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ELECTRIC SHOCK TREATMENT OF INVOLUTIONAL MELANCHOLIA

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I History and Review of the Literature

From the dim past, psychotic patients have been subjected to various forms of treatment with the object of creating a shock to their nervous system. Many of these methods have been barbarous in the extreme. More recent methods of shock therapy include the use of insulin, metrazol, and other pharmacologic drugs not as successful as these. Of recent developments, convulsions induced electrically are the best, it seems, and the electric shock method for the treatment of involitional melancholia is the therapy used popularly now.

EARLY EXPERIMENTS AND USE

The development of both pharmacologic shock therapy and the early use of electroshock was for one purpose only; namely, treatment of schizophrenia. L. von Meduna as quoted by Impastato (1942), refers to a group of investigators who noticed that schizophrenia and epilepsy are distinctly antagonistic; i.e., mutually exclusive. Typical epileptic seizures are extremely rare in schizophrenia, and several cases had been reported in which the psychosis terminated with the

onset of an epileptic process. Suspecting therefore that an artificially produced attack of epilepsy might benefit a schizophrenic patient, Meduna attempted to produce such attacks in a series of schizophrenic patients by means of camphor or cardiazol injections. Meduna reported "encouraging results" in 10 of 26 patients; three cases of only temporary improvement; and in 13 cases no effect was observed. Meduna claimed to have "proved conclusively" the existence of antagonism between schizophrenia and epilepsy.

Following this early use of shock therapy, the work of Cerletti and Bini (1938) which they did in 1937 is next in importance. These men were the first investigators to use electric shock therapy. Schuëlter, as quoted by Sheply (1939), in 1937 noted improvement in two cases of hysteria, four anxiety states, and three depressed patients as well as in schizophrenics treated with cardiazol. Other men, meanwhile were treating depressed states with poly camphosulphonates in non-shock doses, (Montussut and Lemare, 1935). They found that many depressive symptoms in mild cases disappeared, but that true depressives were not helped. Low (1938) et al reported on 16 patients with

manic depressive psychoses. Five of these were in the manic phase, nine depressed, and two in the involuntional period. Five of these patients got well. Then investigators (Giorgio Sogliani, 1939) in Germany took up work with electric shock. From Germany, early experiments extended to Britain and the United States. In 1939 Bennett mentions other investigators who at that time had confirmed the value of shock therapy in terminating severe depression psychoses. He quotes Verstacten, who reported favorable results in three depressive cases. Goldstein, Dombrowsky, et al (1941) included one depressive and three manic patients in a report of theirs on schizophrenia. Three manic states out of seven and two depressive cases were reported cured out of the same number of patients, (Kay, 1940). Madler, quoted by Bennett (1939) reported a 70% "improvement" in 61 depressed patients; and Bennett mentions many other investigators who have reported favorable results treating depressive and melancholic patients. Among those mentioned here are Winn, Serka, Cook, and Young and Young.

EARLY EXPERIMENTS WITH DEPRESSIONS

After failure in 1937 with insulin, A. E. Bennett (1939) was one of the first investigators to show encouraging results in the treatment of states of depression with metrazol convulsion therapy. He said then that 90% of the severe depression psychoses, especially involuntional melancholia, clear up in three to four weeks after six to eight shocks. In spite of this work, little information was found in the literature concerning the application of convulsion therapy in psychoses other than those of the schizophrenic type up until 1941 when more experimentation was done. In 1942 and 1943 it was clear to all observers that manic depression psychosis and involuntional melancholia were the two types which responded best to electric shock therapy. It had been clear to Bennett in 1939 that such was the case.

In 1940, investigators began to realize the definite advantages that electric shock had over pharmacologic methods. Muller (1938) wrote of the early work of Cerletti and Bini, and he added individual observations of his own for the application and the management of patients given treatments. Kalinowsky and Barrera (1940) stated that they had

used electric shock for schizophrenia or depression; especially the agitated depressions. They showed figures to indicate that the treatment was at least partially specific for manic depressive psychoses. Erlangen as cited by Bennett (1940) tells of his experience. He used convulsive therapy primarily for schizophrenia, but also experimented with eight manic depressives and seven patients with involuntional melancholia. The author states that "all responded favorably to treatment". In 1943, Fitzgerald summarized previous work in his article, "Experiences in the Treatment of Depressive States by Electrically Induced Convulsions". From this time on, it may be seen that electro-shock has been considered almost specific in the treatment of depressive psychoses and melancholia.

EARLY CLINICAL EXPERIENCE

The early use and clinical experience using electric shock was crude and varied. The methods for introducing the shock, the threshold of the amount of electricity a patient could tolerate, the sequella, complications, and ultimate results were not well known.

Gerletti and Bini as quoted by Impastato (1942)

published a method in 1938 which they discovered of inducing convulsions by electric shock. They had tested their apparatus, first on dogs, then on pigs, and finally they felt ready to use it on man. This they did, using for their subject an old schizophrenic in April 1938. Bini constructed an apparatus which governed the amount of volts and the length of time for the shock. The first attempts as cited by Kalinowsky (1942) were unsuccessful because the voltage applied was too small. Early use prescribed the induction of a so called "petit mal" attack by the application of 60 to 70 volts. It was soon discovered, however, that a very strong response to a convulsion with its severe vasomotor and other brain changes was necessary to bring about therapeutic results. Kalinowsky (1942) prescribed the use of a petit mal attack followed in five minutes by a greater convulsion using 60 to 110 volts and 300 to 600 milliamperes. The length of time for the application of the current was 1/10 to 15/100 of a second. He recommended three shocks per week for a course of eight to ten treatments in involuntional melancholia.

All early apparatus resembled that described by Sheply (1939). It consisted of two independent

electrical units. . The first was a low voltage DC current suitable for measuring the patient's head resistance. The second was capable of applying the treatment itself along with the expected results in the way of a major electro-fit. Since these early descriptions are not as well standardized as are later ones, I shall devote space for more modern concepts on the application and results of shock therapy later in this paper.

It was seen early in the experimental stage that this new electrical method for inducing convulsions was better than the old pharmacologic method because of two main reasons. First, the method is technically simpler and cleaner than IV injection of large amounts of fluid. Second, there is an immediate loss of consciousness which spares the patient any recollection of the application, and reduces refusal of treatment. It can be stated without further elaboration that both of these points were great drawbacks in using the pharmacologic methods.

II Introductory Discussion Of True Involitional Melancholia

There have been whole works written on the

subject of involuntional melancholia, and it is not my purpose to cover the subject completely here. However, it will be necessary to review the subject briefly so that we can refer to the discussion later in this paper while presenting the results and treatment and prognosis of the various forms of melancholia. For our purpose, two papers by Palmer, Hastings and Sherman (1938 and 1941) will be reviewed first. These men working at the University of Pennsylvania began their study in September 1935 at the suggestion of E. A. Strecher. They have covered well the subject of the "involuntional melancholia process", as they call it.

ETIOLOGIC AGENTS

Three main factors are seen as etiologic agents in involuntional melancholia. These are prominent personality traits, or the so called prepsychotic personality; the precipitating situation which takes the form of some psychic traumata; and definite organic changes which occur at the change of life.

PREPSYCHOTIC PERSONALITY

Generally it is seen that the involuntional personality from its earliest formative phase reveals a quality of rigidity, inelasticity or unadaptivity

which predisposes it to make poor or faulty adjustments to the transitions of the involitional period. It is noted that the personality maintains an even horizontal line with no cyclic changes in mood, as is often seen in manic depressive disorders. During youth, the patient with involitional melancholia most often has been an unusually guarded introvert. Also, these people with potential involitional melancholia have imposed many restrictions on themselves; have carefully guarded their instinctual life to the point of fanaticism, so that they follow a stern, unbending moral code which no person could hope to follow. They are generally pathologically inhibited, scrupulously meticulous about trifles, chronically worrisome, and their life is guided into a narrow, affectless mood which could at best only stifle the free play of personality. It is interesting to note that these limitations of personality not only lead to the development of involitional melancholia, but their degree determines the prognosis of the disorder. It can be stated here that the obsessive traits in the personality make-up lead to a very poor prognosis. Likewise, sexual maladjustment, which is so predominant in these personality types leads to a poor prognosis. The

general personality make-up is summed up by Palmer et al (1941) in this manner; "Introverted personality, strong conscious repression, obsessional character, and sexual maladjustment were the predominant character difficulties in both men and women". They state other factors as sadomasochism, hyper-religiousness, and a chronic disordered menstrual life as being contributory factors also. It is known that involuntional melancholia represents one phase of a life-long biologic process; hence it can be seen that the fixed personality make-up is truly a prepsychotic stage to the eventual great change.

PSYCHIC TRAUMATA

The patient with an involuntional melancholia will place the blame for his downfall on some psychological state or definite trauma which occurred during the involuntional period. Palmer and Sherman (1938) quote the figures of Mabron, Brew, and Henderson and Gillespie. These show well that of the precipitating factors, the psychotic causes were listed as from roughly 50 to 70%. Psychosomatic causes were listed as from 17 to 26% of the patients, and somatic causes were given credit as the precipitating factor by from 6 to 38% of the patients in different groups.

Many of the psychotic factors precipitating the actual breakdown, are traced to the fact that the person with an involuntional melancholia has a personality type that predisposes to the development of great psychic upheavals. As mentioned before, the rigidity of the personality make-up drives the person into pathologic reaction formations at various stages of his career and prepares the way for the development of his psychosis at the crucial era of transition into the late middle years. It is theorized that when the individual encounters at last the numerous traumata of the involuntional years, he breaks down into an actual psychosis.

The major difficulties that face the patient at this time represent the culmination of life difficulties, failing health, diminished vitality, the enforced relinquishing of more vigorous activities, loss of financial productiveness, a restriction of the sphere of personal influence and power, and the loss of a spouse or close friends. Pearson and MacCurdy are quoted by Palmer (1941) as students of the character type in patients with involuntional melancholia. They have found deep castration complexes in the make-up of each person studied; and they add further that money

and sexual potency are the special subjects which cause obsessional anxieties. It is now thought that these factors here mentioned are the real important precipitating blows that cause the breakdown. An etiology on an organic basis, the idea that was indeed very popular in early investigation and treatment, is now being dropped.

ORGANIC CHANGES

However, it behooves us to make mention of these organic features which were given in earlier days as the out and out cause of involuntional melancholia. For example here, Werner, Hoctor, and Ault (1941) still cling to the theory that involuntional melancholia is an exaggerated form of the "climacteric syndrome". They claim that a certain type of psychosis occurs in cases of hyperthyroidism, hypothyroidism, and pituitary and gonadal imbalance. They cite as proof of this, the personality changes which are seen during a pregnancy. It is true that the number one organic change witnessed at this time takes the form of an endocrine disturbance, atrophy of the thyroid, pituitary, ovarian or testicular glands with a subsequent great decrease in their secretions, has and is

still being given as the main etiology for involuntional changes in the mental picture. Again, quoting Werner et al (1941), they have shown that of 69 patients having involuntional melancholia, treatment with estrone led to "social adjustment" in 88.2% of the cases. Most men now agree with Wittson (1941) who says that many organic changes are undoubtedly present during the involuntional period; however, the use of estrogens as a cure for these symptoms is no good. This, he concludes, would tend to disprove the theory that hyposecretion of many hormonal glands causes the melancholia. Because the cures attributed to estrogens now vary from zero to 100%, I am inclined to agree with the majority here, and support the prepsychotic personality etiologic theory rather than the estrogen idea. It is doubtful that other presenile changes such as beginning arteriosclerosis cause involuntional melancholia symptoms, because these changes cause other fairly well defined syndromes.

TYPES OF INVOLUTIONAL MELANCHOLIA

There are at present, several distinct types of involuntional melancholia. In the classification of mental disorders approved by the American Psychiatric

Association, the term "involutional psychosis" denotes a group including melancholia, paranoid types, and other types. The group is a broad, and obviously a somewhat indeterminate one, and opinions as to the proper classification of individual cases have been various. Even now some authors do not agree with this classification of the American Psychiatric Association. In 1907 Drefus, as quoted by Malamund (1941), advanced the view that the involutional melancholias belonged to the category of the manic depressive psychosis. We find at present, some textbooks that still advance this point of view, as Strecker and Ebaugh (1943). This tends to confuse the picture a great deal, and shifts the emphasis away from the problems that are specific to the involution. However, the majority of the present day men working with Involutional Melancholia lay stress on the pre-psychotic personality types, the precipitating situation during the climacterium, the actual menopausal symptoms, and the fact that these patients have had no history of familial mental trouble or previous mental upsets themselves. In general, most writers differentiate true involutional melancholia from manic depressive psychosis only for the purpose of prognostic

values, hence it was difficult to find many writers who did this.

DEPRESSIVE MELANCHOLIA

The depressive melancholias are the most common types of melancholia. They are those individuals whose life has always been very rigid; the description that was given before while describing prepsychotic personalities. Strecker and Ebaugh (1943) point out that the outward appearance of these patients shows a composite of a depression combined with an apprehensive anxious effect and considerable psychomotor agitation. Common findings show hypochondriacal and delusional trends. The attitude and general behavior is dominated by the depressive-apprehensive effect. This is expressed in the facies and the posture of the patient. Some degree of motor activity varying from restlessness to actual agitation with suicidal attempts is not uncommon. Strecker (1943) found in 20% of the patients with involuntional melancholia there were catatonic symptoms, as fixed attitudes, catalepsy, negativism, stereotopy, grimacing, mannerisms, automatic movements, refusal of food, and retention of urine and feces. Prout and Boucier

(1940) note that the most common presenting symptoms in the depressed melancholics fall under these five classifications: depression, agitation, anxiety, confusion, and personality changes. Usually there is poverty of thought with monotonous and repetitive speech. The affect and mood is an admixture of apprehension and depression. There may be wide range of emotional reactions including irritability, anger, inadequacy, pessimism, sarcasm and ironical witticisms. This is the main picture that the depressed involuntional melancholia patient presents.

PARANOID MELANCHOLIA

The second group of involuntional melancholics is the so-called paranoid group. This group is fortunately much smaller than that of the depressed type; fortunately, since the prognosis in these cases is more severe. Noyce (1944) says that although they never were previously psychotic, nearly all such persons will be found to have been ones whose prepsychotic personalities were characterized by defensive patterns. Strecker and Ebaugh (1943) point out that in addition to the rigid personality of the depressed melancholic, the life pattern of one who develops an involuntional

paranoid psychosis has an underlying sense of insecurity which shows up as a timid, seclusive, pious and prudish personality. Usually he has been critical of others, inclined to blame others for his failures, and has seen slights where none were intended. He is regarded by associates as obstinate in opinion, jealous, unforgiving, secretive, unhappy, dissatisfied, and suspicious. These characteristics supported his personality until the involitional period when, with added burdens of the climacterium, they were no longer adequate, and more extreme defensive measures as seen in the paranoid psychosis had to be set up. These take the form of delusions, misinterpretations, hallucinations, withdrawal, and confusions with a general distortion of reality.

These paranoid melancholias usually show up later in life than do the depressive types, and the prognosis is less favorable than in melancholia.

A COMPOSITE FORM

Only a mention will be given the so called composite form of melancholia. Little is said in the literature about these cases other than to list them in the types given treatment. Presumably this is a

form which cannot be classified as strictly depressive or paranoid. The prognosis is also less favorable than it is in the depressive forms.

III The Nature Of The Electric Shock Treatment

- Present Status -

The present day technic for the introduction of the electric shock is well standardized. Generally, the machine for electric convulsion therapy is based essentially on Bini's original design - a machine described previously. This consists of a stop watch attachment for time regulation to fractions of a second and a device for measuring and regulating current. Alternating current with a frequency of fifty to sixty cycles is used. A circuit with a potentiometer is used to measure the head resistance which varies from 200 to several thousand ohms - and the stimulating current causes a drop in head resistance. These are the essentials of present-day apparatus described by Kalinowsky (1944) and others.

APPARATUS

The type of electrodes now in use are several. Large electrodes five centimeters in diameter made of

metal strips on rubber mounted on large metal disks are popular. These are mounted on a large forceps-like grip that is applied to the patient's head. More recently, Heath and Norman (1946) in Philadelphia have been experimenting with small electrodes eight mm. in diameter, instead of the conventional five cm. They claim many advantages over use of the large electrodes. The temples are swabbed with alcohol and saline solution to remove grease and replace it with a conducting solution, (Hemphill and Walter (1941). Other authors use a special contact paste. However, the use of saline and alcohol solution is adequate.

DOSE AND SPACING OF TREATMENTS

The dose and spacing of treatments is now fairly well standardized as five to ten treatments for involutional melancholia. Kalinowsky (1944) points out that because patients in this group show severe disorientation, under treatment, it is preferable to apply three treatments only during the first week; and to give additional treatment at wider intervals. Early investigators as Low (1938) and Bennett (1939) were instrumental in setting up this dose for melancholia. Bennett (1945) suggests the use of "booster shots"

after the patients seem cured to prevent the remissions which are rather common. Kalinowsky (1944), however, believes that if the patient is cured completely, he stays cured, and no further therapy is necessary. This view is also held by Fox, Sogliani, and others quoted by Bennett (1945) who believe that the remission rate is due to improper diagnosis; i.e., the attempt to treat a patient who has a paranoid depression rather than one with an involutional change.

So far as the actual voltage goes, Kalinowsky and Hoch (1944) have reviewed the literature on this subject. They claim the potential differences of 70 to 130 volts for 0.1 to 0.5 seconds will usually produce a convulsion. The actual current passing during the treatment was found to range between 200 and 1600 milliamperes. The prescribed course to follow, as outlined by these two men is simple. Eighty volts is the recommended dose for a new male patient, while 100 volts is usually needed as a starter in females. The length of the shock is set arbitrarily at 0.2 seconds. These writers explain that if the preceding dose is not sufficient to produce a convulsion, a second stimulus of 120 volts is applied; and, if necessary, even a third shock with longer time exposure may be used.

MANAGEMENT OF THE PATIENT DURING AND AFTER THE SHOCK

Many authors who were early experimenters with electric shock devoted much careful writing to the management of the patient during and after his shock treatment. In a similar way much observation was given by investigators to the phases that a patient will go through while having a seizure. As one reads this literature now, he is inclined to skip over it as unimportant, because we now have methods of control to regulate the severity of a seizure.

As a general rule, early technic follows this description given by Impastato (1942) who worked with Cerletti and Bini. "During flexion, the patient is held down by the shoulders and hips to prevent acute flexion of the spine, to prevent fractures of vertebrae. Following the spell, the bed is lowered so that the patient can breath better and be in a safer position." The author goes on to explain how the patient is confused, startled and assaultive as he emerges from a coma. He advises, "It is therefore prudent to keep a safe distance from the patient to avoid an unpleasant reaction."

At the present time, these "unpleasant reactions" are avoided with the use of barbiturates, and

fracture complications are lessened since the introduction of curare; however, there are still many general nursing aids which must be followed. These include, among other things, the giving of only a light breakfast before the morning treatment; voiding of the bladder and emptying of the bowels; removal of dentures, hairpins and the like, and the loosening of clothing before treatment. A. E. Bennett (1940 and 1941) has recommended the use of curare and sodium pentothol, the principle gains, and dosage of which will be given later in this paper. After the convulsion, the patient is turned on his side and allowed to sleep. He is given close surveillance by a nurse to watch carefully his post-convulsive reactions. Mouth gags are used during the convulsion to prevent tongue bite, and care must be taken when inserting these to keep the lips from getting between the gag and the teeth. Immediately after the treatment, attention should be given to the patient's respiration. If needed, artificial respiration can be given until regular respiration is assured.

THE SELECTION OF THE PATIENTS FOR TREATMENTS

The selection of the patients for treatment

should include a very careful history, and an even more careful physical examination. Palmer and Sherman (1938) and Fitzgerald (1943) say the history of the prepsychotic personality type with present melancholic symptoms, a history of no previous attacks, and the story of increased symptoms at the time of mid-life due to a precipitating situation, is generally a very good indication of true involuntional melancholia. Fitzgerald (1943) warns that one must exclude the non-delusional cases of depression. He also states that cases with melancholic traits in prepsychotic personality types have a better prognosis than do cases in which manic traits are exhibited.

PHYSICAL EXAMINATION

A composite of the views of several authors is presented with the opinions on what the physical examination should stress and why it should include these features. The main authors who have written most on this subject are Fitzgerald (1943), Fox (1940), Kalinowsky (1944), Cook (1943), Smith et al (1942), and Samuel (1943). The physical examination of a patient preparatory to electric shock treatments should, of course, be a complete one. Special stress

should be laid on the heart. Even though cardiac complications are quite rare in electric shock therapy, an electrocardiogram should be run to determine the extent, if any, of cardiac pathology. Kalinowsky (1944) quotes the experiences of Ebaugh et al who had two cases of cardiac complications in which the cardiologist had previously approved electric convulsive therapy on the basis of an electrocardiogram. From this, he claims that it is impossible to foresee many cardiac complications. Other authors however, stress the fact that coronary disease with occlusion is a definite contraindication, and an electrocardiogram should be used to find this. Any heart enlargement is considered a definite contraindication to electroshock therapy, and because of this a chest plate is recommended by most authors. This will rule out severe heart conditions, aortic aneurysm, tuberculosis, and other respiratory pathology, and it will also aid in finding any generalized bone pathology. Whereas some authors recommend the use of chest plates only when patients actually complain of cough or show clinical signs of respiratory disease, other men say that chest films are essential. In all cases showing fibrotic tuberculous foci, even if they appear quiescent,

electric shock treatments should be given only if reasonable hope of cure by this method can be entertained.

A neurological examination should be done on all patients. An electroencephalogram is a test which is not indispensable; however, it is useful to know the brain wave pattern prior to the institution of treatment. Brain wave patterns and the neurological examination are both useful in ruling out the presence of brain tumors.

X-rays of bones, especially the spine, are recommended by Smith et al (1942) and Samuel (1943) particularly, and by many other authors too. These are needed to demonstrate the presence or absence of bone pathology. Of greatest importance here, it seems, is the decalcification of bone observed in senility. Whereas osteoarthritic changes were once thought to predispose to fractures, it has been found that in the large joints it does not add to the risk of fracture unless these changes are accompanied by senile decalcification. In addition to the fact that lateral X-rays of the spine will show pathologic change before the shock treatments are instituted, these films will

act as a control in post treatment films to check on compression fractures. Other pathologic conditions which should be corrected before electric convulsion therapy are generalized passive congestion due to heart difficulty, and malnutrition with inanition.

In general, so far as precluding electric convulsion therapy goes, all pathological conditions should be established prior to the convulsive treatments, and the risks of possible complications should be carefully weighed against the risks of the psychosis. It is truly unjustified to shift the decision for or against treatment on to a cardiologist or other specialist who has had no experience in electric convulsion therapy. The decision and the results, to quote Kalinowsky and Hoch (1944), rest squarely on the psychiatrist.

HOSPITAL MANAGEMENT AND PSYCHOTHERAPY GIVEN PATIENTS

The hospital management and the psychotherapy given patients with involuntional melancholia during the course of their electric convulsive therapy, is very important. We have already discussed the handling of the patient medically during the actual treatment,

in the section concerning the nature of application of the treatment. Following the treatment, the patient may become irrational and assaultive. This has been reduced somewhat, however, in recent years by using barbiturates. Other methods including actual restraint, may be needed to prevent the patient from injuring himself. It is common for patients to have a period of amnesia immediately after their shock. No patient should be allowed to get up until he is quiet and able to answer simple questions satisfactorily. Symptomatic treatment is given headache, dizziness, and nausea, all of which are often present. Bennett and Wilbur (1944) make special reference to the fact that the patients should have adequate nutrition, since many of them have refused to eat during the development of their psychosis. They recommend sub shock insulin in some cases to stimulate the appetite. Other authors prescribe the use of vitamins and iron to combat malnutrition.

Bennett (1944), Jones (1945), Fitzgerald (1943), and Kalinowsky and Hoch (1944), are all emphatic in their recommendations for the use of psychotherapy in conjunction with convulsive treatments. Bennett (1944)

claims this is a very important adjunct to prevent relapse. It is feasible that this is true, theoretically speaking, since most writers now give more credit to the psychologic origin of melancholia than they give to the organic mechanisms taking place at this time. Levy and Grinker (1943) advocate a reassuring and loving attitude of the psychiatrist during the treatments. Kalinowsky and Hoch (1944) claim little benefit from interviews given while the shock therapy is being instituted. Bennett (1944) cautions that psychotherapy is best used after the course of treatments because then the patient will be able to remember the interviews. During the actual period of the shock treatments, the patient is in so much confusion that little is gained. Probably the best solution to this problem is to use occupational therapy during the course of the shock treatments; and then to add psychotherapy to help the patient grasp the ground that he has gained and hold himself there. I agree with Wolfe (1945) who says that one should observe the patients for two weeks following convulsive treatment, giving them a combination of occupational and recreational therapy along with psychotherapy.

IV Complications And Contraindications Of Shock Therapy

Previous reference has been made to the fact that certain conditions predispose to complications which occur during electric shock treatment. It is also true that some of these prove quite serious and even fatal. However, at the present time it seems that too often there is an over emphasis laid on these complications as contraindications to electric shock treatment. When the results of electric convulsive therapy are discussed, it will become apparent that convulsive treatments are surely the best, if not the only, cure now offered for true involitional melancholia. The study of the complications has aided however in striving for their prevention, and the literature proves that since the institution of preventive measures, these complications have dropped considerably in occurrence.

FRACTURES AND DISLOCATIONS

The most frequent complications of shock therapy are fractures and dislocations. The first reports to come out on fractures following convulsion therapy

were in 1938. These were concerned with metrazol treatments. Then, in 1939, an exaggerated condition seemed to exist where some authors reported 50% or more of their metrazol convulsion cases to have spinal fractures alone. Polatin et al (1939) reported a 43% incidence of spinal fractures in a series of 51 patients treated. Bennett and Fitzpatrick, as quoted by Samuel (1943), are reported to have found 47% spinal fractures in a series of similarly treated cases. Later figures by Samuel (1943) himself show the incidence to be decreasing greatly. He claims only 2.8% of his 420 patients treated by electrical convulsion suffered spinal injury. Kolb and Vogel (1942) showed a figure of 9 per 1,000 as the incidence of mechanical injuries following electric shock. There are several features of interest in explaining why these figures are so contradictory. One is the fact that many investigators were overzealous in their attempts to show fractures in 1938 and 1939. Another is that metrazol convulsive therapy seems to have a much higher incidence of fracture than does electric convulsion therapy. This is explained on the basis that electric shock treatments have an onset of muscle contraction slower than that in metrazol

treatments; this is described by Bennett and Wilbur (1944) as a "less lightning-like contracture". The third main feature in fracture reduction is the fact that new methods for the prevention of these complications have been instituted. The sites of fracture are chiefly the spine and the femoral neck. Others occur in the humerus and in the pelvis. Theoretically, any bone is subject to fracture. The most common dislocation is that of the jaw.

Fractures of the spine are the most common injury sustained, but as pointed out by Kalinowsky and Hoch (1944), there is a great disproportion between the clinical importance of the type of vertebral fractures occurring in convulsion therapy, and the emphasis given them in medical literature. That their clinical importance is not very great is evidenced by the fact that only after several years of application of convulsive therapy were they recognized. The commonest site for vertebral fractures to occur according to Samuel (1943) is in the upper dorsal spine. It is believed that this area of the spine becomes subjected to converging muscular forces acting from above and below, and that, here too, the extensor muscles of the back have their weakest development. The commonest

injury is a crush-type fracture. Kalinowsky and Hoch (1944) quote Eaton and Sommers who point out that the pedicals, laminae, or the transverse or spinous processes are never involved. Only the body of the vertebra is fractured: the most common one being the fifth dorsal because of its inherent weakness. Samuel (1943) describes how carefully one has to measure the bodies of the vertebrae to find fracture evidence in some cases. It is doubtful that these sub-clinical types will cause much trouble. Palmer (1939) classifies spinal fractures into three groups: First, fractures of the anterior tip of the vertebral body; Second, minor degrees of compression of the vertebral body; Third, complete collapse of the vertebral body. Palmer states also that because the compression type fractures can be prevented, he does not believe this complication should be regarded as a contraindication to shock therapy. As will be pointed out later, curare has greatly lessened the fractures and dislocations all over the body from electric convulsion therapy.

Other fractures and dislocations referred to above, are those of the arm, leg and jaw. Little is found in the literature concerning these; hence, no

elaboration is possible. The only literature on these subjects concerns one or two cases at a time, and one gets the impression that they are very rare. Likewise, only scattered articles are found on sprains and muscle tears. The most common complication, dislocation of the jaw, is reduced easily while the patient is yet conscious.

CARDIAC PATHOLOGY

Cardiovascular pathology is considered by most men a major contraindication to electric convulsion therapy; however, it is now known generally that it is very difficult to predict the possibility of cardiac or vascular complications. Already quoted is the experience of one investigator (Ebaugh et al 1943) who had deaths in two patients with previous normal electrocardiograms. Jetter (1944) reports circulatory failure in patients with chronic endocarditis and myocarditis due to the muscle exertion during the convulsion, which he says causes cardiac dilatation. Kalinowsky and Hoch (1944) quote other workers, chiefly European, who have reported cardiac complications. Hadorn, they say, attributes this phenomenon to central vagal stimulation. He recommends atropine as a

prophylactic to prevent this. Kalinowsky and Hoch quote Muller and agree with his findings. He says subconvulsive responses lead more frequently to cardiac arrest than do actual convulsions. In general, no observer has found definite proof of cardiac pathology being caused by electric convulsion therapy, and because of this, cardiovascular complications are somewhat slighted by most investigators.

OTHER GENERALIZED COMPLICATIONS

The most interest to other complications has been directed toward chest pathology, especially tuberculosis. Bulley and Green (1941) noted that with metrazol convulsion therapy, patients who developed tuberculosis immediately following treatment were considerably older than the 20 to 30 age incidence which is usually seen in this disease. They advised therefore, a careful study of the pulmonary status of patients over 40. However, the general trend now seems to be that because the possibility of dissemination of a latent tuberculosis process in patients treated with electric convulsive therapy is less common than it was with metrazol, all patients, even those who are institutionalized with tuberculosis should be given shock

treatments. Their reasoning here is sound: shock treatments get the patients over their psychosis, which helps their general nutrition since they eat again. Other respiratory complications center around the apnea which is caused in a convulsion. This is central in origin. Kalinowsky and Hoch (1944) consider this the main danger of shock treatment. They recommend the routine use of artificial respiration after each treatment. Other methods are the turning of the head from one side to the other, spraying the ear with cold water, and the use of hyperventilation with oxygen prior to the treatment.

As pointed out by Ziskind et al (1942), damage to the brain is unknown because the patient improves with each shock. There is a theory here that the shock does the same thing to the brain that a pre-frontal lobotomy does; namely, it destroys tracts to and from the frontal lobes. This theory is expounded by Heath and Norman (1946) who have experimented with the effects the shock has on the brain by stimulating small discrete areas in the cortex with small electrodes. There have been many observations of neurological and physiological manifestations of electric convulsive therapy on the patient, but these theories

and ideas are all conflicting. The most important question is whether the shock treatments will cause spontaneous epilepsy. This was settled in the minds of Pacella and Barrera (1942) when they found that no patient with a normal electroencephalogram developed any seizure. Of lesser importance are those patients with abdominal complications. Some of these are: ruptured diverticulitis, bleeding from a gastric ulcer, both of which were seen by Ziegler (1942). Cases of glaucoma and severe arthritis have been reported as being precipitated by shock therapy.

In summary, there are physical risks in the use of electric convulsive therapy to be sure, but as pointed out by Evans (1943), one has to expect a certain mortality, just as one expects mortality with surgical procedures. Evans has treated cardiac patients, malnourished cases, one patient with osteoporosis, and many others with severe contraindications getting very few serious complications. The fatalities from electric shock therapy are very low. Kolb and Vogel (1942) in their survey of all American hospitals found a death rate of 0.06% for electric convulsive therapy. This rate is certainly not prohibitive for the use of shock therapy when it is needed.

SUBSTANCES AND METHODS WHICH PREVENT COMPLICATIONS

The main substance now used to combat fractures, the chief complication of shock therapy, is curare. This drug was first used in 1939 and 1940 by A. E. Bennett. Further experimentation was carried out in 1940 and 1941, and the standardization of the drug was done during this experimentation by A. R. McIntyre as quoted by Bennett (1941). This drug is now used the world over, but before its indoctrination, attempts were made with many other methods, most of which were unsatisfactory.

An early method used in the prevention of traumatic fracture as described by Bennett (1941) was a hyperextensive procedure of the spine under orthopedic guidance, restraining the pelvis, the hips and the shoulders to prevent flexion spasma of the spine. Another procedure was the introduction of the shock after first inducing insulin coma, on the theory that the insulin shock produced hypotonia sufficient to prevent fracture complications. Another measure was preliminary upbuilding of the boney skeleton, by using calcium or viosterol. This too failed. Experimentation with drugs causing a less severe shock, namely tutin, picrotexin, and coriamytrin was not successful because none

of these drugs would produce seizures sufficiently mild to prevent fractures. Nitrogen inhalation to reduce the severity of the convulsion advocated by Alexander and Himwich as quoted by Bennett (1941) was also a failure.

Hansa and Bennett (1939) recommended the use of spinal anesthesia to lower the incidence of fractures during a convulsion. They advocated the use of 10 mg. of pontocaine hydrochloride dissolved in 4 cc. of spinal fluid, injected one to one-half hour before the shock therapy was instituted. This procedure did paralyze the lower extremities, but it was abandoned because it left the upper extremities unprotected, and also it was not easy to administer.

BARBITURATES

The use of barbiturates as sodium amytal and sodium pentothal was next advocated. Brody (1945) reviewed the use of these drugs and came to the following conclusions. He claimed that sodium amytal and sodium pentothal injected intravenously produced a rapid narcosis which facilitates handling of the resistive or apprehensive patient. Of the two, he uses sodium pentothal because of its quicker action

and brief duration which makes it more desirable for this use. These drugs both produce an excellent narcosis but their relaxing effect on the body is poor and the danger of traumatic fracture remains. Both drugs raise the threshold of the shock, inhibit the speed of the current, and shorten the duration of the convulsion. Impastato et al (1943) use this to produce a modified convulsion in order to reduce the danger of fracture. However, this practice is not generally used. Brody (1945) concludes that sodium pentothal can be used advantageously in conjunction with curare; but, used alone, it is not much aid.

CURARE

The use of curare was popularized by A. E. Bennett (1941) who, working with A. R. McIntyre, not only applied the drug for its relaxing effect in electro fits, but also standardized it for use in other procedures. Curare interrupts the neuromuscular mechanism and makes possible a convulsion with a weak peripheral action and reduces surgical trauma to nothing. Curare may cause a sense of weakness and choking, however, which is sometimes alarming to the patient.

This is compensated for by the amnesia produced by the convulsion, and may be covered up well using sodium pentothal as Jones and Pleasants (1943) point out. Usually, the intercostal muscles and the diaphragm are relatively insensative to the drug, and respiratory paralysis occurs only after the other muscles have first been effected. The technic of curarization preliminary to convulsive shock therapy has been well outlined by Bennett (1940 and 1941). He gives an intravenous injection of an aqueous solution of intercostrin, (Squibb) the commercial preparation of curare used, containing 10 mg. of active curare principle per cc., over a period of one to two minutes. The dosage used is one cc. per 15 to 20 pounds of body weight. Females take less than males, older patients less than younger ones. Usually 5 to 8 cc. are needed for a 100 to 150 pound female, and 8 to 12 cc. are needed for a 150 to 200 pound male. If injected rapidly, the dose will be lessened. One to two minutes after the injection, physiologic curarization will be seen. The object is not to produce complete paralysis, but to soften the contraction to prevent complications. Muscles are effected in this order: first, the fine fast moving muscles of the eyes; then, those of the throat;

and finally the neck, the extremities, and the diaphragm. When the patient is barely able to lift the head or the legs, the peak reaction has occurred, and the electric shock is applied. Curare has then broken the path for nerve impulses, and the jack-knifing effect caused by the contraction of peripheral muscles is greatly lessened. This has reduced fractures, of course.

Many investigators are hesitant to use curare in all cases, as does Bennett (1941), because of the side effects produced. Respiratory embarrassment is serious, say Kalinowsky and Hoch (1944), and they point out too that the effect on cardiac action may be serious. Jones and Pleasants (1943) show one case in which curare caused cardiac embarrassment, according to the electrocardiogram, and they go on to say that curare, by its depressing effect on the accessory muscles of respiration, could still further prolong any apneic period to the heart muscle with impairment in function, at a time when the work of the heart is already considerably decreased. On the other hand, some investigators actually recommend it for use in cardiac patients to cover the blow of the shock. Bennett (1941) advises close surveillance of the

patient following curare, with artificial respiration to aid in helping to carry over the period when the drug is still in effect. Most men say that curare is contraindicated in severe cases of cardiac disease only. Kalinowsky and Hoch (1944) and Cook (1944) recommend it for use only in patients who have had previous fractures or those who are known to have bone pathology such as osteoporosis, Paget's disease, and the like. Bennett (1941) prescribes curare routinely and his view on this subject is upheld by Jones and Pleasants (1943) who use it as a routine measure in the New Jersey State Hospital. Wolfe (1945) who wrote on the complications and results of over one thousand patients treated with convulsive shock, stated that no orthopedic fractures or no other accidents have occurred when curare has been used. He counteracts respiratory difficulty with prostigmine.

Probably the best use of curare is in conjunction with one of the barbiturates, preferably sodium pentothol, a technic outlined by Brody (1945). It is especially useful in resistive patients, and in patients in whom the curarization effect causes anxiety. He prescribes 300 mg. of sodium pentothal in a 2.5% solution injected intravenously in 30 seconds followed

by 0.45 curare per pound body weight injected in one minute. This is followed in four minutes by the shock. Both narcosis and relaxation are produced; a result which thus far is as close to the ideal situation as is possible. Bennett concludes his views on the use of curare in an article written in 1941 with this statement. "If a continued safe supply of curare, or a safe synthetic curare-like drug can be obtained, it will soon be illegitimate to administer convulsive shock therapy without this safeguard or shock absorber against frequent and serious traumatic accidents".

V Clinical Results And Prognosis

As mentioned previously, it was not until several years after the introduction of convulsive therapy that its usefulness was recognized in the treatment of the affective psychoses. The first psychiatrist to stress this fact was Bennett (1939). Since electric shock therapy has now supplanted pharmacologic treatments, results here given are for the electrically induced convulsions as well as the earlier metrazol convulsions. Results do not vary much so far as the prognosis of the mental disease is concerned. In the affective psychoses, involutional melancholia offers the most

spectacular results to shock therapy, second only to the depressed phase of manic-depressive psychoses. Because the paranoid type of involuntional melancholia has a much poorer prognosis than does the depressed form, they are separated in this section devoted to the clinical results. Roughly 90% "improvement" in depressed melancholics was noted by Bennett when he started his treatments in 1940. This figure has been confirmed by Kalinowsky (1942 and 1944). In fact, all depressed affective psychoses have approximately a 90% improvement rate. The paranoid melancholia cases, as will be shown later, do not respond favorably at all.

It is interesting, before any data is presented on the prognosis of involuntional melancholia treated with electric shock, to present a control series. This shows the general prognosis in involuntional melancholia that has had no physical treatment. Drobnes (1943) shows figures from a group of 51 involuntional psychoses which demonstrated this well. He wrote only of patients who were "suffering from a functional psychosis occurring for the first time in individuals between the ages of 40 and 60". He found 68 patients or 0.8% of the total admissions to the Norwich State

Hospital, which fell into this class. Of these 68, 17 or 25%, died during the period of investigation. These deaths were due usually to extreme states of malnutrition in which patients were found upon admission. He says that they died soon afterwards. He notes that tuberculosis was likewise a frequent finding. Of the 51 patients remaining, 23 or 45% recovered or improved sufficiently enough to make a satisfactory adjustment outside; 28 patients, or 55%, remained unimproved or worse. Generally, Drobnes (1943) found that men seem to have a better chance for recovery than do women. He states other factors, such as a high incidence of divorce, separated and unmarried individuals in the unimproved group. A 70% introverted personality type predominates in the improved group.

DEPRESSED MELANCHOLICS

It is now well known that figures for the prognosis of involutional melancholia patients who are treated with electric shock are much higher than those of Drobnes'. The fatalities he spoke of, due to malnutrition mostly, can be avoided if the patient is treated as early as possible in his illness. This usually returns his appetite which helps him from a

nutritive standpoint. Bennett (1945) and others counteract inanition with vitamin and mineral therapy. The fatalities resulting from electric shock when compared to those which occur when no treatment is given, certainly are arguments in favor of electric convulsion therapy. Kalinowsky and Hoch (1944) reported no fatalities in 2000 cases treated; and, to quote Kolb and Vogel (1942) again, they found a death rate of only 0.06% for electric convulsion therapy in a survey of all American hospitals.

The prognosis for the depressed melancholics will be given first. As stated above, these patients show an excellent result from treatment; a general overall figure of 90% being reported as "improved" after electric shock. This figure is now regarded as too high by most men. The necessary number of treatments for cure is from five to ten. Failures are due usually to an admixture of paranoid or other schizophrenic symptoms. Palmer and Sherman (1941) report a 73% recovery or social remission in metrazol convulsions. At this time, they said that this was the most successful treatment thus far developed. From these early figures, we turn to those published in 1945 by Wolfe. These were the results of convulsive shock

therapy in over 1000 patients of the Oregon State Hospital. Of these 1000, over 700 patients were treated with electric shock. One hundred thirteen were classed as involuntional psychoses, 84 were depressed melancholics, and 29 were paranoid melancholics. He reported two deaths attributable to acute circulatory collapse during the electric shock treatments. This figure of about 2% is much higher than the average. His results for six month cures are higher than those calculated immediately after the treatments, due to spontaneous remissions, he says. Generally speaking, Wolfe found a 60% good result in patients after six months in the depressed melancholics. Alexander (1946) quotes these figures on involuntional melancholics treated with electric shock therapy. Of 32 patients, 31 were depressed melancholics, and one was a paranoid type patient. He compared results for the prognosis of patients immediately after the treatments had been given, against those figures of patients examined 30 days after the last treatment. His results disagree strikingly with those of Wolfe (1945). Alexander (1946) found that electric convulsion therapy was successful in 84% of all cases of involuntional melancholia, in results tabulated in patients immediately

after the series of treatments. Thirty days later, in this same series, successful cures were reported as 41%. Kerman (1945) advocates the use of booster treatments to prevent relapses following the shock therapy. With maintenance doses of two electric shocks per week, he reports approximately 80% "total improvement" in patients with involuntional melancholia, and a 97% total "partial improvement". Three per cent failed to recover completely.

In pure involuntional melancholia, the prognosis does not seem to be influenced by the duration of the illness, which in untreated cases of involuntional depression may be much longer than in manic depression psychoses. Therefore, the selection of such cases from the chronic wards of mental institutions produces gratifying results. When shock therapy was first instituted, this was a method used to reduce the hospital population considerably. It can be seen that it still stands uppermost in importance for treating these cases. Bennett (1944) has shown that old patients can be successfully treated with favorable results. He had one series of gratifying patients in which the oldest case was 83. He claims that so far as sustained recoveries go, they are even better in this older age

group. Kalinowsky (1942) adds that the presence of arteriosclerotic or senile brain changes in a patient with an affective psychosis does not exclude the chances for favorable results. In general then, it may be said that in the depression-type of involutional melancholia, successful results as quoted by several authors vary all the way from 50 to 90%; the percentage here of improved cases seems to depend entirely on how strictly the investigator defines the terms "improved", "successful results", "social remissions", and so on. Electric convulsive therapy definitely helps these patients to gain an earlier remission from their symptoms. It often prevents death from secondary causes attributable to the malnutrition of the patient; and when it is combined with booster shocks and psychotherapy, it results in prolonged cures. Because of these main reasons, the prognosis is regarded as excellent, and is of course, the treatment of choice in these patients.

PARANOID TYPE OF INVOLUTIONAL MELANCHOLIA

As stated before, the paranoid type of involutional melancholia has much less favorable prognosis than does the depressed type. Noyes (1944) and

Strecker and Ebaugh (1943) have attributed this to a different personality make-up in these patients. Defensive patterns and paranoid reactions are seen in the early personality patterns of these cases. Malzberg (1943) has quoted a 22.4% recovery rate with a 36.4% "much improved" figure being given for the cases which he has treated. Kalinowsky (1942) found 43.7% of his cases much improved. This figure is much higher than most. Wolfe (1945) quotes figures for his paranoid melancholia cases as 15 to 20% with a good recovery, and 30 to 50% are listed as having a poor recovery. Another interesting feature as pointed out by Kalinowsky and Hoch (1944), Wolfe (1945) and others, is the fact that whereas the depressive melancholias take from five to ten treatments to cure them, the paranoid type melancholia cases take up to twenty treatments. Also, the duration of the illness has a definite effect on the prognosis; i.e., cases with longer histories will have a poorer prognosis.

The third classification of involuntional melancholia as outlined previously, is the so-called composite form. This classification is fluid and not well understood; hence, most authors give no figures on the prognosis at all. Wolfe (1945) has quoted a

40% good recovery for this type, and a 35% poor recovery rate. His monograph was the only one found to list such a series with the prognosis.

VI Summary And Conclusions

The electric shock treatment of involuntional melancholia has been outlined in this thesis. It has not been the purpose here to show the neurological or physiological changes which the shocks may have on the human organism, but rather, to show the effect of electric convulsive therapy on the depressed personality of the individual. A review of early experimentation with electric convulsion therapy has been given. A discussion of the etiology and the types of involuntional melancholia is offered so that the reader may construct some rationale for using this type of therapy. The nature and the application of the treatment, the amount of electricity administered, and the management of the patient during hospitalization have been outlined. The complications and contraindications of treatment have been enumerated so that they may be watched for, and thus prevented. The most common methods for counteracting complications and unwanted sequellae have been reviewed; namely, the careful

selection and the examination of patients prior to treatments, the use of curare to prevent fractures and dislocation, and the use of barbiturates to lessen anxiety on the part of the patient. The clinical results and the prognosis of the patients treated with electric shock have been compared with a control group of patients which received no physical therapy for this psychosis. This was done to show the superiority of electric convulsion therapy over other methods.

From the evidence presented, the following conclusions may be drawn:

Electric convulsion therapy is the best treatment offered at the present writing for involuntional melancholia. Figures have been quoted by various authors showing a 50 to 90% recovery rate for this psychosis; the variation seems to be due to the interpretation of the clinical picture of recovery.

For the depression type of involuntional melancholia, electric shock treatments may be regarded as specific. The prognosis for the paranoid type and the composite forms of melancholia is not as good.

Fractures and dislocations, the most common complications of the shock treatments, may be

controlled by the use of curare which gives the patient an artificial myesthesia gravis and prevents severe muscular contractions during the shock.

The combined use of curare plus sodium pentothal is recommended for near-ideal results in the prevention of all unwanted sequelae.

The standard treatment consists of from five to ten separate applications of the shock. The dose to produce the fits varies from 60 to 110 volts, and 300 to 600 milliamperes. The time of the shock is 1/10 to 15/100 of a second.

In less than ten years, electric convulsion therapy has followed the complete cycle that all new treatments must take before their adoption. It was acclaimed universally at the onset; then, discredited because of the complications of the treatment; and now, the use of shock therapy in involutional melancholia is recognized as the closest therapy afforded to the ideal or most perfect treatment possible.

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