Brain Mapping in Suicidal and Non-Suicidal Depressives.

By: A. Okasha and M. Raafat.

ABSTRACT

Reports and experience reveal the fact that 15% of major depressive patients will commit suicide. Do those suicidal depressives constitute a special sub - group of depressives? Can we predict by some markers those with high suicidal risk? CT findings, neuropsychological testing and EEG showed abnormalities in a sub- group of depressives. Previous findings have reported a low 5 HIAA of the CSF of suicidal or violent patients. Through BEAM studies, previous authors have attempted to separate paranoid and non-paranoid depressives and depersonalized and non-depersonalized depressives. This study is an attempt to differentiate between high risk suicidal and non-suicidal depressives through BEAM. Our study showed encouraging results in that, with more cases, more modifications and more statistical analysis regarding amplitude, power and distribution, we can develop a possible neurophysiological marker for high risk suicidal depressives thus giving better prophylaxis and caution. Our findings showed that 64% of suicidal depressives show the right parieto-occipital dysfunction seen in the non-suicidal depressives with temporal extension.

INTRODUCTION

Brain Electrical Activity Mapping (BEAM) is the evaluation of changes in the brain electrical activity either using computerized EEG spectral analysis or Evoked Potential.

BEAM findings in schizophrenia showed

a) Bilateral frontal lobe dysfunction with increased delta activity,

b) Left hemispheric dysfunction,

c) Persistent deficient activity of auditory P300 in the left middle and posterior temporal regions (Morihisa et al . 1987). In depression, there was increased slowing (delta and theta) in the right posterior temporal region, increased frontal beta bilaterally, predominantly on the left side and significant differences on VEP and AEP when depressed patients were classified into: i) Paranoid and non-paranoid depressives, ii) Depersonalized and non-depersonalized depressives (Schatzberg et al.1986). Perhaps one of the most interesting observations was made by Flor-Henry (1969) who reported that patients with non-dominant temporal lobe lesion tend to present with manic-depressive symptoms, whereas those with dominant lobe lesion present with schizophrenic-like symptoms. Our studies with BEAM replicated findings that more schizophrenics have left hemispheric dysfunction and more depressives have right hemispheric dysfunction (Okasha et al. 1988).

Many studies replicated the finding that a low level of CSF 5 HIAA is associated with violent behaviour and suicide i.e. serotonin metabolism. This low level of CSF may be a marker of impulsivity rather than a specific type of violence, that is suicide is an internally directed violence (Linkowski, 1985). In suicide, we may have high risk groups but it is not possible , at the present time, to predict suicide. The various suicide prediction scales such as the "S" scale of MMPI or 5HIAA in urine or CSF and clinical interviews, all have too many false positives and false negatives. It is our observation that there were differences of BEAM findings between patients who are suicidal or attempted suicides and non-suicidal. This research aims at studying the BEAM presentation in a selective group of suicidal and non-suicidal depressives.

METHODOLOGY AND RESULTS.

A pilot study was done as a screening and to show standardized BEAM in different types of affective disorders using the SEEG system. A subset of the international 10-20 system was used to collect 16 channels EEG data for 3-5 mn. EEG data was recorded by the monopolar technique using 16 scalp electrodes with a linked earlobe reference and forehead ground . EEG channels were recorded with a CAR and the summated segments without artifacts were selectively recorded. Then quantitative analysis such as FFT was performed on the EEG and results displayed as a topographic map for each frequency band (delta, theta, alpha and beta).

Fourteen cases of manic episodes all showed abnormalities : 5(38%) right hemispheric dysfunction, another 5 (38%) left hemispheric dysfunction, while 4 (34%) revealed diffuse abnormality. Seventeen cases of bipolar disorders were examined of which 9 (53%) showed right hemispheric dysfunction, 3 (18%) left hemispheric dysfunction, 2(12%) diffuse dysfunction while 3 patients (17%) showed normal or borderline records. (Table I and II)

Table I MANIC EPISODE AGE RANGE :18-40 MEAN=28 SEX (8 M. & 6F.)

CHANGES	ABNORMALITY			NORMAL
	RIGHT	LEFT	DIFFUSE	
DYSFUNCTION	1	3	4	
HYPERAROUSAL				
FOCAL CHANGES				
* DYSFUNCTION	2	1		
* HYPERACTIVE FOCI	1			
* MIXED	1	1		
TOTAL N =	5	5	4	
%	38%	38%	34%	

Forty cases of major depressive episodes diagnosed according to DSM III R criteria were examined. They were divided into two groups : suicidal and non-suicidal depressives. Suicidal patients were diagnosed according to previous suicidal attempts, a positive family history of suicide, serious suicidal feelings or intentions following a special suicidal scale including a full evaluation of suicide risk with variables related to the course of the illness, violent or impulsive behaviour, ideations and attempts. All patients had their brain mapping performed on the first day of clinical examination whether as an out -patient or an in-patient. All patients receiving maintenance therapy of antidepressants or lithium were excluded . Thus it was reassured that there was a one week wash out of medication before the BEAM so that the results were not contaminated by psychotropic drugs. Similarly, only patients who had not received ECT for the last 4 weeks were included.

Table II BIPOLAR AFFECTIVE DISORDERS AGE RANGE: 23-55 MEAN=35.3 SEX :F : 8 M : 9

CHANGES	ABNORMALITY			NORMAL
	RIGHT	LEFT	DIFFUSE	
DYSFUNCTION	3	1	2	
HYPERAROUSAL				
FOCAL CHANGES				
* DYSFUNCTION	2	2		
* HYPERACTIVE FOCI	2			
* MIXED	2			
TOTAL N =	9	3	2	2
%	53%	18%	12%	17%

Results revealed that from the 40 depressed patients, 19 (47.5%) showed right hemispheric dysfunction, 6(15%) left hemispheric dysfunction, 6(15%) diffuse dysfunction while 9(22.5%) showed normal or borderline records. Table III and IV , Figures I and II.

There were 24 non-suicidal and 16 suicidal patients. Two of the suicidal patients showed normal records, 12 right hemispheric dysfunction and 2 diffuse dysfunction. Nine out of the 14 suicidal patients with an abnormal record showed specific temporal extension (64%). Seven (30%) of the non-suicidal depressives showed normal records, 7 (30%) right hemispheric dysfunction, 6 (25%) left hemispheric dysfunction and 4 (15%) showed diffuse dysfunction. Therefore, the results showed that there is more right hemispheric dysfunction in suicidal than in non-suicidal depressives and there is a marked difference between both groups regarding the distribution of the right hemispheric dysfunction where 64% of suicidal depressives showed right temporal involvement.These results were found in CAT studies in bipolar patients where depressed patients showed high density in the right temporal region (Dewan, 1988).

Table III MAJOR DEPRESSIVE EPISODE AGE RANGE : 20-55 MEAN : 40 SEX: F:22 M:18

CHANGES	ABNORMALITY			NORMAL
	RIGHT	LEFT	DIFFUSE	
DYSFUNCTION	3		6	
HYPERAROUSAL	1			
FOCAL CHANGES				
* DYSFUNCTION	11	4		
* HYPERACTIVE FOCI	2			
* MIXED	2	2		
TOTAL N =	19	6	6	9
%	47.5%	15%	15%	22.5%

Table IV BEAM OF SUICIDAL AND NON-SUICIDAL DEPRESSIVES

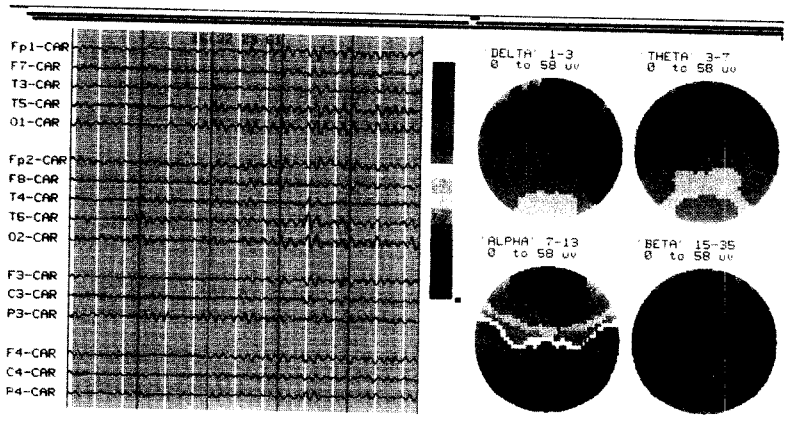
CHANGES	ABNORMALITY						NORMAL	
	RIGHT		LEFT		DIFFUSE			
	S	NS	S	NS	S	NS	S	NS
DYSFUNCTION		2			2	4		
HYPERAROUSAL		1						
FOCAL CHANGES								
* DYSFUNCTION		9 2		4				
* HYPERACTIVE FOCI								
* MIXED		3 2		2				
TOTAL N =	12	7	6		6		2	7
%	47.5%		15%		15%		22.5%	

DISCUSSION.

Despite clinical similarities between schizophrenics and bipolar patients, there has been a relative dearth of CT and BEAM studies of bipolars . There have been reports of lateral ventricular enlargement, cerebellar atrophy, a trend towards increased cortical atrophy and increased parenchymal density in bipolars (Nasrallah et al. 1981, 1982) These findings may lead to the speculation that there may be a sub-group in bipolars with an organic aetiology which is identifiable by CT and which may be associated with poor premorbid personality adjustment, increased negative symptoms, more frequent hospitalization and persistent unemployment (Lippmann et al. 1982, 1985; Pearlson et al. 1981, 1984, 1985; Schlegal et al. 1987). Dewan (1988) found in bipolars, third ventricle enlargement, bilaterally increased density in the periventricular diencephalic nuclei, the caudate and thalamus, findings previously noted in schizophrenics. This may be related to periventricular gliosis shown in PM in schizophrenics. Dewan (1988) also found increased

NORMAL BRAIN MAPPING

PAGE COPY



SUICIDAL DEPRESSIVE

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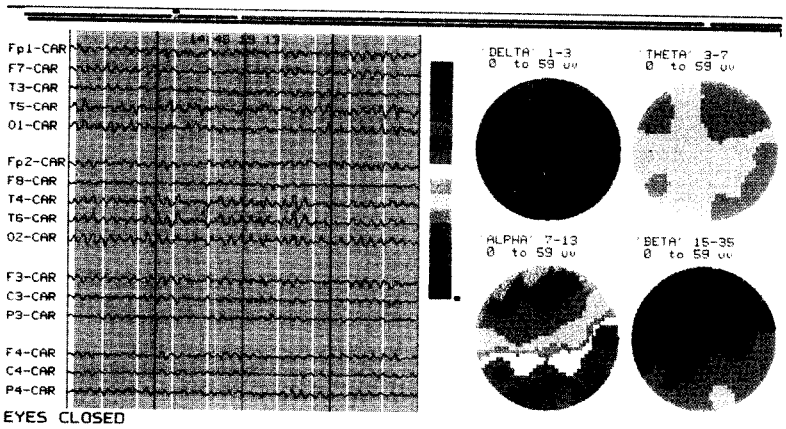

EYES CLOSED

NON-SUICIDAL DEPRESSIVE

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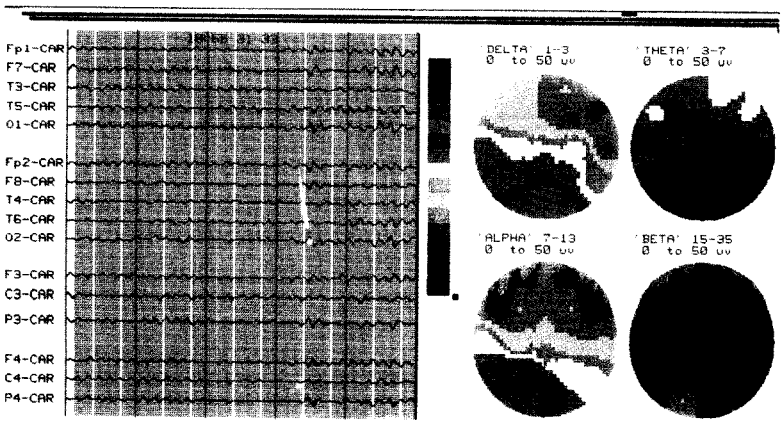
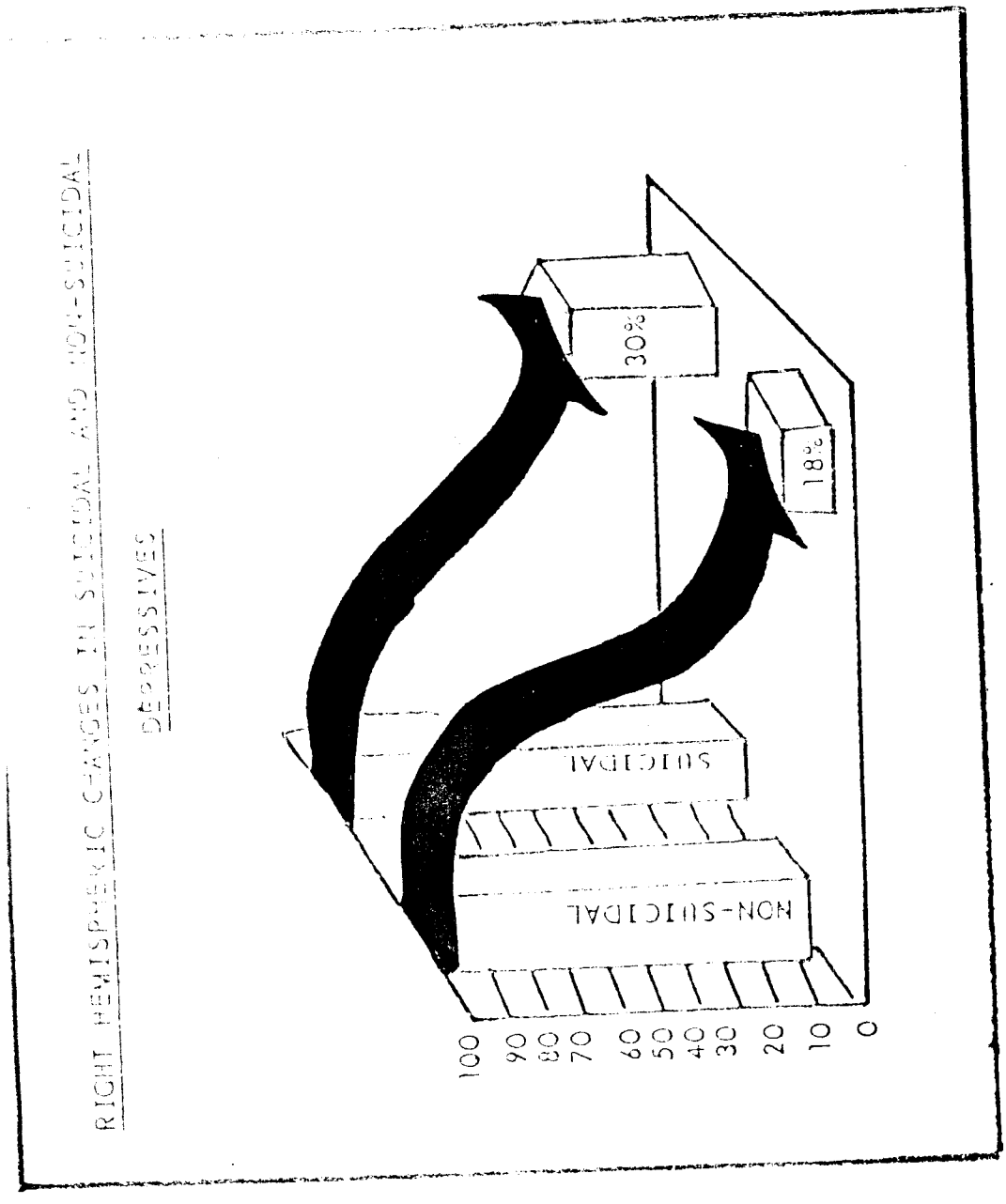
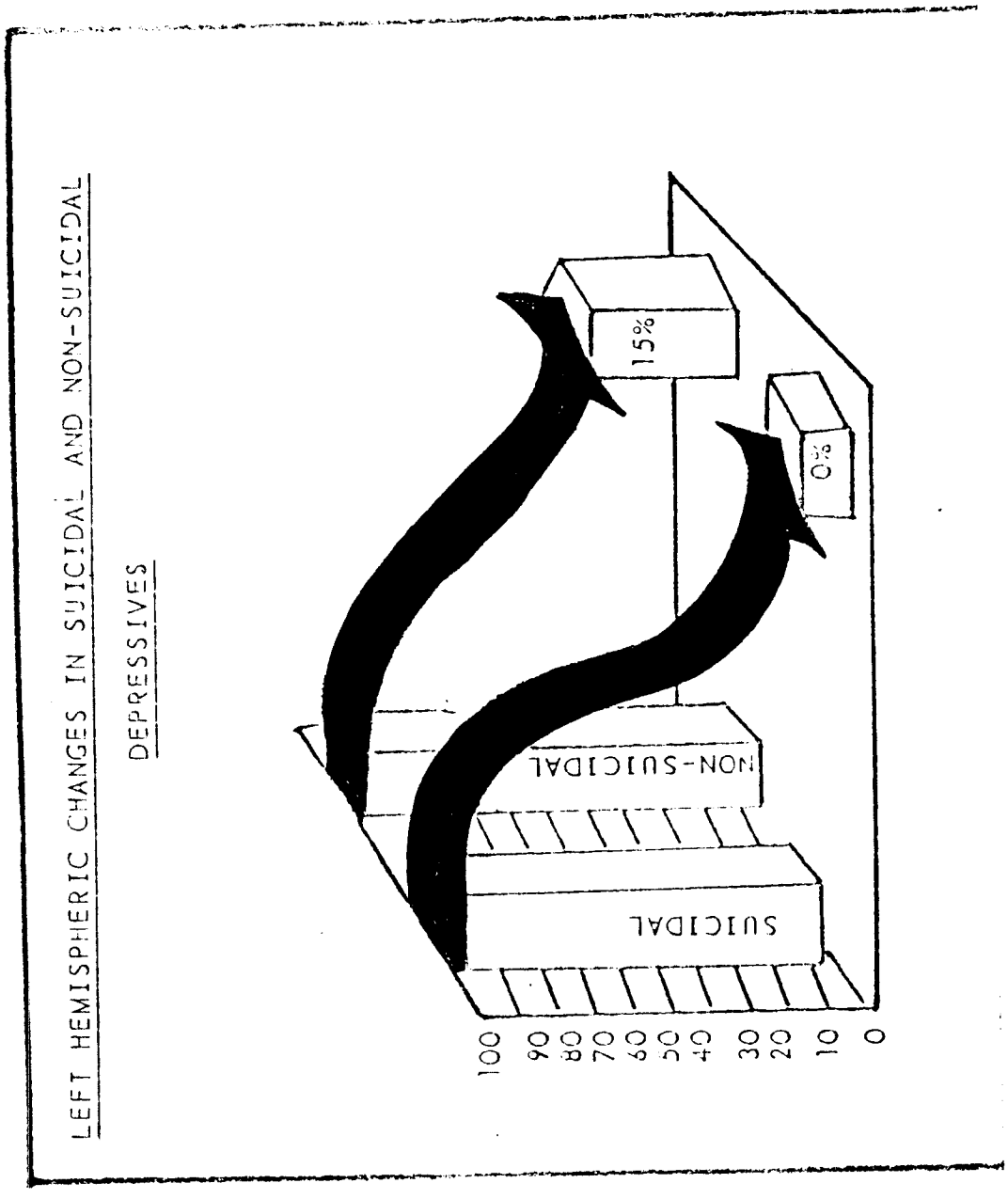



RIGHT HEMISPHERIC CHANGES IN SUICIDAL AND NON-SUICIDAL
DEPRESSIVES
30%
18%
SUICIDAL
NON-SUICIDAL
100
90
80
70
60
50
40
30
20
10
0


LEFT HEMISPHERIC CHANGES IN SUICIDAL AND NON-SUICIDAL
DEPRESSIVES
15%
0%
NON-SUICIDAL
SUICIDAL
100
90
80
70
60
50
40
30
20
10
0

density of anterior cortical white matter in their bipolar patients, a finding previously seen in schizophrenics which raises the possibility that this abnormality may be related to psychosis rather than to a specific disorder. This finding in bipolar patients redirects attention to the hypothesis that the dopamine rich diencephalic limbic area is important to our understanding of all psychotic syndromes.

The difference between grey and white matter density was due to specific differences in chemical composition. It is plausible that there is an abnormal chemical composition of white matter in psychotic conditions but evidence of this is lacking at present.

Dewan et al. (1988) reported increased density in the right temporal lobe in bipolars, a finding not reported in other psychotic conditions except in some patients with Alzheimer's disease. This abnormality suggests a more specific pathological focus in the non-dominant hemisphere, a notion which received support from neuropsychological tests, dichotic listening, EEG, tachistoscopic studies and lateral eye movement responses to stimuli of differing content. Their results may have been influenced by the fact that their patients were exposed to lithium and anti-psychotics. Two reports indicate that medication did not affect ventricle size in bipolar patients. Lithium has a minimal effect on water shifts in the brain. Antipsychotics lead to decreased not increased brain density (Lyon et al. 1981).

Previous studies have reported that 17.25% of all bipolar patients have abnormal EEGs (Cook et al. 1986; Kadrmas et al. 1971). Flor-Henry(1984) found left temporal EEG abnormalities in schizophrenics and bi-temporal, mainly right temporal, in affective disorders. Abrams and Taylor(1979) reported left temporal abnormalities in schizophrenics but parieto-occipital abnormalities predominantly on the right in their cohort of 10 manic patients.

Flor-Henry and Koles (1984) have postulated that in the psychoses, there is an increasing disorganization of the right hemisphere (least in depression, intermediate in mania and maximal in schizophrenia) together with left hemisphere disorganization (in both mania and schizophrenia). Dewan's abnormal EEG rate was 45% higher than expected. Abnormal EEG results were not associated with lateral ventricular enlargement. Weinberger (1982)

suggested that EEGs may distinguish between groups with cortical (abnormal RRGs) and sub-cortical (normal EEGs) with abnormal third ventricle pathology.

On neuropsychological testings, 69% exhibited abnormalities with bilateral parietal lobe errors and non-dominant hemisphere dysfunction in affective disorders (Donnelly et al. 1972).

Our results with BEAM revealed that 64% of our suicidal depressives with right hemispheric dysfunction showed marked extension of the right parieto-occipital dysfunction to the right temporal region. These results may indicate that suicidal depressives may represent a sub-group of depressive disorders with some organic pathology or there may be a physiological marker or predictor to the impulse of suicide. Whether this is a marker for impulsivity and dangerousness including violent crimes like the CSF 5 HIAA is a matter which needs further replication and more cases.

The possibility that there are some sub-groups in affective disorders with organic pathology as shown by CT, BEAM and neuropsychological tests can be reinforced by studies on cerebral asymmetry. Normally there is right frontal and left occipital width larger than their contralateral structures. This asymmetry is reversed in dyslexic children and schizophrenics (Dewan et al. 1987). In bipolars, Tanaka (1982) found a tendency towards increased reversal but Weimberger (1982) could not find it. Again P300 latency was significantly prolonged in schizophrenics compared with controls and depressives. P3 amplitude, by contrast, was reduced in both the acutely depressed and schizophrenic groups and, following treatment, became normal in the depressed group but remained reduced in the schizophrenic group (Blackwood et al . 1987).

It is suggested that a prolonged P3 latency and reduced P3 amplitude indicate an impairment of auditory information processing in psychotic conditions.

Further research is required to predict suicide which is a cognitive strategy through P300 which is a physiological marker for cognition and more sophisticated BEAM studies to differentiate between the sub-group of suicidal and non-suicidal depressives. Our findings of an extension of right parieto-

occipital dysfunction to the temporal region in suicidal depressives, if proved by further replications, can be a helpful marker for dangerousness, impulsivity and possibily suicide.

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TOPOGRAPHIE DU SPECTRE EEG CHEZ LES DEPRIMÉS SUICIDÉS ET LES DEPRIMÉS NON-SUICIDÉS

ABSTRAIT

Rapports et experience révélent qu'il est 15% de suicide parmi les malades des depressions majeures.

Semble t-il que ces deprimés suicidés constituent un sous-groupe des malades deprimés ? Existe-il un marqueur specifique chez ces déprimés suicidés?.

Anomalies EEG , tomodensitométrique et neuropsychologique ont été decrites dans certains sous-groupes des malades déprimés.

Les études préliminaires retrouvent une diminution significative de la production de 5HIAA dans le liquid cephalorachidien chez les malades violents et suicidés.

Selon BEAM technique , plusieurs auteurs ont essayé de différencier les deprimés paranoides et non-paranoides et les deprimés dépersonnalisés et non-dépersonnalisés.

Ce travail est un essai pour mettre en évidence par l'analyse spectrale une différence entre les deprimés á un risque suicidaire et les deprimés non-suicidés.

Bien que préliminaires , nos resultats sont encouragés. Nul doute que l'augmentation de nombre des malades , la modification des techniques recents et des analyses statistiques d'amplitude , de puissance et de localisation spatiale specifiques , on pourra definir un marqueur neurophysiologique chez les deprimés á un risque suicidaire , ainsi que donnant plus de prophylaxie et de caution.

Dans ce travail nous rapportons que 64% des déprimés suicidés montrent un désfonctionnement de l'hémisphére droit , en particulier , la région parieto-occipitale marqué par l'augmentation de l'activité des ondes lentes (theta-delta), ainsi trouvé chez les deprimés non-suicidés , avec une extension temporale spécifique.

لموجز

مسح المخ التوبوجرافى بالكمبيوتر بين مرضي الاكتئاب الجسيم ذوى الميول الأنتحارية وبين المرضى الخاليين من هذه الميول.

تكشف الأبحاث والتقارير أن حوالى ١٥ ٪ من مرضى الأكتئاب الجسيم ينهون حياتهم أنتحارا، فهل نعتبر المكتئبون المنتحرون مجموعة متميزة من مرضى الأكتئاب ؟

وهل نستطيع التنبؤ بأحتمال الأنتحار ؟

قد أظهرت الأختبارات النفسية والعصبية ، ورسام المخ الكهربى والفحص المقطعى للمخ بالكمبيوتر بعض التغيرات العضوية مما يجعل بعض المجموعات من مرضى الأكتئاب تنفرد بصفات خاصة ، وقد أثبتت الأبحاث السابقة انخفاض مستوى "٥ هيا" فى السائل النخاعى الشوكي في حالات العنف والإنتحارية ، وكذلك أظهرت نتائج مسح المخ التوبوجرافى بالكمبيوتر إختلاف بين مرضى الأكتئاب البانويا ى وغير البارانويدى وكذلك بين مرضي الإكتئاب مع اختلال الانية وعدم اختلالها ، وهذة دراسة تبحث فى محاولة التفرقة والتنبؤ بين مرضى الأكتئاب الجسيم وذى الخطورة الإنتحارية وهؤلاء الذين لا يشكلون خطورة الإنتحار وقد أظهرت نتائجنا أن ٦٤٪ من مرضى الأكتئاب الجسيم ذوى الأفكار الإنتحارية يتميزون بامتداد الاضطراب الموجود فى الجزء الجدارى المؤخرى الأيمن الى الفص الصدغى الأيمن ، ويحتمل أن يكون ذلك علامة فسيولوجية تنبؤية لاحتمالات العدوان الخارجى أو الداخلى والإنتحار. ويحتاج أثبات ذلك الى تكرار هذة النتائج فى معامل وباحصائيات متعددة مستعملا قوة وسعة وتوزيع الموجات الكهربية المخية.