intensity in the other. If this claim be allowed, the next step is to explain or account for the absence of infection in one group and its dominant influence in the other. Clearly the most likely sources of infection must be sought in the mouth, the nose and accessory cavities, and the pharynx; and it can be stated at once that in the matter of cleanliness of the mouth there was an obvious difference between the two groups. All 14 members of the silent group were edentulous and had been so for several years before the presumed onset of the disease, whilst of the 3 members of the anaemic group not one was edentulous, for all possessed natural but bad teeth: in two the teeth were carious, broken, and blackened, and there was severe gingivitis; in the third patient, aged 43, the teeth were not so manifestly diseased, but actually several were found to be dead and to show x-ray evidence of root infection. Dr. J. F. Wilkinson, to whom first this patient was sent because of the strong suspicion of haemolytic anaemia, recorded: "Very pale, with suspicion of yellow in skin. Teeth almost normal in number but dark in colour and free from gross caries. Red cell count 3,500,000, Hb 37%, colour index 0.52, white cell count 16,000." Within two weeks of an exceptionally severe operation—for this involved *en bloc* resection of three-quarters of the stomach, and the transverse colon with omental and mesenteric attachments—this patient's facial appearance had improved remarkably, though none of the teeth had been removed. The improvement continued steadily, and was no doubt later accelerated by the administration of iron. It is probable that infection of dental origin so severe as to cause the kind of illness described will only be met with in patients whose teeth and gums are badly infected; but the patient of cancer age rarely has perfectly sound teeth, and it is likely that lesser degrees of infection may be found in patients who have retained their teeth in apparently fair condition, and may well account for the varying degrees of anaemia and asthenia so noticeable in any large series of patients with gastric cancer. Indeed, the patient whose disease runs a silent or symptomless course and whose blood picture remains almost normal in an advanced stage will, I suspect, almost invariably be found to be edentulous and to have been so for several years before the approximate time of onset of the disease. It is hardly necessary to point out that this suspicion does not imply that cancer of the stomach in a patient already edentulous will always run a silent course. Clearly there are other important factors which influence the symptoms, such as the position of the growth: cancer beginning at the inlet or outlet of the stomach will produce obstructive troubles before infection has had time to play a part; cancer developing in a chronic ulcer is very unlikely to be symptomless; and the primary cancer which imitates closely in its earlier stages the clinical and even radiographic features of a gastric ulcer is almost a clinical entity which is probably quite independent of infection. Furthermore, as already suggested, there are other possible sources of infection, though I have not observed these in actual practice.

Conclusion

An attempt, then, has been made to show the influence of infection, and a common source of this, on the clinical expression of gastric cancer, and, by taking two groups, each of extreme and unmixed examples, it has been possible to exhibit two pictures, the contrast between which is so arresting—for the disease is the same in each group—that it challenges the clinician to seek an explanation.

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THE TREATMENT OF DEPRESSION IN LATER LIFE

BY

DALTON E. SANDS, M.R.C.P.Ed., D.P.M.

AND

WILLIAM SARGANT, M.B., M.R.C.P., D.P.M.

From an E.M.S. Neurological Unit

In Great Britain severe mental depression occurs every year in thousands of patients between the ages of 40 and 65. Obsessional, hypochondriacal, and paranoid symptoms may complicate the picture, which must nevertheless be distinguished from an organic dementia such as general paralysis or the late onset of a schizophrenic illness. The fate of patients with a late depressive illness is more serious than is generally realized. According to reliable English and American estimates, only a little over a third of those who enter mental hospitals recover, excluding those with manic-depressive syndromes. Very many more patients remain at home as total invalids, not bad enough to be treated in hospital; some carry on at work with greatly reduced efficiency: these contribute to the heavy yearly quota of suicides. Spontaneous remission, if it should occur, generally takes months or years. Particularly at present, such patients, if well, would be replacing younger men and women in industry and holding responsible positions, instead of being a total loss to the community.

In the past, specific treatment of this condition has seemed hopeless, and the long-drawn-out suffering of patients has been more pitiable than in most other forms of mental illness. Suggested treatments have, in the hands of independent workers, failed to show a recovery rate greater than that for spontaneous remission. Convulsion therapy should by now have altered this picture completely. For the past 6 years a continuous stream of favourable reports have been coming in, particularly from America, as to its benefit in depressive illness and, for the last 4 years, even in depressions of later life. 60 to 90% of social remissions or cases greatly improved are continually being reported. Osgood (1942), for instance, wrote a paper solely to analyse why 5 patients out of a group of 72 cases of depression adequately treated with cardiazol failed to respond.

Convulsion therapy appears, in fact, to be far more certain in its effects in depression than it is in schizophrenia, but in the English literature we can find few references to its specific value in those depressions of later life; even in the psychiatric journals only one reasonably but briefly reported series of cases treated among other mixed psychiatric conditions has been found (Wyllie, 1940). Consequently, treatment of these cases is still often neglected. Patients are allowed to drag on for years in mental hospitals in a state of avoidable misery, and business men and civil servants, indispensable at the present time, are being unnecessarily retired from their jobs.

A Series of Cases treated by Convulsion Therapy

For these reasons we wish to report a series of 39 cases of depression, most of them typical "involutional" states, which have been treated by convulsion therapy. This series comprised 21 men and 18 women between the ages of 40 and 62, 35 being treated by electrically induced convulsions, 1 with cardiazol alone, and 3 by combined cardiazol and electrical methods. Of the cases 14 were dealt with in two separate mental hospitals, one group being specially selected because of their desperate mental state and reasonably good previous personality; 21 were treated in an E.M.S. neurological unit, and 4 patients of this type were treated among others as out-patients at a London teaching hospital. Every degree of severity was therefore investigated. The only selection attempted was that in most cases the patients had had a reasonably good previous personality and work record. The duration of the attack varied from 3 years to 2 months in different patients. At the time of writing no fewer than 32 (82%) have either made social remissions or been very greatly improved. All except 3 of these

are considered fit to return to work or to their domestic occupations as an asset rather than a liability to the community, and 2 more are likely to be able to do so in the future. Five further cases were somewhat better, and only 2 failed to show any improvement at all. Of the group that responded so well, 2 had been ill for 3 years, 7 for 2 years or more, and 10 for a year or more. Whatever their source, all groups of patients did equally well: 18 out of 21 treated in an E.M.S. unit, 11 out of 14 treated in mental hospitals, and 3 out of 4 treated as out-patients were greatly improved. An analysis of the 5 patients who showed only moderate improvement revealed that one refused to complete treatment, one had a schizophrenic component in his illness, one had overwhelming social difficulties, and another showed hysterical and arteriosclerotic features. In both the failures treatment could not be completed; one patient refused to go on, the other had a scapula fractured in the second treatment and still remains depressed over a year later, though the fracture is completely healed. We were finally forced to the conclusion that if a patient shows no response at all to treatment the diagnosis of a primary involutional depression should be questioned (as with myasthenia gravis if it does not respond at all to prostigmin), and other reasons should be sought to account for the persistence of the condition, such as poor previous personality, strongly adverse environment, arteriosclerosis, schizophrenic features, and so on.

These results confirm those of American workers, but our high remission rate may also have been due to the fact that these cases were selected mostly on the basis of a reasonably good previous personality, even though several of them had had temporary breakdowns. The severity of the condition did not seem to influence the eventual prognosis unduly. The consequence of neglect of previous treatment of these patients was emphasized when it was found that the 32 patients who came into the social remission group had, taking them together, been ill over 500 months. If we reckon that each patient cost the community even only an average of £2 a week for hospital treatment, medical expenses, loss of earning capacity, etc.—probably a low estimate—the total amounts to £4,000 for these few patients alone. Among those able to return to work were several civil servants, two armament workers, an accountant, and a bank employee who spoke five languages. Many women had husbands and children to look after on returning home.

Of the patients followed up, one relapsed and remains inadequately re-treated outside our control. Any tendency to relapse in other patients has so far been checked by further treatment. Other relapses are probable in the future until recoveries are stabilized, and many could be controlled on the basis of out-patient maintenance fits if necessary. Some have already remained well over a year. One patient needed 15 fits before remission was obtained; the majority required fewer than 10, while some had fewer than 4. As the investigation progressed we induced only enough fits to get recovery under way, subsequent fits being induced when the patient tended to drop back a little. Up to 3 fits a week were given, though the majority had only 1 or 2 a week. We tried to make treatment individual for each patient rather than use rule-of-thumb methods. It was also found essential to social recovery that patients should be sent out on week-end passes to relatives as they got better; the improvement then became obvious to the patients themselves, and so reinforced the effect of the treatment. Superficial psychotherapy or practical advice was also given when recovery was sufficient for this to be of any real value. After long periods of illness patients had naturally to be helped in their social readjustment. This proves more difficult the longer the illness is allowed to drag on. No cases of over 3 years' duration have so far been treated.

Discussion

It appears to be emotional rather than rational considerations that deter many clinicians from using this treatment. One distinguished neurologist remarked, while watching the treatment in progress, "But this is a terrible thing! All his muscles are in spasm!" This sounds rather naïve perhaps, but it corresponds to the bias, in itself entirely admirable, against taking the slightest risk with the defenceless mental patient. In this respect we carry on the traditions of a long line of physicians;

while the treatment is in its nature surgical, and must be regarded from a surgical point of view. In no branch of surgery to-day would a patient be allowed to linger in illness if a form of treatment existed which offered such a high chance of recovery. The death rate of operations for cholecystitis or thyrotoxicosis, for instance, probably exceeds the risk of even a really dangerous complication in convulsion therapy done with reasonable clinical skill. If the previous personality is good, and up to 80% of remissions can be obtained by means of this treatment, it seems to us entirely wrong to allow the illness to drag on till the patient has lost his job and the chance of rehabilitation. These patients are often far above the average in conscientiousness and worthiness, and at the time of life at which the illness appears they have established themselves; if they cannot be brought through the crisis within a reasonable time it will be beyond their power to start life again from the beginning, even if a spontaneous remission eventually occurs.

Complications, which are such a bugbear to those who have no personal acquaintance with the treatment, are in fact neither unduly frequent nor as a rule really serious. Two fractures occurred in this series. One woman had a simple impacted fracture of the humerus, but was so much improved mentally by the treatment that she was far better off, despite this temporary disability; the other, already referred to, cracked a scapula early in treatment and still remains in a mental hospital. These are the only two fractures, except spinal ones, in over 200 psychiatric cases given cardiazol or electrical treatment. If we had allowed ourselves to be unduly depressed by these incidents many patients who are now working would still be ill in hospital. Contrary to early reports, fractured vertebrae are now known to have little significance, for they have been shown to exist as a normal complication of severe epilepsy, and in 8 years of convulsion therapy the majority have been symptomless. By the use of electrical methods and hyperextension of the spine their incidence is low, and they are not even a contraindication to the continuation of treatment. The limbs were carefully positioned and controlled during the fits. Spinal anaesthetics were employed in cases in which we were particularly afraid of fractures or a complicating arterial hypertension. Sometimes the treatment was done in an operating theatre with every emergency measure at hand. We have obtained valuable help and advice from surgical and medical colleagues in difficult cases. Throughout the investigation we have adopted the reasonable surgical view that ordinary risks have to be taken to achieve worth-while results and that incidents should not be avoided at the expense of a patient's mental recovery.

We have found that a *mild* complicating arteriosclerosis is not necessarily a contraindication to treatment. Cerebral haemorrhage is rare as the result of fits in elderly epileptics. Bennett (1941) has treated patients up to the age of 75, using curare or spinal anaesthesia to lessen the force of the convulsion; and Weisel (1942) treated a physician of 72, with eventual recovery. But where the risks of complications are greater one should exercise more clinical skill and ingenuity in overcoming them. These will form the subject of another paper. Some of our more intelligent patients reported minor memory defects after treatment which had generally cleared up by the time they resumed work. The memory disturbances can undoubtedly be greatly reduced by giving the minimum of treatment, as widely spaced as possible, consistent with recovery. Some treated as out-patients actually continued work during part of the treatment.

To us the problem is not whether to treat but when to start treatment. A period of up to three months may be thought desirable to find out if spontaneous remission will occur, provided this does not entail a loss of the patient's job or provided there is not such a degree of continued agitation that he would seem to require treatment as urgently as a patient with a fracture needs morphine. The electrical method of inducing convulsions undoubtedly makes earlier and wider application of the treatment possible. There is no memory of the convulsion and no apprehension except that inherent in the illness. Patients who would refuse cardiazol willingly submit to this method. The after-effects are not so severe, there is especially an absence of vomiting after treatment, and the convulsion is more easily regulated. If the first attempt fails, the second and third are not feared by the patient. The total effect on the symptoms seems as satisfactory as that of cardiazol. Recently, Strauss's

(1941) opinion that electrical fits may be given to selected patients in an out-patient department of a general teaching hospital met with considerable criticism, but we have found his views substantially correct. The patients should be carefully chosen and be accompanied by sensible relatives who are prepared to have them admitted to hospital if necessary. In deciding whether to give in-patient or out-patient treatment, the question of risk of suicide, temporary confusional states, and the type of supervision the patient can have at home should be considered. The social consequences of admission to a mental hospital can still be disastrous in certain occupations; therefore E.M.S. neurological units have been found ideal, unless the patient is very agitated, is suicidal, or is refusing treatment. The atmosphere approximates more to that of a general hospital, patients are willing to come for treatment very much earlier, and supervision is adequate. If the problem is to be solved satisfactorily, facilities for treatment away from certified patients will have to be widely extended through the country and clinicians allowed greater latitude inside mental hospitals.

Conclusion

Our results amply confirm the findings of American workers that convulsion therapy is at present the most effective treatment available for depression in later life. Very high percentages of remissions in good previous personalities may be expected. Complications do not outweigh benefits to be obtained in any large group of cases, if reasonable clinical skill is exercised and every possible measure is used to avoid them. The full application of this treatment all over Britain would result in very large numbers, amounting to thousands, of patients being able to leave mental hospitals or resume a reasonable degree of working efficiency without prolonged invalidism. It seems urgently demanded in the present emergency, since a physician, using electrical methods and working only 2 hours a day, can treat over 50 uncomplicated cases in a week.

We wish to thank Drs. Louis Minski, L. H. Wootton, and L. C. Cook for their co-operation in this investigation, and our colleagues who referred cases to us; and also the Medical and House Committees of St. George's Hospital, London, who allowed the trial of this method in their out-patient department.

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HEALTH SERVICES IN CARDIFF

Cardiff's death rate from pulmonary tuberculosis has fallen from 5.3 per 1,000 to 0.78; the typhoid fever death rate from 1.8 to an insignificant figure; and the death rate from small-pox from 2.0 to zero. These figures are given in the report for 1940 of Dr. Greenwood Wilson, medical officer of health. The death rate from tuberculosis in 1940 was the lowest on record, coinciding with the setting up of the council's care scheme whereby the social welfare of tuberculous patients and their family units is maintained. Infectious disease was not troublesome during the year, except for influenza (in the first quarter) and diphtheria. Cerebrospinal fever caused 29 deaths, and 322 cases were admitted to the isolation hospital—by far the largest number in any one year. A fall in the case mortality from 60% to under 10% is attributed to the use of the new chemotherapeutic methods. The city's death rate was 14.2 per 1,000 (lower than that of most of the other large British seaport towns), and the infant mortality was 59 per 1,000 births. Almost half the notified births and stillbirths in the city were attended by municipal midwives or in the maternity wards of a municipal hospital; the maternal mortality rate for 1940 (2.91 per 1,000 births) was the lowest on record. Cardiff has a new nursery school with accommodation for 120 children. One conclusion of a special nutrition survey undertaken during the year was that there was marked deficiency of protein in the food of the majority of malnourished children. Carbohydrates abound and fats are widely used, but protein is limited, partly because of the greater cost, but partly also because of the strong belief among many mothers that protein in the form of meat is injurious to children. The impression received from this survey of over 22,000 children was that a higher percentage of cases of malnutrition occurred in the age group 7-11 than in the 5-7 or 11-14 age groups. Girls showed less evidence of malnutrition than boys. In the port of Cardiff 55 cases of notifiable infectious disease (30 of them malaria) were landed from vessels during the year.

UNDULANT FEVER

A SMALL OUTBREAK IN A GIRLS' SCHOOL*

BY

J. C. CRUICKSHANK, M.B., Ch.B., D.T.M.

AND

G. A. STEVENSON, M.R.C.S., L.R.C.P.

Although a number of outbreaks of undulant fever have been reported, mostly from Canada and the United States, it is more usual in this country to encounter the isolated case in which the occurrence of pyrexia with indefinite physical signs has caused the disease to be suspected and later confirmed by the agglutination reaction or blood culture. Elkington, Wilson, Taylor, and Fulton (1940) described an outbreak in a boys' school in England. In this epidemic, believed to be the first to be recorded in Britain, 2 definite clinical cases occurred a few weeks after the school, which had previously used milk from a certain tuberculin-tested herd, changed to another raw supply. The subsequent investigation revealed that there were 26 mild infections and that latent infection had probably occurred in about a third of the 400 boys. The purpose of the present report is to put on record the occurrence of a similar small outbreak, mostly of mild infection, in a girls' boarding-school, due to the consumption of unheated milk from a herd infected with *Br. abortus*.

Two boarding-schools for girls, normally situated in a large town on the South Coast, were combined and evacuated in May, 1941, to a country house on an estate in Devonshire. The total number of girls was 54, between the ages of 9 and 17, with a staff of 14 teachers and maids.

Clinical History of Cases

Case 1.—On Nov. 8, 1941, a girl aged 12 had a rigor. During the next three days she complained of headache and general malaise, but had no other marked symptoms, and her appetite remained good. For the first 10 days of her illness her temperature rose to 100°-101° F. in the evenings, then settled slowly to normal during the next 7 days. Epistaxis was frequent throughout this period. The spleen was not palpable; there was no rash or other physical sign. On Nov. 22 her serum agglutinated *Br. abortus* to a titre of 1 in 640 and the organism was cultured from the blood. Six c.cm. of blood had been inoculated direct into 50 c.cm. of broth and incubated in 10% CO₂.

Case 2.—On Nov. 10, 1941, another girl, aged 9, complained of headache, and was found to have a temperature of 101° F. Her illness ran a similar course with few symptoms except sweating, which was pronounced during the first few days. An evening temperature of 101° F. persisted for 10 days, and for a further fortnight there was a rise to 99° F. each evening. In her case also there were no physical signs. On Nov. 22 this girl's serum agglutinated *Br. abortus* to a titre of 1 in 320, and the organism was isolated from her blood on that date.

These two girls were given symptomatic treatment only.

Case 3.—On Nov. 18, 1941, a third girl, aged 16, had a mild attack of diarrhoea and vomiting. For the next 6 days her evening temperature rose to 103° F. On Nov. 21 a short course of sulphanilamide was started: 1 g. 4-hourly for 9 doses—9 g. in all. On Nov. 22 her serum agglutinated *Br. abortus* to a titre of 1 in 320, but blood cultures taken the same day remained sterile during 6 weeks' incubation in CO₂. On Nov. 24 the temperature dropped to normal and did not rise again. The slight headache and sweating which had been the only symptoms disappeared and appetite returned.

All three girls made a good recovery, and at the end of Feb., 1942, there had been no relapse.

Case 4.—This patient, a girl aged 14, came under treatment in Hertfordshire. We are grateful to Dr. A. W. Franklin, physician to the Children's Department, St. Bartholomew's Hospital, for giving us the full details of this case. The patient, who had a history of periodic nose-bleeding in earlier childhood, had a febrile attack associated with epistaxis and a boil on the face in May, 1941, while at school. In August, while on holiday, she became ill with fever lasting 9 days, and as recovery was not complete she was admitted to hospital on Sept. 18. Undulant fever was suspected, but, apart from indicating

* Report to the Medical Research Council from the Emergency Public Health Laboratory, Exeter, and Devon County Laboratory.