

Emotional status after right vs. left temporal lobectomy

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Nineteen temporal lobectomy patients with epilepsy were evaluated (11 right and 8 left) with a brief questionnaire that addressed: (1) General Happiness; (2) Depression; (3) Anxiety; (4) Impulse Control; and (5) Socialization. The patients with left temporal lobectomy reported increases in depression and decreases in socialization compared with the right temporal lobectomy patients after surgery. Furthermore although the right temporal lobectomy patients reported increases in general happiness, no changes in general happiness were reported by the left temporal lobectomy patients. The present study supported the idea that an increased negative affect is associated with left rather than right temporal lobectomy. This is consistent with a model of negative emotional valence when the right hemisphere dominates awareness.

Key words: temporal lobectomy; emotion; neuropsychology.

INTRODUCTION

Quality of life issues in epilepsy are receiving increasing attention^{1,2}. There are several treatments available that substantially reduce the frequency of seizures, and researchers are now evaluating the related emotional adjustments. Surgical excision of the anterior temporal lobe in intractable epilepsy has proven to be an effective means of seizure control³. In the present study, the patients' evaluations of their own emotional state after surgery compared with before surgery were evaluated.

A variety of emotional difficulties have been reported in patients with seizure disorders, including depression and anxiety^{4–6}. Social difficulties are also a frequent complaint^{7,8}. These emotional difficulties persist after temporal lobectomy. Depression, suicide, psychotic episodes and continued social isolation have been reported after surgery^{9–12}. However, some improvement compared with pre-surgical adjustment has been reported^{11,13,14}. One factor related to improvements in emotional state after temporal lobectomy is the extent of seizure relief¹⁵.

Another factor that may moderate improvement in emotional state after temporal lobectomy may be the side of surgery. It has long been noted that depression occurs more frequently after left-sided than after right-sided lesions^{16,17}, although some studies do not find this¹⁸. The studies that do report this asymmetry

have evaluated patients with stroke and other structural lesions^{19–22}, and the reaction of patients to unilateral ECT²³, and have used measures including structured psychiatric interviews and the Hamilton and Zung Depression scales.

Of relevance to the present study are the reports of emotional state during the intracarotid sodium amobarbital test in epileptic patients. Lee *et al.*²⁴ reported that depression was more common after left than after right hemisphere inactivation, in a series of 30 epileptic patients, consistent with other reports^{25,26}. Lee *et al.*²⁷ videotaped patients during the Wada test and found that laughter reactions were more common after right than after left hemisphere anaesthesia, and that crying occurred only after left hemisphere anaesthesia. Ahern *et al.*²⁸ had patients mark a schematic representation of pleasant, neutral, and unpleasant faces to match their mood during the Wada test. During left hemisphere inactivation, patients rated their mood as more negative than baseline. There was no significant difference between baseline and the right hemisphere inactivation state.

Thus, when the right hemisphere dominates awareness, a more negative affect is seen. Davidson¹⁶ has attributed these left/right mood difference to the anterior frontal/temporal system. For example, the EEGs of clinically depressed subjects showed increased activity in the right region compared to the left²⁹. Simi-

larly, in EEGs of normal subjects, positive affect was associated with higher left activity and negative affect was associated with higher right activity³⁰. After left anterior temporal lobectomy, more negative affect reports would be expected. At least one study supports this: Bladin⁴ reported increased anxiety (using DSM-III criteria) after left temporal lobectomy.

The present study evaluated the patient's perception of his own emotional state after temporal lobectomy compared with before temporal lobectomy. It was hypothesized that left temporal lobectomy would be associated with post-operative increases in negative affect.

MATERIALS AND METHODS

Nineteen patients who had undergone anterior temporal lobectomy to treat medication-resistant epilepsy were evaluated with a brief questionnaire. There were 11 right temporal lobectomy (RTL) patients (3 male, 8 female) and eight left temporal lobectomy (LTL) patients (3 male, 5 female). This was a single blind study, because the patients were unaware that we were comparing left vs. right surgery cases. This was a continuous series, and patients were not selected on the basis of any particular pre-operative emotional state.

The questionnaire addressed: (1) General Happiness; (2) Depression; (3) Anxiety; (4) Impulse Control; and (5) Socialization. The questionnaire was constructed by the authors, and it was felt that it had good face validity. The questionnaire items are listed below and the patient was asked whether a change had been noticed compared with before surgery for each item. The patients were asked to evaluate each item as being better, the same, or worse.

- (1) General Happiness
- (2) Appetite
- (3) Sleeping
- (4) Feeling depressed
- (5) Hope about the future
- (6) Fidgeting or pacing
- (7) Feeling nervous or anxious
- (8) Angry outbursts
- (9) Self-control
- (10) Impulsivity
- (11) Rapid changes of attitude or feeling
- (12) Socializing

Table 1: Mean values for General Happiness, Depression, and Socialization (range is from -1 to +1).

	LTL	RTL	<i>P</i>
General Happiness	0	0.59	< 0.05
Depression	-0.63	0.64	< 0.025
Anxiety	0.25	0.09	NS
Impulse Control	0.75	-0.41	NS
Socialization	-0.43	0.20	< 0.05

RESULTS

The mean age of the LTL group was 38.5 years, and 27.4 years for the RTL group. The mean time between surgery and administration of the questionnaire was 20.6 months for the LTL group and 14.4 months for the RTL group. Post-operative seizure rate was classified using the Palm Desert Scale³¹. Twelve (4 LTL, 8 RTL) of the current 19 patients were free of disabling seizures (Class I). Three patients (2 LTL, 1 RTL) had rare disabling seizures (Class II), and four patients (2 LTL, 2 RTL) showed worthwhile improvement (Class III).

The questionnaires were scored such that a response of 'Better' was assigned a score of +1, 'Same' was assigned a score of 0, and 'Worse' was assigned a score of -1. Five scores were evaluated, General Happiness (item 1), Depression (items 2,3,4,5), Anxiety (items 6,7), Impulse Control (items 8,9,10,11), and Socialization (item 12).

The LTL group, compared with the RTL group, reported increased Depression ($t = 2.22$; $P < 0.025$), and decreased Socialization ($t = 1.76$; $P < 0.05$). RTL patients reported improved General Happiness, whereas LTL patients reported no change ($t = 1.92$; $P < 0.05$). No group differences were found for Anxiety or Impulse Control. Table 1 shows the mean values for the scores, which have a range of +1 to -1.

DISCUSSION

The present study supported the idea that increased negative affect is associated with left rather than right temporal lobectomy. The patients with left temporal lobectomy reported increases in depression and decreases in socialization compared with the right temporal lobectomy patients after surgery. Furthermore, although the right temporal lobectomy patients reported increases in general happiness, no changes in general happiness were reported by the left temporal lobectomy patients. These findings are consistent with the literature reviewed earlier.

It is unlikely that these results were due to different left vs. right post-operative seizure rate outcome, because there were similar proportions of patients in seizure rate classes I, II, and III.

As discussed, Davidson has attributed these left/right mood differences to the anterior frontal/temporal system, and has postulated that the right hemisphere mediates withdrawal reactions, which involve negative affect, and the left hemisphere mediates approach responses, which are usually positive. The mood of the whole person would reflect that of the dominant hemisphere, which may be dominating for a variety of reasons, such as anaesthetization or simply less neural tissue due to a lesion. In normal subjects, these asymmetries have been demonstrated in individuals in positive or negative mood states via left/right differences in EEG, EMG, or eye movements³²⁻³⁴.

The findings of the lesion studies reviewed earlier, that left hemisphere lesions are associated with negative affect, have also been discussed as a release phenomenon^{14,35}. Left hemisphere lesions 'release' the depressive emotional valence of the right hemisphere by being unable to inhibit it. Similarly, right hemisphere lesions result in a loss of inhibition over left hemisphere positive emotional states.

Thus, data from a variety of investigations support the model of a negative emotional valence for the right hemisphere and a positive emotional valence for the left hemisphere. Whatever the underlying neural mechanism, the data are fairly consistent. Of course, the data from the present study reflect a small sample size which reduces the generalizability of the current findings, and the consequent lower statistical power may have resulted in other more subtle findings being missed (such as the anxiety effect reported by Bladin⁴). Furthermore, the new questionnaire used awaits further evaluation. However, the consistency of the significant findings in the current data with the data from the other studies cited, suggests that the emotional valence factor should be considered when evaluating psychosocial outcome after temporal lobectomy, and when anticipating possible outcomes.

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