nished the patient's confidence in traditional methods of treatment.

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VESTIBULAR REACTIVITY IN SCHIZOPHRENIA AND ITS CORRELATION WITH THE EFFECTS OF NEUROLEPTICS

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By an accidental finding when the author practiced caloric test and found some of the chronic schizophrenic patients whose reactivity was completely absent while the non chronic schizophrenic patients were normally reactive. Reviewing the literature and finding that the results of caloric stimulation on schizophrenia were so fragmentary and in some respects contradictory, it seemed advisable to obtain first hand information on the possible changes of caloric reactivity in the schizophrenic group. It was decided to conduct the present study which was designed to test whether or not

1) Chronic and non-chronic schizophrenia might differ in caloric test.
2) Any relation with usage of neuroleptics.

Along with these explorations, the present study was also designed to investigate if the difference of caloric responses had any effect on the pharmacotherapy.

METHODOLOGY

Subjects: Fifty-four hospitalized schizophrenic patients served as subjects in which 20 patients were tested at Boston State Hospital (8 were from chronic ward while all the other 12 were from acute intake ward) and 34 patients at Taipei City Psychiatric Center in this investigation. Patients with defective ear drums and with a history of middle ear infection or similar ailments were

excluded. Otherwise, no selection was made. Technique: The nystagmic reaction to caloric stimulation was tested in the Fitzgerald and Hallpike method. The patient was placed in a bed with his head raised 30 degrees. The temperatures used were 30°C and 44°C. Each of these was allowed to flow into the external acoustic meatus from a reservoir for 40 seconds, during which period no less than 250 ml of water would flow. The effects were measured in terms of the time interval between the application of the stimulus and the end of the resulting nystagmus. (2) (3) (9). Each non response to caloric test patient should be repeated with the time interval of at least 2 days. On the other hand, the positive response patients should receive another test 13 weeks after the initial test or at the time when presence of neuroleptics induced extrapyramidal symptoms.

Clinical and Psychiatric Evaluation

These were measured only on the 34 patients at the T.C.P.C. and were designed on a blind basis.

1) The clinical impression of chronicity was made by the resident in charge.
2) Diagnostic Scale for Chronicity (D.S.C.) was rating 6 weeks after the initial caloric test from patient's record. (4) (5) (6) (7) (Table I)
3) Brief Psychiatric Rating Scale (B.P.R.S.) was completed at the beginning and at the end of 12 weeks or at the time of discharge from hospital by the same psychiatrist. All of the 34 patients in T.C.P.C. were in the same milieu and were on different kinds of neuroleptics; the dosage adjustment and drug selection were assigned depending on the clinical needs by the psychiatrist in charge.

RESULT

Twenty patients were tested at the B.S.H. Out of 12 patients from the acute intake ward, 11 patients showed positive while only 1 showed negative response to caloric stimulation. The remaining 8 patients from chronic ward showed negative or markedly reduced response. The differences were significant at $P < 0.005$ level (Table 1). Thirty-four patients were tested at the TCPC; out of 15 patients who were labelled as non-chronic schizophrenia by clinical impression of chronicity, 13 showed positive and only 2 showed negative response to caloric stimulation, while only 2 out of 19 chronic schizophrenia showed positive response to the test. The differences were again highly significant at $P < 0.005$ level (Table II). Analysis of D.S.C. also showed significant differences between caloric test positive and negative group at $P < 0.002$ level (Table III). These results of two different ways of measurement of chronicity indicate that the negative caloric response is related to the chronicity of schizophrenic illness.

The further B.P.R.S. evaluation revealed significant differences of mean change between positive and negative group at $P < 0.005$ level (Table IV). Three out of 13 positive response to caloric test patient developed definite drug induced extrapyramidal sign but repeated caloric tests were still reactive at that movement, except on patient whose caloric test became temporarily negative at the movement of occulogyric crises.

Table I

Caloric test for 54 schizophrenic patients

	Positive	Negative	Total
B.S.H.*			20
Acute Intake ward	11	1	12
Chronic Ward	0	8	8
T.C.P.H.**			34
Non chronic	13	2	15
Chronic	2	17	19
* $x^2 = 17.9$	N = 1		$P < 0.005$
** $x^2 = 17.9$	N = 1		$P < 0.005$

Table II

Diagnostic Scale for Schizophrenic Chronic Vs Non Chronic

Factor	Scale 0	1	2	3	4
1) Onset	more than 2 yrs.	6 mths–2 yrs.	1–6 month	< 1 month	Suddenly
2) Precipitating factor	None	mild	moderate	marked	Strongly
3) Married (also age factor)	None age 40	None 30–40	None 20–30	Some Problem < 20	yes Any age

4)	Schizophrenic Premorbid History	definite	moderate	mild	Very mild	Not Present
5)	Duration of illness	> 10 years	4 yr–10 yr.	2–4 yr	6 mths–2 yr	6 mths
6)	Presence of Previous episode	> 6 times or continue for 5 yrs.	4–6 continue for 2–5 yrs.	2–4	1–2	Not Present
7)	Length of present Hospitalization	>2 yrs.	6 mths–2 yr	2–6 mths	1–2 mths	< 1 month
8)	Age of onset	< 16	16–20	20–30	30–40	> 40
9)	Effective on treatment	None	mild	moderate	marked	dramatic
10)	Clinical impression of chronicity	Severe	moderately severe	moderate	mild	Not present

Table III

Result of Diagnostic Scale

Caloric	N	Score
Positive	15	25 ± 4.9
Negative	19	15 ± 5.6

* Maximum Score: 40

** $P < 0.002$

Table IV

Mean Change of Total B.P.R.S.

	CALORIC TEST	
	Positive	Negative
Case number	15	19
Initial Score	64.2	58.8
12 weeks after medication	29.87	46.85
mean change	46.85	11.95
% of improvement	74.33	29.29

$P < 0.005$

DISCUSSION

Before proceeding to discuss the results, certain errors of caloric test technique must be pointed out. In some cases in which the reactivity was very low only a few extremely weak movements of the eye could be observed, and it is questionable whether these could be counted as true nystagmic beats. Therefore, in instances in which the total reaction consisted 6 or less feeble or incomplete beats, the counts were negative. The main source of error in this study was in the measurement of time, it was therefore not possible to stop the watch at exactly the last nystagmic beat. However, in spite of these errors of technique, we only counted positive or negative. The data were reliable enough to demonstrate the important gross features of the reaction, either positive or negative response.

The striking evidence of negative response to caloric stimulation in chronic schizophrenia, seemed to indicate the relationship between the vestibular function and the chronicity of schizophrenic illness. In the literature, there were occasional reports on abnormality of vestibular function in schizophrenia 30 years ago. As early as 1921, Pekelsky reported 2 cases of catatonic schizophrenia in which there was a transitory absence of the nystagmus in response to vestibular stimulation. In 1940 Amgyal reported several papers on caloric test and concluded that in total group of schizophrenic patients vestibular reactivity was generally reduced with particular low responsibility. Claude, Joo olaimed that the reduction of vestibular response in schizophrenia is related to the duration of the illness rather than to the clinical type.

The results of the present study seemed to indicate the abnormality of vestibular reactivity in chronic schizophrenic group. The question arose, whether the result of negative response to Fitzerald and Hallpike caloric test indicated the labyrinth was dead, or by some reason not sensitive enough to produce nystagmus. We tested again for the 19 non-reactive patients with a stronger test, Barany mass caloric test (8) (9), by imigating cold water at 16.6°C, the irrigation was continued until nystagmus began. If no nystagmus ensued in about four minutes the labyrinth was considered dead. The result by this method, we found that all of the 19 patients showed reactive and the nystagmus started after 2 to 3 minutes of continued irrigation of water. It became more clear that in the chronic schizophrenic group the sensitivity of vestibular reactivity decreased.

The result of significant difference of B.P.R.S. changed in the same milieu between positive and negative groups indicating the significant correlation with the effects of neuroleptics. We could not find any change or vestibular Sensitivity during the time of neuroleptic-induced extrapyramidal sign. A follow-up study to find out any relation with the long-term usage of neuroleptics and the decrease of vestibular reactivity is indicated.

In discussing the mechanism and localization of the changes of vestibular reactivity, it is however impossible to determine which parts of the vestibular apparatus are responsible for this change in function in the present study. However it is a worthwhile and valuable method of Fitzgerald and Hallpike caloric test in predicting the prognosis and the effect of neuroleptics for schizophrenic patients.

SUMMARY

The vestibular reactivity to caloric stimulation in 54 schizophrenic patients has been studied at Boston State Hospital (B.S.H.) and Taipei City Psychiatric Center (T.C.P.C.).

In response to Fitzgerald & Hallpike caloric stimulation, the significant differences between the acute and the chronic schizophrenia were observed, and they were correlated with the therapeutic response of the neuroleptics.

Twenty patients were tested at the B.S.H. Out of 12 patients from the acute intake ward, 11 patients showed positive while only 1 showed negative response to caloric stimulation. The remaining 8 patients from the chronic ward showed negative or markedly reduced response. The differences were significant at $P < 0.005$ level.

Thirty-four patients were tested at the T.C.P.C.; out of 15 patients who were labelled as non-chronic schizophrenia, 13 showed positive and only 2 showed negative response to caloric stimulation, while only 2 out of 19 chronic schizophrenia showed positive response to the test. The differences were again highly significant at $P < 0.005$ level.

The above findings seemed to indicate the relationship between the vestibular function and the chronicity of schizophrenic illness. Further psychopharmacological studies by B.P.R.S. were performed. The differences were also highly significant at $P < 0.005$ level. The value of Fitzgerald and Hallpike caloric test at the measure of vestibular function in predicting the effect of neuroleptics is discussed.

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