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Original Research Article.

Visual Evoked Potential (VEPs) and Brainstem Auditory Evoked Responses (BAER) in Non Dialysed and Dialysed Non Diabetic Uraemic Patients

Jagdeesh Chandra Kookna[1], Arvind Vyas[2*], Jitendra Acharya[3]

[1]DM (Neurology), Assistant Professor, Neurology, SP Medical College, Bikaner, Rajasthan, India.
[2*]DM (Neurology), Professor, Neurology, SMS Medical College Jaipur, Rajasthan, India.
[3]Senior Demonstrator, Department of Dentistry, S P Medical College, Bikaner, Rajasthan, India.

ABSTRACT

Introduction: The earliest report on uremic state having an adverse effect on the central nervous system are traced back to the last century. The symptoms of Central Nervous System (CNS) damage in patients with renal failure and particularly in dialysed subjects may be of different intensity and variability within a short period of time. These include headaches, apathy and irritability as well as psychotic reactions, consciousness disorders, convulsion.

Material And Methods: This study was carried out in non-diabetic uraemic patients admitted in different medical wards of S.P. medical College and Associated Group of Hospitals, Bikaner in North West Rajasthan. Subjects selected according to above mentioned criteria were included in the study. A pre informed written consent was obtained from every case of CRF. Identification data (e.g. name, age, sex, address) were recorded.

Results: Pathological VEPs were found in 24 (48%) patients of CRF on conservative line of treatment and in 19 (38%) patients of CRF on maintenance hemodialysis group. 2. Pathological BAERs were found in 22 (44%) patients of CRF on conservative line of treatment and 19 (38%) patients of CRF on maintenance hemodialysis group.

Conclusion: There was no correlation between pathological EP and age, dialysis duration, the degree of anaemia, blood urea, serum creatinine and creatinine clearance.

Keywords: Central Nervous System, VEP, CRF, BARE.

***Correspondence to:**

Dr. Arvind Vyas,
DM (Neurology), Professor, Neurology,
SMS Medical College Jaipur, Rajasthan, India.

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INTRODUCTION

The earliest report on uremic state having an adverse effect on the central nervous system are traced back to the last century.[1,2] Recent improvement in dialysis therapy brought about a longer life expectancy in such patients and accordingly a growing interest in the form of neurological complication of renal failure was stimulated.

The symptoms of Central Nervous System (CNS) damage in patients with renal failure and particularly in dialysed subjects may be of different intensity and variability within a short period of time. These include headaches, apathy and irritability as well as psychotic reactions, consciousness disorders, convulsion.

Etiology of neurological symptoms in the course of renal failure remains obscure. An important role is certainly played by metabolic, uremic toxin, water, electrolyte acid base disorder or anaemia. Aluminium intoxication or harmful effect of so called intermediate molecule are considered a damaging factor.[3]

Evoked potential, like VEP, provide objective information on the functional integrity of CNS structures and find their greatest clinical use in the diagnosis of demyelinating, brainstem or sensory organ diseases.[4]

Visual and sometosensory evoked potential have been reported to represent a useful test in the early diagnosis of central nervous system involvement in renal insufficiency". Recently the short and middle latency components of auditory evoked response have been described as new tools to evaluate subclinical defective impulse conduction along the brain stem pathways in dialysed patients.[5]

MATERIALS AND METHODS

This study was carried out in non-diabetic uraemic patients admitted in different medical wards of S.P. medical College and Associated Group of Hospitals, Bikaner in North West Rajasthan.

Inclusion Criteria: One hundred patients of non-diabetic CRF and 30 healthy control patients were taken for study. Diagnosis of CRF is based on following clinical and laboratorical criteria[6].

1. Progressive azotemia over months to years.
2. Symptoms and signs of uremia when hearing end stage disease.
3. Hypertension in majority
4. Bilateral small kidney on USG was diagnostic.

Fifty patients belonged to conservative treatment group and equal number of CRF patients on maintenance hemodialysis.

Exclusion Criteria: Following patients were excluded from this study

1. Diabetes mellitus
2. Age >70 years and <10 years.
3. Known case of visual and auditory disturbance
4. History of psychiatric illness
5. Mental retardation, CVA seizure disorders, mass lesion
6. Alcoholism, strokes, patients had been receiving ototoxic drug/neurotoxic.

Method: Subjects selected according to above mentioned criteria were included in the study. A pre informed written consent was obtained from every case of CRF. Identification data (e.g. name, age, sex, address) were recorded. All the patients were subjected to detailed history and physical examination which were recorded in Performa. A careful examination for deafness and visual aquity were done in all patients. All cases were subjected to routine lab investigation like FBS, CBC, RJFT, LFT, S. electrolyte, urine complete/microscopy and lipid profile, USG and other radiological investigations including imaging.

Total three different groups were made .according to treatment modalities.

Group I: Conservative line of management

Group II: Maintenance hemodialysis

Group III: Healthy controls

Table 1: VEP in Control Subjects (N=50)

VEP	Mean (ms)	SD	Mean (|iv)	SD
Right	99.59	4.32	4.48	1.88
Left	100.07	3.38	5.03	2.01

Table 2: BAER in control subjects (n=50)

BAER	I		III		V		III-V		I-III		I-V	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Right	1.69	0.08	3.65	0.09	5.53	0.09	1.88	0.14	1.96	0.15	3.84	0.13
Left	1.66	0.08	3.61	0.17	5.52	0.16	1.91	0.20	1.95	0.13	3.86	0.20

Table 3: VEP in Conservative Treatment Group (n=50)

VEP	Mean (ms)	SD	Mean (uv)	SD
Right	106.20	8.89	4.25	2.89
Left	108.52	14.27	5.08	3.62

Table 4: BAER in conservative treatment group (n=50)

BAER	I		III		V		III-V		I-III		I-V	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Right	1.87	0.30	4.07	0.58	6.13	0.68	2.07	0.51	2.38	0.59	4.26	0.62
Left	1.86	0.25	3.94	0.42	6.17	0.69	2.23	0.70	2.90	0.49	4.31	0.72

Table 5: BAER in Maintenance Hemodialysis group (11=50)

BAER	I		III		V		IH-V		I-III		I-V	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Right	1.83	0.25	4.03	0.40	6.12	0.47	2.09	0.52	2.19	0.51	4.28	0.40
Left	1.83	0.27	3.95	0.46	6.17	0.77	2.21	0.84	2.12	0.53	4.33	0.79

Table 6: Pathological VEP in conservative treatment group

	Right VEP		Left VEP	
	No.	%	No	%
Abnormal	19	38	24	48
Normal	31	62	26	52
Total	50	100	50	100

Table 7: Pathological VEP in maintenance hemodialysis group

	Right VEP		Left VEP	
	No.	%	No	%
Abnormal	17	34	19	38
Normal	33	66	31	62
Total	50	100	50	100

Table 8: Pathological BAER in conservative treatment group

Right BAER (Wave)	Abnormal	%"	Normal	%
I	5	10	45	90
III	4	8	46	92
V	7	14	43	86
III-V	6	12	44	88
I-III	10	20	40	80
I-V	12	24	38	76
Left BAER (Wave)				
I	3	6	47	94
III	3	6	47	94
V	7	14	43	86
III-V	5	10	45	90
I-III	11	22	39	78
I-V	13	26	37	74

Table 9: Pathological BAER in hemodialysis group

Right BAER (Wave)	Abnormal	%"	Normal	%
I	3	6	47	94
III	5	10	45	90
V	8	16	42	84
m-v	7	14	43	86
I-III	11	22	39	78
I-V	10	20	40	80
Left BAER (Wave)				
I	1	2	49	98
III	3	6	47	94
V	5	10	45	90
III-V	8	16	42	84
I-III	11	22	39	78
I-V	10	20	40	80

Table 10: Electrophysiologial abnormality in different groups

Electrophysiological Abnormality	Group I	%	Group II	%
Right VEP	19	38	17	34
Left VEP	24	48	19	38
Right BAER	22	44	19	38
Left BAER	20	40	18	36

OBSERVATIONS

Our study shows mean and standard deviation of latency and amplitude of visual evoked potentials values of control group. Abnormal VEP was diagnosed when latency of individual case was above the +2.5 SD. (Table 1)

Table 2 shows mean and SD of latency of different peak wave and inter peak latencies of BAER of control group. Abnormal BAER was diagnosed when latency of individual case was above the +2 SD. This table shows the mean and SD of VEP values of conservative treatment group.

(Table 3) This table shows the mean and SD of different wave and interpeak latency values of BAER in conservative treatment group. (Table 4) Table shows the mean and SD of different wave and interpeak latency values of BAER in Maintenance Hemodialysis group.(Table 5) This table shows that 24(48%) patients have pathological VEPs, [19(38%o), bilateral and 5(10%) unilateral] in conservative treatment group.(Table 6) This table shows the mean and SD values of VEP in Maintenance Hemodialysis Group.19(30%) patients have pathological VEPs [17(34%) bilateral and 2(4%) unilateral].(Table 7)

Most prominent abnormalities in conservative treatment group are interpeak (I-V > I-III>III-V) and wave V. I-V abnormalities in 13(26%) (12 bilateral and 1 unilateral), I-III abnormalities in 11(22%), (10 bilateral and 1 unilateral), III-V abnormalities in 6(12%) (1 unilateral, 5 bilateral) and V abnormalities in 7(14%) (1 unilateral and 6 bilateral). (Table 8) Most prominent abnormalities in maintenance hemodialysis group are interpeak (I-III>I-V>III-V) and wave V. I-V abnormalities in 10(20%) (10 bilateral), I-III abnormalities in 11(22%), (11 bilateral), III-V abnormalities in 8(16%) (1 unilateral, 7 bilateral) and V abnormalities in 8(16%) (3 unilateral and 5 bilateral).(Table 9) Table shows 24(48%) patients have abnormal VEP in group I, 19(38%) patients have abnormal VEP in group II, 22(44%) patients have abnormal VEP in group I, 19(38%) patients have abnormal VEP in group II.(Table 10)

DISCUSSION

A variety of neurological disorders manifest in the patients of chronic renal failure, though dialysis, renal transplantation and improved medical management have resulted in improvement of both the duration and quality of life in patients with end stage renal disease. Method for determining the subclinical involvement of central nervous system dysfunction is being studied. Kuba and Hamell et al sated that VEP is only one of a possible universe of measure that may provide quantitative information about the degree of renal insufficiency and in uraemic patients the VEP parameter may differ from standard values and may change with varying clinical condition. Prlonged latency of visual evoked potential to both flash[7] and pattern reversal[8-10] visual stimuli has been demonstrated in uraemic patients by several authors.

Rossini et al[11] had found that the latencies of VEP's of patients maintained on chronic haemodialysis seldom return to the normal range of values. In our study we also found that there is no significant difference of pathological VEP in dialysed and conservatively treated group. EP investigation seems a more sensitive diagnostic method in patients of chronic renal failure. Pathological visual response may occur also in those cases when spontaneous bioelectrical brain function remains within normal range. Thus, it seems that EP investigation, particularly in patients without clinical sign of CNS damage, may be useful in the monitoring of the course and treatment of chronic renal failure.

Analysing our results we conclude that pathological BAER were found in conservative group in 44% and in haemodialysis group 38% of non-diabetic chronic renal failure patients. In conservative group 22 cases, the prolongation of interpeak latency was observe (19 bilaterally; 3 unilaterally) (I-III) 11 cases, III-V 8 cases and I-V 10 cases. Maria et al[3] described pathological BAER which is slightly higher. This is most likely related to selection criteria applied to our study group especially non diabetic CRF patients.

BAER alteration we report here might be ascribed to defective impulse propagation along the brainsem auditory pathways secondary to structured or functional abnormalities due to an unfavourable perineural environment. Many hypothesis have been raised on the role of possible circulating toxins, middle molecular weight molecules and electrolytic disequilibrium in the genesis of CRF encephalopathy, without any definite evidence.[12,13]

In our study the results are slightly different. We observed prominent abnormalities in both dialysed and conservatively treated group are the presence of prolonged I-V, III-V and I-III interpeak time in both symptomatic and asymptomatic group. Although it is higher in symptomatic group and in conservatively treated group than asymptomatic group and dialysed group.

CONCLUSION

Abnormal VEP and BAER were found both in dialysed and non dialysed patients, coexistant symptoms of CNS damage, and without such symptoms. 1. Pathological VEPs were found in 24 (48%) patients of CRF on conservative line of treatment and in 19 (38%) patients of CRF on maintenance hemodialysis group. Pathological BAERs were found in 22 (44%) patients of CRF on conservative line of treatment and 19 (38%) patients of CRF on maintenance hemodialysis group. There was no correlation between pathological EP and age, dialysis duration, the degree of anaemia, blood urea, serum creatinine and creatinine clearance.

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