

SOME OBSERVATIONS ON THE CAUSES, ACTUAL CONDITION,
AND SUGGESTED LINES OF TREATMENT OF DISORDERLY
ACTION OF THE HEART (D.A.H.) AS FOUND IN SOLDIERS
ON THE WESTERN FRONT.

Thesis for the Degree of M.D.

by

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The following thesis is written from experience as a Regimental Medical Officer for nine months, and as Medical Officer in charge of Reinforcement Base Depots for ten months. During that period over six hundred cases of D.A.H., of sufficient severity to prevent the men carrying out duties with the battalion, came under my observation. The thesis is based on general observations and on the examination of 557 of these cases, as in the remainder I did not consider that the cardiac condition had been produced by the conditions at the Front. The trench experience of the latter was in practically all cases less than seven days, and in many cases the men had never reached the trenches as they had joined the battalion whilst at rest and had been considered unfit by the medical officer on first examination. Even during that period any incident might have occurred which could have produced D.A.H. in a perfectly fit man, but this was always carefully investigated so that if it did occur, the case has been included in those produced by war conditions. These men had either marked D.A.H. in civil life, or it had been produced by their preliminary training to such a degree as to render them unfit for active service at the front. Of the 557 cases already mentioned, I have divided 523 of those/

those as they have occurred amongst three categories of men which I have enumerated later, as by so doing one has been able to demonstrate the type, and relative frequency of occurrence of DAH in the different classes of men.

The remaining 34 cases occurred in men which could not be included in those categories, and to which I have fully referred further on.

Of the 523 cases

12	occurred	in	Category	I
337	"	"	"	II
174	"	"	"	III

Owing to the number of men examined it has only been possible to give Illustrative Cases.

As a Regimental Medical Officer one is able to experience, and to study every cause contributory to that condition which, in a varying degree, exists in so many of our soldiers now, after 3 years of the most nerve-straining war the world has ever seen.

Trench warfare may be considered first, as in so doing one is able to point out the many factors, direct and indirect, which tend to make the equilibrium of the heart unstable.

The General conditions may be taken first.

A man is at least 4 days in the trenches (i.e. in the front line) without being relieved. During that period he is never allowed to leave boots or clothes off, is constantly exposed to all weather conditions, and is allowed to enter dug-outs during the day only, and not even then, except when he is off his tour of duty.

The usual routine is then, 4 days in support, where similar but not so severe conditions prevail as in the front line, and 4 days in rest billets.

This is merely a nominal rest, as during that period they are always under gun-range, and often under shell-fire, and have to proceed almost daily to the front line as working or fatigue parties, such conditions alone constituting a physical and nerve strain, and/

and can be endured for a considerable time, only by the most robust constitutions.

Again, a great part of this time in front and support is spent in inaction, a factor which leads to distinct over-indulgence in smoking (mostly cigarettes) and to reflection and in the constitutionally nervous, to much introspection and self-concentration.

Then there is the war-activity, which is undoubtedly the greatest factor in the causation of D.A.H.

First of all there is the incessant strain to which every man is subjected, being ever on the alert, as he is always near the enemy and liable to become a casualty at any moment.

Threatened raid, attack, or gas-alarms are frequent, although extremely seldom is there any incident to justify them, as these have been probably raised by some uninitiated sentry whose nervous strain is at top tension.

Then may be considered what is one of the most important of war conditions which tend to the production of D.A.H., and one to which every man who has had a fair experience of trench warfare is subjected, viz.-

The Concussion of bursting shells.

The average daily amount of shelling on a battalion frontage varies from twenty, in a fairly inactive part of/
of/

of the line, to two hundred and fifty or three hundred, where much more activity prevails.

Apart from this there is the ominous sound of an approaching shell which is going to fall in a man's proximity.

Until a man has had a considerable experience of shell-fire, it is extremely difficult for him to judge whether a shell is coming near him or not.

It may be noted here that a large shell can be heard passing over 1000 yards to the right or left of the individual, and the sound can be compared to the noise produced by a train crossing over a railway bridge with iron-girders.

What may be considered separately are trench-mortar shells.

These unlike ordinary shells can easily be seen approaching, and their concussion can only be described as terrific, the wave of concussion from the largest ones (Minnenwerfer) being easily felt 600 yards away from the point of explosion, and this applies also to the larger calibre of ordinary shells, e.g, 12 inch shell.

The force of concussion of large calibre shells at the immediate point of explosion is said to be ten tons to the square yard. Exposure to concussion varies. A man may be blown over suffering a slight, physical/

physical and nervous shock, or he may be rendered unconscious and recovery may take some time.

Burial of a man from the bursting of the shell, whether it be in a trench or in a dug-out, is another very important factor in the causation of D.A.H. As many as 63% of all cases produced by war conditions, which I observed, gave a history of burial by shell-fire, varying in duration from ten minutes to thirty-seven hours. An example of the extreme nervous tension, apart from the actual force of the explosion, with the consequent sympathetic stimulation of the cardiac movement, may be judged from one man's statement. He was absolutely pinned down, he said, and the shells were still falling thickly around him. It seemed to him like a railway accident, where a man is pinned down in the wreckage, and, although conscious, cannot be rescued from the oncoming fire.

Another important factor in the causation of D.A.H. is the General Exhaustion produced by these war conditions, and the long exhausting fatigues which men are nightly called upon to perform, after enduring the excitement of the day. The heart already overworked by sympathetic stimulation, is called upon to react to extra muscular action. Many of these men I examined when the work was over and the results I found were as follows.-

(93 cases examined)

Inspection.

Precordial pulsation observed in many cases.

Frequently there was Aortic Abdominal Pulsation.

76 cases revealed unduly strong cardiac pulsation.

47 cases revealed an apex-beat of a heaving character.

18 cases revealed a sharp and sudden apex-beat as in cardiac irritability.

Pulse

28 cases revealed the rate to be definitely slowed, varying from 52 to 68 per minute. One of these men I afterwards ascertained, had a normal pulse-rate of about 55 per minute.

The remainder of the cases either had an ordinary pulse rate (70-74), or the frequency was definitely accelerated.

11 cases had a pulse-rate of over 100 per minute, and all these presented symptoms of Nerve-Exhaustion. Auscultation revealed nothing to note.

Other factors in the production of D.A.H which are the direct result of war conditions are Trench Fever, PUO (Pyrexia of uncertain origin) and Gas-Poisoning. These I will refer to later. In open warfare such as we experience in the battles of the Somme, Arras and Messines, there is no extra contributory cause, although every exciting factor is there in a more abundant degree.

General Observations.

In going the round of the trenches I practised taking pulse observations, and found on the average, that only one in every four men had a normal pulse-rate (70-74).

The remainder had their rate increased, varying from 80-120 per minute.

From a record of 100 cases where the pulse-rate was accelerated, I find that 82 had a pulse-rate between 85 and 100 per minute.

On separate occasions I had the opportunity of examining the pulses of 3 individuals within 5 minutes of their having been exposed to violent concussion.

Case 1 and Case 2.

Pte. N___ and Pte. C___ K.O.S.B. were coming from the latrines at 5.30 p.m., when some one shouted that a Minnie (Minnenwerfer - the largest German trench-mortar shell) was coming.

They bolted for a dug-out but just before they got in, the shell fell about 15 yards away, Pte. N___ being blown over on his back and Pte C___ being blown up against the parapet. Neither of them was rendered unconscious, but both were distinctly dazed though unwounded. They were both sent down to me and I met them in the communication trench within 5 minutes after the occurrence.

Pte./

Pte. N—— Looking pale and shaky.

Pulse-rate - 68 per minute.

Pte. C—— Looking fairly fit.

Pulse-rate - 63 per minute.

Both volunteered the statement that they felt all right.

(This is common in the line, as the men, in spite of their conditions and the constant dangers and hardships they have to face, do not want to leave their comrades.)

They were sent to the Aid-post for the night. In the morning they both had distinct Tachycardia (both over 100 per minute), and were evacuated for a rest. Pte. C—— had slight symptoms of neurasthenia.

Case 3.

No.—— Pte. W—— K.O.S.B. was on sentry duty in a sap about 8.30 p.m., when our field-guns were shelling the German front line trenches, these being only about 50 yards away from the sap. One of our shells fell short and burst on the parapet beside him. He was blown over and distinctly dazed though unwounded. I saw him within 5 minutes after this occurred. He was distinctly pale and was suffering from shock. Pulse - 59 per minute. He was put in the aid-post for the night as we were being relieved on the following night. Next morning he had a pulse-rate of 123 per minute and was still distinctly shaky. He was kept/

kept under observation for four days, when the Pulse-Rate was still above 100 per minute, so he was evacuated for a rest.

In studying the actual occurrence of D.A.H amongst the men I have divided them into three categories as mentioned previously.

Category I.

Old Soldier - I mean by this the man between 40 and 50 years of age, who has had military training in peace-time and who has had a considerable amount of service in the firing line in this war.

Category II.

Young "Old Soldier" - I mean by this the man between 20 and 40 years of age, who belonged to the regular army in peace-time, and the soldier of sound physique enlisted after the declaration of war, both having had more than 6 months service at the front.

Category III.

Defective Recruit with limited active service experience.

I mean by this the man enlisted since the commencement of the war who is below par owing to some defect, and who has had less than 6 months experience at the Front.

Old Soldier.

Actual battle activity affect these men least, as after nerve-racking experiences these men emerge less/

less perturbed than any. The Myocardium has in many cases been weakened by toxins, e.g. Rheumatic Fever, Syphilis and Alcohol and the majority have had to do hard manual work to earn their living. It is the living conditions that tell, viz. Exposure, want of sleep and fatigues, nerve-stimulation playing a very minor part in the production of D.A.H in this class. I made a practice of examining the cardiac condition of this type of man, even when they attended from other complaints, as they relatively unfrequently complained of heart symptoms, unless there were some definite valvular lesion. Altogether I only observed 12 cases in this category who were rendered unfit for the firing line by D.A.H. and who complained of definite cardiac symptoms. Of these 9 had Tachycardia with Extra-Systoles, and of these 4 had a history of Rheumatic Fever, 2 had a history of Syphilis, 1 admitted Rheumatism only. Of the remaining 3 of the 12, 2 had simple Tachycardia, 1 had Tachycardia with re-duplication of second sound. 11 had definite Atheroma. The whole gave a history of excessive alcoholic consumption.

Their complaints were almost solely

Dyspnoea on exertion.

Vertigo and Palpitation.

Cardiac Pain was practically absent.

I now give observations based on examination of 100 men of this category.

They are merely taken at random, and the most of them were reporting sick from other causes, e.g., Rheumatism, Lumbago, Sciatica.

What forcibly impressed me was the relative absence of cardiac symptoms, when in many cases there were definite signs of Cardio-Vascular abnormalities. I merely state this in contrast to the Cardio-Vascular condition found in men of other categories, which in many cases presented fewer abnormalities, but in which cardiac symptoms were much more marked.

Of the 100 cases,

76 gave a history of excessive consumption of Alcohol.

23 gave a history of Syphilis (in some cases insufficiently treated).

17 gave a history of Rheumatic Fever.

There was a combination of toxins at work in some of those cases as evidenced by the figures given.

Pulse.

78 cases had pulse regular in time and force and of the remaining 22 cases

18 had a pulse irregular both in time and force

4 had irregularity in time only

63 cases out of the 100 revealed an accelerated pulse-rate.

In practically all cases the arteries were atheromatous.

Heart.

47 cases revealed Cardiac hypertrophy, the apex-beat being correspondingly displaced and sometimes fairly diffuse.

I wish to emphasise this condition as compared with that found in men of other categories, as these men relatively infrequently complained of cardiac symptoms, whilst the younger men with no cardiac hypertrophy complained much oftener.

Auscultation revealed in all Tachycardia cases an accentuation of both sounds, the second being relatively more marked than the first.

17 had extra-systoles.

13 " a reduplication of the second sound.

Illustrative Case 1. (No Cardiac Complaint)

C.S.M. P_____ K.O.S.B., aet. 45.

Complaint - Septic hand due to barb-wire scratch.

History - 14 years with the colours. 18 months active service in this war. Had syphilis whilst in India 2 years after enlistment for which he was in hospital and treated. Distinctly alcoholic.

Pulse - 78 per minute. Occasional intermissions.

Arteries distinctly atheromatous.

Heart - Apex-beat displaced downwards and outwards and rather diffuse. Auscultation reveals occasional extra-systoles and definitely accentuated second sound.

No other modifications. This N.C.O. made absolutely no complaints of cardiac symptoms.

Illustrative/

Illustrative Case 2. (with Cardiac Symptoms)

No. — Pte. C — K.O.Y.L.I., aet. 49.

Complaint - Dyspnoea on exertion. Vertigo. Admits Palpitation with no Pain.

History - Service 16 years. 28 months in this war. He had Rheumatic Fever. Denies venereal disease. States he used to be a heavy drinker but now teetotal.

Pulse - 93 per minute. Frequent intermissions. Arteries distinctly atheromatous.

Heart - Hypertrophied. Apex-beat in 6th Intercostal Space. Auscultation reveals fairly frequent extrasystoles, and accentuation of both sounds. No other modification.

Since D.A.H. occurs so prominently in the next two categories, and since battle activity is such a powerful factor in its production, I now propose to deal more minutely with all the causes common to those two categories.

A. Anxiety for self-conservation under conditions always dangerous to life.

Even the best of men admitted that under the above-mentioned conditions they suffered from Palpitation and a "Sinking feeling in the stomach" and that they really were afraid but daren't show it. The more they are subjected to such experiences, the less able they get to stand it. If a man is afraid or/

or if he be roused to anger, in the one case under other circumstances he would run, and in the other fight, but as he must suffer these emotions with inaction, the nervous stimulation is conveyed to the only organs capable of undergoing increased action, viz., Heart, Intestines and Kidneys, and of these the heart frequently brings itself most forcibly to the attention of the sufferer.

B. Concussion.

Every case of D.A.H. admitted being exposed to direct concussion. Many dated the onset of symptoms from that occurrence and several stated that they had experienced in their dreams the sensation of being blown up, and had suffered as much in them, as when the incident actually occurred.

Practically all the cases who dated the onset of cardiac symptoms from concussion showed definite signs of Neurasthenia and Psychasthenia.

C. Burial by shell-fire.

A history of burial by shell-fire was present in 63% of all cases of D.A.H. This varies to a great extent.

A man may be merely pinned down by sand-bags and earth in a trench, where he is shortly released, or he may be buried in a dug-out, and I have known a man in such a condition for 37 hours before being extricated.

The/

The actual effect on the individual also varies.

He may be rendered unconscious, or he may be physically injured. In my opinion the degree of burial is not of vital importance. This is another incident from which a man is apt to date his symptoms, and which often afterwards causes Neurasthenia and Psychasthenia.

D. Excessive Cigarette smoking and strong tea-drinking.

The condition of a man's life in the trenches is such that the most of them indulge in excessive cigarette smoking, as in addition to ration allowance each man is frequently allowed more from concert and canteen funds.

He has tea to practically every meal in the day, and this is made to individual tastes, as each man makes it in his own "canteen". This tea has often been boiled for some time, and is usually very strong and often bitter, producing a detrimental effect on the general and nervous condition of the soldier.

E. Exhaustion.

This comprises two forms, viz., Nerve and Muscular.

The nerve exhaustion is produced by lack of sleep, and by the general conditions of warfare already enumerated.

It is a common sight, when a battalion is being relieved,/

relieved, when a halt is called, for men to be sound asleep within a few minutes.

Muscular exhaustion is produced by the heavy fatigues which men are nightly called upon to do after the spell of trench duty during the day, proceeding as soon as it is dusk for long distances over difficult country to bring back the necessaries for the trenches; or to hurriedly carry out trench repairs which cannot be effected in day-light.

F. Masturbation.

This practice is commoner in the trenches than is supposed, and exists mainly amongst those of a neurotic temperament.

I have known of men occupying the same dug-out indulging in this pernicious practice.

For long periods at a time these men cannot get access to women, and many of those who are habitués of sexual indulgence in civil life resort to this evil.

G. There is another feature which portrayed itself rather forcibly. In 53% of all cases of D.A.H. in categories II and III, one or both parents of the individual had a history of Cardiac Disease, and the men when complaining of heart symptoms frequently volunteered the above information.

I do not think there is any indication of hereditary/

hereditary affection but in many cases the patient suffered from Neurasthenia and consequently indulged in much introspection. As soon as he began to be affected with Cardiac pain and palpitation, he imagined he was the victim of his parents affliction.

H. Trench Fever, PUO (Pyrexia of uncertain origin) and Gas-Poisoning.

These are the direct results of war conditions and form a fair contribution to the roll of men unfitted by D.A.H. I have referred to them more fully later.

This practically includes all causes which contribute to the production of D.A.H, especially in categories II and III.

I now proceed to describe the definite type of D.A.H. which constitutes the bulk of the cases in the afore-mentioned categories.

Category II.

Total number of cases of D.A.H. - 337

Number of cases of this type - 298.

Category III.

Total number of cases of D.A.H. - 174

Number of cases of this type - 123.

In my opinion this is the true type of soldier's heart as it is produced by conditions on the Western Front.

General/

General Description of the patient.

The individual is usually between the ages of twenty and forty, has undergone hard physical preliminary training and has seen a fair amount of service in the trenches.

He is usually slightly anaemic, and his tongue is furred and slightly tremulous. The hands betray a slight tremor and the fore and middle fingers of the right hand are stained with nicotine. The palms of the hands, soles of the feet, and armpits are often bathed in sweat. In practically all cases he has symptoms of nerve-exhaustion and is over-indulgent in self-concentration and morbid introspection. When asked if he wishes to go back to the front he states he is perfectly willing but not anxious.

In cases where Neurasthenia is very pronounced the heart symptoms are less prominent.

Symptoms.

The following are given in their relative frequency of occurrence.

1. "Sub-Mammary (Left) Pain.

This is usually described by the soldier as "Pains over the heart". It is a dull aching pain with occasional sharp twinges, and occurs frequently whether the patient is resting or undergoing exertion.

The symptom is complained of in every case and is/

is almost always the first mentioned by the soldier.

2. Dyspnoea on Exertion.

This is almost as frequently complained of as Sub-Mammary Pain. It occurs when the patient is undergoing exertion, e.g., Route Marches, Heavy Fatigues, etc.

There is no history of Dyspnoea when resting.

3. Vertigo.

This is usually described by the soldier as "Dizziness in the head".

The attacks may come on when the patient is resting and according to experience he is much less frequently attacked whilst undergoing exertion.

It is present in practically all cases.

4. Palpitation.

This condition is not so frequently complained of as the others. It was present in 234 cases.

It occurs only on exertion and even then is not marked. It has practically always to be elicited from the patient.

5. Suffocation.

The patient describes this as "choking in the throat."

It was complained of in 73 cases and occurs only on exertion. It frequently occurs in conjunction with /

with Palpitation. The loss of Vaso-Motor tone is conspicuous in most cases. If the finger be pressed firmly on the forehead, or hand, the white patch is long in recovering its original colour, or if the hand be hung downwards, it turns a duskier blue, or if held above the head the vessels become empty.

If the finger is drawn sharply and firmly down the chest or abdomen, the resulting red line persists for some considerable time.

Another feature which is present in practically all these cases is Hyperaesthesia of the left mammary region more particularly the area directly over the heart.

Pulse.

The rate is always accelerated. It varies in moderate cases from 90 to 120 per minute.

In more pronounced cases it may be as rapid as 160 or 180 per minute.

It is regular in rate and rhythm and usually betrays no abnormality except the rapidity.

When the patient is subjected to slight exertion the rate increases on the average from 30 to 50 beats per minute. E.g. 104 before exertion and 140 after.

Heart.

Pulsation is frequently observed over the Cardiac Area.

Aortic/

Aortic Abdominal Pulsation was present in 233 cases. Pulsation was also as frequently observed in the carotids.

Palpation.

This revealed no displacement of the Apex-beat.

In 61 cases it was of a sufficiently heaving character to suggest Hypertrophy.

In 242 cases it revealed the sharp and sudden beat of a heart working under excessive nerve stimulation. The pulsation of the heart is found to be generally more perceptible than normally.

Percussion.

This in no case revealed any increase in the cardiac dullness.

Auscultation revealed an accentuation of both sounds the second being relatively more marked than the first.

A faint systolic murmur was heard at the apex in 27 cases.

14 cases revealed a faint systolic murmur over the Aortic Valve.

49 cases had a faint systolic murmur over the pulmonary area.

143 cases revealed a distinct systolic murmur at the junction of the 3rd left costal cartilage with the sternum.

It/

It was impossible to say definitely whether this murmur and the murmur heard over the pulmonary area were of common origin, but the fact that they very frequently occurred in conjunction seemed to point to such being the case. Sometimes there was a combination of other murmurs but these were relatively infrequent and investigation revealed nothing definite to note.

In investigating the murmur at the junction of the 3rd costal cartilage (left) with the sternum, I found that, if the patient was made to bend forward the murmur became more distinct, and if he lay on his back and held his breath, then it usually became fainter, but only in comparatively few cases did it completely disappear. There was no propagation. In my opinion the murmur is due to one of two causes. The heart under a condition of overstress is working more vigorously than normally, and forcibly expels the air from a lappet of lung in the area mentioned, or the murmur is due to the impingement of the pulmonary artery against the chest wall.

This practically completes the description of this condition, and where numbers of cases have been quoted, it always means numbers of this type of D.A.H. only, unless otherwise mentioned.

In none of these cases was there any Albuminuria.

Frequently there were excessive phosphates and

a deposit of urates.

Some have stated that the bulk of cases of D.A.H. produced on the Western Front have been caused by an infection.

This type of DAH constitutes the bulk of the cases produced, and I find that infection is a relatively minor causal factor.

Illustrative Case.

Case 1. Category II.

Sgt. D _____ Middlesex Regiment, aet. 28.

Total amount of service in the war - 18 months.

Admitted to hospital suffering from D.A.H.

History.

Was slightly wounded and buried in April 1917. Evacuated to Casualty Clearing Station, then Base Hospital, and then to Convalescent Camp.

Returned to Unit 3 months after being wounded and was with them without mishap until September 1917, when he was blown over by a shell and was then evacuated with D.A.H.

Complaint.

"Pains over the heart and Dizziness in the head".

Patient is a man of exceptionally fine physique with a slightly worried facial expression.

Shows a distinct hand tremor and the fingers stained with nicotine.

Will/

Will only admit smoking 3 cigarettes per diem.

Shows signs of Neurasthenia.

Pulse.

Rate - 97 per minute.

On exertion increases to 132 per minute.

Regular in time and force.

Heart.

Apex-beat in 5th intercostal space internal to the nipple line.

Percussion. - reveals no increase of Cardiac Dullness.

Auscultation.

Sounds accentuated especially the second.

A slight systolic murmur present over pulmonary area. No other variation.

Case 2. Category III.

Pte. C—— East Yorks Regiment, aet. 23.

Total amount of service at the front - 5 months.

States he was sent to Field Ambulance by his medical officer because he could not stand the trenches.

Physique - Poor and is rather anaemic and thin.

History.

Came out to France in July 1916. Wounded 10 days later. Returned to front in June 1917, and was with them until October 1917.

Was buried in July 1917 but did not leave battalion.

Complaint/

Complaint.

"Pains over the heart and breathlessness".

Pulse.

Rate - 85 per minute.

On exertion increases to 127 per minute and he shows definite signs of Dyspnoea.

Heart.

Apex-beat in 5th intercostal space internal to the nipple line.

Both sounds accentuated. Faint systolic murmur present at junction of 3rd left costal cartilage and sternum. No other abnormality.

This now completes the description of the type of DAH, which I stated, was, in my opinion, the true type of "Soldiers Heart" as it exists to-day, and which occurs so predominantly in Categories II and III.

I now propose to deal with the remaining cases taking those in Category II first.

Category II.

There are 39 cases which cannot be included under the definite type of DAH just described, as they do not present its typical features.

Description of Patient.

The appearance of the patients in the remaining cases vary greatly and no typical description can be given, but the essential differential feature is this, whilst/

whilst in the former case, nervous symptoms are very prominent, here they are very slightly present, or altogether absent.

Nerve-stimulation is a minor causal factor, toxins alone contributing largely to the production of D.A.H. in those remaining cases.

In contrasting the part played by toxins in the 298 cases of this category, as compared with the other 39 I found the following.-

A.

Out of 298 cases

27 gave a history of PUO or Trench Fever.
 13 " " " of Rheumatic Fever.
 23 " " " of Gas-Poisoning.

B.

Out of 39 cases.

8 gave a history of Rheumatic Fever.
 29 " " " " PUO or Trench Fever.
 14 " " " " Gas-Poisoning.
 1 " " " " Enteric Fever.

In many of those cases there was a combination of toxins at work as evidenced by the figures given.

These statistics prove beyond a doubt the vital importance of Febrile Toxins in the production of not a few cases of D.A.H.

Symptoms./

Symptoms.

Dyspnoea occurring both whilst the patient is at rest and undergoing exertion.

This is the principal symptom of those remaining cases and is often very marked.

Palpitation - occurs on exertion and is sometimes very marked.

Vertigo - seldom present.

Cardiac Pain - Altogether absent.

Pulse.

Rate always accelerated, varying from 90 - 180 per minute. In one case it was over 200 per minute. In 9 cases there were simple intermissions.

On slight exertion the rate increases from 30 - 60 per minute.

Heart.

In 4 cases this was slightly dilated, the remainder being perfectly normal in size.

Both sounds usually accentuated.

8 cases had faint systolic murmurs (7 at apex and 1 over the pulmonary area).

12 cases had extra-systoles.

No other abnormality.

Illustrative/

Illustrative Case.

No. _____ Pte. McElroy, H.L.I., aet. 27.

Total amount of service at the front - 11 months.

Admitted to hospital suffering from "PUO".

History.

No history of disease prior to this war.

Was in hospital six weeks in June and July 1917
suffering from Trench Fever.

Came out and rejoined unit.

Admitted to hospital again in September 1917
suffering from PUO.

Complaint.

"Breathlessness on exertion.

Pulse.

Rate 117 per minute. Regular in time and force.

On exertion increases to 157 per minute.

Heart.

No increase in size.

Apex-beat in 5th Intercostal space, internal to
the Nipple Line.

Both sounds accentuated.

No other abnormality.

Category III./

Category III.

These men in this category under ordinary peace-conditions would never have been enlisted, and consequently were handicapped from the beginning.

Their defects principally consisted of the following.-

1. Underage and Underdevelopment.
2. Poor Physique.
3. Minor Physical deformities.
4. Debility.
5. Anaemia.
6. Neurasthenia.
7. Lung conditions. E.g. Bronchitis (slight).

Early cases of Phthisis.

8. Cardiac irritability.
9. Cardiac hypertrophy or Cardiac irregularity with no valvular disease.
10. History of Illnesses. E.g. Rheumatic Fever.

Enteric Fever. Repeated attacks of Pleurisy and
• Chronic Rheumatism.

Owing to the continued hardships and incessant strain of active service, many of these men were destined to have an early break down, both because of their various defects, and also because many had only undergone a modified preliminary training in England owing to their physical condition.

Out/

Out of 174 cases of D.A.H. occurring in this category, 123 presented symptoms similar to those already described under the definite type of D.A.H., which is so predominant in Categories II and III, and which I stated was the true type of "Soldier's Heart" as seen on the western front. These call for no special comment, except that they occurred principally amongst men suffering from any of the following complaints. Anaemia, Debility, Neurasthenia, and Minor Physical Deformities, especially where in spite of being handicapped the will-power to "carry on" was strong.

Cardiac irritability was more marked than in those of the previous category.

The remaining 51 cases, which cannot be included under the afore-mentioned definite type, occurred principally amongst those suffering from Poor Physique, Underage and Underdevelopment, Cardiac Hypertrophy and those who gave a history of Rheumatic Fever, Enteric Fever, Trench Fever or PUO.

In many cases it was merely a sign of their physical impossibility to "carry on".

Description of Patient.

This varied to such an extent that no one description can be given, but the principal feature was the comparative absence of nervous symptoms, muscular fatigue and toxins acting as the principal factors in the causation of D.A.H.

Symptoms.Dyspnoea on exertion.

This was present in all cases and was the commonest symptom.

Palpitation on exertion.

This was the next most common symptom and was often very marked.

Vertigo - Relatively infrequent.

Cardiac Pain - Entirely absent.

Pulse.

Tachycardia was present in all cases, the pulse-rate varying from 90-170 per minute.

On exertion it increased from 30-60 per minute.

This was most marked in cases which gave a history of Rheumatic Fever, Enteric Fever, Trench Fever or PUO. 9 cases of intermission were present.

This was due to extra-systoles.

Heart.

Precordial Pulsation frequent.

Apex-beat occasionally displaced and diffuse.

Cardiac Dullness increased in 13 cases.

Auscultation revealed 9 cases of extra-systoles and 3 of Reduplication of second sound.

In practically all cases there was accentuation of both sounds.

No other abnormality.

The above description applies to the 51 cases only, the others having been already considered.

Illustrative Case.

No. — Pte. McG — Yorks Regiment. Aet. 21.

Complaint.

Breathlessness on exertion and weakness.

History.

Was 10 months in training in England, during which time he frequently reported sick. On one occasion he received 7 days Field Punishment No.2 for reporting sick without a cause.

States he always complained of weakness, and was ultimately excused carrying his pack when training.

Was sent to France and was a month with the battalion. He fell out on a route-march and was sent to Field Ambulance by the medical officer, and was then evacuated to the Base.

He was only employed in light work before the war.

Has a history of Rheumatism only.

Smokes 5 cigarettes per diem.

Teetotal.

Description of Patient.

Height - 5 ft. 1½ ins.

Slight Kyphosis. Slightly Anaemic. Cheery Facial expression.

Teeth Deficient.

Well nourished and Abdomen rather prominent.

Pulse/

Pulse.

Rate - 103 per minute. Irregular in time and force.

On exertion increases to 145 per minute.

Irregularity diminishes.

Dyspnoea evident.

Heart.

Apex-beat in 5th intercostal space in the nipple line.

Slight Cardiac Enlargement.

Auscultation - reveals fairly frequent extra-systoles with no other irregularity.

The remaining 34 cases of D.A.H which could not be included in any of the afore-mentioned three categories may now be considered.

Of these 26 occurred in men between twenty and forty years of age who had had less than six months experience at the front, and 8 occurred in defective recruits who had had more than six months experience at the front.

23 were of the type described as "the true soldier's heart as found on the western front".

The remainder call for no special comment.

I now give the various types of DAH, with their relative frequency of occurrence in each category.

Tachycardia/

Tachycardia.

Present in practically all cases of D.A.H. observed.

Especially marked in men of all categories who gave a history of Rheumatic Fever, Typhoid Fever, Trench Fever, PUO or Gas-Poisoning.

Tachycardia with Cardiac Irritability.

This was present in almost every case of all categories. It was often very marked in those cases who gave a history of Rheumatic Fever or Gas-Poisoning and sometimes in these who suffered from the "true type of Soldier's Heart".

Depression of Contractility.

By this I mean the failure of the ventricular contractile power, the beats varying in strength but not in time.

I had only one case of this.

He was a man aet. 48 with a history of Syphilis and excessive consumption of Alcohol.

Irregularity in time (Apart from Intermission)

Slight irregularities presented themselves frequently but in exceptionally few cases was this so marked as to call for definite comment.

Bradycardia/

Bradycardia.

While acting as Regimental Medical Officer I frequently examined men of all categories who were suffering from exhaustion due to over-strain and long exhausting fatigues, and in 28 cases out of 93 observed, there was slowed pulsation.

This was also present immediately after extreme nerve-shock.

Intermission.

This condition of the pulse was always due to extra-systoles and occurred mainly in those of all categories whose DAH was produced by toxins.

Extra-Systole.

This was frequently present especially in cases of Categories I and III and was consequently often a complication of Tachycardia.

In Category I it was sometimes the only indication of D.A.H.

It was the most frequent type of Arrhythmia observed.

It was frequently marked in those cases of all categories who had a history of Rheumatic Fever, PUO or Trench Fever and in those who had marked Neurasthenia.

Excessive smoking especially in those cases of Category II and III frequently produced this condition.

I now wish to specially refer to four conditions which affect the heart's action and which are the direct result of the war.

These are

Trench Fever

PUO (Pyrexia of uncertain origin)

Gas-Poisoning

Gun-shot wounds.

Trench Fever.

This condition is extremely common on the western front, and men who have once had the disease are extremely liable either to a recurrence, or to a fresh infection.

The toxin produced has a definite effect upon the Myocardium.

Almost invariably when a man was discharged to his base depot subsequent to a period of convalescence after Trench Fever, on the slightest attempt to do heavy exertion he would at once complain of Dyspnoea and Palpitation, and this almost without exception continued for a considerable period, and in many cases this persisted indefinitely, and the individual was rendered permanently unfit for active service at the front.

The average case presented the following features.

Pulse/

Pulse.

Rate 100-120 per minute.

On exertion this would immediately run up to 130-150 per minute.

Occasionally there were intermissions due to extra-systoles.

There was no other irregularity.

Heart.

Auscultation revealed a rapidly acting heart with accentuation of both sounds. Occasionally there were cases with extra-systoles.

Several cases presented a faint systolic murmur at the Apex.

In a few cases there was cardiac dilatation.

I had two cases of Valvular Disease, due to Trench Fever.

One had Aortic incompetence and he had no history of illness, with the exception of Trench Fever, nor was there any other indication of anything which might have affected the heart.

The other case had a Pre-systolic Mitral (Mitral Stenosis) and his only history of illness was two attacks of Trench Fever.

PUO./

PUO. (Pyrexia of uncertain origin)

Many cases who had suffered from this presented similar features to those who had suffered from Trench Fever, although in a less marked degree.

Undoubtedly many of these cases have really been Trench Fever, whilst others have been proved to be Typhoid or Para-Typhoid.

Gas-Poisoning.

It is often difficult to ascertain by which gas these men have been poisoned, as such a variety is now employed by the Germans.

The following are the principal gases used.-

1. Dichlorethyl Sulphide $(C_2H_4Cl)_2S$
2. Chlorpicrin $(C Cl_3 NO_2)$
3. Diphosgene =Trichlormethylchloroformate $(Cl COOCl_3)$
4. Monochlormethylchloroformate $(Cl COOC Cl H_2)$
5. Benzyl Bromide.

Dichlorethyl Sulphide and Benzyl Bromide have little or no effect upon the heart's action.

The former is the most recently employed mustard gas, and the latter is the Lachrymatory Gas.

Chlorpicrin and Diphosgene have a very definite action upon the heart, especially the latter.

Monochlormethylchloroformate has much the same action as Diphosgene.

The/

The effect produced is Tachycardia with marked Cardiac Irritability.

The average case presents a regular pulse rate of about 120 per minute which with a little exertion mounts up to 160 or 180 per minute.

The Cardiac irritability is very persistent.

In addition these patients frequently present signs of Bronchial Catarrh and Apical Emphysema.

Gun-Shot Wounds.

What I have noticed frequently is the fact that men do not complain of Cardiac symptoms until they were wounded and in hospital.

The nature, extent, and position of the wound did not seem to materially matter.

In my opinion these cardiac symptoms (which were almost always those described under the "true type of soldier's heart") were present whilst the soldier was in the line previous to being wounded, but as one frequently experiences, some of these men will bear many complaints without reporting sick at all, but once away from the excitement and the exhaustion of the line, these men will utilise the medical opinion so easily available, and consequently when in hospital recovering from wounds, will only then complain to the medical officer, and unless steps are taken immediately to remedy this, he may lapse into a typical/

typical subject with "D.A.H."

Sometimes they stated that the symptoms were more severe in the hospital or the depot than ever they were at the front.

This I do not believe, but with their much greater relaxed system of life, they have more time for introspection and self-concentration with the evident result.

SUGGESTED LINES OF TREATMENT.A.

Treatment of slighter cases may be attempted in the line, but this is only done from the wish to retain the individual longer as an effective, and not with the idea of effecting a radical cure, as this is practically impossible in the line.

In cases of General Debility, Anaemia and Neurasthenia (slight) a suitable tonic may be tried. E.g. Arsenic or Strychnine.

A tonic is supplied to the Army Medical Officer in the form of a Tabloid. It is composed as follows. -

Ferri. Hypophosph.	grs II
Quininae Busulph.	grs I
Acidi Arseniosi	grs $\frac{1}{50}$
Strych. Sulphatis	grs $\frac{1}{60}$

I found this to have very little effect and the patient practically would not admit any amelioration of symptoms except in isolated cases, which showed distinct signs of improvement.

In cases where the "DAH" was due to intense nervous excitement and where the patient suffered a good deal from sleeplessness, I found Bromides to have a marked beneficial effect, and where the insomnia still persisted I found Morphia a valuable asset.

I found Pot. Bromide grs X given in the morning, and another grs XX given about 9 p.m. to have a marked effect in allaying nervous excitement and if this treatment was continued for several days the D.A.H. (Tachycardia) improved and also the general condition of the patient.

If the insomnia still persisted then I gave the patient Morphine Tartrate gr $\frac{1}{4}$ with instructions to take it if not asleep by 12 p.m.

The above treatment was carried out in the line (at Aid Post) and also in rest billets.

I should like to say that the treatment of men at the front is at all times a most trying problem, as often you cannot keep them under observation, and so much depends upon the individual in these cases as to carrying out instructions.

In order to have any measure of success, it is absolutely essential to gain the complete confidence of the individual.

This has probably more effect than any medicine.

B./

B.Complete Change of Work.

As I have said the foregoing treatment is only to retain a man longer at the front as an effective, not to effect a radical cure.

In order to obtain a cure, this second phase of treatment is a "Sine qua non".

This usually means labour work behind the line or in the lines of communication.

In the slighter cases, and in those which are mainly produced by nerve-stimulation through fear, the change very often effects a remarkable improvement, and in many, effects a complete cure, at least for a time. I have not the least doubt that with a return to active service conditions at the front the old symptoms would reappear. I had one case, a N.C.O., who was evacuated to the base with DAH produced by strain of Active Service and burial by a shell, who returned four months later and won the D.C.M. His DAH still persisted, and I have no doubt he would again be evacuated for the same complaint.

Even the severer cases which are not in hospital show a distinct improvement when retained at the base, unless there is a distinct indication of muscular change in addition to the irritability.

I/

I found Tinct Nux Vom .m. X̄ T.i.d. a distinct benefit in some of those cases with indications of muscular change. Bromides were used in the other cases with marked beneficial effect.

C.

Graduated Exercises.

This has been extensively employed but although admirable in many ways, does not seem to meet with the success deserved.

Some cases improve, others don't.

The man knows perfectly well that he is again being made fit for Active Service at the front, and since, in the majority of these cases, the D.A.H. has been produced by strain at the front, he works against himself and consequently progress is slow.

To remain under one medical officer and for him to gain the man's confidence is almost essential for progress in all these cases.

D.

Complete Rest.

This should only be adopted for the severest cases, as the slighter cases improve quite as well under some form of work.

This should take the form of Complete Rest in bed and plenty of easily digested food combined with

a/

a suitable Tonic. E.g. Syr. of Hypophos or Tinct Nux Vom.

Where nervous excitement is intense Bromides should be employed instead.

All smoking should be disallowed, and all other defects should be attended to. E.g. Gingivitis, Pyorrhoea and Constipation.

In addition to all this the patient should be regularly visited by the Medical Officer every morning, from whom every assurance should be given as to his recovery.

Sympathy should be withheld as this has a tendency to aggravate rather than alleviate the condition.

When the DAH. has shown some improvement he should be allowed up and made go for short walks.

The exercise should gradually be increased and medicine withdrawn. Light work should follow next and this gradually increased until the individual has reached the capacity of "carrying on" at some form of recognised army work.

He should never again be put on active service in the shell-swept zone.

I have not the least doubt that many men who are at present unfitted by DAH. will improve greatly, and probably recover completely, on the declaration of/
of/

of Peace. In fact it is not an uncommon practice for men to wilfully cause DAH and thereby render themselves unfit for the front.

This is done by eating Cordite got from rifle Cartridges.

In addition to marked Tachycardia, this often produces a flushing of the face by which the cause is diagnosed.

C O N C L U S I O N S .

Disorderly Action of the Heart, or "D.A.H." as it is more commonly termed both by the medical officer and the soldier, has now become a very powerful factor in the production of men unfit for the firing line.

No statistics have possibly yet been made as to its relative position in the cause of inefficiency, but according to my experience it ranks next highest to actual incapacitating wounds, and it is almost as relentless, as comparatively few once evacuated with D.A.H. ever return as effectives to the actual firing line, and of the few that do return the majority only remain for a limited period, when a recurrence makes itself manifest.

In truth, the term "D.A.H." has now become such an extremely popular term with the soldier, and so frequently is it fixed irretrievably on the mind of the victim, that in the majority of cases it is well-nigh impossible to effect a radical cure owing to the defiant mental attitude assumed.

The immediate cause of D.A.H. in the large majority of cases is nerve-stimulation, which is sometimes accompanied by Hyperthyrodism.

In only 4% of all cases of D.A.H. could I observe any clinical evidence as to excess of thyroid secretion being/

being present, so that I believe that this factor does not contribute so largely to its production as some people affirm.

The nerve-stimulation takes the form of Sympathetic nerve stimulation, accompanied by loss of control of the Vagus.

I have enumerated cases, where, at the primary shock, the heart appears to come excessively under the influence of the Vagus, with consequent Temporary Bradycardia.

This action however disappears shortly after the first shock, when the heart comes under the excessive stimulation of the Sympathetic and Tachycardia ensues.

In addition to the nerve-stimulation there must be considered the action of toxins, and the actual condition of the cardiac musculature.

To give these full consideration I mean to deal separately with the DAH, as observed in the three different categories.

Category I.

In this category are the men over forty years of age, men who in most cases have commenced life unhandicapped with any defect either physical or mental, but who have regulated their lives imperfectly, with the result that many are prematurely old.

Always relatively unimpressionable, they have reached/

reached the age when they have become stolid and practically unemotional.

Consequently nerve-stimulation plays a minor role in the production of DAH, and this abnormality exists principally owing to the inherent condition of the heart muscle.

The Myocardium has become weakened, and in some cases organically affected by various toxins, e.g., Rheumatic Fever, Syphilis, and Alcohol, and the cardiac condition has been rendered yet worse, not so much by the nerve-stimulation resulting upon impressions, as by the general living conditions these men experience.

I mean by this the prolonged exposure to all weather conditions, the exhausting fatigues, and insufficient rest.

The want of Cardiac nerve-stimulation renders "DAH" a relatively small cause of inefficiency in this category.

Another condition which renders it less prominent, is the fact, that many of these men have reached the stage when they become subject to numerous other ailments, e.g. Chronic Bronchitis, Rheumatism, Sciatica, and General Debility, which unfit them for trench work.

Category II.

It is in this category that DAH figures so prominently as a cause of inefficiency, and where we find so many typical subjects of the definite type of DAH observed, and which I have described as the true "soldier's heart" as found on the western front.

The reason for the above is this.

These men commence unhandicapped by any disability, and have as yet not reached the devitalising age which lays them open to such numerous ailments.

Consequently these men, unless they are killed, wounded or attacked by some acute illness, e.g. Trench Fever, PUO or Enteric must "carry on" until something gives way. This is frequently the heart.

These men are at an impressionable age, are more liable to the emotions and nerve-shock, consequently nerve-stimulation is the all powerful factor in the production of DAH in this category.

Repeated nerve-shocks and the more or less constant nerve-tension whilst in the front line exhausts the nervous system, with the result that many become definitely neurasthenic. The heart's action under all this nerve strain is accelerated owing to stimulation by the Sympathetic and to loss of Vagal control, the Vagus nerve being exhausted owing to repeated stimulations, /

stimulations, and also owing to excessive cigarette smoking.

In this way is produced the definite type of DAH described as the true soldier's heart in the Western Front, and which may be defined as follows.-

"A condition of slight Cardiac muscular strain, caused by over-stress due to excessive nerve-stimulation, accompanied by a condition of nerve exhaustion in the patient.

This produces a state of Tachycardia with Cardiac irritability."

"DAH" in this category but to a minor degree is caused by, in addition to nerve-stimulation, the Myocardium being affected by febrile toxins. E.g. Toxins produced by Rheumatic Fever, Trench Fever or P.U.O. In this, nerve symptoms are practically absent, and instead of pain being the principal symptom, we find Dyspnoea on exertion occupying premier place, and pain being conspicuous by its absence.

The fact that in these cases the nerve condition is not so pronounced, seems to point to the fact of this (nerve-condition) being responsible for the cardiac pain in the type of DAH described as the true soldier's heart of the western front.

The essential differential features of this type of DAH ("true soldier's heart") in comparison with the other cases of DAH observed are as follows.-

1. Cause. /

1. Cause.

This is almost solely due to incidents of battle-activity producing repeated nerve-shocks and consequent acceleration of the cardiac movement.

Toxins play an unobtrusive part in its production.

2. Symptoms (in some cases very marked) of nerve-exhaustion in practically all cases.

3. Cardiac Pain is a symptom in every case, and is frequently the one most complained of.

4. Presence of Hyperaesthesia over the praecordial area in many cases.

5. Tachycardia with cardiac irritability is almost the sole abnormality.

The principal differential features in the other cases of DAH, which cannot be described under the true "soldier's heart" of the western front, may be defined as follows.

1. Cause.

Toxins and muscular fatigue act as the principal cause.

Nerve-stimulation plays a minor role.

2. Absence or relative infrequency of symptoms of nerve-exhaustion in the patient.

3./

3. Dyspnoea on exertion is the principal symptom.

Complete absence of Cardiac Pain.

4. Tachycardia often present with other irregularities, e.g.

Extra-systoles

Reduplication of 1st or 2nd sound.

Often marked cardiac irritability.

Occasional signs of cardiac dilatation.

Category III.

DAH. figures less prominently in this class than in category II, because these men commence handicapped by some disability, and therefore are frequently unfitted by other complaints.

In many cases also the mental attitude does not tend to ward off disease.

Here we have DAH. caused by three separate factors

1. Defects. E.g. Poor Physique, Anaemia, Debility and History of Fevers.

2. Nerve-stimulation produced by nerve-shock.

3. Muscular exertion beyond their capacity.

In this category are found many cases of what I have described as the true soldier's heart of the western front, the actual number having been already given.

This I consider due to the fact that many do their/

their utmost to carry on in spite of being handicapped, and hence the nerve-exhaustion and D.A.H. ultimately unfit them.

The remaining cases are mostly where the D.A.H. has been produced by toxins aggravated by defects and battle-activity, and some are merely an indication of the physical impossibility of the patient to carry on, general living conditions and muscular fatigue contributing mainly to their production.

Trench Fever and PUO.

The toxins produced by these two diseases have undoubtedly a definite effect upon the myocardium, a fact which has not as yet been sufficiently recognised, and I have enumerated two cases where the Endocardium had been damaged.

The type of D.A.H. is Simple Tachycardia with well-marked Cardiac Irritability.