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A neurobehavioral approach for treatment of complex partial epilepsy: efficacy†

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This is a retrospective study of the efficacy of a short-term comprehensive multidisciplinary neurobehavioral treatment approach for complex partial epilepsy. Eleven patients were treated intensively for five consecutive days followed by 6 months of weekly telephone contact and an additional 6 months of monitoring of seizure logs and journals. Data was analysed at least 24 months after initiation of treatment. Pre-treatment seizure frequency ranged from 1 to 15 per month. Post-treatment seizure frequency was zero per month for the nine patients who experienced less than four seizures per month prior to treatment and less than two per month for the other two patients. Additional benefits of the treatment program were improved levels of professional achievement in the arts and computer sciences and reduction of medication dosages.

Key words: neurobehavioral treatment approach; complex partial seizures.

INTRODUCTION

Despite the availability of multiple older antiepileptic drugs (AEDs) and a renaissance in production of new AEDs, the incidence of uncontrolled seizures in the population with complex partial epilepsy remains at approximately 50%[1,2]. Side effects of AED therapy, particularly with higher dosages and the use of multiple medications significantly impair the quality of life for a large number of patients[3,4]. These deficiencies in current epilepsy treatment prompted the authors to develop a comprehensive neurobehavioral treatment approach for complex partial epilepsy formalized in the workbook *Taking Control of Your Epilepsy: A Workbook for Patients and Professionals*. Andrews and Schonfeld[5] previously reported the successful application of this approach and Richard and Reiter[6] have detailed the essential aspects and benefits of this type of treatment. Although patients recognize the need to participate in their own wellness[7,8], time and distance constraints can interfere with regular participation. For this reason the authors designed a short-term treatment protocol which is described in an accompanying publication[9].

MATERIALS AND METHODS

Eleven patients with uncontrolled complex partial seizures (CPS) were treated with a short-term protocol. Patient demographics are summarized in Tables 1a and b. The age at the start of treatment ranged from 9 to 58 years. Number of seizures at the start of treatment from 1 to 15 per month with a mean of 3.95 per month and median of 2 per month. Total months of follow-up was greater than 24 for nine patients with a maximum follow-up period of 96 months. All patients underwent thorough neurological evaluations, which are summarized in Tables 2a and b. Nine of the 11 patients had undergone multiple medication trials previously with inadequate control of seizures and/or side effects (Tables 3a and b).

The authors are a neurologist (JR) and an epilepsy counselor (DA) who treat each patient as a team. Each patient was seen by the neurologist at the beginning and end of the 5-day treatment period for a total of 4 hours, allowing for assessment of prior diagnosis and treatment, the need for further diagnostic evaluation, and the adequacy of AED therapy. Each patient was required to be accompanied by a support person throughout the treatment program. Support people included parents, spouses, siblings and friends. Patients and support people provided extensive histories and were encouraged to ask unlimited questions. Muscle and EEG biofeedback monitoring was obtained at the beginning and end of the 5-day residential treatment program. During the 5 days of treatment the counselor undertook an in-depth exploration of seizure precipitants (triggers) and identification of pre-seizure warnings as well as seizure auras. Patients learned behav-

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Table 1a: Patient demographics.

Patient	Age at start of treatment program	Present occupation	Number of seizures at start of program	Number of seizures at completion of program	Months to complete program
BR	26	computer programmer	5/month	0/year	14
RP	58	aerospace engineer	1/week	0/year	12
CE	23	teacher	2/month	1/year	14
MK	17	college student	4/month	0/year	24
GS	19	entrepreneur	1/month	0/year	24
SJ	26	artist	3/week	1/month	18
AC	9	school child	15/month	<1/month	24
BC	9	school child	8/year	0/year	6
DE	40	homemaker student	1/week	<1/year	36
SC	43	artist	4/year	0/year	12
FM	35	doctor	1/month	0/year	12

Table 1b: Patient demographics.

Patient	Number of seizures at start of program	Number of seizures at completion of program	Months to complete program	Total months of follow-up
BR	5/month	0/year	14	42
RP	1/week	0/year	12	48
CE	2/month	1/year	14	39
MK	4/month	0/year	24	27
GS	1/month	0/year	24	96
SJ	3/week	1/month	18	20
AC	15/month	<1/month	24	44
BC	8/year	0/year	6	12
DE	1/week	<1/year	36	60
SC	4/year	0/year	12	56
FM	1/month	0/year	12	48

Table 2a: Medical evaluation.

Patient	Type of Seizures	Age at onset	EEG	MRI
BR	Nocturnal GTC	23	Rhythmic R F-T sharp during sleep	Normal
RP	CPS	50	R F-T spike-wave during sleep	Normal
CE	CPS GTC	12	R frontal spike and sharp/slow	Normal
MK	CPS GTC	14	R temporal sharp/spike	Normal
GS	CPS (atypical absence)	17	Generalized 2–3 and 5–6 Hz sharp/slow	T2 small punctate lesions

Table 2b: Medical evaluation.

Patient	Type of seizures	Age at onset	EEG	MRI
SJ	CPS (adversive head movement to R) GTC	11 (age 10 months high fever with transient R hemiparesis)	R anterior temporal sharp; R temporal spikes	Routine MRI normal; volumetric R hippocampal atrophy
AC	CPS	4 months; 4	Bioccipital 3 Hz slowing; R > L low amplitude spikes; L frontal spikes	Normal
BC	CPS GTC	4	Normal	Normal
DE	CPS GTC	37	R F-T slow/sharp; LT sharp (spike) with occasional R T sharp	Normal
SC	CPS GTC	13	L F-T sharp and rhythmic sharp/slow occasionally to R	Normal
FM	CPS	32	Normal	Normal

Table 3a: AED medications.

Patient	AED at beginning of intensive	AED at end of follow-up	AEDs used previously with little success &/or side effects
BR	Valproate 500 mg tid	Valproate 750 mg bid	*phenytoin*
PR	Carbamazepine 200 mg tid	Carbamazepine 200 mg bid	*felbamate*
CE	Phenytoin 160 mg bid Lamictal 150/100	Phenytoin 160 mg bid Lamictal 150/100	*carbamazepine valproate, gabapentin*
MK	None	Carbamazepine 300 mg bid	*phenytoin valproate*
GS	Valproate 625 mg/day	Carbamazepine 200 mg tid	

Table 3b: AED medications.

Patient	AED at beginning of intensive	AED at end of follow-up	AEDs used previously with little success &/or side effects
SJ	Phenytoin 400 mg Gabapentin 800 mg	Phenytoin 400 mg Gabapentin 800 mg	*carbamazepine, valproate felbamate, primidone*
AC	Valproate 250 mg bid	Valproate 187 mg	*carbamazepine, clonazepam gabapentin, vigabatrin*
BC	Valproate 625 mg	None	*carbamazepine*
DE	Carbamazepine 400 mg bid Clorazepate	Carbamazepine 400 mg bid	*phenytoin, phenobarbital*
SC	Valproate 250 mg bid	Valproate 125 mg bid	*phenytoin, felbamate carbamazepine, gabapentin*
FM	None	None	

Table 4: Seizures reported with and without emotional triggers.

	Observed values					
	Anger	Fear	Excited	Worry	No emotion trigger	Total
Left	2242	0	223	187	1444	4096
Right	10	444	1	492	501	1448
Total	2252	444	224	679	1945	5544

(P value > 0.0001).

Table 5: Number of patients reporting emotional triggers.

	Worry only	Anger (w/o fear)	Fear w anger	Fear w/o anger	Total
Left	0	23[a]	0	0	23
Right	5	0	3	13[b]	21

P value < 0.0001.
[a] Excited was never reported by itself, but 16 patient reported excitement with anger on at least one occasion.
[b] Excited was reported by one person on one occasion with fear.

showed no significant difference in the attainment of seizure control between the two groups.

It did not appear that a pre-seizure warning is significantly related to achieving control. While it is true that the proportional reduction of seizures in the group $n = 12$ who did not have a pre-seizure warning was lower, 0.909 versus 0.958 it was not a statistically significant difference. One reason for this finding may be that the group that did not have a pre-seizure warning was too small to test the significance of this variable. Another reason why statistical significance was not found may be that one of the goals of the treatment, to achieve a 'relaxation response', by itself may have resolved the seizures in some of these patients.

The subjects in both groups were studied to discover the pattern of change in their seizure potentials to determine if, in fact, they get worse before they get better. This question was studied because of the observation that some individuals appear to have more seizure potentials, for a short period-of-time, after they abort their first seizure. The use of the word potential here means pre-seizure warnings that did not result in seizures, but typically would have and these are referred to as aborted seizures. The combined count of actual seizures and aborted seizures were analysed to identify the pattern for seizures. The analysis of this variable did not identify a typical pattern of increase. In those that do experience an increase, it is short-lived (lasting less that 2 months) and is then followed by a significant decrease.

This study looked at the possibility that damage in a specific hemisphere was vulnerable to being triggered into seizures by specific emotions. The seizure logs used for the study identified specific emotions that were suspected as potential seizure triggers. The independent sample chi-squared test determined that a significant difference does exist between the two groups. To answer the question of the importance that emotions play in the trigger for seizures, two tests were run: (1) on the number of seizures reported that were preceded by an emotional response (showed a significance level at P value $=< 0.0001$) and (2) the number of subjects reporting emotional triggers (showed a significance level at the P value $=< 0.0001$).

The analysis of seizures showed that an emotional trigger was reported 64% of the time in the left-hemisphere group and 65% of the time in the right-hemisphere group. Further, the types of emotion reported in the left-hemisphere group was predominantly anger and excitement and for the right-hemisphere group was fear. Worry was mentioned by both groups with some regularity and presents as a possible global trigger. This was not a complete list and therefore much more study is necessary to uncover the full extent of this parameter in limbic system function. The second test showed that all of the subjects in this study reported emotional triggers for some percentage of their seizures. This suggests that patients with complex partial seizures are vulnerable to emotional reactions and that these reactions are involved in triggering seizures.

CONCLUSION

The efficacy of this treatment approach was 79.5% achieving control. There was no statistically significant difference between subjects with right- and left-hemisphere seizure foci.

Having a pre-seizure aura was not statistically significant in the goal to achieve control. This was an unexpected finding and clearly demands that a more

Table 7:

Seizure triggers	Solutions
BC Nine-year-old child who felt hurt and angry when people did not listen to her. She experienced psychic impressions that bad things were about to happen. She was sure that there was something evil in the woods behind the family house and was mad that her parents did not believe her.	Her parents started to listen to her. They took her warnings seriously and restricted the children from going into the woods. CB's anxiety diminished with a resultant decrease in her feelings of anger.
DE Her husband made all the family decisions involving their two children, house and finances. When she began to have seizures, he exerted even tighter control. In turn she kept a tight rein on her children's activities. Her parents who lived nearby demanded daily contact without regard to her schedule or needs. She was angry constantly about her inability to make her own decisions and control her life.	She went back to school to get an advanced degree despite her husband's opposition because of her seizures. DD began to express anger when her husband made decisions without consulting her. She gave her children more freedom. She and her husband made the joint decision that he would accept a new position in a distant city.

Table 8:

Seizure triggers	Solutions
SC She was an artist whose husband pressured her to manage his engineering business. Although he seemed to be a relaxed person, he loaded her up with work from his business. She had been the victim of incest which caused post-traumatic anger. Her lack of control over her life magnified her anger.	She separated from her husband and dated another man briefly. She began to paint and function more out of her right brain. This allowed her to go back to her husband and limit his demands to work in his business. She was successful in showing and selling her painting.
FM Her mother died when she was young. She grew up with her father and brothers who made most of the family decisions. She learned to be dependent on them. This dependency engendered anger which interfered with successful schoolwork and relationships with men.	She moved away from her family home and studied Chinese medicine. She established an independent and successful practice of Chinese and natural medicine.

ioral interventions to use both on a daily basis and at the time of pre-seizure warnings. Following the 5-day intensive program, patients contacted the epilepsy counselor weekly by phone for 6 months to provide details of progress, ask questions about interventions and be reinforce prior learning or address new issues in treatment. After the 6 months of phone contact, patients mailed the counselor their seizure logs and journal entries for an additional 6 months. Further details of the counselor's treatment are described in the accompanying publication[8].

RESULTS

Post-treatment seizure frequency was zero per month for the nine patients who experienced less than four seizures per month prior to treatment and less than two seizures per month for the two patients who experienced greater than 12 seizures per month prior to treatment (Table 1a). AED medication was either reduced or unchanged except for one patient who started on a previously untried AED medication (Table 3a).

Every patient underwent a significant improvement of quality of life (QOL) during the period of treatment and follow-up. Furthermore, the improved QOL was a necessary accompaniment of improved seizure control. Each patient had unique seizure triggers which had to be identified and impacted to allow both improved seizure control and enhanced QOL. Although the counselor used similar methods to treat each patient, the solution for each patient was unique. The identified seizure triggers and solutions are summarized in Tables 4–8.

DISCUSSION

These case studies demonstrate that there is a 'missing link' in the customary treatment of epilepsy. The individual history contains the clues to improving control. Although it can be a time-consuming process, this approach is essential for many people to gain control of their epilepsy. Patients in this study underwent thorough medical evaluations prior to inclusion in the treatment program, including adjustment of anti-epileptic medications to minimize side effects. Neuropsychologic testing aided in the development of the treatment approach by determining cognitive and emotional strengths and weaknesses. Patients learned

how to keep daily journals which detailed life events, emotional responses to daily living, seizure auras and seizures. With practice they became able to identify triggers that precipitated seizures and early warning symptoms that occurred before seizures. Understanding seizure triggers resulted in major changes in old learned patterns of response to life stressors. Behavioral interventions included deep breathing, visual imagery and cognitive restructuring. Individuals used the behavioral interventions to prevent the progression of early seizure warnings to seizures. Repeated success reinforced new learned response patterns.

Increasing self-awareness and control over seizures created many opportunities for improved quality of life. Patients obtained further education; changed jobs; improved relationships with family members and coworkers; and cultivated latent abilities and talents.

One case study (SJ) requires special mention. Although his EEG and MRI localize to the R temporal lobe, his history indicates L hemisphere onset of seizures (Table 7). His emotional trigger is anger which supports a L hemisphere onset as well[8]. Two consultants at a major epilepsy center recommended R temporal lobectomy despite the available history. He chose to participate in our intensive treatment program with marked success. Most important, he was able to resume work as an artist. His artistic ability might have been impaired had he undergone R hemisphere surgery.

CONCLUSIONS

This study demonstrates the efficacy of a comprehensive neurobehavioral approach in reducing seizure frequency and improving the quality of life for patients with complex partial epilepsy.

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