THE USE OF ELECTROPLEXY IN MENTAL DISEASE WITH CLOUDING OF CONSCIOUSNESS.

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CLOUDING of consciousness is a common feature of organic psychoses. It may be of any degree of severity from acute delirium to some diminished capacity for clear thinking and impairment of retention for recent experiences. However, such a diminution in the level of awareness also occurs occasionally in " functional " mental disorders ; severe and rapidly evolving attacks of mania or depression may be associated with some degree of clouding of consciousness, and Meduna in some recent papers (Meduna and McCulloch, 1945 ; Meduna, 1950) has redirected attention to " oneirophrenia," an acute psychotic disorder originally described by Mayer-Gross (1924) in which clouding of consciousness is the general rule.

The possibility of an organic factor in causation needs always to be investigated in the presence of such a clouding of the sensorium. If a physical illness is in fact discovered, or where it has been known to exist from the beginning, treatment must naturally be directed first towards its elimination. However, both diagnosis and treatment may present problems of some difficulty (*a*) when a psychosis continues after spontaneous or therapeutic termination of the illness in the course of which it originally developed ; (*b*) when a psychosis commences after recovery from a toxic or infective illness ; and (*c*) when an illness whose clinical picture and natural history strongly suggest an affective or schizophrenic psychosis is complicated by some clouding of consciousness. The presence of some degree of constitutional disturbance in the form of mild pyrexia and tachycardia which is common in such cases (in addition to clouding of the sensorium which may be present in variable degree in all three kinds of case) makes it difficult to exclude the possibility that some unidentified toxic factor is at any rate partly responsible for the continuation of the illness.

The problem of treatment in such cases is one of some difficulty. For in a case of acute affective disorder, E.C.T. could be expected to terminate or alleviate the attack ; but in the face of some impairment of awareness, memory and orientation, there is a natural reluctance to use a procedure itself liable in excessive dosage to produce these defects. Yet leaving such cases to take their natural course is fraught with some risk, as severe " confusion " (in the sense of clouding of consciousness) is a serious complication in any mental disorder, especially in the old ; restlessness and starvation may bring about rapid exhaustion, and even a fatal issue is not uncommon. It is therefore of particular importance to know that E.C.T. has been used with safety and success in many cases of psychosis complicated by clouding of consciousness.

Some of the cases described in the literature would appear to have been symptomatic psychoses, others acute confusional states without any specific cause (Delay and Maillard, 1945, 1946 ; Delay, 1946). However, E.C.T. has also been used effectively for psychotic symptoms of frankly organic orgin such as those associated with G.P.I., epilepsy, pernicious anaemia, and pellagra (Ewald and Haddenbrock, 1942 ; Kalinowsky and Kennedy, 1943 ; Delay, 1946 ; Fernandes and Polonio, 1946 ; Bini, 1947 ; Yaskin, 1948 ; Kalinowsky, 1949 ; Lopez Ibor, 1950). These reports are of considerable theoretical as well as practical importance, but relatively little attention appears to have been paid to them in this country. We have therefore thought it desirable to place on record the following account of eight cases of

psychosis with clouding of consciousness in which E.C.T. was used with success, and to use our experience as a starting-point for a discussion of the significance of the reports published on the use of E.C.T. in organic psychoses.

Case Records.

Case 1 : *Mrs. M. G—, housewife, aged* 54.—The patient had a history of chronic cholecystitis of two years' duration. She was admitted to a general hospital on 11.vi.51 during an exacerbation of symptoms. The physical state improved with conservative measures, but on 13.vi.51 she became withdrawn, confused and restless. She was transferred to mental hospital on the following day and was then completely disorientated. For the greater part of the time she sat in bed with her hands clasped above her head. She resisted passively all forms of attention and refused to swallow. The simplest question elicited a nonsensical answer. Left to herself, the patient muttered incoherently and appeared to be both visually and aurally hallucinated. Abnormal physical findings were limited to faint icterus, a raised E.S.R. (30 mm.), moderate leucocytosis, râles at the lung bases. The patient was given 300,000 units distaquaine-penicillin twice daily, and fluids were administered by tube-feed. By 19.vi.51 confusion showed no sign of clearing spontaneously and E.C.T. was started. On the following day the patient was restless and tore sheets and clothing. The second treatment was given on 21.vi.51 and improvement was seen a few hours later. Next day Mrs. G— was fully orientated, pleasant and co-operative, but quiet and subdued. A further convulsion was given on 25.vi.51 and thereafter the patient was active and cheerful. She was discharged recovered on 13.vii.51.

Case 2 : *Mrs. M. W—, housewife, aged* 40.—She was inclined to be highly strung, excitable and sensitive, and was given to worrying over trifles. In childhood she had been neglected by irresponsible parents and was somewhat backward at school. Her marriage had, however, been happy, and had brought out assets such as a capacity for hard work, devotion, and a gift for friendship with people. Following ea h of her two pregnancies she had been very ill (pleurisy, venous thrombosis) ; a third pregnancy was terminated at three months and the patient was sterilized. She had had four previous attacks of lobar pneumonia, and on 16.viii.50 she again developed pain on the left side of the chest. Physical signs of consolidation were confirmed by X ray and she was treated with penicillin. On 21.viii.50, when the signs of consolidation were subsiding and the pyrexia had ceased, she was described as having become restless, interfering, confused, and deluded about the other patients and the nurses in the medical ward to which she had been admitted. Her conduct disturbed her fellow-patients, and she was transferred to mental hospital on 28.viii.50 under Urgency Order. On admission she was completely disorientated and out of contact. Her upper limbs carried out manneristic movements and her face was contorted in bizarre grimaces ; her talk was incoherent. She made secret-significant gestures and addressed herself to God, as if He were in her presence. E.C.T. was commenced on 1.ix.50. After three treatments she was composed, rational, and able to give a good account of herself. During the course of seven E.C.T., which ended on 19.ix.50, she continued to improve, becoming more composed, aware of her surroundings and less toxic in her appearance. She made a complete recovery, but had a total amnesia for the acute phase of her illness. She was discharged on 4.x.50.

Case 3 : *Mrs. J. C—, housewife, aged* 42.—The patient had been happily married for 22 years and had a healthy family of seven. She was good-natured, sociable and efficient. In 1943, while her husband was overseas, she had a brief period of depression which remitted without hospital treatment. About three months prior to admission to mental hospital she was worried by a pain over her heart. She was given a " tonic " by her doctor and the pain and anxiety disappeared ; she continued to take the medicine. In March, 1949, her attitude towards her husband became less friendly. Soon afterwards she openly accused him of theft, infidelity, and attempting to poison her. It was noticed that she had become forgetful and repetitive. The patient was admitted on 25.iv.49. Physical abnormalities included dilated pupils reacting sluggishly to light, marked tremor of the tongue and hands, and exaggerated tendon reflexes. She was restless, noisy and agitated. Her thought content was devoted to her husband's misdemeanours ; everyday events were put forward as indisputable evidence of his crimes. The systematization of her delusions was obscured by incoherence and thought disorder. Defects of attention, retention and recall were prominent and she was disorientated for time. The serum bromide was found to be 250 mgm./100 ml. Routine treatment by sodium chloride, fluids and sedation was started. By 3.v.49 the serum bromide had fallen to 201 mgm./100 ml., but the patient remained agitated. Her paranoid ideation extended to include most of her fellow-patients and the staff. She misinterpreted every action, found sinister significance in commonplace objects, and accused the nurses of poisoning her. As her condition was deteriorating in spite of a falling blood bromide, E.C.T. was started. A dramatic improvement followed the second convulsion. She became quite cheerful and composed, and paranoid delusions faded into the background ; only a slight lability of affect remained. By 17.v.49, after six convulsions, the serum bromide was 83 mgm./100 ml. After one further treatment on 21.v.49 electroplexy was discontinued. The

patient was then cheerful and stable. She smilingly denied persecutory ideas and spoke of her husband with affection and appreciation. She remained well, and was discharged recovered on 3.vi.49.

CASE 4: *Mrs. E. T—, housewife, aged* 36.—The history of the patient's life before illness was negative, except for several months' tension and irritability after the birth of the youngest of her three children, nine years previously. In the summer of 1947 the patient complained of lack of energy, and "rheumatism." Her appetite had been poor for some time and this feature became more marked. She had been greatly attached to her father, and her condition worsened after his death in January, 1948. There were increasing irritability, restlessness, insomnia, vague somatic complaints and unjustified accusations of cruelty on her husband's part. She was admitted to hospital on 13.ii.48 and was found to be emaciated (weight = 6 st. 3 lb.) and hypertensive (B.P. = 180/120). No contact could be made with her. Occasionally she would nod or shake her head in response to persistent questioning. From time to time she moaned and whined. She was in bed for long periods; her head, limbs and trunk were in constant, purposeless, writhing movement, accompanied by grotesque facial contortions. When on her feet the movements would continue until interrupted by sudden complete muscular relaxation and she flopped on the floor. This puppet-like behaviour was best seen when she was being supported; left to herself she walked without difficulty. She refused food, and micturated on the ward floor in the presence of fellow-patients. E.C.T. began on 16.ii.48. After the second convulsion the patient answered questions for the first time, but her replies were meagre and wide of the mark and showed her to be grossly disorientated. Destructive behaviour and stereotyped hyperkinesis continued until after her fourth fit. On 26.ii.48, after six E.C.T., she was rational, orientated, co-operative and composed. Amnesia blotted out the acute phase of her illness and obscured many events occurring during the weeks before admission. She showed embarrassment when explaining that she had thought that a holy war was going to begin after Gandhi's death. At this stage the patient still looked toxic, and a labial herpetiform eruption was noted. B.P. was 156/84. At the beginning of March she became unco-operative, restless, over-talkative and confused. This relapse was aborted by three E.C.T. By 18.iii.48 she was very well mentally and was again affectionate towards her husband. She had gained 14 lb. in weight. A few days later signs of relapse reappeared and electroplexy was again resorted to, with rapid improvement. It was decided to improve her state of nutrition by modified insulin therapy, which was started on 24.iii.48 and continued until 30.iv.48. During this her behaviour remained relatively normal; she produced no psychotic ideas, but appeared to have slight emotional blunting. B.P. on 3.v.48 was 184/110. Later in the month she appeared to be well, but complained of lack of energy and showed ambivalence towards her husband. On 12.vi.48 she returned home on trial holiday. Her husband reported that she was mildly irritable and quick-tempered, but considered that these were normal features of her personality. At the time of her discharge, 14.vii.48 she had gained 35 lb. in weight.

CASE 5: *Mrs. M. J—, housewife, aged* 43.—Healthy, lively and intelligent in her earlier days, she had a good school record and a successful career as a nurse. She was ill-treated by her husband, from whom she had been separated for years. She was placid, good-tempered, and devoted to her family of three. After her last parturition, 15 years previously, her weight had steadily increased. In April, 1949, on returning from the wedding of her eldest son, she was exhausted and depressed, expressed ideas of self-reproach, showed apprehension and tension, and slept poorly. Fleeting episodes of confusion were noticed. She was admitted to hospital on 9.v.49, and presented a widely fluctuating clinical picture with day-to-day changes in mood, sensorium and the thought processes. Affect fluctuated from perplexity to extreme agitation. At times she was disorientated and grossly confused, at times showed only retardation, defects of retention and recall, and impaired conceptual thinking. Memory for recent events was always impaired. Weight on admission was 16 st. 9 lb. Apart from this obesity and a 17-ketosteroid output of 22·4 mgm./24 hours, no gross abnormality was found in any physical system, although the blood bromide, urea and cholesterol were investigated in addition to a full clinical examination. On 16.v.49 pyrexia to 101° F. began, and continued at a slightly lower level until 30.v.49, in spite of courses of penicillin and sulphathiazole. No septic focus could be discovered. The patient became more constantly agitated, destroyed clothing and gave vent to strident and stereotyped self-recrimination. Little contact could be made with her. Treatment by sedation and massive doses of the vitamin B complex brought no improvement, and E.C.T. was given on 24.vi.49. A distinct change was noted after the second convulsion. At the sixth treatment, on 5.vii.49, the patient was fully orientated, quiet, composed and friendly; diurnal sedation could be reduced to a minimal level. The course of nine E.C.T. was concluded on 16.vii.49, and convalescence was uneventful. The patient was discharged recovered on 13.viii.49.

CASE 6: *Mrs. G. R—, housewife, aged* 54.—The patient showed a degree of timidity in childhood, but had a normal school career and worked happily and efficiently as a domestic servant. She had been happily married for 14 years. She was cheerful, active and friendly, although inclined to worry needlessly. Her health had been good, except that there was a vague story of "heart trouble" before marriage. Her illness began in April, 1949, with

anxiety, pressure of talk, increased domestic activity and hyposomnia. These symptoms worsened until on 8.viii.49 she abused and struck her husband and rushed out into the street in her night attire. She returned before her husband could catch her and then locked him out of the house, shouting and singing the while. Thereafter there was a brief period of comparitive normality, and then further restlessness, pressure of activity, singing, and dwelling on events of the remote past. Admitted to hospital on 15.viii.49 she looked thin, haggard and toxic. No gross abnormality was found in any physical system. Peripheral arteriosclerosis was not marked, and the B.P. was 130/86. An E.E.G. recording on 17.viii.49 showed features often found in toxic states ; the alpha rhythm was obscured by a persistent low voltage, fast beta rhythm, most pronounced in the parieto-occipital areas. For long periods the patient would lie motionless, staring in front of her ; suddenly she would burst into song or declaim passages from the Bible in a shrill crescendo. She constantly identified the staff as close relations. She was irritable and distractable, and the slightest provocation roused acute paranoid excitement. In such episodes she shouted obscenities at the staff and accused them of poisoning her. There were brief periods of relative lucidity when she was quiet, submissive and apologetic, and able to describe her previous disturbed behaviour although not with complete insight. E.C.T. was started on 17.viii.49 and repeated on the following day. By 24.viii.49 she was lucid and much quieter. A course of eight E.C.T. was terminated on 4.ix.49, by which time the patient showed no psychotic features but was tense and inclined to seek frequent reassurance. There was increasing confusion during the following two weeks, with anxiety and mild depression. She constantly mislaid articles and became paranoid when they could not be found. She was given mild diurnal sedation. On 25.ix.49 her B.P. was found to be 200/100. Thereafter confusion with restlessness and disorientation for place and time increased. She wandered round the ward with a vacant stare and accosted all comers, refused food for fear of poisoning, made accusations of stealing, and besought the doctor not to send her to a nunnery. As her agitation was increasing, electroplexy was recommenced on 11.x.49, but after the first few fits treatments were spaced at 5-day intervals. After the fourth convulsion she again became rational and purposeful, although still fussy about her personal belongings. The second course of eight treatments finished on 4.xi.49, by which time no psychotic symptoms remained. During convalescence she remained cheerful and active, although undue timidity could be seen from time to time. She was discharged recovered on 17.xii.49.

CASE 7 : *Miss J. M—, housewife, aged* 40.—The patient had always been quiet and reserved. She had worked as a nursemaid and housemaid and for five years during the war served with the Red Cross ; thereafter she stayed at home caring for her widowed mother. During the past year she had been keeping company with a man for the first time. They had hoped to marry, but the patient's mother could not be left alone. For a few weeks before admission sleep had been less satisfactory than usual. Two days before admission the patient had fleeting episodes of agitation in which she showed perplexity and foreboding. On the next day she was confused and agitated, asking for her father, who had died during her infancy. She attempted to go for a walk in her night-clothes, and when prevented, tried to jump through a window. She became abusive and violent when interviewed by her doctor, and was with difficulty sent to hospital on 5.vii.49. On arrival she was wildly excited and resistive. She rocked herself to and fro muttering " What's happening ? Why is the world like this ?" Though she was now normally orientated she had a complete amnesia for the preceding two days. Little contact could be made with her during the next few days. Her demeanour was one of inarticulate misery and she seemed unaware of her surroundings. Occasionally she whispered, " I seem to have got mixed up somehow. I can't get it right." With difficulty she was spoon-fed. E.C.T. began on 10.vii.49 and convulsions were given on three consecutive days. On 13.vii.49 her temperature rose to 100·8 ° F., reaching a normal level two days later. No physical abnormality save obstinate constipation could be detected. The patient was less restless and agitated, but showed little spontaneity and considerable perplexity. Electroplexy was resumed on 19.vii.49. After the fifth convulsion she was cheerful, friendly and composed. Amnesia blotted out the acute phase of her illness. She was able tc give an accurate outline of her past career ; she denied that her courtship or its future prospects had been a source of anxiety to her. A course of eight E.C.T. was completed on 1.viii.49, by which date the patient appeared to be very well. A fortnight later she was unduly concerned about trivial matters, e.g., losing a thimble, but further investigation showed that post-convulsive amnesia had caused greater anxiety than any material loss. When this cleared she remained well, and was discharged recovered on 23.ix.49.

CASE 8 : *Mrs. R. T—, housewife, aged* 56.—The patient had always enjoyed good health, and her personality showed no neurotic traits. She had recently been concerned about her husband's ill-health and her son's welfare while on active service. She conducted the family hairdressing business during her husband's indisposition. Two weeks prior to admission she became sleepless, restless and agitated, and expressed delusions of poverty. A few days later she began to shout, sing and dance, and refused all nourishment. After admission on 16.i.47 she was depressed, sullen and suspicious. She was treated by three leptazol convulsions followed by four E.C.T. and was discharged recovered on 9.iii.47. She remained well until September, 1948, when she became anxious over trivial matters. She soon

developed loosely-connected paranoid ideas and extreme agitation. On readmission on 1.x.48 she was almost stuporose. E.C.T. again brought rapid improvement and the patient was discharged on 12.xii.48. She was then noted to be facile and had only superficial insight. Her remission lasted only a fortnight, and she returned to hospital on 27.i.49, again depressed and sub-stuporose. As before, E.C.T. roused her from this state to apparent normality, but again for no longer than a fortnight. Treatment was repeated with similar results. In April, 1949, the unusual features in this case became more prominent and suggested the possibility of presenile dementia. The patient shuffled slowly about the ward, staring fixedly at her fellows. She adopted peculiar fixed postures and mumbled constantly to herself. From time to time a vacant grin spread slowly over her features. From this state she could be roused to give the date, her whereabouts, name and address, but not the doctor's name. Later in the month the euphoric smile vanished; she had to be spoon-fed; she could be roused only for a few seconds to make a wrong guess at the day of the week. On 6.v.49 she was noted to be carrying out bizarre, stereotyped movements with her hands and to be muttering incessantly a stream of incoherent jargon. She had a wild, mad stare and was completely out of contact. After careful consideration it was felt that, in spite of the transformation of the clinical picture, a change in diagnosis in a case of recurrent affective disorder should not be decided on without a therapeutic test. E.C.T. was therefore recommenced; after seven E.C.T. the patient made a remarkable recovery, her facial expression was bright and alert, she was quickly responsive to all stimuli, fully orientated, interested in her ward-mates, and free from all delusions. At the same time she exhibited emotional facility and was garrulous. Although E.C.T. could reverse the clinical picture in this case, the result was transient. The patient's progress during the following months is a record of relapse to a state resembling dementia followed by restoration to apparent normality. When it became clear that no permanent amelioration could be hoped for from electroplexy, a prefrontal leucotomy was carried out on 27.x.49. After some early inertia she made uninterrupted progress to a stable recovery from her psychosis. The previous finding of emotional shallowness was still present after operation, but to no more marked an extent. At the time of the patient's discharge on 19.ii.50 her husband considered that she was completely her former self again. She has resumed work in the family hairdressing business.

Discussion.

The cases do not form a homogeneous group. Cases 1 and 2 were precipitated by an acute infective illness, while in Case 3 a specific organic factor, bromide intoxication, was demonstrated as a cause. In Cases 4 and 5 no definite infective or toxic factor was isolated, but the extreme emaciation and toxic appearance of 4, the severe constitutional disturbance and fluctuating clinical picture in 5, and the marked clouding of consciousness in both, make it probable that they were psychoses of the toxic-infective group. Case 6 may have had an acute affective psychosis of the "mixed" variety, but the severity of the affective disturbance did not seem adequate to account for the clouding of consciousness, which thus introduced the possibility of some subsidiary organic cause. Case 7 may likewise have suffered from an atypical affective disorder, but here again the lability of the clinical picture, and the confusion and patchy amnesia for acute phases of the mental illness, made it impossible to exclude an organic factor in causation. Case 8 was undoubtedly one of manic-depressive psychosis, but severe clouding of consciousness so transformed the clinical picture in later attacks that the possibility of some organic disease of the brain arose. This case teaches the important lesson that a change in the clinical features of a mental illness does not by itself warrant the revision of a firmly established diagnosis of affective disorder; one should be cautious about a change of diagnosis from a recurrent but reversible illness to a progressive, irreversible one, and only the strongest evidence justifies it.

All eight patients were women, but this was probably due to the fact that during most of the period in which they were observed, each of us was in charge of female wards.

The first seven cases described were probably suffering from a psychosis that was wholly or in part toxic-infective in character; the clinical picture in all eight raised the possibility that unidentified infective or toxic agents had contributed in causation or were partly responsible for perpetuating the condition. With the exception of the last case, the group as a whole is in many respects comparable with the cases described by Delay and his co-workers in their papers on "les syndromes confusionnels." The aetiology and precise nosological status of such conditions present problems of some complexity into which we do not wish to enter here. We are concerned mainly with the difficult decisions these cases present for treatment.

Our experience has confirmed that of other writers we have quoted; if an acute

psychotic disturbance continues after the physical illness which gave rise to it has been dealt with, or if no aetiological agent can be discovered after full investigation for such a mental illness, E.C.T. is a safe and effective treatment. In the case of an old and restless patient it may be a life-saving measure.

The efficacy of convulsive treatment in the cases described raises the wider problem of the effect of E.C.T. on organic psychoses in general. This is a large subject to which full consideration cannot be given here, but the opportunity afforded by the study of our cases will be taken to summarize some of the recent findings, since they have great theoretical as well as practical significance. Fernandes and Polonio (1946) have reported the successful use of E.C.T. in a number of psychoses of clearly organic aetiology. Thus it terminated akinetic states associated with pellagra which failed to recover after treatment with nicotinic acid. An hallucinatory paranoid state in pernicious anaemia, which persisted after treatment with liver had produced a normal blood picture, likewise responded to it. E.C.T. has also been described as effective in the treatment of withdrawal symptoms in morphine addicts (Kalinowsky, 1949; Lopez Ibor, 1950), the fulminating and often fatal catatonia of Stauder (Ewald and Haddenbrock, 1942; Lopez Ibor, 1950), and the acute psychotic disturbances of mental defectives.

In all these conditions the organic factor in causation is either unknown (as, for example, in " fatal " catatonia), or it had been eliminated by the time treatment had begun. Even more unexpected is the effect produced by E.C.T. on mental disorders caused by a specific organic factor that continues to be active. Thus it has been described as largely effective in delirium tremens (Delay, 1946; Lopez Ibor, 1950), and it has been known for some time that in the epileptic fugues and twilight states, in which severe E.E.G. abnormalities are nearly always demonstrable, electrically induced convulsions rapidly bring the condition to an end (Kalinowsky and Kennedy, 1943; Delay, 1946; Fernandes and Polonio, 1946). In general paralysis acute psychotic symptoms are relieved, and severely disturbed patients may be rendered capable of co-operating in treatment with penicillin or malaria. Manic-depressive and in some cases confusional symptoms, hallucinations and delusions that persist after specific treatment also respond frequently to E.C.T. (Ewald and Haddenbrock, 1942; Bini, 1947; Solomon *et al*, 1948; Yaskin, 1948; Kalinowsky, 1949; Lopez Ibor, 1950). However, there is nothing to suggest that negative symptoms such as dementia or emotional facility are influenced, and the infection itself is unaffected, for the serology and neurological signs remain unchanged. There is therefore no justification for using E.C.T. until the infection has been treated with penicillin and/or malaria unless the patient is so grossly disturbed that he is in danger of exhaustion, or so unco-operative that specific treatment is effectively prevented.

An attempt has been made by Delay (1946) to account for the unexpected efficacy of E.C.T. in psychoses with clouding of consciousness. Consciousness as we know it in man, according to Delay, is merely the function of vigilance or awareness of lower animals at a higher level of development. In this light the level of consciousness can be described along a quantitative scale that extends from coma, through less profound states of impairment such as delirium and confusion, and more superficially again through mild impairment of grasp, to normal vigilance. This conception* of delirium and confusion as stages along the path of dissolution of consciousness or vigilance is illuminating, though it cannot be accepted without considerable qualification. It may be objected, for example, that the delirious patient cannot be aroused like the dreamer with whom Delay compares him. If, however, we postulate a second factor which, in addition to reducing his level of consciousness, immobilizes him at a transitional stage between sleep and full awareness, we come somewhat closer to understanding why he can be neither aroused nor easily sent to sleep; insomnia and nocturnal restlessness are, as is well known, almost invariable in delirium.

Delay believes that E.C.T. influences the " commutator " of consciousness in the diencephalon, thus rectifying the impairment of consciousness, and the patient, rendered normally aware of his environment, ceases to behave as if in a dream. There is, in fact, much evidence to indicate that the control of consciousness is maintained from the diencephalon, as also that the therapeutic effects of E.C.T. are to be attributed to an influence upon diencephalic centres (Delay, 1946; Roth, 1951

* A restatement, as Delay makes clear, of a view implicit in the writings of earlier authors.

and 1952). However, if such an explanation is adopted in the case of confusion, a somewhat different mode of action must be postulated for E.C.T. in affective psychoses and schizophrenia, while still further explanations must be invoked to account for its influence on organic psychoses such as general paralysis and pellagra.

We believe that more cogent explanations for the unexpected action of E.C.T. in organic psychoses may be derived from an examination of the range of clinical conditions in which E.C.T. has been shown to be more or less effective. It becomes evident at once that E.C.T. is a non-specific treatment, for it influences clinical phenomena of opposite sign such as mania and depression, stupor and hyperactivity, agitation and apathy, and conditions as varied in causation as schizophrenia, epileptic twilight states and the symptomatic and organic psychoses described or referred to above.

It is difficult to conceive of aetiological factors common to such a very wide range of disorders. The only physio-pathological factors common to them are those of a most general kind ; they are all qualitatively new patterns of behaviour superimposed upon those established in the individual before illness. In view of the rapidity with which E.C.T. tends to eliminate them and the completeness with which premorbid behaviour is restored, it is also unlikely that they are derived (directly at any rate) from structural changes in brain cells of a kind demonstrable by our present methods of investigation. It may be objected that its action in the organic psychoses can hardly be used as a further argument for the non-specificity of convulsive treatment, as it does not really counteract the effects exerted by the organic agent on the brain, but merely the depressive or schizophrenic components of the organic picture which may be regarded as the reaction of a predisposed constitution. However, confusion, which as we have seen is often reversed by E.C.T., is certainly not a response confined to individuals with a specific predisposition for it. Nor are depressive and other functional symptoms totally independent of the organic agents with which they may be associated. Thus it has been shown that if the syphilis is untreated, the " functional " symptoms in a general paralytic tend to relapse rapidly after convulsive treatment (Broggi, 1937 ; Solomon *et al.*, 1948). Further evidence that E.C.T. does in fact tend to counteract some of the effects of organic agents on the brain is provided by the observation that in acute confusional episodes due to toxic factors that are still active, the effects of E.C.T. are transient, and relapse continues until they have been dealt with (Delay and Maillard, 1945). E.C.T. may therefore be legitimately claimed to act not only in functional psychoses of varied causation, but to some extent also in organically determined mental disorders.

This non-specific character of convulsive treatment suggests that it is unlikely to act directly upon the causes of psychiatric disorders for which they are used but (like other markedly non-specific treatments such as ACTH and cortisone) upon the regulating and defensive mechanisms of the organism which may be mobilised into activity against them. There is much evidence in support of this view. It is well known that during a course of E.C.T. the patients treated exhibit rapid changes in sleep rhythm, appetite, weight, and menstruation, which are probably due to an influence on the diencephalic centres regulating these functions. Altschule *et al.* (1948) have shown that E.C.T. evokes the whole syndrome of neurohypophyseal activity. The rapid changes in the electrical activity of the brain are also due probably to a primary influence on the diencephalon, and may have a homeostatic action (Roth, 1951, 1952). Such a mobilization of the activity of cerebral centres concerned with homeostasis could be expected to exert a non-specific effect, for regulators should correct different kinds of derangement of stable conditions.

In the light of this argument the action of E.C.T. on the symptomatic psychoses we have described and the organic psychoses cited from the literature may be attributed to *a tendency to* abolish or impede behaviour patterns that are as yet poorly assimilated into the basic patterns characteristic of the individual personality, and to promote the establishment of the most stable and integrated organization of activities of which the brain remains potentially capable. Theoretically, E.C.T. could therefore be expected to produce some effect on all illnesses imposing *qualitatively new* patterns of behaviour not due to structural alterations in the brain. (Evidently basic patterns of behaviour cannot be restored if their anatomical foundation no longer exists.) This provides no grounds for the indiscriminate use of E.C.T. In the first place the effect produced may be far too transient, trivial or uncertain to justify the risks incurred, and the anxiety and discomfort

suffered by the patient. Moreover, it will be obvious, on commonsense grounds (and apart from any consideration of duration of effects), that no psychosis should be given a non-specific physical treatment until the organic factors in causation have been dealt with as far as possible, or the presence of such factors excluded by thorough investigation. This last statement requires a minor qualification because in rare acute psychoses such as the fatal catatonia of Stauder, the presence of a severe constitutional disturbance may lead to an undue prolongation of fruitless investigations so that the life of the patient is endangered; in such cases E.C.T. would appear to be a life-saving measure, and should not be delayed until all the remote possibilities in diagnosis have been excluded.

As to the details of the physiological processes by means of which E.C.T. exerts the effects described on confusional states among other psychoses, we have as yet little knowledge. It is of interest, however, that some authors (Delay and Maillard, 1946; Delay, 1946) have described a fall in temperature and blood urea and a decrease in leucocytosis during the treatment of acute delirious states with E.C.T. Moreover, it is known from the work of Richter and his associates (Richter and Dawson, 1948; Dawson and Richter, 1950) among others, that there are dramatic, though transient alterations in the biochemistry of the brain following the administration of an electric shock to the head in animals. The most striking and sustained physiological changes known, however, are those to be observed in the E.E.G., and it has been suggested (Roth, 1951, 1952) that the very slow and simple electrical rhythm imposed on the brain by E.C.T. acts with a selective severity upon the engrams subserving behaviour patterns not as yet integrated into the mental apparatus of the individual.

The non-specificity of convulsive treatments should make us cautious in drawing inferences, as Ewald and Haddenbrock (1942) have done for schizophrenia, about the aetiology of the mental disorders in which they are effective. The wide range of conditions in which convulsive treatments have an application rather underlines our ignorance of the nature of the specific causes of such conditions as schizophrenia and manic-depressive psychosis, and lends urgency to the quest for their identification.

Summary.

1. An account is given of eight cases of mental disorder with clouding of consciousness, in which electroplexy was successfully used, and the literature dealing with the use of E.C.T. in organic psychoses is reviewed.

2. Our experience confirms that of other authors; E.C.T. is a safe and effective treatment in acute confusional psychoses with clouding of consciousness if the physical illness that may have precipitated the condition has subsided or has been eliminated by treatment. In some cases clouding of consciousness and constitutional disturbance suggest a toxic or infective cause, but none may be identified even after detailed investigation; if the patient's mental state gives cause for concern E.C.T. is fully justified, and has either an enduring or a temporary therapeutic effect.

3. The theoretical implications of the findings for the problem of the mode of action of E.C.T. are discussed.

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