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"CAT FINDINGS IN SCHIZOPHRENIA : RELATIONSHIP TO SUBTYPES, PERSONALITY, AND PSYCHODEMOGRAPHIC DATA"

BY

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Abstract

CT scan was carried out in 60 schizophrenic patients and 57 healthy controls. Results revealed that patients had a significant central atrophy, increased mean density of both hemispheres, and non significant higher incidence of mild, moderate cortical and cerebellar atrophy than did the controls. 45% of patients had ventricular enlargement as equivalent to having a VBR more than 2 SD larger than that of control group mean, Patients with larger ventricles have a significant higher incidence of negative symptoms, but they could not be differentiated from those with small ventricles regarding personality and psychodemographic variables.

Introduction

There has been some evidence for altered C.N.S. morphology in schizophrenic patients since the advent of computerized axial tomography (CAT). These findings have challenged the traditional concept that schizophrenia is not associated with structural brain abnormalities, and have reawakened interest in the

Kraeplenian notion that a subtype of chronic schizophrenic patients may have a disorder similar to the dementias (Andreasen et al., 1982a). The CT studies of those patients suggest that they differ from normal control subjects in the following ways: they have significantly larger cerebral ventricles (Johnstone et al., 1976; Weinberger et al., 1979a, b; Golden et al., 1980; Okasha & Madkour, 1982); are more likely to have dilated cortical fissures and sulci (Reider et al., 1979; Nyback et al., 1981); they have a greater prevalence of apparent atrophy of the anterior cerebellar vermis (Health et al., 1979; Nasrallah et al., 1981; Lippman et al., 1982); and they have a greater frequency of reversed occipital lobe assymetry (Luchins et al., 1979).

The origin of these structural brain pathology remains unknown whether they form an integral part of the pathogenesis or whether they develop following the disorder. Several reports have suggested their relation to a number of important correlates such as poor premorbid adjustment, associated soft neurological signs, poor response to neuroleptic medication (Weinberger et al., 1980), presence of negative schizophrenic symptoms (Andreason et al., 1982b), and impaired cognitive functions (Johnstone et al., 1976).

The aim of this study was to investigate the CT scan characteristics of Egyptian schizophrenics and the possible association with symptomatology, personality profiles, treatment and different schizophrenic subtypes.

Methods

The sample for this study, which was relatively selective, depending on a quota sampling consisted of 60 schizophrenic patients with a mean age 33.38 $\pm$ 10.8 years, 78.3% were males, all patients satisfied the DSM-III 1980) criteria for schizophrenia; 35% disorganized, 31.7% "Paranoid", 8.3% "Catatonic", 6.7% "Undifferentiated", and 18.3% "Residual".

All patients were subjected to a semistructured psychiatric interview, Brief Rating Scale (BRS) (Overall & Gorham, 1962), and Eysenck Personality Questionnaire (EPQ) (Eysenck & Eysenck, 1964).

Control healthy subjects were 57 individuals matched as much as possible with patients for age, sex and socio-economic status. They had undergone CT scan for reassurance and as a part of the routine diagnostic work up for complaint of psychogenic headache.

All subjects and controls were right-handed and they were evaluated with a neurological and medical examination to rule out illnesses that might cause ventricular enlargement. None of them was alcoholic or had a history of head injury.

The scanner used is the ND 8000 CGR with a matrix 25 x 256 starting from the orbitomeatal line, a series of 9-11 cuts were taken for every patient, with a distance of 9-10 mm between each two successive cuts. The following measurements were taken:

I. For Diagnosis of Central Atrophy:

[A] Linear Measurements:

(1) The width of the third ventricle was measured directly. Meese et al. (1976) have reported a normal third ventricle width of less than 8mm, while slight dilatation ranged from 8-11mm, moderate dilatation from 11-14mm, and severe dilatation more than 14mm.

(2) Ventricular Index: A quotient of the distance between the choroid plexus and the greatest width between the frontal horns (Meese et al., 1976) the lower limit of normal is more than 1.6mm.

(3) Cella Media Index: Is the quotient of a bilateral, and the largest external distance of the lateral ventricles (Meese et al., 1976) the lower limit of normal is 4.0mm.

[B] Planimetric Measurements:

(1) The ventricular brain ratio.

$$VBR \frac{\text{Ventricular cross-sectional area}}{\text{Brain cross-sectional area}} \times 100$$

The VBR was found to be about (5) in those subjects without detectable pathology, about (7) in equivocal cases, above (10) in abnormal cases.

(2) The inner surface is a measurement of the ventricular cross-sectional area alone using automated planimeter.

II. **For Diagnosis of Cortical Atrophy**

Three slices were identified, the first was at the level immediately above the disappearance of lateral ventricles, the second and third were the next higher slices respectively (Andreasen, 1982a). This method is easier and more reliable than measuring the width of cortical sulci or counting their numbers as they are usually tortous.

III. **For Diagnosis of Cerebellar Atrophy**

The visualization of two or more vermian folia (Allen et al., 1979; Killer et al., 1981).

IV. **Density Measurements**

For each patient, the same slices used for cortical atrophy were used to decrease artifacts from the ventricles. The midline between the hemispheres was located and the mean density of the whole hemisphere was obtained by direct reading from the apparatus.

IV. Data collected were analysed by the suitable statistical parameters and by the help of computer program.

Results

This sample of 60 schizophrenics had a significant central atrophy as evident by the increased mean width of the third ventricle (4.22+1.6), the larger mean ventricular brain ratio (9.89±3.5) and the greater planimetric inner ventricular surface (1470+535) than did the control subjects (3.3±1.18), (7.59±2.87), (1223±498) respectively ($P<0.01$).

The mean density for the right cerebral hemisphere is 48.38±8.07 for the patient group and 43.55±7.4 for the controls ($P<0.001$), while the mean density for the left hemisphere for the former group is 45.5±7.7 and for the latter group is 41.05±6.95 ($P<0.001$). Schizophrenic patients showed a non significantly higher incidence of mild (31%), moderate (14%) cortical atrophy and cerebellar atrophy (17%) than did the control subjects (26%), (7%) & (8%) respectively ($P>0.05$).

We had followed the interesting strategy of Weinberger et al. (1976), Andreason et al. (1982a) to

identify a subgroup of schizophrenic patients who had ventricular enlargement as equivalent to having a VBR more than 2 SD larger than that of control group mean.

Thus only 27 schizophrenic patients out of 60 (54%) who would have ventricular enlargement according to this criterion were compared to the rest of schizophrenic as shown in table I & II. The sample of schizophrenic patients with small ventricles did not show any statistical significant differences than did the controls in all of the measurable values of central atrophy except that of the third ventricle, on the other hand they showed significant statistical differences than patients with larger ventricles in all of the measurements except that of the cella media and ventricular indices.

Table (I) Measureable Values of Central Atrophy.

ITEM	SCHIZ. PTS LARGE VENTRICLES N= 27	SCHIZ. PTS. SMALL VENT. N= 33	CONTROLS N= 57
Mean VBR	12.95 ± 2.3	7.37 ± 2.03	7.59 ± 2.87
Inner surface	1938 ± 37	1088.3± 338	1223.7± 498
Cella media index	3.14 ± 0.45	3.3 ± 0.55	3.3 ± 0.45
Ventricular index	1.4 ± 0.19	1.68 ± 0.35	1.6 ± 0.4
Third ventricle	4.6 ± 1.68	3.8 ± 1.48	3.3 ± 1.18

The sociodemographic characteristics showed that 82% of patients with large ventricles were males and 59% had never married, they were significantly older (mean age 36.25 ± 13.7 years) than patients with small ventricles (mean age 27.3 ± 9.2 years) $P<0.05$.

They also showed non significant ($P>0.05$) slightly higher prevalence of illiteracy (18%) and positive family history of psychiatric disorders (18%) than did patients with small ventricles (15%) and (12%) respectively.

Table (II) Illness Data

Item	Patients with large ventricle		Patients with small Ventricle		Test used	P
Duration if illness (in months)	Mean 64.1	S.D. 68.2	Mean 57.3	S.D ± 71.4	t 0.61	>0.05
Hospitalization: Duration (weeks)	20.1	36.4	13.7	14.7	0.51	>0.05
No. of E.C.T.	12.1	9.2	7.4	3.8	2.2	<0.005
Medication (months)	49.8	48.2	47.2	51.4	0.14	>0.05
E.P.Q. Scor						
P	8.5	3.9	7.3	2.5	1.5	>0.05
N	13.7	4.4	12.6	3.8	0.27	>0.05
E	13.9	13.4	12.2	4.2	0.43	>0.05
C	14.4	4.2	13.1	5.5	1.04	>0.05
L	13.4	11.4	11.2	4.83	1.02	>0.05
Hospitalization:	No.	%	No.	%	X2	
Yes	15	55	21	64	0.4	>0.05
No	12	45	12	36		
E.C.T.						
Yes	13	48	23	70	2.8	>0.05
No	14	52	10	30		
Medication						
Yes	26	96	33	100	1.24	>0.05
No	1	4	00	000		
Diagnosis:						
Paranoid	8	30	10	30		
Disorganized	9	33	13	40		
Residual	6	22	5	15	3.2	>0.05
Undifferentiated	3	11	1	3		
Catatonic	1	4	4	12		

Data concerning illness (Table II) revealed that the former group showed non significant earlier onset of illness (Mean duration 64 months) and higher tendency to infrequent but long term hospitalization. They received non significantly less frequent ECT, but significantly more number of shocks and they used less frequent but more prolonged phenothiazine medication. Those with small ventricles were more frequently diagnosed as "Disorganized" and "Catatonic" subtypes than patients with large ventricles who were labelled the diagnosis of "Undifferentiated" and "Residual" subtypes more often according to DSM-III criteria. Score on EPQ were non significantly higher in patients with large than small ventricles

Table III compares the rating for individual symptoms and signs in schizophrenic patients with large and small ventricles. The former patients showed a significantly higher frequency of blunted affect ($P<0.001$) and emotional withdrawal ($P<0.05$). However, patients with small ventricles presented significantly with hallucinations ($P<0.01$), suspiciousness ($P<0.01$) and depressed mood ($P<0.05$).

Discussion

The presence of structural brain pathology in schizophrenic patients still remains a matter of controversy. Some investigators have confirmed ventricular enlargement (Weinberger et al., 1980; Tanaka et al., 1981; Revely et al., 1982; Nyback et al., 1982) others have proved no differences between patients and controls (Trimble & Kingsley, 1978; Gluck, 1980; Benes et al., 1982; Jernigan et al., 1982 and Shima et al., 1985).

The present investigation showed that a group of schizophrenic patients had a significant central atrophy more than a group of healthy control subjects. The only measurement which could identify schizophrenic patients with either small or large ventricles from control was the width of the third ventricle (Table I). Our investigation revealed that cortical atrophy is slightly more prevalent in the patients group, yet there is no

statistically significant difference between them and controls ($P>0.05$). This is in line with data reported by Tanaka (1981) and Okasha & Madkour (1982).

Cerebellar atrophy was observed more frequently in schizophrenic patients than in controls similar to previous studies (Heath et al., 1979; Nasrallah et al., 1981). There have been also suggestions of an association between schizophrenic chronicity and cerebellar atrophy (Weinberger et al., 1979c) but in this study the presence of 2 vermian folia was found only in 17% of patients compared to 8% of controls ($P<0.05$).

Contrary to Golden et al. (1980) and Coffman et al. (1984), in our sample the density was higher in schizophrenics than in controls. The cause of hyperdensity may be attributed to glial proliferation and periventricular gliosis in chronic schoziphrenics in the light of Stevens' report (1982).

Golden et al. (1980), recognized that many of the following changes in the brain could explain the apparent density loss: enlarged ventricles, enlarged sulci, atrophied cell bodies, atrophied or undeveloped dendritic processes, presence of fewer cell bodies or extracellular fluid, lack of complete and/or degenerative myelinization, decreased glial cells and other similar processes. The investigators did not encounter these problems in the normal brain.

Another point related to density measurements was the right left differences. The right side has always higher readings of density than the left side. The finding was present in both cases and controls. As none of them was left handed , we supposed that it might be related to handedness. The same results were reported by Largem et al. (1983). In contrast to these studies, Golden et al. (1980) and Coffman et al. (1984) found significantly left-right differences in favour of the left side.

Table (III) Scores on brief rating scale

Item	Patients with large VBR(N=27)		Patients with small VBR(N=33)		X2	P
	No.	%	No.	%		
Somatic concern	19	70	22	66	0.09	>0.05
Anxiety	24	88	26	78	0.48	>0.05
Withdrawal	17	63	12	36	4.21	<0.05
Concept. disorg.	13	48	24	72	3.79	>0.05
Guilt feeling	4	15	9	27	1.36	>0.05
Tension	11	40	14	42	0.02	>0.05
Mannerism	7	26	7	21	0.18	>0.05
Grandiosity	6	22	11	33	0.9	>0.05
Depressed mood	13	48	24	72	4.2	<0.05
Hostility	13	48	18	54	0.24	>0.05
Motor retardation	22	81	27	82	0.09	>0.05
Uncooperativeness	10	37	13	39	0.03	>0.05
Suspiciousness	12	44	26	78	6.18	<0.01
Hallucination	14	52	26	78	4.85	<0.01
Delusion	12	37	17	51	0.29	>0.05
Blunted affect	19	70	11	33	8.15	<0.001

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موجز

نتائج استخدام الأشعة المقطعية المحورية فى مرض الفصام (العلاقة بأنواع الفصام ، وبالشخصية وبالمعطيات السيكوديموجرافية)

استخدمت الأشعة المقطعية المحورية لدراسة التغيرات العضوية لدى ٦٠ فصامياً وعينة ضابطة تضم ٥٨ فرداً سليماً. وأظهرت النتائج وجود ضمور مركزى ذى دلالة احصائية لدى الفصاميين وزيادة متوسط كثافة المخ فى كلا الفصين لديهم، كما وجد ان لديهم زيادة، وان كانت ليس لها دلالة احصائية، فى الضمور اللجائى، البسيط والمتوسط، وضمور المخيخ. وقد وضح ان حوالى ٤٥٪ من المرضى لديهم تمددا بطينيا كما يتضح من أن متوسط مساحة البطينيات للمرضى يزيد عن متوسط مساحة البطينيات لدى العينة الضابطة بأكثر من ضعف الانحراف المعيارى. هذه المجموعة الأخيرة تتميز أيضا بمعدل أكبر من الأعراض السلبية لكن يصعب تفرقتها عن الفصاميين الذين ليس لديهم هذا التمدد البطينى من حيث عوامل الشخصية والعوامل السيكوديموجرافية.

ABSTRAIT

Les trouvailles de la tomodensitometrie dans la schizophrenie (relations avec les sous-types, personalité et les données psycho-demographiques)

60 schizophrenes et 57 temoins sains ont subi un examen tomodensitometrique. Les resultats montrent que les patients ont une atrophie centrale significative et une moyenne de densité élevée dans les deux hemispheres. Ils ont aussi une incidence plus élevée, mais nonsignificative d'atrophie corticale, legère et modèrée, ainsi qu'une atrophie du cervellet en les comparant avec les témoins. 54% des patients presentent une dilatation ventriculaire plus que le double des écarts types de la moyenne de la taille des ventricules du groupe des temoins. Les symptomes negatives sont plus marquées chez les patients qui ont une large taille ventriculaire. Cependant, c'est difficile de leur discriminer des patients ayat une petite taille ventriculaire par les donnees psycho-demographiques et par la personalité.