effects of increased sympathetic action, which, as has been said, are already probably eliminated by the absence of a fast heart, but it does not exclude the possibility of hypertrophied arteries, which could still dilate to loss of vasomotor control or to suitable chemical stimuli. In regard to this latter point it ought to be mentioned that a fall of arterial pressure does not necessarily mean that the vessels concerned in a high blood pressure have dilated. Histamine or amyl nitrite, for example, may lower the blood pressure in hypertensive patients by dilating the capillaries and producing capacity effects; indeed, histamine is known to lower arterial pressure while actively constricting arteries. The finding that certain vasodilator drugs lower the blood pressure in cases of hypertension is of no significance in relation to the problem.

It should be pointed out that Oliver (1896), who gave extensive study to the problem, was quite familiar with the fact that the radial artery in patients with high blood pressure caused by chronic nephritis reacted quite normally to changes in posture. It was more constricted when the subject was standing than when recumbent. He, with his arteriometer, examined a number of persons who suffered from periodic attacks of high blood pressure, and found that in these the postural variations in radial calibre disappeared, although between the attacks they were quite normal. He considered, however, that the size of the lumen of the radial artery usually depended on the blood pressure, but pointed out that in all cases of hypertension the lumen of the artery diminished in size progressively.

Another possibility is that the kidney is particularly affected by mental stress; but while there is such confusion regarding the function of nerves on the kidney it is difficult to go further than to mention it. It is possible, too, that the mental stress, by interfering with digestion, which it does admittedly, or with the metabolism, may lead to toxic changes.

Thus it becomes evident that the nervous and chemical hypotheses may yet be brought together; and, in any case, it is not sufficient to say that the kidney or any other organ is at fault without at the same time considering why it is at fault.

Conclusion

In closing these lectures I cannot but plead for the closer relation between physiology and medicine which these lectures were designed to promote. I trust the necessity for this has been evident from what I have said. More will agree that it is needed than did in Oliver's time, but too often the statement is but a pious expression of opinion to which no effect is given. There are still too many who are satisfied with the diagnosis and treatment of disease according to recognized formulae and who are not interested in the progress of their subject. Would that the spirit which imbued Oliver were more prevalent; but may we hope that those who plan the medicine of the future will have vision beyond the immediate needs of the patients, and will organize so that medical research will be as much a routine as is treatment.

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THE INCIDENCE OF DYSPEPSIA IN A MILITARY HOSPITAL

BY

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The occurrence of dyspepsia in the Army during the present war has proved to be one of the major medical problems. Several investigations have been recorded in which the incidence of the various causes of dyspepsia has varied considerably. Payne and Newman (1940) reported that 60% of 287 patients, many of whom were evacuated to England from the B.E.F., had duodenal ulcer. This finding has been criticized by Hartfall (1941) and Spillane (1941) as not being consistent with their experience among soldiers serving in this country. Two factors may explain this discrepancy: Payne and Newman's cases included many from the B.E.F. which had been carefully selected by C.C.S.s and base hospitals in France as likely to be instances of organic disease; and there can be little doubt that in the early days of the war many men who had been suffering from peptic ulcer for some years in civil life were mobilized—for example, reservists and volunteers with special training allowing of their rapid dispatch to France. Presumably most of these men have now been discharged from the Army by medical boards, and it might be expected that the incidence of organic dyspepsia among troops would consequently be lower than in the early months, especially as civilian medical boards examining recruits are more aware that ulcer cases do not do well under military conditions.

Saffley (1941) reports that of 320 soldiers investigated radiologically 50.3% were "normal" and 38.7% had peptic ulcers. He also states that of 338 cases of dyspepsia in a near-by military hospital from which he drew his patients no lesion was found in 124, ulcers were present in 133, and the remarkably high proportion of 38 cases were diagnosed as anxiety neurosis. Working in another military hospital, I have not found this high incidence of neurosis, and the psychiatrist there has informed me that few cases of neurosis passed on to him have symptoms referred to the gastro-intestinal organs. On the other hand, the occurrence of peptic ulcer among all cases of dyspepsia referred to this hospital has been considerably less than that found by Payne and Newman (1940) in cases evacuated from the B.E.F. It was therefore deemed worth while to publish the incidence of the various types of dyspepsia investigated by us during a period of four months—November, 1940, to February, 1941—especially as these were cases sent "direct" from units in the area.

Method of Approach

In the vast majority of instances the question to be answered was, Is there or is there not an active ulcer present? A summary will therefore be given of our method of approaching a possible case of ulcer dyspepsia, and of the basis on which the diagnosis was made. This will be followed by a detailed account of all types of cases and by a discussion of further points in differential diagnosis.

Most of the cases of dyspepsia referred to this hospital were first seen at the out-patient clinic, where the history was taken and a careful clinical examination was made. With few exceptions investigation by fractional test meal (F.T.M.) was then carried out in the out-patient department by appointment, unless it was at once obvious that

the condition was not ulcer dyspepsia, or if documentary evidence was forthcoming that the soldier had been adequately investigated elsewhere within the preceding three months. If the history, clinical findings, and result of the F.T.M. were suggestive of ulcer the case was put on the waiting list and hospital investigation arranged within a week or two, either here or in a neighbouring civil or E.M.S. hospital. Some patients—e.g., those with bleeding ulcers, men over 40 years with a short history, and men who appeared ill and in pain—were admitted direct from the out-patient clinic. If the history was not suggestive of any of the recognized organic causes of dyspepsia and if clinical examination and the F.T.M failed to reveal evidence of organic dyspepsia the patient was returned to the unit with a note to the medical officer recommending any simple measures that seemed appropriate. Further investigation was rarely thought necessary, and often was undesirable, in such cases, as the soldier is notoriously highly suggestible and the idea of disease is more easily implanted than eradicated. In special circumstances a diagnosis of peptic ulcer was made in the out-patient clinic without in-patient investigation. Thus if a man had a paramedian abdominal scar with a typical history of ulcer dyspepsia and a history of perforation, gastro-enterostomy, etc., and if the F.T.M. done here showed a climbing hyperchlorhydria, there was considered to be enough evidence to justify "boarding" him as a case of peptic ulcer. Or if a man gave a typical history of ulcer along with a convincing story of having been investigated in civil life and treated by Sippy or Lenhartz type of diet, then a climbing or plateau hyperchlorhydria with consistent clinical signs—e.g., localized epigastric tenderness, pallor, and often loss of weight—was regarded as sufficient evidence of the existence of an ulcer. Marked hyperchlorhydria—i.e., a curve which after the first hour was consistently at or above 60 c.cm. N/10 HCl—was required before such a step was taken. Such cases were labelled peptic ulcer, as it was often impossible to determine the location of the ulcer accurately without another barium meal and as the aim was primarily to determine whether or not a man was fit for military duties. The in-patients were investigated by a second F.T.M., a barium meal, and often examination of faeces for occult blood; and the diagnosis was based on a careful consideration of the history, a clinical examination, and the results of special investigations. Ulcer was never diagnosed if the radiologist reported a normal stomach and duodenum. On the other hand, a marked hyperchlorhydria in the presence of active symptoms and consistent clinical findings, if there was persistent deformity and defective filling of the duodenal cap, was taken to be enough evidence of duodenal ulcer: it was thought to be wrong to base a diagnosis on "direct" vision of an ulcer crater only and on no other grounds. In some cases reflex duodenal spasm was excluded by cholecystography, pyelography, etc., if the history or clinical examination suggested such a possibility. The presence of occult blood in the faeces was sometimes helpful. Gastric ulcer was, of course, diagnosed only in the presence of "direct" radiological evidence.

During the period November, 1940, to February, 1941, 257 cases presenting symptoms of dyspepsia as a principal feature were seen at this hospital. Of these, 45 must be disregarded, as a final diagnosis was not made here, some having moved to another area before investigation could be started, some having been admitted to near-by civil or E.M.S. hospitals from our waiting list by arrangement, and a few recent ones having to await admission. The remaining 212 cases were fully dealt with and investigated by us; 88 were in-patients and 124 out-patients. These two groups are discussed separately.

In-patients

In Table I the in-patient cases are classified according to type of dyspepsia; it gives the numbers and percentage incidence of each type, the average age of onset according to the patient's history (which is not always as reliable in the Army as in civil life), and the numbers of each type originating during Army service or in civil life.

TABLE I.—*In-patients*

Diagnosis	No.	Percentage	Average Age of Onset	Onset in Civil Life	Onset in Army
			yrs.		
Duodenal ulcer	30	34·1	28·0	25	5
Gastric ulcer	10	11·4	29·3	6	4
Functional dyspepsia	25	28·4	27·2	9	16
Acute gastritis	4	4·6	39·0	0	4
Chronic gastritis	2	2·3	33·5	2	0
Psychoneurosis	5	5·7	18·4	5	0
Hyperchlorhydria	2	2·3	19·0	2	0
Achlorhydria	1	1·1	39·0	0	1
Dyspepsia (aetiology obscure)	2	2·3	40·0	1	1
Constipation	2	2·3	30·5	0	2
Carcinoma of stomach	1	1·1	50·0	0	1
Appendicular dyspepsia	1	1·1	27·0	1	0
Chronic cholecystitis	1	1·1	34·0	0	1
Pulmonary tuberculosis	1	1·1	42·0	0	1
Banti's syndrome	1	1·1	19·0	0	1
Total	88	100		51	37

45.5% of the 88 cases were proved to be ulcers, the incidence of gastric ulcer being remarkably high, although 5 of these were at the pylorus and were judged by the radiologist to be gastric and not duodenal. 28.4% were labelled functional dyspepsia. This group was composed of men complaining of active indigestion, nearly always of a type similar to that found in ulcer cases; but in the majority the history was atypical in some direction, and investigation by the F.T.M., barium meal, and occult blood test, and often cholecystography, chest radiography, urine culture, etc., was negative, although transient hyperchlorhydria or mild hypochlorhydria was found in some or there was radiological evidence of hypermotility or atony. In no instance was this diagnosis made if any well-defined sustained abnormality was reported. A point of clinical interest is that in the functional dyspepsia group abdominal tenderness was rare, whereas in the ulcer group well-defined localized epigastric tenderness was usually present. In the 4 cases of acute gastritis there was vomiting with or without diarrhoea; some were febrile, others dietary in origin. The 2 cases of chronic gastritis had hypochlorhydria, with excess mucus in all specimens, and a compatible history; the barium meal served to exclude other causes. Of the 5 labelled psychoneurosis 3 were cases of hysterical vomiting, 1 was globus hystericus, and 1 was aerophagy that was manifestly hysterical; investigation by barium meal was negative in every case. In all 5 cases the hysterical symptoms had been present several years before enlistment. Of the 2 cases of hyperchlorhydria 1 had a very high climbing curve and an atypical history, and two barium meals failed to reveal any ulcer of stomach or duodenum. This patient responded well to treatment with alkali and light diet, and returned to duty. The other also showed a climbing curve, but with a history typical of duodenal ulcer, although the barium examination failed to reveal any abnormality: as there was a fifteen-year history and the symptoms did not improve on alkali and simple dietary measures, and as he was physically under-developed, he was "boarded" out of the Army. The case of achlorhydria, confirmed by histamine, occurred in a thin middle-aged man who complained of anorexia and loss of weight, and in whom all other investigations were negative. He returned to duty, having gained weight after treatment with acid. hydrochlor. dil. and graded diet. Two cases were labelled dyspepsia of unknown type. One of these was that of a man aged 55 who had an eight-year history of recurrent attacks of

vomiting, each lasting two to three weeks: he was admitted during an attack. Clinical and barium examinations were negative, and the F.T.M. showed only mild hyperchlorhydria and no mucus. Renal and chest investigations were also negative. As he was of low mentality and had pronounced arteriosclerosis he was " boarded " out of the Army. The other case of dyspepsia of unknown type was that of a man aged 33, with epigastric pain after meals not relieved by alkali or food, in whom a barium meal showed exaggerated gastric mucous folds and spastic duodenal cap without obvious cause. As he was unable to swallow a Ryle tube and gastroscopy could not be performed the diagnosis remained uncertain (? chronic hypertrophic gastritis). Simple treatment allowed of his return to duty. Among the remaining cases the patient with appendicular dyspepsia had a recurrent subacute appendicitis, and the case of pulmonary tuberculosis occurred in a prematurely old man aged 43 whose only symptoms were gastric in origin and in whom fibroid tuberculosis was detected only after gastric tests were negative. In this series of 88 cases there were 3 of haematemesis and melaena—2 due to duodenal ulcer, which recovered, and 1 in which death occurred after repeated severe haematemeses and in which necropsy showed advanced changes of Banti's syndrome. Only 1 of the 88 patients was admitted with perforated (pyloric) ulcer.

Out-patients

In Table II the out-patient cases are classified in a similar manner. Of the 124 cases 35.5% were diagnosed as peptic ulcer on the basis already outlined. As might be expected

TABLE II.—*Out-patients*

Diagnosis	No.	Percentage	Average Age of Onset	Onset in Civil Life	Onset in Army
			yrs.		
Peptic ulcer	44	35·5	26·9	36	8
Functional dyspepsia	54	43·6	25·0	26	28
Acute gastritis	2	1·6	27·0	0	2
Chronic gastritis	4	3·2	38·0	2	2
Psychoneurosis	6	4·8	20·3	4	2
Hyperchlorhydria	2	1·6	25·0	2	0
Achlorhydria	3	2·4	31·0	2	1
Appendicular dyspepsia	4	3·2	29·5	0	4
Chronic cholecystitis	1	0·9	37·0	1	0
Malingering	4	3·2	29·0	0	4
Total	124	100		73	51

the functional dyspepsia group (43.6%) is greater than in the in-patient series; these cases gave an atypical history, although often there were points of similarity with ulcer dyspepsia cases, in which the patient looked fit and in which epigastric tenderness was absent. In no instance did the F.T.M. show any sustained departure from normal, although mild degrees of transient hyperchlorhydria and hypochlorhydria, as well as a suggestion of hypertonia or hypotonia, were not uncommon.

Six cases are included under the heading psychoneurosis: 2 were cases of neurotic aerophagy (1 of long duration, 1 dating from enlistment); 1 was a case of hysterical dysphagia with other hysterical stigmata; 1 was that of a man, with visceroptosis as shown by barium series, who had already been discharged from the Army in peacetime for this complaint and was markedly neurotic; the remaining 2 were cases of anxiety neurosis following bombing and melancholia, in neither of which were dyspeptic symptoms outstanding, but which were referred on this account.

The cases of hyperchlorhydria showed fairly high curves; 1 had a quite atypical history, and the other had had a barium test meal in another military hospital just previously. The 3 cases of achlorhydria were in comparatively young men who had normal blood counts and minor symptoms. Of the remaining patients 4 were regarded as malingering: 2 of these were under escort, 1 had already been investigated in another military hospital, and, like the fourth man, in whom investigation was not regarded as necessary, the bizarre history was impossible of belief. In all cases the men's attitude was obviously that of trying to " put one over " on the M.O. These men were warned of the possible consequences of untrue complaints. While I cannot agree with the view held by some that malingering does not occur in the modern Army, it is in my experience extremely uncommon.

Discussion

This analysis will not elicit any facts in the aetiology of peptic ulcer. However, several interesting points emerge therefrom. First, the incidence of ulcer in this series is probably very similar to that found in civil hospital practice. This finding is not incompatible with the figures of Payne and Newman (1940), for reasons already mentioned. My experience with the B.E.F. was that a much higher incidence of ulcer was found than in the present series, although in the evacuation from France the actual figures were lost. It will be seen from the tables that 67 ulcers began in civil life, against 17 during Army service. Of the latter, 3 were in Regular soldiers and 4 in Regular officers of many years' service; therefore only 10 out of the 84 cases of ulcer arose in the Army during this war. The majority of ulcer cases in this series occurred in reservists during their period in civil life and in volunteers and conscripts from 27 years upwards. These figures do show that the problem of peptic ulcer incidence in the Army does not differ from that in civil life, and it is probable that the increased incidence of ulcer among civilians since the last war is the major factor in the prominence of such cases in this war in comparison with the Army of 1914-18. Increased awareness of its existence is probably also a factor in a medical service which, so far, has been less busy with battle casualties than in the previous war, so that more time can be given to cases of dyspepsia. The disposal of the man with peptic ulcer has been by medical board and discharge from the Army, as it is clear that this kind of man does not do well in the Army. The only exceptions to this rule have been those highly trained Regular officers who were given a full course of medical treatment: the officer can usually regulate his diet in a way that the rank and file cannot, and the officers in this series so treated have returned to duty symptom-free.

The incidence of 79 cases of functional dyspepsia in 212 cases is probably higher than that met with in civil life, and it will be seen that 44 of these had their origin during Army service, as against 35 arising in civil life, a finding that is not unexpected. I have no doubt that in each of these cases the man was suffering from genuine dyspepsia due to some, often minor, disturbance of function: the word " functional " is used advisedly to indicate this, and not loosely to include all cases in which organic disease could not be found. The aetiological basis of this type of case is not easy to define, although it is probably no more obscure than the aetiology of peptic ulceration. As already mentioned, evidence of some functional disturbance was frequently present, such as minor degrees of hyperchlorhydria, hypochlorhydria, hypermotility, gastroptosis, or atony, although sometimes it was not of a degree consistent with the severity of the symptoms. In a number of cases dental sepsis was present. It is obvious that the causes of this type of dyspepsia lie deeper than in the factors which have already been mentioned and which were often absent. In some cases the sudden change from civil diet to Army diet and from a sedentary life to vigorous training undoubtedly served at least to aggravate any tendency to gastric upset. In my opinion a potent factor in those

cases was worry and anxiety, often arising from circumstances—domestic, financial, etc.—already present in civil life and carried with the man into the Army. In other cases the source of worry was associated with the war, although not with Army routine. It is not always realized that the soldier in this war has the same sources of worry as are so universal among the civilian population; thus very many men are anxious about their wives and parents in bombed areas, or about their families evacuated to unfamiliar surroundings. Then there are men who have left good civilian positions for much less remunerative Army service, not all having their pay made up; others have had their training for a skilled but non-essential occupation interrupted and are apprehensive of the future. Army life itself gives few causes of worry, as the soldier is well looked after; but undoubtedly some men worry about the uncertainty of when their next move will be made and where it may take them. It seems reasonable to suggest that anxiety may play a part in the production of dyspepsia in men whose autonomic nervous system is constitutionally somewhat precariously balanced, especially as it is agreed that worry has an adverse influence on the symptoms of established peptic ulcer. In pointing out the factor of anxiety it is not suggested that those men suffered from anxiety neurosis: quite the contrary, as with them, unlike cases of anxiety neurosis, there was adequate cause for worry. Nor was the anxiety of pathological intensity or such as to interfere with their general efficiency: such men were never medically "boarded," and simple measures were sufficient to fit them for duty. They were firmly assured that they did not suffer from any organic disease and that their health was good and would improve under Army conditions. In only a few cases were medicines—e.g., acid. hydrochlor. dil. or magn. trisilicat.—necessary. Details of the findings were always sent to the unit M.O.

The incidence of actual neurosis was very low; 9 of the 11 cases arose in civil life and were unchanged by Army service, save possibly for the better. The incidence of chronic cholecystitis and gastric carcinoma is much lower than in a civil hospital, probably owing to the lower average age of our patients.

Conclusion

This analysis shows that the problem of dyspepsia in the Army is more or less the same as that of peacetime civil life, any differences being determined by such factors as age groups, sex, general anxiety about the war, etc. Army conditions have not produced any new syndrome, and it is very probable that they have not increased the incidence of gastric or duodenal ulcer. The increased incidence of dyspepsia in the Army of this war finds its parallel in a comparable increase in the civil population since the last war, and is directly related thereto.

Summary

257 cases presenting symptoms of dyspepsia were seen at a military hospital during a period of four months. Of these, 212 are considered in detail.

The incidence of peptic ulcer was similar to that found in civil hospitals.

There is an increased incidence of functional dyspepsia, the aetiology of which is discussed.

The analysis does not reveal that Army conditions have any marked effect on the production of dyspepsia.

Thanks are due to Colonel R. G. Gordon, A.M.S., officer commanding, for permission to publish this paper, and for his encouragement during its preparation.

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GASTRO-PAPILLOMATOSIS DUE TO VITAMIN A DEFICIENCY INDUCED BY HEATED FATS*

BY

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Since Fibiger (1913) first described experimentally induced tumours of the fore-stomach of the rat many other workers have investigated this problem without, however, reaching a satisfactory explanation of his original results. Fibiger described three types of lesions: (*a*) multiple papillomata of the fore-stomach; (*b*) squamous carcinoma of the fore-stomach; and (*c*) carcinoma of the tongue. He also obtained a carcinoma in a mouse that was transplantable. These lesions he attributed to the presence of a nematode, *Gongylonema neoplasticum*, derived from cockroaches which were present in the animal-house and which were consumed by the rats in addition to their diet of white bread and water. Passey (1934) drew attention to the fact that such diet must have been deficient in vitamins, and that vitamin A deficiency in the absence of the gongylonema can lead to papillomatosis of the fore-stomach of the rat. Cramer (1937) reviewed experimental work, including his own investigations bearing on Fibiger's results, and concluded that "diet and parasite are in themselves not sufficient to account for the lesions observed by Fibiger, and that there must be yet another factor involved which has not yet been identified." More recently Roffo (1938, 1939) claimed to have obtained a wide range of pathological lesions, including ulcers, papilloma, and carcinoma of the fore-stomach, adenocarcinoma of the glandular stomach, and sarcoma of the stomach and liver, in rats fed with heated or ultra-violet-irradiated cholesterol, and with overheated animal and vegetable fats. It is clear from the copious illustrations to his papers that Roffo has induced marked hyperplasia of the epithelium of both parts of the rat's stomach, amounting in some cases to histological evidence of malignancy, though the carcinomata do not seem to have metastasized to the liver, as might have been expected. The sarcomata, however, metastasized freely. These experiments are therefore of outstanding interest and demand independent investigation. Roffo believes that carcinogenic hydrocarbons are formed from sterols by the action of heat or ultra-violet rays, but, according to Cook and Kennaway (1940), his views on the nature of the chemical changes involved are inadequately supported by his experimental evidence. The presence of carcinogenic hydrocarbons in the food has been shown by Waterman (1939) to be capable of inducing tumours in the fore-stomach of mice.

In this laboratory an examination of a variety of fats has been made, after different conditions of heating, for the possible presence of known carcinogenic hydrocarbons, but nothing having the characteristic fluorescent spectrum of these substances has yet been demonstrated. It seems possible, therefore, that other types of carcinogen may be partly responsible for Roffo's experimental results. The suggestion that ordinary cooking fats may develop carcinogenic properties under the action of heat raises a practical problem which might have a bearing on the incidence of gastric cancer in man. The fats used in Roffo's experiments were apparently heated to 300-400° C., a higher

* Communicated to the Pathological Society of Great Britain and Ireland at Glasgow on July 4, 1941.
† Working under a full-time grant from the British Empire Cancer Campaign.