

PREDICTON of THE MEMORY RELATED SIDE EFFECT of THE ELECTRO CONSULSIVE THERAPY (ECT)

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SUMMARY

We have monitored the fluctuations in plasma zinc concentrations after the frist ECT. Then we investigated if the magnitude of these changes have a predictive value for the ECT induced impairment in memory. Subjects who showed the increase of plasma zinc concentration between 15 and 30 minutes after the first ECT were at risk for memory impairment 24 hrs after the fifth ECT. The specific profile of the changes in plasma zinc concentration appeared in the memory impaired population may be related to the underlying pathology directy or it is an indirect phenomenon for the brain and/or blood brain barrier homeostasis disturbed by electricity.

ELEKTRO-KONVULSİV TEDAVİ İLE HAFIZA KUSURU ORTAYA ÇIKMA OLASILIĞININ ÖNCEDEN TAHMİNİ

ÖZET

İlk ECT sonrasında plazma çinko seviyesinde ortaya çıkan dalgalanmaları takip ettik. Bu dalgalanmaların büyüklüğü ile ECT'ye bağlı hafıza kusurları arasında bir ilişki olup olmadığını inceledik. Birinci ECT'den 15 ve 30 dakika sonra plazma çinko seviyesi yükselen olgularda beşinci ECT'den 24 saat sonra test edilen hafıza performanslarında bozukluk olduğunu gördük. ECT'de bağlı hafıza kusura gözlenen populusyondaki spesifik plazma çinko profili hafıza kusuruna yol açan patoloji ile doğrudan bağlantılı olabileceği gibi, yorumuna ulaştık.

The length and significance of the period for which memory is permanenty or transiently lost or new memories can not be made is at the core of medical investigation, ethical debate and political action related to ECT.

It has been demonstrated that acute effect of electrical stimulation leads a release of previously incorporated zinc from the tissue. And an uptake from the extracellular compartment (Wallwork, 1987) We assume that the same result can be seen in reponse to the electro convulsive therapy in the hippocampus which has a critical role on the memory related functions (Horwath and et al 1989) and contains a large concentration of zinc.

The experimental studies concerning homeostatic changes after blood Brain Berrier (BBB) disturbances suggest that the periodic measurements of plasma Zinc level procedure may be used for following the events during re-¹ verible opening of the BBB to particles in conscious or

anaesthetized people with no troblesome sequele (Blair and et al 1990).

We hypothesized that the ECT related reversible changes in BBB (Mander and al 1987) may lead fluctuations in plasma zinc level reflecting the changes in zinc content of the hippocampal tissue, and the rate of this parameter may be used as a biological marker for predicting the possible side effects of electroconvulsive treatment on the memory related funtions of the brain.

We studied 25 phsically healthy patients (mean age +/- 32.5 max age 47. min age 18, 13 mate, 12 female), with histories of DSM-IIR catatonic schizophrenia (N#11) bipolar manic episode (N#7). All the patients were drug free for at least 3 weeks before the cure was started. And none of them has been on an additional therapy during and 24 hrs after the ECT course. No one of the subject were anesthisised for ECT. Electrodes

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TABLE I: FLUCTUATIONS OF THE PLASMA ZINC LEVELS AFTER THE FIRST ECT, AND MEMORY CHANGES AFTER THE FIFTH ECT.

ID#	AGE	SEX	DSM-II-R CODE	BASELINE	24 Hrs after Fifth ECT	Plasma Zn Levels %micgl MEASURED DURING THE FIRST ECT			
						Pre	5mim	15 mim	30mim
1	28	M	295.2	1	2	45	50	50	50
2	30	M	296.4	1	2	85	85	80	80
3	38	M	296.4	1	2	70	70	70	40
4	36	M	296.3	1	3	120	70	80	90
5	26	M	295.2	0	1	90	85	80	70
6	22	F	295.2	2	3	80	75	80	90
7	29	F	296.3	1	2	100	75	750	60
8	39	M	296.3	1	2	70	60	50	45
9	29	F	295.2	2	2	80	90	80	75
10	38	F	295.2	2	2	95	70	90	90
11	35	M	296.3	2	2	40	40	40	40
12	36	M	296.4	2	2	110	100	95	95
13	35	F	296.3	2	2	90	95	90	90
14	45	F	295.2	3	2	90	60	60	60
15	23	F	295.2	3	2	90	60	60	60
16	28	F	296.4	3	1	85	90	90	95
17	35	F	295.2	2	1	130	135	110	130
18	32	M	295.2	3	2	60	60	60	65
19	42	F	295.2	3	2	50	70	60	70
20	32	M	296.3	3	2	80	90	70	80
21	44	M	296.3	2	1	120	110	110	120
22	23	M	295.2	2	1	90	70	60	70
23	32	M	296.4	3	1	90	90	70	70
24	38	M	296.4	3	2	90	90	85	85
25	18	M	296.4	3	2	80	90	75	80

were placed bilaterally on both frontotemporal locations. Oxygenation was maintained throughout. The current type was sinewave (dupulse MK-4). The intensity was 100v. The stimuli were given for 2 seconds. Motor convulsions were lasted approximately 20 to 40 seconds for the subjects: patients were interview on two occasions. The first interview took place 30 minutes before the first ECT done After this interview, they were informed of the nature of electroconvulsive treatment and their agreement was obtained. Second interview took place 24 hrs after the fifth ECT. Patients were screened for memory impairment having them learn three unrelated words, and recalling after 5 minutes (Folstein and et al 1975). After overnight fasting, ECT was induced at 9.00 a.m. three times a week with the same intervals for each patient. Blood samples were collected before the ECT course and 5 mim, 15mim, 30mim after the first, ECT and before, 5 mim, 15mim, and 30mim after the fifth ECT. Sera were analyzed in duplicates for Zn by atomic absorption spectrometry using a Perkin

Elmer medol 360 spectrometer. Results were given microgram per 100ml. Results for individual patients are described in Table I.

We have subtracted the first scores of the MMS from the scores obtained after the fifth ECT. Then we made three subgroups, 1. IMPAIRMENT; if the results were negative, 2. NO CHANGE; if the result were positive.

In statistical analysis, considering distributional characteristics and the selected experimental desingn. Wilcoxon 2-Sample Test was used to identify predictive value of the changes in plasma zinc concnetrations within a time course after the first ECT done Table-1 summarizes the comparisons between three groups. Concerning the changes in the plasma zinc levels between 15 minutes and 30 minutes after the first ECT, significant differences were found between memory impaired patients and the patients who did not show any change in their Performance. Same finding was evident me-

TABLE II: Wilcoxon Scores (Rank Sums)
 Classified Variable MEMORY CHANGES (Average Scores were used for Ties) Wilcoxon 2-Sample Test
 (Normal Approximation, Continuity Correction of .5) T-Test approx. Significance = 0.0132

Zn CHNGE IN TIME	GROUPS	N	Sum fo Scores	Expected Under HO	Std Under HO Score	Mean Score	S	Z	P>Z																																																																																																																																																																																																																																																																												
(pre-5m)	IMPROVEM	8	64.0	60.0	7.65	8.0	41.0	-45	0.6474																																																																																																																																																																																																																																																																												
	NOCHANGE	6	41.0	45.0	7.65	6.8				(pre-15m)	IMPROVEM	8	66.0	60.0	7.53	8.2	39.0	-72	0.4657	NOCHANGE	6	39.0	45.0	7.53	6.5	(pre-30m)	IMPROVEM	8	69.0	60.0	7.69	8.6	36.0	-1.10	0.2693	NOCHANGE	6	36.0	45.0	7.69	6.0	(5m-15m)	IMPROVEM	8	59.5	60.0	7.55	7.4	45.5	0	0.9999	NOCHANGE	6	45.5	45.0	7.55	7.5	(5m-30m)	IMPROVEM	8	66.0	60.0	7.58	8.2	39.0	-72	0.4682	NOCHANGE	6	39.0	45.0	7.58	6.5	(15m-30m)	IMPROVEM	8	63.0	60.0	7.39	7.8	42.0	-33	0.7354	IMPAIRME	6	42.0	45.0	7.39	7.0	(pre-5m)	IMPROVEM	8	98.5	80.0	11.96	12.3	98.5	1.50	0.1325	IMPAIRME	11	91.5	110.0	11.96	8.3	(pre-15m)	IMPROVEM	8	80.5	80.0	12.01	10.0	80.5	0	0.9999	IMPAIRME	11	109.5	110.0	12.01	9.9	(pre-30m)	IMPROVEM	8	98.5	80.0	11.99	12.3	98.5	1.5	0.1336	IMPAIRME	11	91.5	110.0	11.99	8.3	(5m-15m)	IMPROVEM	8	57.0	80.0	11.76	7.1	57.0	-1.91	0.0557	IMPAIRME	11	133.0	110.0	11.76	12.0	(5m-30m)	IMPROVEM	8	88.5	80.0	12.00	11.0	88.5	0.66	0.5051	IMPAIRME	11	101.5	110.0	12.00	9.2	(15m-30m)	IMPROVEM	8	105.0	80.0	11.79	13.1	105.0	2.07	0.0378	IMPAIRME	11	85.0	110.0	11.79	7.7	(pre-5m)	IMPROVEM	6	60.5	54.0	9.81	10.0	60.5	0.61	0.5410	IMPAIRME	11	9.25	99.0	9.81	8.4	(pre-15m)	IMPROVEM	6	43.5	54.0	9.80	7.2	43.5	-1.01	0.3080	IMPAIRME	11	109.5	99.0	9.80	9.9	(pre-30m)	IMPROVEM	6	62.0	54.0	9.70	10.3	62.0	0.77	0.4395	IMPAIRME	11	91.0	99.0	9.70	8.2	(5m-15m)	NOCHANGE	6	38.0	54.0	9.77	6.3	38.0	-1.58	0.1127	IMPAIRME	11	115.0	99.0	9.77	10.4	(5m-30m)	NOCHANGE	6	54.0	54.0	9.75	9.0	54.0	0.05	0.9591	IMPAIRME	11	99.0	99.0	9.75	9.0	(15m-30m)	NOCHANGE	6	81.0	54.0	9.50	13.5	8.10	2.78	0.0053 ****	IMPAIRME	11
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	NOCHANGE	6	39.0	45.0	7.58	6.5				(15m-30m)	IMPROVEM	8	63.0	60.0	7.39	7.8	42.0	-33	0.7354	IMPAIRME	6	42.0	45.0	7.39	7.0	(pre-5m)	IMPROVEM	8	98.5	80.0	11.96	12.3	98.5	1.50	0.1325	IMPAIRME	11	91.5	110.0	11.96	8.3	(pre-15m)	IMPROVEM	8	80.5	80.0	12.01	10.0	80.5	0	0.9999	IMPAIRME	11	109.5	110.0	12.01	9.9	(pre-30m)	IMPROVEM	8	98.5	80.0	11.99	12.3	98.5	1.5	0.1336	IMPAIRME	11	91.5	110.0	11.99	8.3	(5m-15m)	IMPROVEM	8	57.0	80.0	11.76	7.1	57.0	-1.91	0.0557	IMPAIRME	11	133.0	110.0	11.76	12.0	(5m-30m)	IMPROVEM	8	88.5	80.0	12.00	11.0	88.5	0.66	0.5051	IMPAIRME	11	101.5	110.0	12.00	9.2	(15m-30m)	IMPROVEM	8	105.0	80.0	11.79	13.1	105.0	2.07	0.0378	IMPAIRME	11	85.0	110.0	11.79	7.7	(pre-5m)	IMPROVEM	6	60.5	54.0	9.81	10.0	60.5	0.61	0.5410	IMPAIRME	11	9.25	99.0	9.81	8.4	(pre-15m)	IMPROVEM	6	43.5	54.0	9.80	7.2	43.5	-1.01	0.3080	IMPAIRME	11	109.5	99.0	9.80	9.9	(pre-30m)	IMPROVEM	6	62.0	54.0	9.70	10.3	62.0	0.77	0.4395	IMPAIRME	11	91.0	99.0	9.70	8.2	(5m-15m)	NOCHANGE	6	38.0	54.0	9.77	6.3	38.0	-1.58	0.1127	IMPAIRME	11	115.0	99.0	9.77	10.4	(5m-30m)	NOCHANGE	6	54.0	54.0	9.75	9.0	54.0	0.05	0.9591	IMPAIRME	11	99.0	99.0	9.75	9.0	(15m-30m)	NOCHANGE	6	81.0	54.0	9.50	13.5	8.10	2.78	0.0053 ****	IMPAIRME	11	72.0	99.0	9.50	6.5																																																												
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	IMPAIRME	6	42.0	45.0	7.39	7.0				(pre-5m)	IMPROVEM	8	98.5	80.0	11.96	12.3	98.5	1.50	0.1325	IMPAIRME	11	91.5	110.0	11.96	8.3	(pre-15m)	IMPROVEM	8	80.5	80.0	12.01	10.0	80.5	0	0.9999	IMPAIRME	11	109.5	110.0	12.01	9.9	(pre-30m)	IMPROVEM	8	98.5	80.0	11.99	12.3	98.5	1.5	0.1336	IMPAIRME	11	91.5	110.0	11.99	8.3	(5m-15m)	IMPROVEM	8	57.0	80.0	11.76	7.1	57.0	-1.91	0.0557	IMPAIRME	11	133.0	110.0	11.76	12.0	(5m-30m)	IMPROVEM	8	88.5	80.0	12.00	11.0	88.5	0.66	0.5051	IMPAIRME	11	101.5	110.0	12.00	9.2	(15m-30m)	IMPROVEM	8	105.0	80.0	11.79	13.1	105.0	2.07	0.0378	IMPAIRME	11	85.0	110.0	11.79	7.7	(pre-5m)	IMPROVEM	6	60.5	54.0	9.81	10.0	60.5	0.61	0.5410	IMPAIRME	11	9.25	99.0	9.81	8.4	(pre-15m)	IMPROVEM	6	43.5	54.0	9.80	7.2	43.5	-1.01	0.3080	IMPAIRME	11	109.5	99.0	9.80	9.9	(pre-30m)	IMPROVEM	6	62.0	54.0	9.70	10.3	62.0	0.77	0.4395	IMPAIRME	11	91.0	99.0	9.70	8.2	(5m-15m)	NOCHANGE	6	38.0	54.0	9.77	6.3	38.0	-1.58	0.1127	IMPAIRME	11	115.0	99.0	9.77	10.4	(5m-30m)	NOCHANGE	6	54.0	54.0	9.75	9.0	54.0	0.05	0.9591	IMPAIRME	11	99.0	99.0	9.75	9.0	(15m-30m)	NOCHANGE	6	81.0	54.0	9.50	13.5	8.10	2.78	0.0053 ****	IMPAIRME	11	72.0	99.0	9.50	6.5																																																																												
(pre-5m)	IMPROVEM	8	98.5	80.0	11.96	12.3	98.5	1.50	0.1325																																																																																																																																																																																																																																																																												
	IMPAIRME	11	91.5	110.0	11.96	8.3				(pre-15m)	IMPROVEM	8	80.5	80.0	12.01	10.0	80.5	0	0.9999	IMPAIRME	11	109.5	110.0	12.01	9.9	(pre-30m)	IMPROVEM	8	98.5	80.0	11.99	12.3	98.5	1.5	0.1336	IMPAIRME	11	91.5	110.0	11.99	8.3	(5m-15m)	IMPROVEM	8	57.0	80.0	11.76	7.1	57.0	-1.91	0.0557	IMPAIRME	11	133.0	110.0	11.76	12.0	(5m-30m)	IMPROVEM	8	88.5	80.0	12.00	11.0	88.5	0.66	0.5051	IMPAIRME	11	101.5	110.0	12.00	9.2	(15m-30m)	IMPROVEM	8	105.0	80.0	11.79	13.1	105.0	2.07	0.0378	IMPAIRME	11	85.0	110.0	11.79	7.7	(pre-5m)	IMPROVEM	6	60.5	54.0	9.81	10.0	60.5	0.61	0.5410	IMPAIRME	11	9.25	99.0	9.81	8.4	(pre-15m)	IMPROVEM	6	43.5	54.0	9.80	7.2	43.5	-1.01	0.3080	IMPAIRME	11	109.5	99.0	9.80	9.9	(pre-30m)	IMPROVEM	6	62.0	54.0	9.70	10.3	62.0	0.77	0.4395	IMPAIRME	11	91.0	99.0	9.70	8.2	(5m-15m)	NOCHANGE	6	38.0	54.0	9.77	6.3	38.0	-1.58	0.1127	IMPAIRME	11	115.0	99.0	9.77	10.4	(5m-30m)	NOCHANGE	6	54.0	54.0	9.75	9.0	54.0	0.05	0.9591	IMPAIRME	11	99.0	99.0	9.75	9.0	(15m-30m)	NOCHANGE	6	81.0	54.0	9.50	13.5	8.10	2.78	0.0053 ****	IMPAIRME	11	72.0	99.0	9.50	6.5																																																																																												
(pre-15m)	IMPROVEM	8	80.5	80.0	12.01	10.0	80.5	0	0.9999																																																																																																																																																																																																																																																																												
	IMPAIRME	11	109.5	110.0	12.01	9.9				(pre-30m)	IMPROVEM	8	98.5	80.0	11.99	12.3	98.5	1.5	0.1336	IMPAIRME	11	91.5	110.0	11.99	8.3	(5m-15m)	IMPROVEM	8	57.0	80.0	11.76	7.1	57.0	-1.91	0.0557	IMPAIRME	11	133.0	110.0	11.76	12.0	(5m-30m)	IMPROVEM	8	88.5	80.0	12.00	11.0	88.5	0.66	0.5051	IMPAIRME	11	101.5	110.0	12.00	9.2	(15m-30m)	IMPROVEM	8	105.0	80.0	11.79	13.1	105.0	2.07	0.0378	IMPAIRME	11	85.0	110.0	11.79	7.7	(pre-5m)	IMPROVEM	6	60.5	54.0	9.81	10.0	60.5	0.61	0.5410	IMPAIRME	11	9.25	99.0	9.81	8.4	(pre-15m)	IMPROVEM	6	43.5	54.0	9.80	7.2	43.5	-1.01	0.3080	IMPAIRME	11	109.5	99.0	9.80	9.9	(pre-30m)	IMPROVEM	6	62.0	54.0	9.70	10.3	62.0	0.77	0.4395	IMPAIRME	11	91.0	99.0	9.70	8.2	(5m-15m)	NOCHANGE	6	38.0	54.0	9.77	6.3	38.0	-1.58	0.1127	IMPAIRME	11	115.0	99.0	9.77	10.4	(5m-30m)	NOCHANGE	6	54.0	54.0	9.75	9.0	54.0	0.05	0.9591	IMPAIRME	11	99.0	99.0	9.75	9.0	(15m-30m)	NOCHANGE	6	81.0	54.0	9.50	13.5	8.10	2.78	0.0053 ****	IMPAIRME	11	72.0	99.0	9.50	6.5																																																																																																												
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PREDICTON OF THE ECT INDUCED SIDE EFECTS ON MEMORY
15 mim – 30mim Serum Zink Levels (After First ECT)

SUBJECTS N#25

Cumulative Changes in Memory Functioning (Baselina minus 24 Hrs. After the Fifth ECT)

Mory impaired population and the population who showed an improvement in their memory capacity.

Thus, our results indicate that subjects who show increase of plasma zinc concentration between 15 and 30 minutes after the first ECT are at risk for memory impairment 24 hrs after the fifth ECT.

Although, there is a number of possibility have been suggested , the reason for cognitive impairment as a result of ECT stil rematins unclear.

Changes of the zinc content in cell membranes may lead to membrane destabilization and altered regulatory funtions at receptor and transport sites (Srinivasan, 1984), and/or enzymes (Kula and et al 1990).

(Note: since, the main purpose of this study was establishing a methodology for prediction of cognitive side effects of the ECT, we anticipated that the results would need replications, there fore, we decided to use the simplest memory assessment procedured so that it could be used in any insitute on any patient and by any investigator. On the basis of this idea, we have selected the Folstesin's Mini Mental State Examination to screen for memory impairments a result of ECT. Allowing the researcher to repeat the measurements within a short period

without any concern about the patients habituation was another advantage of the of this procedure.)

KAYNAK

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