over the end of the lever—a rather awkward *contretemps* in the middle of an operation.

The instrument can also be used as a haemostatic guillotine, and left *in situ* for five minutes, as advocated by La Force.

I find by the method above described that while in the vast majority of the cases removal of the tonsil is complete, there is no greater amount of sloughing of the bed of the tonsil than when a sharp blade with cutting edge is used. The loss of blood is markedly lessened, as also the risk of serious haemorrhage. The amount of blood swallowed is reduced to a minimum.

The sister in charge of my recovery wards is quite clear that post-operative sickness is lessened, and in consequence, where patients have to go home the same day, as in hospital practice is often unfortunately necessary, they are sooner fit for removal.

RELATION BETWEEN THE GENERAL NERVOUS SYSTEM AND SYMPTOMS OF "D.A.H." IN NEURASTHENIC PATIENTS.

BY

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An investigation¹ carried out by one of us in conjunction with J. S. Haldane and J. C. Meakins at No. 15 Canadian General Hospital, Taplow, during 1918, on patients suffering from symptoms of D.A.H.—chiefly in consequence of irritant gas poisoning—led to the recognition of the importance of the symptom of shallow breathing. This symptom appeared to be due to some abnormal upset of the Hering-Breuer reflex.

Hering and Breuer² described in 1863 the reflex control of the respiratory movements. Their experiments proved that inspiration and expiration are initiated in response to afferent impulses passing up the vagus, and that a state of deflation or inflation of the lungs provides the stimulus which originates the impulse leading to inspiration and expiration respectively. Hering and Breuer's work, however, did not throw any light on the question as to how the depth of breathing is normally regulated. The nature of this regulation was made clear by the work of Haldane and Mavrogordato,³ who showed that the degree of inflation or deflation of the lungs which is necessary to excite the Hering-Breuer reflex depends upon the CO₂ tension of the arterial blood.

Besides the abnormality of the Hering-Breuer reflex the patients also manifested many other functional and nervous symptoms, and consequently it seemed advisable to make some attempt to work out the relationship, if any, between their abnormal respiration and disturbance of other functions of the nervous system.

With this object in view the work was transferred to the Ashhurst War Hospital, and the present paper embodies the results of observations made there on neurasthenic patients. These patients were not selected, but were taken at random. All were admitted for "neurasthenia." The total number of patients on whom observations were made was 100.

The first point to which attention was directed was the prevalence and severity of D.A.H. symptoms among patients admitted for neurasthenia, and with this end in view the patients were all subjected to the following examination as far as possible:

1. Pulse rate at rest.
 2. Pulse rate after two minutes' work on a bicycle ergometer at 3,170 foot pounds per minute.
 3. Time taken for pulse to return to resting rate.
 4. Rate of respiration sitting quietly in chair.
 5. Rate of respiration sitting quietly and breathing through inspiratory and expiratory valves so that the volume could be measured.
 6. Volume per respiration and volume per minute.
 7. Vital capacity.
 8. Time during which the breath could be held (a) in inspiratory, (b) in expiratory position.
- In addition a note was made of any spontaneous complaint by patients of shortness of breath on exertion.

It may be well here to point out one difficulty which we experienced—namely, that the observations were made at very varying times after the onset of symptoms and after various kinds of treatment. Hence the patients had recovered to different degrees. In considering the results it was noticed that the patients exhibited a gradation of D.A.H. symptoms from none to moderate severity. They did not, however, except in a very few cases, show by any means such an extreme degree of severity of symptoms as was common among patients admitted directly in consequence of the effects of irritant gas.

An attempt was made to classify the cases observed under three heads: (1) Those with marked D.A.H. symptoms, (2) those with definite D.A.H. symptoms, and (3) those with no appreciable D.A.H.

Table I gives a selection of representative results of this classification.

TABLE I.

	Pulse at Rest.	Pulse after Work.	Time (min.) for Pulse to Return.	Complaint of Dyspnoea.	Respn. with-out Valves.	Respn. with Valves.	Respn. during Work.	Holds breath, Inspn. (secs.).	Holds breath Expn.	Vital Capacity, Litres.
Marked D.A.H....	88	136	2+	No	35	48	48	7	5	2.7
	80	176	7+	Yes	32	32	62	25	15	3.5
Definite D.A.H....	96	124	1	Yes	15	15	28	20	15	3.5
	84	100	4+	No	22	20	30	55	25	3.0
No appreciable D.A.H.	58	72	$\frac{1}{2}$	Yes	22	27	29	43	18	4.0
	60	88	2	No	13	26	22	54	33	3.2

On examining the figures for the whole series of cases it is evident that in the several degrees of D.A.H. the regulation of the pulse and respiration are both upset, but that in the milder cases the symptoms may be manifested chiefly with respect either to the pulse or respiration.

This is shown in Table II, where two cases of mild D.A.H. are compared.

TABLE II.

No. of Case.	Pulse at Rest.	Pulse after Work.	Time (min.) of Return of Pulse.	Complaint of Dyspnoea.	Respn. with-out Valves.	Respn. with Valves.	Respn. at Work.	Holds breath, Inspn. (secs.).	Holds breath Expn.	Vital Capacity, Litres.
97	72	116	3+	No	18	18	22	42	25	2.7
39	72	84	1	No	25	21	29	19	18	3.2

Table III gives a summary of the results, and in addition shows the relation of previous infection and gas poisoning to the frequency of D.A.H. symptoms.

TABLE III.

	No. of Cases.	Gas and/or Infection.	No Gas or Infection.
Definite symptoms of D.A.H. ...	13	12	1
Less marked symptoms ...	57	37	20
No appreciable D.A.H. ...	30	14	16

It appears from this table that of the 13 cases which showed well defined symptoms of D.A.H., 12, or 92.3 per cent., gave a history of gas poisoning or infection, either recent or from which the symptoms dated; of the 57 cases with ill defined symptoms, 37, or 64.9 per cent., and of the 30 cases free from D.A.H. symptoms, 14, or 46.6 per cent., gave this history.

These results accord well with the findings of Lewis and his co-workers.⁴ In considering them it should be borne in mind that several of the cases with no appreciable D.A.H. which are shown as having suffered from gas or infection gave a history of very slight gassing. Also in this connexion it should not be forgotten that the patients examined had been under treatment for very varying periods. Hence the figure of 46.6 per cent. may be taken as a maximum.

A certain number of the patients definitely attributed the onset of their nervous symptoms to some infective illness. It therefore appeared to be desirable to endeavour to find out if there was any causal relation between the effects of gas poisoning and infections, and the onset of symptoms of neurasthenia. With this objective in view the whole series of cases were analysed with a view to separating those who had recently been gassed or suffered from some infection previous to the onset of nervous symptoms from those in whom there was apparently no antecedent infection or gassing which could be related to the neurasthenia.

The result was as follows: Of the 100 cases, 52 gave a history of recent gassing or infection previous to the onset of neurasthenia, 48 gave no such history. The nervous symptoms were so diverse in character, and it is so impracticable to estimate them quantitatively, that it was not possible to classify the patients in order of severity of their symptoms, so that a table comparable to Table III cannot be given.

As stated above, the circulatory and respiratory mechanisms are not necessarily proportionately affected in mild cases of D.A.H., and with a view to obtaining further information in this connexion we have examined the condition of other reflexes in these neurasthenic patients. In making this attempt we were faced by the obvious difficulty that reflex responses cannot be estimated quantitatively. One has therefore to depend on some such arbitrary classification as brisk and sluggish or increased and normal.

On examining the clinical notes of the whole series of cases, it appeared that on the whole there was a tendency for the patients to show some exaggeration of the tendon reflexes, abdominal reflexes, etc. Tremor of hands and tongue was also frequently present. With regard, however, to both tremors and tendon reflexes, it was not possible to classify the patients into groups corresponding to the headings of Table III. There did not appear to be any relation between the severity of D.A.H. symptoms and the frequency of occurrence of exaggerated reflexes. Similarly, no relation could be observed between exaggerated reflexes and a history of recent gassing or infection.

With regard to tremors, however, it was evident that this symptom is more severe in cases showing well marked D.A.H. symptoms than in those who do not suffer in this way.

In view of the functional symptoms so frequently found in patients suffering from D.A.H. as a result of irritant gas poisoning, it was thought advisable to try to obtain some information as to the possibility of the upset of the Hering-Breuer reflex in these patients being of functional origin. An attempt in this direction was made at Taplow.

One of the gassed patients who showed the symptom of rapid shallow breathing to an extreme degree was hypnotized, and while in the hypnotic state was told to breathe slowly and deeply. In response he somewhat increased the depth of his respirations, but the rate remained quite unaltered. Consequently, when the experiment was terminated after a few minutes, he showed indications of over-ventilation. Immediately after he was roused from the hypnotic state the breathing became as shallow as before. The rate remained uninfluenced throughout. Since in this preliminary experiment there was no certainty as to the degree of hypnosis obtained, a second attempt to influence the rapid shallow breathing by hypnotic suggestion was made at the Ashhurst War Hospital.

The patient (Pensr. W.) joined the army in 1914, having previously always had good health. He gave a history of gradual onset of nervousness and of dysentery in France. Never gassed.

On admission his respirations were rapid and shallow, varying between about 40 and 53 per minute. His pulse rate also varied from about 80 to 120.

Hypnotic treatment was tried as follows:

January 3rd. First hypnosis: Not asleep; respirations 44 per minute.

January 5th. Second hypnosis: Slightly deeper; respirations 44 per minute.

January 8th. Third hypnosis: Relaxes well; respirations 44, varying slightly and going up to 46 just before he wakes spontaneously.

January 9th. Fourth hypnosis: Respirations 36, sitting quiet; 34 after three minutes.

January 11th. Fifth hypnosis: Seems to go fairly deep; feels warm glow in abdomen; cannot lift hand; respirations remain at 36 per minute, in spite of suggestion; respirations almost entirely costal.

Hypnotic treatment was then suspended for a time, and during the next few months he improved somewhat on the whole with rest, graduated exercise, and occasionally oxygen at night.

In May hypnosis was again tried by another medical officer daily for about a week. Respirations in waking state varied between 30 and 40 per minute. Under light hypnosis they could be reduced to 24, and on one occasion to 20 for about a minute, becoming more abdominal in character. The respirations would remain at about 25 per minute as long as he remained recumbent and relaxed, but returned to 30 to 40 as soon as he sat up.

CONCLUSIONS.

1. Of 100 patients admitted for "neurasthenia" 13 showed well marked symptoms of D.A.H., and 57 had the same condition in lesser degree.

2. The evidence available does not show the same causal relation between previous infection or gassing and "neurasthenia" as holds in the case of D.A.H.

3. No definite relation could be traced between the abnormal Hering-Breuer reflex of D.A.H. patients and the altered tendon reflexes of neurasthenia.

4. Attempts to control the Hering-Breuer mechanism by hypnotic suggestion were only partially successful. The respiration could be slowed for a short time while the patient was relaxed, but no permanent effect could be obtained.

We are indebted to the medical officers of the Ashhurst War Hospital for the clinical notes of the patients, and in particular to Major W. McDougall, F.R.S., who also carried out the first hypnotic treatment in the case of Pensioner W. We are also indebted to the Medical Research Committee for much help, and also to the British and Australian army authorities. To all these we wish to express our thanks.

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TWO CASES OF PNEUMO-BACILLARY MENINGITIS OF BACTERIOLOGICAL INTEREST.

BY

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The following is an account of a bacteriological and pathological investigation of two cases of meningitis which occurred in No. — General Hospital, E.E.F., during 1917; they presented features of unusual interest, for the reason that the organism isolated from the first case closely resembled *B. pestis*, and in the second case the clinical aspects were so closely allied to those seen in cerebro-spinal meningitis that until the *B. pneumoniae* was isolated from the cerebro-spinal fluid the case was considered to be one of meningococcal infection.

CASE I.

Pte. X. was admitted to hospital suffering from an enlarged, hard, and painful gland in the posterior triangle of the neck; his temperature on admission was 102° F., and his mental condition was sluggish. In a short time (about one week) marked drowsiness supervened, and this passed on to coma, from which he did not recover. Shortly after admission the gland in the neck was incised; a sterile swab was passed deeply into the wound and sent in for bacteriological investigation. No obvious collection of pus was found upon incision.

An agar culture was made, and after forty-eight hours at 30° C. opaque, greyish-white shining colonies had appeared; a Gram preparation made from these colonies showed: (1) Cocco-bacilli, a few of them showing bipolar staining with fuchsin, and occurring at times in pairs. (2) Rod and filament forms. Both of these were negative to Gram staining. A guinea-pig inoculated with the culture died after six days; films made from the spleen (which showed, naked eye, numerous yellowish-white areas) and inguinal glands showed large numbers of cocco-bacilli, many of which showed definite bipolar staining with fuchsin or Loeffler's methylene blue.

Cerebro-spinal fluid from this patient was cultured upon agar and serum-agar at 30° C., and colonies similar to those obtained from the gland juice had grown after thirty-six hours; films made from these colonies showed Gram-negative cocco-bacilli and filament forms, with occasional bipolar staining in the former. The sugar reactions of a pure subculture gave glucose (ac.), lactose (ac.), mannite (ac.), no gas being formed in any. Gelatin was not liquefied, and upon potato the organism grew well.

At the end of the third week the patient died, the *post-mortem* findings being as follows: (1) Purulent exudate at base of brain: