is usually found. One meets with various types of anxiety after a bombardment or a "blitz," some of which are true neuroses, but many of which are simple states of fear or anxiety that pass away with the passing of the stimulus of danger. The fact that these patients are predisposed to anxiety, as we shall see most of them are, does not mean they are neurotic: they are simply frightened. Rest for a few days with sedatives and a little elementary psychotherapy is often enough to restore such a man's courage and confidence so that he returns to duty. The excellent results reported as having been obtained with prompt treatment near the front line during the last war may have been partly due to the fact that such cases of ordinary anxiety, which are not cases of true neurosis, are included. But in other instances we may see, as time passes, the process of repression and symptom formation taking place with the transition from ordinary anxiety into neurotic symptoms, hysterical and psychosomatic. The so-called "period of meditation" between the original trauma and the onset of definite neurosis was in fact the period of transformation of this emotional conflict into the somatic or other neurotic

**The Neuroses in War*, edited by E. Miller, p. 120.

symptoms. Such cases also may often be satisfactorily dealt with on the spot; indeed, our aim should be to catch these conditions before their transformation from anxiety to hysteric symptoms is effected. Many of these early cases of neurosis can, with prompt treatment, even be sent back to the line; but for how long it has never been determined, since there is no evidence of their later history. Many of them undoubtedly relapsed.

But in spite of the stress which has been laid on the importance of early treatment of the neuroses, and the excellent arrangements which have been made for such patients to be examined and treated as early as possible, we have found in an unselected number of cases—50 in all—that the average period between the time when the man first “went sick” with the neurosis in this country and when he reached the neuropathic hospital was 7½ months! By that time many of our patients are so bored with hospitals and medical examinations that co-operation is difficult to obtain and treatment is unnecessarily prolonged.

The table of diagnosis (which had to follow the very inadequate *Nomenclature of Diseases* of the Royal College of Physicians used in the Army) shows that of a total (for ten months) of 700 patients, 53% belonged to the anxiety group, whereas only 24% were diagnosed hysteria.

TABLE I.—*Diagnosis of 700 Cases*

(a) Psychoneuroses (577):		(b) Psychopathic personality	
Psychoneurosis (alone)	15	Psychopathic personality	63 (9%)
Obsessions	8	Psychopathic personality	29
Neurasthenia	13	Temp. instability	34
Hysteria	170 (24%)	(c) M.D.	7
Anxiety neurosis	371 (53%)	(d) Psychotic	24
		(e) Epilepsy	5
		(f) Physical	24
			60 (8.6%)

Another striking feature, borne out in the last war, is that there are very few obsessions (8%) which may be accounted for by the fact that war gives legitimate release to the aggressive impulses and at the same time relaxes moral standards, these two factors being the essential ones in the formation of obsessional conditions. The term “neurasthenia” (2%) we used in its stricter sense. “Psychopathic personality” (9%) was a term also used in a specific sense and not as a dumping-ground: it may be defined as “a disorder of a constitutional nature manifesting itself especially in anti-social behaviour.” Half of the psychopathic personalities were of the schizoid type. There are only 3 out of 700 diagnosed as “psychoneurosis—effort syndrome,” probably owing to the fact that many effort syndrome cases were placed in the anxiety group, to which they properly belong, and because many such cases were sent to Mill Hill Hospital for special investigation.

This table of diagnosis, and the figures based on it, cannot be regarded as scientifically accurate owing to the restrictions of the *Nomenclature* and of Service regulations. For instance, the term “depression” does not appear as a diagnosis of psychoneurosis because in the *Nomenclature* it is used only of psychotic states, the authors of this work apparently failing to recognize a depression of neurotic origin or reactive depression. When, therefore, the depression was obviously not psychotic it was sometimes placed among the anxiety states with which it was most commonly associated. Again, those diagnosed “psychotic” amounted to only 3.4% of the total; but that does not represent all the psychoses, for if a patient was diagnosed psychotic he had (at that time) to be discharged from the Service according to regulations; but there were some early psychotics (e.g., cyclothymic states in the older N.C.O.s) who were fit for more service and were often

anxious to remain in the Army. They were therefore variously diagnosed—e.g., as temperamental instability (cycloid, schizoid, or paranoid type)—in order to keep them in the Service. Again, only 7 out of 700 were mental defectives; but this does not represent all the mental deficiency by any means, for when the deficiency was associated with marked instability or anxiety the patients were sometimes dealt with under these heads in order to facilitate the discharge from the Army when they were unsuited for the Pioneer Corps. Any future statistics based on the Army diagnosis of such cases are therefore bound to be misleading because of these strictures on diagnosis. But these inaccuracies are not sufficient to affect the broad generalizations mentioned above, such as the prevalence of anxiety states and the fewness of obsessional states.

Aggravation and Attributability to War Service

The practical problem as to how far these cases are attributable to, or how far they are aggravated by, war service is important from the point of view of pension, and also from that of psychological treatment, since old-standing chronic cases take longer to treat.

To assess the amount of aggravation we arbitrarily divided the patients, who numbered 332, into four groups:

1. *No Aggravation (Ag—)*.—These were cases in which there was no aggravation at all or no appreciable aggravation from war service—that is to say, men who were neurotic before admission or those in whom the breakdown was due to nothing else than the ordinary conditions of Army life. Such are the patients of “limited adaptation” who could carry on satisfactorily in their work in civilian life so long as they were left to their tailoring or clerical work, but who could not adapt themselves to changed conditions, the discipline and routine of Army life, or the separation from home. They numbered 32% of the whole. Inasmuch as these men have broken down with no other stimulus than Army life, they are usually unfit for any form of military service, even civilian work in the Army. They should never have been recruited in the first place, or, having been recruited, should have been examined and segregated at the training depot, and forthwith discharged without admission to hospital. If they are sent to a general hospital their neurosis becomes hospitalized and they become worse, whereas if they are returned to their limited sphere of occupation they will settle down and do useful work.

2. *Mild Aggravation (Ag+)*.—These cases include the men who were subjected to somewhat more severe conditions in Army life, such as a bomb falling in the neighbourhood (but in which the patient was not personally involved) or the evacuation from France but without particularly bad conditions. Such are the conditions of danger to which many civilians are now subjected. These conditions are not sufficient to break down an ordinary healthy-minded person, and probably operate by arousing old latent predispositions, such as infantile fear, or by bringing to light a constitutional instability. These cases comprise 28% of the 332. These patients are men of neurotic predisposition, some of whom have had previous nervous breakdowns of a mild nature. Most of them are unfit for general service; but in the more promising cases, though radical cure is impossible, that part of the neurosis which is due to war service may be treated with some success, without any attempt being made to reach the more chronic substratum of neurotic predisposition. Even with treatment they are unfit for front-line units, and the most we can do with them, as a rule, is, after a process of rehabilitation, to use them in the Army for trades and civilian occupations, a scheme for which is now in full operation.

3. *Serious Aggravation (Ag++)*.—This group includes those subjected to more serious conditions, such as being wrecked, or evacuated from Dunkirk beach under persistent machine-gun fire and bombing, but without being actually blown up or injured; or those who have been subjected to serious road accidents in which, however, there was no concussion. Pre-

disposing factors were often present in such cases, which accounted for their breaking down when many thousands undergoing the same experience did not. But in many cases the predisposing factors were not obvious, and had to be looked for. These patients were perfectly capable of doing their work adequately before service, and although they may have been of a nervous type they had never previously had a breakdown, nor had they been off work with a nervous disability. They are for the most part to be regarded as genuine war casualties. *Of these there were 21%.*

4. *Attributable (Att.).*—This group consists of cases in which the precipitating factor was all-important—mostly traumatic cases, the patients having been blown up, buried, concussed by injury from bomb or by shell fire, or involved in motor-cycle accidents. Often they were men who had never suffered from nerves, and had never been taken for, or had considered themselves, anything but normal. This does not mean that there was no predisposition, although in some cases none was found; in others it was found even though the patient at first seemed to be free from it. The precipitating factor, however, is the important one, and the predisposing factor, when present, was usually negligible. *Of these cases there were 19%.*

The classification of the 332 cases was therefore as follows:

TABLE II

Ag -	..	..	32%	} 60% (chronic cases)
Ag +	..	..	28%	
Ag ++	..	..	21%	} 40% (acute cases)
Att.	..	..	19%	

From these figures it will be seen that 60% of our patients, whose cases were carefully scrutinized and examined by the Command specialists before admission, had had little or nothing to do with active service, whereas only 40% could be regarded as war casualties. These figures were taken over the Dunkirk and Norway period, and therefore represent a larger proportion of war cases than during the last six months of the year (1941).

The question "What is the cause of the disability?" (Army Form B179) is a peculiarly difficult one to answer in the neuroses, considering the complexity of the factors involved.

In order to help the medical boards in assessing the aggravation we usually described the patients under four categories: (a) "constitutional" (in the Army sense)—i.e., those with bad predisposition, whether strictly constitutional or acquired, such as the old chronic neurotics, whose condition was not materially aggravated by war service; (b) "constitutional, but aggravated by war service"—i.e., those in which there was material aggravation, but in which the predisposing factor was more important than the precipitating; (c) "bombing, etc., by enemy action in a person predisposed to neurosis," in which the precipitating factor was more important than the predisposing or constitutional factor; and (d) "bombing, etc., by enemy action," in which the predisposition was immaterial and the war experience was all-important. These four groups corresponded roughly to the Ag-, Ag+, Ag++, Att., but not entirely. This classification (the precise wording of which is immaterial) has proved of value to medical boards in assessing attributability.

Predisposition

How far are our patients predisposed to neurosis?

The question of predisposition is of importance from the point of view of attributability and from that of length of treatment. It is also interesting from a scientific point of view. An investigation was obviously called for. We found that of 326 cases there was a predisposition of a constitutional or an acquired type in 82% and apparently no predisposition in 18%; moreover, in 69% the predisposition was in early childhood, before puberty. Probably

this is a low estimate of predisposition, for in most cases the investigation was on a somewhat objective basis, and there is little doubt that a more thorough analysis would have revealed a predisposition in most of the 18%, judging from the experience of cases in civil life, where the predisposing factors often reveal themselves only after considerable analysis, and may then prove to be of the greatest significance: indeed, in a more detailed and thorough investigation, mentioned later, only 3 out of 100 showed no psychological predisposition. This suggests that the precipitating factors, though important; seemed incapable, except in a few cases, of producing a neurosis unless there had been a predisposition. This is in keeping with what one finds in civilian practice, but the traumatic experiences of war led one to expect a larger proportion of these where breakdown was entirely due to the severity of present-day experiences. Of these there were very few even amongst the traumatic cases.

A striking feature of the cases in this war is the fact that so many of our patients *volunteered* the statement: "I have been nervous all my life: I have had depressed turns as long as I can remember." It was often said during the last war that the patients ascribed their condition to the war in order to get a pension. It is certainly not true of our patients to-day. So often did they volunteer the statement that we took statistics and found that nearly half (47%) spontaneously stated that they had had their symptoms before entering the Army. In others the same fact of a long history of neurosis was elicited by questioning and in subsequent analysis, but these were not included in the 47% given. But can we rely on the patients' statements? If they are not trying to get a pension, are they not telling a tale to get out of the Army, by trying to prove that they are useless as soldiers? That may be so, but it may also be nothing less than the truth that they *are* unfit to be soldiers, and ought never to have been in the Army; for thousands of neurotics are recruited who are not, never have been, and never will be fit to be soldiers.

As a "check up," however, on the truth of the patients' statements, we sent out a questionnaire to the parents of an unselected group of 40 (we found it impracticable to get the information from the doctors also, as we should have liked).

The following letter was sent, the exact phrasing of which is important:

Dear —,

Your son is a patient under my care at this hospital. It would help me very much in treating him if you would tell me about any childhood illnesses he had—that is, whether he was delicate and difficult to bring up. Information which you think may have any effect on his health will be useful to me, and you might tell me something about the health of the family."

It will be observed that in this letter (drafted by Major E. Miller) signed by the medical officer in charge of the case we did not mention that the son was suffering from nervousness; no questions were asked about nervousness in childhood (but only regarding childhood illnesses, etc.) and no mention was made of the fact that this is a neuropathic hospital (although the parents may have known). The inquiry was therefore heavily weighted in favour of a negative reply.

In spite of this, 30 out of the 37 were confirmed by the parents' replies (7 confirmed, 18 substantially confirmed, and 5 confirmed and amplified). In 1 there was no information. Of the other 6, in four cases the parents obviously took the letter at its face value as referring to physical illness, and replied accordingly that he had had "whooping-cough at 3," etc. One was a case of homosexuality of which the parents were not likely to have been aware, and one a psychopathic personality and a chronic liar. In

every case, however (except the last, who couldn't be believed, anyway) the patient's statements were confirmed in the subsequent analysis. There was thus a very high confirmation rate from the parents and, one may say, a complete confirmation, from the patient's subsequent analysis, of the statements regarding early predisposition. It is obvious that these men were not inventing the story, whether to get out of the Army or not.

That does not mean, of course, that there is no "skrimshanking" among the soldiers. "Skrimshanking," if we may define it so, is making the most of symptoms we have, as distinct from "malingering," which is deliberately inventing symptoms we have not. Skrimshanking we found to be fairly common: malingering is, according to most experts in the last war and in this, comparatively rare, and is fairly easily detected. Patients exaggerate their symptoms for various reasons: but a common one found among neurotics is that the man has severe symptoms of pain, indigestion, and headache which are real enough, although hysterical, yet has so often been told that there is "nothing the matter with him" that he is compelled to exaggerate his symptoms in order to obtain the attention and treatment he requires.

The failure of the medical officer to recognize the neurosis as a definite disorder thus actually accentuates it, and the effect of treating the genuine neurotic as a semi-malingeringer is to make him so. Many medical officers are disinclined to discharge the neurotic or the psychopathic personality because they object that he should "get away with it." For the medical officer to be thus swayed by his prejudices is to do a grave injustice to the commanding officers to whom such men are sent, and may endanger the lives of men with whom they are compelled to serve. It is just as criminal to send to a combatant officer an unreliable man of poor calibre who is likely to break down as it is to send him a defective gun or an untested plane.

Type of Early Symptom and Position in Family.—An investigation (65 cases) into the form of symptoms in early childhood revealed a multiplicity of such symptoms. Only five had one symptom alone, and the number of phobias, etc., averaged out at nearly five to every patient, pointing to a nervous disposition rather than to isolated conditioned fears. Only 8 out of 100 were the youngest child in the family, and there were nearly twice as many who were the oldest child.

Constitutional or Psychological?

Granting there is a predisposition, the next question is, "How far is this predisposition 'constitutional' and how far 'psychological'?" By "constitutional" we mean innate, endogenous, and dependent on the physiological and biochemical make-up of the individual; by "psychological" we mean acquired and due to environmental conditions, especially in early childhood—such as bad training, infantile fears, an unhappy home, or other experiences affecting his psychological disposition, with the formation of morbid complexes. The two factors often interact, but it is important to differentiate them on account of treatment; for we can give only palliative treatment for the constitutionally predisposed, but can radically cure the psychoneurotic and acquired type since it is in the nature of a conditioned reflex. The amount of predisposition was found to be about equal: of 289 cases 49.4% were predominantly constitutional and 50.6% predominantly psychological.* In 10% both factors were significant and provided a bad prognosis, as we shall see.

* The figures probably overemphasize the constitutional predisposition, since our investigation included not only the psychoneuroses, which by definition are primarily psychogenic and not constitutional, but cases of psychopathic personality, which by definition are constitutional in nature.

A further investigation to determine the extent of the predisposition in each case, whether mild or severe, revealed that out of 193 cases 19% were mild and 28% serious constitutional, and 34% mild and 19% serious psychological.†

It will be noted that those who broke down with mild predisposition of both types (53%) are not very different in numbers from those who broke down with severe predisposition (47%). This is probably to be accounted for by the fact that there were more in the Army with mild predisposition than with serious, the latter having been excluded before reaching hospital. But what is of interest is that, whereas in the constitutional cases it was the serious more than the mild which tended to break down (28 as against 19), in the psychological or acquired it was those with mild predispositions which broke down in greater proportion than the serious. The total number of cases (193) is probably too small to have conclusions based on it, but, taking the figures as they are, how are we to interpret them?

There are many mild constitutional defectives in the Army who make quite a good showing as soldiers (we have met them as N.C.O.s, and one had gained the Military Cross), and therefore avoid detection. It is only when they have a serious constitutional disorder, whether mental defective or schizoid, that they come under the notice of the company officer for their peculiar behaviour. Moreover, the mild constitutional has less insight into his condition and is himself less aware of his disability, and therefore does not go sick. The man with mild psychological predisposition, on the other hand, is more aware of his neurotic complaint and is more vociferous in making it known. He is not sent to the medical officer; he goes. But there is a greater proportion of serious constitutional cases than there is of psychological because the serious constitutional, even if he has little insight into his own condition, is more easily spotted by the company officer for his clumsiness, inability to learn, anti-social behaviour, and bizarre conduct, and is sent to the medical officer. The man with serious psychological predisposition is more capable of disguising his disorder, if he wishes to, than is the constitutional, but the lower proportion of serious psychological cases is probably due to the fact that such men are disposed of before they reach the hospital stage.

Correlation‡ between Predisposition and Aggravation

As a rule the more the predisposition the less the aggravation necessary to produce a breakdown; the less the predisposition the more the aggravation necessary. This was proved in the following analysis of the 332 cases. Of those not predisposed 14% broke down with mild aggravation (Ag- and Ag+), and 86% broke down with serious aggravation (Ag++ and Att.). Of those predisposed, whether constitutional or psychological, 72.5% broke down with mild aggravation, and 27.5% broke down with serious aggravation. There was therefore an obvious inverse ratio between the amount of predisposition and the amount of aggravation necessary to precipitate the breakdown. This correlation is not inevitable, for there is no reason why a man of neurotic disposition should not be blown up like any other, in which case both the predisposing and the aggravating factors are important.

† One must, of course, take into consideration the fact that the estimates of what is a mild and what is a serious predisposition depend to some extent on the individual judgment of the specialists, and also that the criterion of judgment of what constitutes a mild or a serious disorder in the constitutional group differs from that in the psychological. But in the question under discussion this does not matter, as it is the difference in ratio between these which is under consideration.

‡ The term "correlation" is not used in too technical a fashion; it is intended to indicate a statistical correspondence between two items.

No explanation is given as to why the 14% with no predisposition should break down with only a mild aggravation, but the reason is probably either that there was an undetected, perhaps constitutional, predisposition, or that there were contributory factors, such as worries at home, which sapped the vitality. It would be interesting to investigate how far contemporary worries of this type contribute to the so-called "war neuroses." Our experience is that it is considerable, particularly in the way of "separation anxiety," men being worried about their families being bombed, their wives and other men, financial matters, or illness at home.

A further investigation into the amount of aggravation as related to (i) constitutional and (ii) psychological predisposition is of interest. In a group of 62 patients of both types who broke down with only a mild aggravation the proportion of constitutional to psychological was 3 to 1—that is to say, the constitutional patient as a whole breaks down sooner with a milder degree of aggravation than the psychological, who appears to stand up to it better, presumably because he has more courage. It takes less aggravation to affect a constitutional case than an acquired one, and the former subject cracks up more easily.

Previous Adaptation to Life

A further investigation was made into the important question of the patient's adaptation to life before he entered the Army. So many patients—for instance, persons of *limited adaptation*—got on perfectly well in their routine civilian life, but broke down when removed into strange surroundings of Army life, while others had always been misfits. How far could one anticipate a breakdown by reference to the individual's earlier objective history, which is so often accepted as significant of a neurotic tendency?

The following were the forms of adaptation for the first 100 patients:

TABLE III

	Ill Adapted (I.A.)	Limited Adaptation (L.A.)	Well Adapted (W.A.)
Physical (e.g., habitus, endocrine, etc.) ..	17	25	58
Mental (e.g., introversion, cycloid, etc.) ..	38	37	25
School	15	26	59
Work	8	31	61
Social	15	46	39
Army	31	28	41
Total	124	193	283

The following points may be noted:

1. Not by any means all of these psychoneurotics got on badly in the Army: 41% were well adapted to Army life, and many wished to remain in the Service; only 31% were ill adapted.

2. As regards civilian life, it was surprising to find how many were well adapted to school life and to work. 59% were well adapted to school life, and only 15% were ill adapted; while as many as 61% were well adapted and only 13% ill adapted to their work. School life and work together averaged 60% W.A., 28.5% L.A., and only 11.5% I.A.

3. On the other hand, the largest group of those ill adapted in civilian life were those *mentally* ill adapted (38% I.A., with 37% L.A. and only 25% W.A.), usually with constitutional peculiarities, such as the inferiors or schizoid.

4. In social life only 39% were well adapted; 46% were limited in their adaptation and 15% ill adapted. Mental and social together average only 32% W.A., with 41.5% L.A. and 26.5% I.A.

The conclusion to be drawn seems to be that in his *objective* adaptation to life and work the psychoneurotic

patient shows up better (60%) than in his more subjective relations, such as mental and social adaptation (32%). Objective adaptation is therefore not a good criterion by which to judge whether a man is psychoneurotic (although it is of course of the greatest importance in judging mental deficiency), whereas mental and social adaptation are more dependable. A man may be a good and efficient worker while suffering from severe neurosis. A neurosis is not a failure in biological adaptation: the neurotic is one who cannot adapt himself to himself, and therefore to others.

As regards *physical* adaptation, 58% were well adapted and only 17% ill adapted, 25% being of limited adaptation. So far as it goes, this refutes the Adlerian view that organ inferiority is the exclusive origin of the neuroses.

(This paper will be concluded in our next issue.)

INTRAVENOUS SERUM IN THE TREATMENT OF PERIPHERAL VASCULAR DISEASE

BY

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One of the chief aims in the treatment of peripheral vascular disease is to aid the development of an adequate collateral circulation in the affected limbs. Good results have been obtained with passive vascular exercises by the Buerger method, alternating suction and compression by the pavaex boot, or intermittent venous occlusion, and it has been shown (Herrman, 1936) that an adequate collateral circulation can be re-established after all the major arterial pathways to a limb have been obliterated.

It has also been claimed that procedures which increase the blood volume stimulate the formation of a collateral circulation. Koga (1913) and Silbert *et al.* (1930) observed that the blood volume in patients with thrombo-angiitis obliterans was decreased. Koga (1913) gave saline or Ringer's solution intravenously, and reported striking improvement in 13 patients, with an increase in the peripheral circulation and diminution in both rest pain and pain on exercise. Silbert (1926, 1930) and Samuels (1936) have recorded good results following the intravenous injection of 300 c.cm. of 2 to 5% saline; the oscillometric readings in the legs increased, the legs became warmer, and trophic changes tended to clear up. The injections were given quickly—300 c.cm. in ten minutes—three times a week at first, and later at weekly intervals. The beneficial results of saline therapy have been confirmed repeatedly (Samuels, 1936).

The effects of intravenous saline on the peripheral circulation are presumably mechanical, produced by the immediate increase in blood volume. This increase is a transient one, lasting several hours only (Gilligan *et al.*, 1938), and it seemed probable, therefore, that if the blood volume could be increased for a longer period of time the effect on the peripheral circulation would be greater. For this reason the effects of increasing the blood volume by giving human serum intravenously were studied.

The serum used was pooled liquid serum, obtained from the North-East London Blood Supply Depot. It has a protein content of 7% and can be safely given to patients of any blood group without cross-matching. The amount