

CUTIS ANSERINA: ITS SIGNIFICANCE IN THE PROGNOSIS OF MENTAL ILLNESS*

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THE autonomic nervous system activity that has been observed to accompany grand mal epilepsy does not occur consistently with the seizures produced by electric convulsive treatment. The dilated pupils, flushing, lacrimation and gooseflesh which appear during the tonic spasm of the electrically induced seizure, and which are the outward manifestations of the autonomic storm within, are often not readily observed because of their transience; they begin to fade almost as soon as they appear and may be gone with the onset of the clonic spasm. Different patients exhibit them in different degrees and the same individual may show changes in the amount of autonomic response over a course of treatments.

Studies of autonomic activity have suggested a relationship between subjects' physiological patterns and their psychological status and response to psychiatric treatment. Funkenstein, Greenblatt and Solomon, for example, observing the changes in blood pressure that followed injections of epinephrine and methacholine, have reported distinct patterns of blood pressure change on the part of patients who benefited from electric shock treatments (1). Gellhorn has presented evidence from blood sugar and other studies that improvement in psychoses is associated with an increased autonomic responsiveness (2).

The authors of the present paper were in search of a simple physical sign that might, like these laboratory procedures, reflect autonomic activity and be a convenient and reliable measure for clinical use. It had been observed that the gooseflesh response to electrically induced seizures varied greatly from patient to patient, some showing marked or moderate eruptions and others little or no discernible response. We were interested in whether this variation in gooseflesh was a result of variations in the method of administering

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the seizure or of some factor inherent in the subject, such as age, sex, diagnosis or prognosis. The discovery of significant correlations between the extent of gooseflesh response and diagnosis or prognosis might provide psychiatric practice with a useful clinical sign.

SUBJECTS AND METHODS

The subjects were forty-three in-patients of the Massachusetts Mental Health Center (Boston Psychopathic Hospital) referred for electric convulsive treatment. Ten received diagnoses of schizophrenia, and thirty-three others diagnoses of affective disorder, including involuntional depressions, psychotic and neurotic depressive reactions and manic-depressive psychoses of both manic and depressive type. All the diagnoses were made before treatment.

Observations were collected on twenty-six additional patients referred for shock treatment from the out-patient department. No follow-up data were gathered on this group, for only the relationship between gooseflesh response and age was studied.

Patients were treated in the morning, two or three times a week, before breakfast, after sitting fifteen to twenty minutes in the waiting room. All treatments were administered with the Reiter Electrostimulator Model RC 47c. Subjects received full amperage for ten to fifteen seconds, until a tonic state was reached, and a much reduced amperage for the remaining thirty to forty seconds.

All the patients were given .0009 Gm. atropine subcutaneously one-half hour before treatment and pentothal sodium (.2-.3 Gm.) and succinylcholine chloride (.025-.050 Gm.) intravenously immediately before applying the electric shock. The current was applied one minute following completion of the succinylcholine injection. Patients also received positive pressure oxygen during the periods of apnoea before and after treatment.

The extent of gooseflesh response was rated during the period of tonic and clonic movements. One observer made all the ratings and used as the test area the upper chest, bounded by the nipples and outer ends of the two clavicles. Gooseflesh was graded on a 3-point scale, none (0), moderate (1) and marked (2). The rating was based on the maximum gooseflesh response observed during the fit.

Immediately after the course of treatments, each patient's psychiatrist was asked to rate the degree of the patient's improvement, little or none, moderate, or marked. The above data were then correlated with status of patient two months after treatment, whether still hospitalized or discharged.

RESULTS

Table I relates the mean gooseflesh responses for all subjects in the two diagnostic groups with status two months after the end of the treatment.

	Mean Responses of Those Discharged Within 2 Months After Treatment	Mean Responses of Those Not Discharged 2 Months After Treatment
All subjects	1.2 (30 subjects)	1.1 (13 subjects)
Affective disorders	1.2 (25)	0.6 (8)
Schizophrenic disorders	0.9 (5)	1.8 (5)

There is no statistically significant difference between the means of gooseflesh response when all the subjects' responses are averaged and the subjects divided into a favourable and unfavourable group as to outcome. When the subjects are separated by diagnosis, however, significant differences appear. It is apparent that among the patients with affective disorders those with the more favourable outcomes have larger mean gooseflesh responses (P less than $\cdot 01$). The opposite is true of the schizophrenic subjects. With these patients, a favourable outcome is associated with relatively small gooseflesh responses (P less than $\cdot 025$).

The subjects with the least favourable outcomes had the most extreme responses, in the case of the schizophrenic patients the greatest and in the case of the depressed the smallest.

Table II shows the relationship between the magnitude of gooseflesh response and improvement as rated just after each course of treatments. The trend of the results with the affective illnesses is similar to that of Table I, but the differences are not statistically significant.

TABLE II

	Mean Responses of Those With Improvement Rated as:		
	Marked	Moderate	Little or None
Affective disorders	1.1	1.0	0.8
Schizophrenic disorders	1.3	1.8	1.5

Table III presents the data on a larger group of subjects (for some of whom no information on outcome was available), relating age and gooseflesh response.

TABLE III

Age (by decades)	Mean Gooseflesh Responses	Numbers of Subjects
20-30 years	1.7	7
30-40 years	1.1	8
40-50 years	1.3	12
50-60 years	0.9	16
60-70 years	0.8	20
70-75 years	0.4	6

It is obvious that the magnitude of gooseflesh response, as measured in this study, falls with increasing age. Are the differences between the groups presented in Table I the result of difference in age? Table IV shows the mean ages of the affective and schizophrenic groups divided as to outcome at 2 months.

TABLE IV

	Mean Age of Those Discharged Within 2 Months (years)	Mean Age of Those Not Discharged Within 2 Months (years)
Affective disorders	51.8	50.1
Schizophrenic disorders	43.8	25.0

The age difference in the affective disorders is not significant. The tendency of gooseflesh responses to fall with age (Table III) probably does not therefore explain the relationship between response and clinical outcome found for this group (Table I). The age difference in the schizophrenic group, however, is significant (P less than $\cdot 01$) and may influence the relationship for schizophrenic subjects in Table I. It is also interesting that with the latter group outcome appeared to improve with advancing age.

A relationship between the *sex* of patients and the amount of gooseflesh response is apparent from Table V.

TABLE V

									Mean Gooseflesh Response
Males	..	..	..	..	..	..	..	..	1.4
Females	..	..	..	..	..	..	..	..	0.7

This highly significant relationship (P less than $\cdot 001$) is probably not a function of differences in the distribution of male and female patients among different age or diagnostic groups. No statistically significant correlations between the sex of the subjects and their age or diagnoses were found.

Is there a relationship between the sex of these patients and the outcome of treatment at two months? Can the differences noted in Table I be the result of differences in the distribution of the sexes among the groups? There are no significant differences in the numbers of men or women in the two outcome groups for the schizophrenic subjects but there are differences for the affective illnesses. The distribution of the sexes (of patients with affective illnesses) is shown in Table VI. These differences are significant at the $\cdot 05$ level.

TABLE VI

					Numbers Discharged Within 2 Months After Treatment	Numbers Not Discharged Within 2 Months
Males	..	..	..	..	19	3
Females	..	..	..	..	6	5

It then becomes necessary to determine if the gooseflesh responses of the affectively ill men and women, averaged independently, are related to outcome. These determinations are shown in Table VII.

TABLE VII

					Mean Responses of Those Discharged Within 2 Months After Treatment	Mean Responses of Those Not Discharged
Males	..	..	..	..	1.42	1.05
Females	..	..	..	..	0.6	0.4

The relationship between gooseflesh response and outcome of treatment in the affective disorders (Table I) now appears partly the result of differences in the distribution of the sexes among the groups. However, where correction is made for the sex factor (Table VII), there are still variations in gooseflesh responses that are related to outcome, especially among the male subjects.

Are differences in the dose levels of the modifying agents pentothal sodium

and succinylcholine chloride related to the differences in gooseflesh responses? Table VIII compares the dose levels of the modifying drugs in affectively ill patients for the two outcome groups.

TABLE VIII

	Mean Modifying Doses of Those Discharged in 2 Montns (Gm.)		Mean Modifying Doses of Those Not Discharged (Gm.)	
	Pentothal	Succinyl	Pentothal	Succinyl
Males .. .. .	.26	.032	.26	.028
Females .. .. .	.22	.032	.23	.030

Only in the case of succinylcholine chloride are there differences in dosage and, contrary to expectation, the group of subjects evidencing the largest gooseflesh responses received the larger amounts of muscle relaxant.

There were no significant changes in the magnitude of gooseflesh response with successive treatments.

DISCUSSION

Under natural conditions, gooseflesh or pilo-erection occurs in two circumstances: as the mechanism involved in conjunction with somatic and vascular musculature in the generation of heat, and as part of the visceral responses that we associate with emotion. The neo-cortical and rhinencephalic areas which subserve these activities discharge by way of connections to the hypothalamus and from the hypothalamus to the preganglionic centres of the brain stem and thoracolumbar cord. The impulses finally are transmitted to the *erectores pilorum* muscles themselves, in man slender bands of unstriped muscle connecting the root of the hair follicle below the subaceous gland to the epidermis.

The emotional significance of pilo-erection has been the common knowledge of poets and naturalists for centuries. The ghost of Hamlet's father had a tale he promised Hamlet would make:

"Thy knotted and combined locks to part,
And each particular hair to stand on end,
Like quills upon a fretful porpentine." (3)

Charles Darwin (4) had also observed the "fretful porpentine" and he described the erection of quills, spines and hairs in animals during states of emotional excitement. Interested in the appearance of gooseflesh in mental illness, he reported that bristling of the hair, "so common in the insane", is not always associated with terror, but most often seen in mania and melancholia. The report of a doctor's wife was cited; she predicted that a certain lady suffering from acute melancholia "will soon improve, for her hair is getting smooth; and I always notice that our patients get better whenever their hair ceases to be rough and unmanageable". With a man "now in the asylum", Darwin noted the observation that before the recurrence of each maniacal paroxysm "the hair rises up from his forehead like the mane of a Shetland pony". The appearance of vigorous autonomic activity in patients who recovered from such illnesses as mania and melancholia is in accord with our findings.

A decline in magnitude of gooseflesh responses with advancing age was another observation of the present study. The reasons for this are not clear. Blumberg, Cohen and Miller have reported that the extent of the hypotensive

response to methacoline in mental patients also changes with age, towards a pattern of the prognostically favourable type (5). This finding suggested that the favourable outcome of electric convulsive treatment with depressed patients was as much a function of their generally advanced age as it was of their having blood pressure responses of the favourable type. In contrast to this, the present study suggested that depressed patients who reacted favourably to electric convulsive treatments were those with larger gooseflesh responses, that is, responses more typical of younger subjects.

This was not the case with the schizophrenic subjects. The schizophrenic subjects who did well had smaller responses than those who did poorly. This difference between schizophrenic and depressed patients does not appear so striking, however, when it is noticed that it is *extreme* responses, great or small, that are associated with unfavourable outcomes. The schizophrenic subjects who showed the poorest results of treatment had the very greatest responses, as the depressed patients who did poorly had the very smallest. The subjects who did best, whether schizophrenic or depressed, had responses close to the mean of the entire group. It appears to be in this mean response range that electric convulsive treatment is most effective.

Males showed significantly more gooseflesh response than did females. The fact that more men responded favourably to treatment than did women is not the whole explanation, for when correction was made for the outcome of the treatment, there were still large differences in the magnitude of gooseflesh between the sexes. It may be that this is due to differences in the size or number of erector muscles in men and women.

Several investigators have presented evidence that the autonomic response to electric convulsive treatments increases with successive seizures. Gellhorn and Safford noted a change in blood-sugar reactions suggestive of increased autonomic activity with successive seizures (6), and Havens and associates have reported an increase in serum epinephrine response to shock treatment in the course of therapy (7). There was no evidence in the present study of any such change in autonomic responsiveness as reflected in the magnitude of observed gooseflesh.

The search for reliable physical and psychological signs in psychiatry has not generally been a fruitful one. The lack of adequate methods of measurement, great variations in the clinical material and the influence of the different situations in which observations are made have all worked to confound the investigator. The present study has not escaped these difficulties. The gooseflesh response is only roughly quantifiable and the method by which it has been elicited, electric convulsive treatment, is one of limited applicability. Certainly the finding reported here requires confirmation in additional subjects and with methods of eliciting the response safer and more convenient than the present method.

SUMMARY

In an effort to develop a prognostic sign useful to psychiatric practice, the gooseflesh response to electric convulsive treatment was observed in 43 hospitalized mental patients. The magnitude of the gooseflesh response was inversely related to the age of subjects and was greater in men than in women. Patients with affective illnesses evidenced a positive relationship between the magnitude of their gooseflesh responses and favourable outcomes of treatment.

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REFERENCES

1. FUNKENSTEIN, D. H., GREENBLATT, M., and SOLOMON, H. C., *J. Nerv. and Ment. Dis.*, 1948, **108**, 409.
2. GELLHORN, E., *Physiological Foundations of Neurology and Psychiatry*, 1953. Minneapolis: University of Minnesota Press.
3. *Hamlet*, Act I, Scene 5.
4. DARWIN, C., *The Expression of Emotions in Man and Animals*, 1896.
5. BLUMBERG, A. G., COHEN, L., and MILLER, J. S. A., *J. Hillside Hosp.*, 1956, **5**, 216.
6. GELLHORN, E., and SAFFORD, H., *Proc. Soc. Exp. Biol. and Med.*, 1948, **68**, 74.
7. HAVENS, L. L., ZILELI, M. S., DiMASCIO, A., BOLING, L., and GOLDFEIN, A., "Changes in catechol amine response to successive electric convulsive treatments". Submitted to *Journal of Mental Science*.