LANGUAGE OUTCOME IN PEDIATRIC PATIENTS UNDERGOING DOMINANT TEMPORAL LOBECTOMY (DTL)

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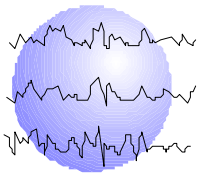

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REVISED ABSTRACT

RATIONALE:

Existing data suggest that, with the exception of diminished verbal memory, cognitive ability is generally stable following temporal lobectomy. However, few studies have examined postoperative outcome by side of surgery or assessed cognitive functions other than IQ or memory. This study was aimed at clarifying language outcome following DTL in pediatric patients and factors that may moderate risk of language decline.

METHODS:

Records of 11 pediatric patients (5 female, 6 male) of normal IQ who underwent DTL were reviewed. Patients' seizures were either cryptogenic or symptomatic (i.e. low grade tumor, mesial temporal sclerosis). Language dominance was left in six patients and bilateral in five patients. Follow-up interval ranged from 4 to 38 months (median=9 months). Ten patients achieved complete seizure control and one experienced infrequent seizures postoperatively. Pre and postoperative scores were compared in the following modalities: VIQ, confrontation naming (CN), repetition speech (RS), language comprehension (LC), verbal fluency (VF), word reading (WR), and phonics skill (P). Patients were considered to have improved or declined if their classification changed, such as from Average to Low Average. Outcome was examined with respect to follow-up interval, age of seizure onset, and left vs bilateral language.

RESULTS:

Most patients experienced stable or improved functioning in each modality. Ten of 11 patients declined in at least one modality, and 5 patients declined from normal to the impaired range. Among those who experienced decline to the impaired range, decline was limited to VF in 3 patients, CN in 1 patient, and CN and LC in 1 patient. These declines were not perceived by families as problematic, with the exception of the patient whose decline was limited to CN, and this patient was evaluated only 4 months postoperatively. Age of seizure onset was later in left dominant patients who experienced decline to the impaired range in at least one modality (13.7 years) than in those who maintained normal language functions in all respects (3.8 years, $p=.07$). There was a trend for postoperative interval to be briefer (8 months vs. 14 months, $p=.30$) in those who experienced decline to the impaired range in at least one modality. The relationship between hemispheric dominance and language outcome was not statistically significant.

CONCLUSION:

Following DTL most language functions are stable or improved. When decline from normal to impaired performance was observed, it usually was not perceived as interfering significantly with the patient's day to day functioning. Early age of seizure onset may mitigate risk of postoperative language decline. Because there was a trend for postoperative interval to be shorter in those experiencing a decline, particularly in those whose decline was in a modality other than verbal fluency, observed declines may represent as-yet incomplete recovery from surgery.

INTRODUCTION

It is well known that patients with dominant temporal lobe epilepsy are at risk for decline in verbal memory following temporal lobectomy. Postoperative declines in confrontation naming, particularly in patients with larger lateral temporal resections or later age of seizure onset, have also been reported. However, little is known about the postoperative language outcome in children and adolescents who undergo dominant temporal lobectomy.

METHODS

The patient sample included five female and six male pediatric patients with normal IQ who underwent DTL. Five were bilateral and six were left hemisphere language dominant. Eight were right handed and three were left handed. Pathology of resected tissue indicated low grade tumor in five patients, normal tissue in one patient, gliotic tissue in one patient, mesial temporal sclerosis in three patients, and cortical dysplasia in one patient. Age at surgery ranged from 9.2 to 16.6 years. Postoperative interval ranged from four to 38 months (mean=11 months). Ten patients experienced complete seizure control and one reported only infrequent seizures at the time of postoperative testing.

Patients were administered language measures as part of a comprehensive pre- and postoperative neuropsychological test battery. Please see appendix for a complete listing of test measures.

RESULTS

Ten of the 11 patients experienced a decline in standard score category in at least one modality, although it should be noted that in many cases the decline was attributable to failure to make expected maturational gains rather than a decline in absolute level of ability. Declines in no more than two of the seven modalities were observed in eight of these patients, and 6 of 10 patients who experienced a decline also experienced improvement in at least one other modality. Declines from the normal to impaired range were observed in five patients, and this degree of decline was limited to verbal fluency in three individuals. In the two of five patients who displayed decline to the impaired range in functions other than verbal fluency, one displayed decline in confrontation naming and one displayed mild impairment in both confrontation naming and language comprehension. No patient experienced a decline in phonics skill.

Three of six left dominant patients experienced a decline to the impaired range in at least one language modality and two of five bilateral language patients experienced such a decline. Among left dominant patients who did not experience decline to the impaired range, age of seizure onset was somewhat earlier (3.8 years) than in those who did (11.3 years, $p = .07$). Age of seizure onset was also somewhat, but not significantly, earlier (4.3 years) in those who did not display postoperative impairment than in those who did (8.8 years, $p = .15$) for the patient sample as a whole regardless of language dominance.

There was a trend for the postoperative interval to be somewhat shorter, on average, in the five patients experiencing a degree of postoperative impairment than in the rest of the sample (8 months vs. 14 months, respectively; $p = .30$). Of particular note, two of the patients who displayed decline to the impaired range had postoperative testing only four months following surgery. Only one family reported decreased language abilities at the time of postoperative testing. The patient whose parents observed decreased word-finding ability four months following surgery, which corresponded with impaired confrontation naming on formal testing at that time, was re-evaluated one year postoperatively. Standard scores at one year follow-up fell in the same standard score category as at four months in those areas in which there was any degree of decline; however, this individual displayed clearly improved ease of verbal expression, syntax, and complexity of utterance on a qualitative measure of language ability relative to both pre- and postoperative functioning.

Because five of six left dominant patients and only one of five bilateral language patients evidenced a structural abnormality other than MTS, the relationship between tissue pathology and language outcome could not be assessed independent of hemispheric language dominance.

There was no relationship between decline in language to the impaired range and extent of resection along the superior temporal gyrus. Surprisingly, those whose resection extended six centimeters or beyond were less likely to display postoperative impairment than those whose resection did not extend beyond 5 centimeters.

There was not a statistically significant relationship between postoperative language outcome and handedness, gender, or age at time of surgery.

CONCLUSION

Following dominant temporal lobectomy, most language functions were stable or improved in each patient. Declines were usually limited to change to a lower but still normal score, and when decline to the impaired range was observed, it was usually limited to verbal fluency. Parents usually did not observe a change in patients' language abilities, and in a case in which decline was reported by parents, the patient displayed clearly improved verbal expression on a qualitative measure. Postoperative interval was particularly short in two patients who displayed declines to the impaired range in functions other than verbal fluency, suggesting that depression of general language functions in the early postoperative interval may represent as-yet incomplete recovery from surgery. Patients with later age of seizure onset appear to be at somewhat greater risk of postoperative decline in language functions.

Appendix: Language Measures

VIQ: Wechsler Intelligence Scale for Children- Third Edition or Wechsler Adult Intelligence Scale- Revised

CN: Boston Naming Test

RS: Memory for Sentences (SB-IV)

LC: Token Test for Children or MAE Token Test

VF: Controlled Oral Word Association Test

WR: Letter-Word Identification of Woodcock-Johnson Tests of Achievement- Revised or Third Edition, or Reading subtest of Wide Range Achievement Test – Revised or Third Edition

P: Word Attack subtest of Woodcock-Johnson Tests of Achievement- Revised or Third Edition

Table 1 Patient Background Information

Patient #	Gender	Age of Sz Onset	Age at Surgery	Months PO	IAP Lang.	Pathology
1	M	3.8	9.3	7	Bil.	Ganglioglioma
2	M	0.75	16.1	6	Bil.	MTS
3	F	8.0	11.0	9	Left	Ganglioglioma
4	M	6.0	11.5	38	Left	MTS
5	F	1.0	12.1	12	Bil.	MTS
6	M	9.7	13.3	8	Bil.	Normal
7	F	1.5	14.8	11	Left	Ganglioglioma
8	M	9.9	10.5	22	Left	Pilocytic astrocytoma
9	F	4.0	9.2	14	Left	Cortical dysplasia
10	F	15.8	16.6	4	Left	Ganglioglioma
11	M	9.1	10.0	4	Bil.	Gliosis

Table 2 Language Decline by Specific Modality in Individual Patients: Pre/Postop Standard Scores

Patient #	VIQ	CN	RS	LC	VF	WR	P
1	111/93	106/88	-	-	-	119/109	-
2	-	-	-	-	-	-	-
3	-	-	-	-	99/78*	-	-
4	115/107	-	-	-	-	-	-
5	-	-	-	-	104/79*	-	-
6	117/102	102/83	-	-	-	-	-
7	-	-	-	-	-	112/102	-
8	-	-	-	-	97/79*	-	-
9	-	-	111/93	-	-	114/102	-
10	-	95/76*	-	93/70*	-	-	-
11	111/99	94/30*	100/89	112/96	-	-	-

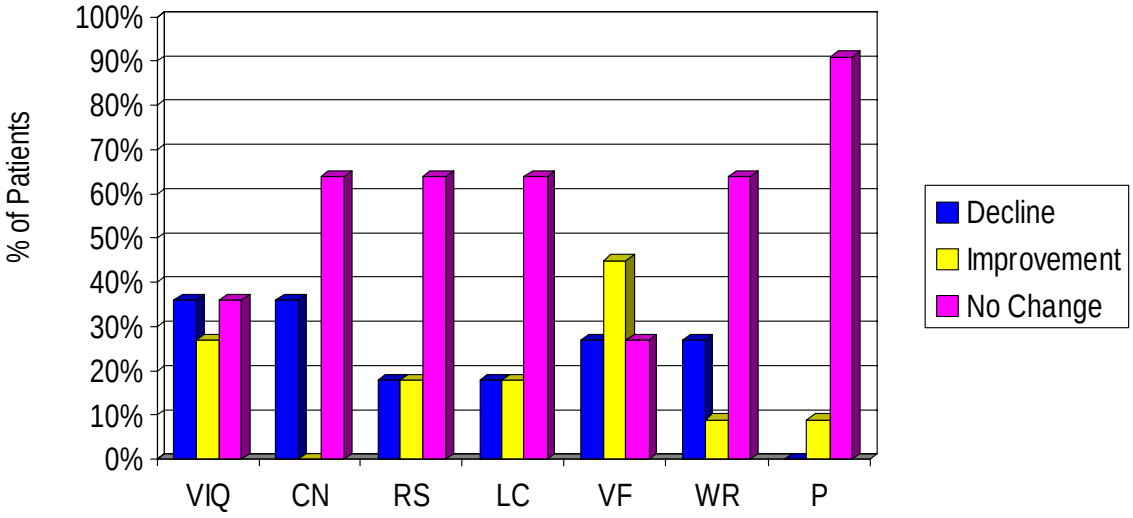
* Decline to impaired range

Table 3 Language Improvement by Specific Modality in Individual Patients: Pre/Postop Standard Scores

Patient #	VIQ	CN	RS	LC	VF	WR	P
1	-	-	-	-	85/113	-	117/123
2	-	-	87/93	-	109/120	106/111	-
3	85/90	-	-	74/107	-	-	-
4	-	-	-	-	94/115	-	-
5	-	-	79/87	-	-	-	-
6	-	-	-	-	-	-	-
7	106/115	-	-	-	73/99	-	-
8	75/82	-	-	86/97	-	-	-
9	-	-	-	-	104/112	-	-
10	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-

Table 4

Incidence of Positive and Negative Changes in Standard Score Category



VIQ = Verbal IQ
CN = Confrontation Naming
RS = Repetition Speech
LC = Language Comprehension
VF = Verbal Fluency
WR = Word Reading
P = Phonics