The Journal of
NERVOUS and
MENTAL DISEASE

VOL. 136, NO. 1
January, 1963
SERIAL NO. 962

THE APPLICATION OF SERIAL ANGIOGRAPHY TO DIAGNOSIS OF THE SMALLEST CEREBRAL ANGIOMATOUS MALFORMATIONS

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INTRODUCTION

The various phases of the cerebral circulation may be determined in definitive intervals of time by means of serial angiography. Statements can then be made concerning the rapidity of flow of the contrast medium through the brain. In contrast to other procedures which determine only the general circulation time, serial angiography permits the demonstration of local disturbances in the cerebral circulation. The latter is of extreme importance for diagnosis of the type of organic process in question. For example, certain intracranial tumors can be differentiated by their specific hemodynamic peculiarities and their differential effect on the total circulation of the brain (9). Comprehensive presentation of these disturbances, as determined by serial angiography, was recently published by Tönnis and Schiefer (12). These authors reported that, with their technique, a diagnosis of the type of cerebral tumor was possible in 76 per cent of cases of glioblastoma multiforme, 29.5 per cent of astrocytomas, 34.5 per cent of oligodendrogliomas, in 38 per cent of meningiomas and, for metastatic cerebral disease, 40 per cent.

Angiography has always been of special importance in the diagnosis of cerebral angiomatous malformations. In the case of arterio-venous angiomas (arterio-venous aneurysms or fistulae), serial angiography may define not only the site and extent of the malformation, but also its location, origin, the number of arterial streams which flow into it and the number of venous channels which flow out. Information can also be obtained about the rapidity of circulation through the angioma and at the same time the commonly associated reduction of blood flow in the surrounding tissue. In the case of saccular aneurysms, the demonstration of the time at which the individual cerebral blood vessels are filled is of great significance as a guide to the operative approach. On the other hand, in these same cases, there are frequently multiple vascular anomalies all of which may not be demonstrable on the same phase of the angiogram. Thus Scott and Seaman (9) in 1951 published a serial angiogram in which a saccular aneurysm of the first portion of the anterior cerebral artery was demonstrated in the early arterial phase. In a later phase, a second, separate arteriovenous angioma in the parietal-occipital area was demonstrable, which was not visible on the earlier film.

A subgroup can be culled out from the group of cerebral vascular malformations which have already been adequately investigated from the pathologic-anatomic and clinical standpoints. This subgroup has

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THE ROLE OF FEAR IN ELECTROCONVULSIVE TREATMENT

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Various workers have speculated that the positive effect of ECT might be attributable less to the direct physical action of the treatment itself on the brain than to its indirect and subtle psychological influences: fear of treatment (noted clinically by many investigators), gratification of guilt and punishment needs, ego-threat leading to greater attention to reality, death-rebirth fantasies, and the like.

Most investigations into the role of psychological factors have been limited to evaluating the role of possible memory defect. However, Fisher *et al.* (3) attempted to study the more elusive psychological factors by intensive interviewing and projective psychological testing of 30 psychotic patients before and after a course of ECT, and reported that patients who showed clinical improvement were likely to be those who had manifested only moderate (conscious and unconscious) fear of the treatment, whereas patients who showed extreme degrees of fear were not as likely to improve. Gallinek (4), on the other hand, evaluating a series of 100 patients (mostly depressive), concluded that fear of ECT was "neither hindrance nor help toward recovery."

In the course of a previous study (2) the extent to which fear of ECT was present in a sample of 96 patients was assessed, which, together with its relationship to treatment outcome, is the subject matter of this report.

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METHOD

Subjects (*Ss*) were 96 male psychiatric patients from the Veterans Administration Neuropsychiatric Hospital (Brentwood) in Los Angeles, for whom ECT was clinically indicated. The sample included 66 with chronic schizophrenic reactions and 30 with schizoaffective disorders or depressive reactions. Most patients had illnesses characterized by intermittent exacerbations and remissions. Ages ranged from 18 to 68 years (Mean = 35). No *Ss* had had shock treatment within the preceding nine months, but 40 had had ECT before that with beneficial results. (Patients with a history of no improvement with ECT in the past were not considered suitable candidates for the treatment.)

Ss were randomly assigned to one of five treatment groups: regular ECT, ECT with anectine, ECT with pentothal, pentothal alone or nitrous oxide alone.[3] All believed they were receiving "shock" treatment. A variety of psychiatric, psychological, physiological and biochemical measurements were made on each *S* before and one month after a course of 20 ECT or simulated ECT, given at the rate of three a week.[4]

Assessment of degree of fear was made from ratings based on clinical interviewing and observations, and quantitative and qualitative analyses of responses to two psychological tests.

The four clinical ratings reflected atti-

[3] In the three ECT groups 40 per cent had had previous ECT, compared with 47 per cent in the two simulated shock groups. A chi-square test of this difference yielded a value of .62 which is not statistically significant. As reported earlier (1), previous ECT was not related to the outcome of treatment.

[4] More detailed descriptions of subjects, method, and results were reported earlier (2).

TABLE 1

Mean Levels and Variability in Level of Improvement

	Units of Improvement		
	Mean	Range	Theoretical Maximum Range of Scale
Lorr Scale	14	−27 to 54	−62 to 62
Psychiatric judgment	2	−3 to 7	−9 to 9
Psychological tests	0.49	−2 to 2	−2 to 2

tude toward and fear of ECT that was directly expressed verbally, and attitude toward and fear of ECT that was expressed in non-verbal behavior. Ratings were made before treatment, at two points during treatment, and two and four weeks after treatment.

The psychological tests given before and four weeks after treatment consisted of the Thematic Apperception Test developed by Fisher[5] and a Word-Chain Association Test[6] containing stimulus words designed to reveal the amount of fear about and the meaning of the treatment to *S*.

Patients were judged as improved or not improved on the basis of three different methods of measuring improvement and a composite measure: the total deviation score on the Lorr Psychiatric Rating Scale (5) based on both clinical interview and ward observation; the score on a ten-point scale of psychopathology and impairment based on psychiatric judgment; and the rating on a five-point scale based on a global evaluation of an extensive battery of psychological tests (not including the Fisher TAT or Word-Chain Association Test).

Each of the particular instruments used represents a major approach to the critical problem of quantifying the outcome of treatment: a standardized quantitative scale consisting of ratings on many individual items of behavior based on interview and ward observation; a global psychiatric evaluation; and a global evaluation of psychological test changes. The correlations of the three sets of measurements with each other were: Lorr Scale and psychiatric evaluation, .53; Lorr scale and psychological tests, .61; psychiatric evaluation and psychological tests, .50. The size of the correlations indicates that there was substantial agreement, yet there was enough disagreement to suggest that the three techniques were emphasizing different aspects of functioning in which improvement could occur. To obtain the most representative and reliable measure, each patient was also classified as improved or not improved according to whether he scored above or below the mean level of improvement on at least two of the three scales. It happened that the mean of this distribution coincided with the median, so that the improved category includes the half classified most improved, and the not improved category includes the half classified least improved, or worse. Table 1 shows for each scale the mean level and range of ratings of improvement. It may be noted that the mean level for each scale might be described as "slightly improved," but there is considerable variability in treatment outcome.

RESULTS

THE PREVALENCE OF FEAR

Both in clinical interview and in projective responses, a high frequency of fear signs was apparent in *S*s, whether treated by actual or simulated shock, even though

[5] The Fisher TAT consisted of stories related by the patient in response to each of ten pictures depicting an ambiguous but possibly fearful situation. Each story was rated with respect to the safety or danger depicted in the story, the degree of optimism or pessimism expressed about the story outcome, and any mention of death..

[6] The Word-Chain Association Test consisted of 25 stimulus words representing seven categories: neutral (paper, book); directly related to ECT (doctor, treatment, shock, convulsions, electrode); distantly related to ECT (table, temple, bite, needle, gag, brain); fear (fear, dread, kill); guilt (punish, guilt, remorse, purify, sin); birth (birth, rejuvenation); others (sad, forget). The subject was asked to produce a chain of four associations to each word.

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s, a high frequency of fear
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it was felt that the instruments failed to bring out the true intensity and bases of the fear. Most *Ss* had been newly admitted to the acute intensive treatment ward. Only a small fraction of the patients on this ward received ECT, so that their fears were more likely to have been related to their own experiences than to any effect of the social climate of the ward. This variable, however, was not tested.

The level of fear noted clinically remained relatively constant throughout the series of treatments. The typical *S* (described from mean values on the clinical ratings) expressed his apprehension about the treatment in terms such as "I'm just afraid of shock," and "I'm afraid something terrible will happen to me from the shock treatment." He revealed his attitude verbally in expressions such as "Oh, well," or "I have a sore throat today and shouldn't take treatment." He appeared somewhat nervous or jittery and shuffled along on his way to the treatment; as the course of treatment progressed, he showed more reluctance and had to be persuaded to keep moving.

Reactions ranged from strong denial of fear, such as "I'm glad to take it," to fear of total mental destruction or death, such as "Shock will destroy my mind," "My heart will stop," "I will die." Many *Ss* expressed fears of being electrocuted, such as one who said, "It's like being burned to a crisp." Often the *S* revealed under questioning a high degree of fear after first denying any fear, such as a depressed *S* who admitted "I'm scared to death every time. I never know if I'm going to come out of it or not." A very psychotic *S* described ECT as "like crossing the river."

Many of the individual associations to the Word-Chain Association Test made it clear that a high level of fear was present, such as:

Shock: "Well done—willing—scared, that's about all I know, you're afraid when you have shock—torture—treatment, treatment" "please don't—treatment—unhappiness," "Unsure—something you don't look for—doctor—treatment—stop—treatment—treatment—electricity—treatment—terror—help."

Treatment: "Depend on—shock—insulin—carbon dioxide—death."

Electrode: "Hot stuff—death—just death—I don't know, just scared."

A response of "fear" was given on 15 occasions to the stimulus word "shock," a response of "harm" on 13 occasions, and a response of "death" on five occasions. The stimulus words "treatment," "convulsions," "doctor" and "electrode" brought out only a few of these associations.

The mean reaction times for "shock" words were higher than for "neutral" words. The stimulus words thought to be distantly related to shock apparently were just about as neutral to our patients as the control words. Again there appeared to be no change in the level of fear at the end of treatment.

It was hypothesized that changes in the Fisher TAT stories would reflect the *S*'s unconscious attitudes toward ECT, since the treatment was the most significant intervening event in his life. Surprisingly little change, however, was found in the tone of the stories. Before treatment 34 per cent of the stories depicted threatening situations, compared with 31 per cent after treatment. Only 15 per cent before treatment and seven per cent after treatment specified pessimistic outcomes. Possibly any increase in fear related to ECT was masked by a decrease in level of general fearfulness, since many *Ss* improved at least slightly during time of treatment.

Whether the patient received actual or simulated shock was not related to any of the fear measures, either before or after treatment. The correlation coefficients ranged from −.005 to .18.

Those *Ss* who had had previous ECT (as noted before, about equally divided between the shock and simulated shock

TABLE 2

Correlations of Fear Ratings with Improvement and with Previous ECT

	Measures of Improvement				Previous ECT
	Composite Improvement	Lorr Scale	Psychiatric Evaluations	Psychological Tests	
Verbal fear of ECT	−.11	−.13	−.08	−.06	.15
Change in verbal fear	.08	−.24*	−.08	−.05	−.25*
Non-verbal fear of ECT	−.03	−.09	−.18	−.01	.02
Change in non-verbal fear	−.04	−.18	−.12	.09	.04
Verbal attitude toward fear	−.01	−.08	−.10	−.13	.01
Change in verbal attitude	−.06	−.19	−.05	.11	−.12
Non-verbal attitude toward ECT	−.08	.05	−.29†	−.12	.24*
Change in non-verbal attitude	−.04	.02	−.14	.08	−.32†
Fear of ECT: psychological tests	.02	−.10	.04	.06	.03
Change in fear: psychological tests	.02	−.05	−.04	−.13	.08
Expectation from ECT: psychological tests	.03	−.11	−.10	−.21*	.04
Change in expectation from ECT: psychological tests	−.14	.17	.16	.29*	.02

* $p < .05$.
† $p < .01$.

groups), showed essentially the same degree of fear as did patients who had never experienced ECT. As Table 2 shows, *Ss* who had already experienced ECT showed a tendency to have an initially higher level of fear expressed in their non-verbalized attitude toward the treatment, compared with those who had never had ECT, but their fears decreased more with treatment, as expressed both verbally and non-verbally. While the correlation coefficients are statistically significant, they are nevertheless quite low. Ideally, patients with previous ECT should have been excluded from the study. Inspection of the data on the 56 patients with no previous ECT, however, suggests that this variable did not seriously contaminate the results.

FEAR AND IMPROVEMENT

Results based on the series of 96 cases shows no relationship between the degree of fear or expectation of death from treatment and subsequent improvement. None of the clinical ratings nor global psychological evaluations of fear showed any meaningful relationship to improvement. (See Table 2.) Of the 36 correlations between fear indices and the three methods of measuring improvement, four coefficients reached the .20 value required for statistical significance at the five per cent level. By chance alone one would expect at least two apparently significant values. As can be seen in Table 2, no fear measure was significantly related to more than one of the three methods of rating improvement, nor was any fear measure related to the more reliable composite estimate of improvement.

A detailed analysis was made of the responses to the Word-Chain Association Test, which, it was hoped, would tap more unconscious attitudes toward ECT than might be elicited by the clinical interviews. The test yielded no evidence for a relationship between fear and improvement with ECT.[7]

[7] Analyses were made of reaction times, total times for associating the chain of four words, rejections, other formal signs of disturbance, such as blocking or leaving the field, and signs of disturbance in the content of responses. The only statistically significant relationships found had to do with signs of general disturbance not specifically related to shock treatment. *Ss* who improved increased in frequency or rejection of words (chi-

nd with Previous ECT

Improvement		Previous ECT
Psychiatric Evaluations	Psychological Tests	
−.08	−.06	.15
−.08	−.05	−.25*
−.18	−.01	.02
−.12	.09	.04
−.10	−.13	.01
−.05	.11	−.12
−.29†	−.12	.24*
−.14	.08	−.32†
.04	.06	.03
−.04	−.13	.08
−.10	−.21*	.04
.16	.29*	.02

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Following Fisher's usage, it was assumed that any change in TAT stories after treatment might reflect the influence of the intervening shock treatment. In contrast to the work of Fisher and his associates, no relationship between the story ratings and improvement was found in this study.

Thus our results stand in contrast to the work of Fisher but support and extend the observation of Gallinek, who found no significant relationship between fear of shock and improvement with treatment. No evidence was found to link improvement following shock treatment with expressed notions of guilt and punishment or death-rebirth fantasies. That such fantasies may still be operating and having an effect at unconscious levels was not completely eliminated by this study.

SUMMARY

The role of fear in electroconvulsive treatment was studied in a group of 96 hospitalized male veteran psychiatric patients given a course of real or simulated ECT.

No evidence was found for any relationship between degree of fear of ECT (as determined from analysis of ratings based on clinical interview and observation and of responses to two projective tests: the Word-Chain Association Test and the Fisher Thematic Apperception Test) and psychiatric improvement with the treatment. Nor was there any evidence linking improvement with notions of guilt and punishment or death-rebirth fantasies.

Some fear of ECT was found to be universal in the patients, the level of fear remaining relatively constant from beginning to end of treatment.

square = 8.05, $df = 2$, $p = .02$) and decreased in other formal signs of disturbance (chi-square = 7.83, $df = 2$, $p = .02$) shown to the entire list of 25 words, including words not having to do with shock treatment. These results are consistent with accepted interpretation of the different signs of disturbance, *i.e.*, that the ability to reject a disturbing stimulus implies a higher level of ego strength than to respond in a disturbed manner.

REFERENCES

1. Brill, N. Q., Crumpton, E., Eiduson, S., Grayson, H. M. and Hellman, L. I., Predictive and concomitant variables related to improvement with actual and simulated ECT. A.M.A. Arch. Gen. Psychiat., **1**: 263–272, 1959.
2. Brill, N. Q., Crumpton, E., Eiduson, S., Grayson, H. M., Hellman, L. I. and Richards, R. A. Relative effectiveness of various components of electroconvulsive therapy. A.M.A. Arch. Neurol. Psychiat., **81**: 627–635, 1959.
3. Fisher, S., Fisher, R. and Hilkevitch, A. The conscious and unconscious attitudes of psychiatric patients toward electric shock treatment. J. Nerv. Ment. Dis., **118**: 144–152, 1953.
4. Gallinek, A. Fear and anxiety in the course of electroshock therapy. Amer. J. Psychiat., **113**: 428–434, 1956.
5. Lorr, M. Multidimensional scale for rating psychiatric patients: Hospital form. V. A. Technical Bulletin No. 10-507, Washington, D. C., 1953.