



# Neurocognitive Changes Associated with Surgical Resection of Right versus Left Temporal Lobe Glioma

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## Introduction

Little is known regarding the impact of resection of temporal lobe tumors upon neurocognitive functioning (NCF). Long term NCF changes after surgical resection may reveal difficult secondary to intervention of multiple factors as these patients undergo radiation and chemotherapy treatment that are known to cause NCF decline. Hence, we discuss here NCF changes in patients with temporal lobe tumors in early post surgical intervention.

Figure 1. Patient population and clinical characteristics

	LTL (N = 45)	RTL (N = 19)
Age in years		
Mean (SD)	50.3 (15.2)	53.2 (8.6)
Range	18 – 78	36 – 65
% Male	46.7	57.9
% White	86.7	94.7
% Right hand dominant	84.4	89.5
Education, years		
Mean (SD)	14.7 (2.5)	14.2 (2.0)
Range	7 – 20	11 – 19
Histology, %		
Glioblastoma	48.9	68.4
Astrocytoma	26.7	21.1
Oligodendroglioma	11.1	10.5
Other	13.3	0.0
WHO tumor grade <sup>a</sup>		
% High grade	80.0	74.2
Temporal Lobe Region		
Anterior	22.2	21.1
Posterior	26.7	21.1
Medial	35.6	52.6
Multi	15.6	5.3
Functional Region, %		
Eloquent	35.6	36.8
Near-eloquent	60.0	57.9
Non-eloquent	4.4	5.3
Tumor Volume, <sup>b</sup> mm <sup>3</sup>		
Mean (SD)	23.0 (26.5)	33.4 (29.1)
Range	0.4 – 142.4	3.3 – 115.8
Extent of Resection, % removed	94.9 (11.6)	94.7 (9.20)
Postoperative FLAIR Volume <sup>c</sup> , mm <sup>3</sup>		
Mean (SD)	14.7 (21.8)	21.3 (20.9)
Range	0.00 – 121.3	0.0 – 70.3
Seizure History, % yes	42.2	36.9
Therapy at Follow-up, %		
Chemotherapy	4.4	0.0
Radiation	24.4	21.1
Both	4.4	0.0
NCF Testing Interval, days		
Baseline to surgery, Mean (SD)	39.2 (28.3)	31.0 (28.5)
Surgery to follow-up, Mean (SD)	34.0 (28.3)	28.9 (28.9)

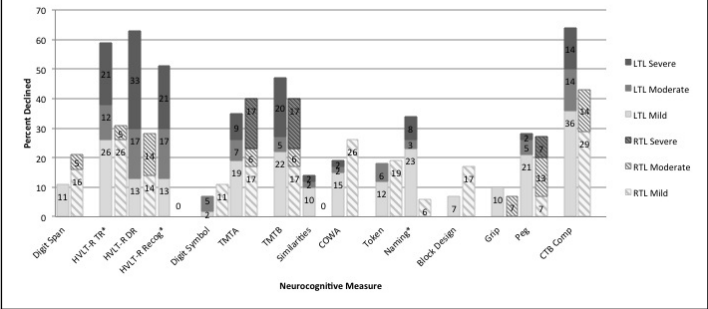
<sup>a</sup>High Grade = WHO Grade III or IV.  
<sup>b</sup>LTL N = 44; RTL N = 19. T1 hyperintense volume for enhancing tumors; T1 hypointene volume for nonenhancing lesions  
<sup>c</sup>LTL N = 45; RTL N = 18.

## Methods

Patients (M age=51.2; education=14.6) with glioma in RTL (n=19; 84% high grade glioma) or LTL (n=45; 80% high grade glioma) completed pre- and postsurgical neuropsychological assessments within 3 months of resection [WAIS-III: Block Design, Similarities, Digit Span, Digit Symbol; HVLT-R; Confrontation Naming; Controlled Oral Word Association (COWA); Token Test; Trail Making Test (TMT); Grip Strength; Grooved Pegboard].

NCF was analyzed with two-way mixed design repeated measures analysis of variance (ANOVA), with hemisphere (LTL or RTL) as an independent between-subjects variable and pre- and post-operative NCF as a within-subject variable.

Figure 2: Rates of postop neurocognitive decline by patient group across measures



## Results

Demographic and tumor characteristics (histology, volume, temporal lobe region) did not differ by hemisphere (Fig 1). A significant effect of surgery was found across numerous measures. NCF significantly decreased following resection on Digit Span [F(1,62)=8.08, p=.006], HVLT-R Recog [F(1,29)=4.44, p=.044], TMTA [F(1,59)=4.65, p=.035], TMTB [F(1,57)=11.89, p=.001], COWA [F(1,58)=7.88, p=.007], and CTB Comp [F(1,27)=17.61, p<.001]. A significant correlation between the surgery by hemisphere and interaction was found on HVLT-R TR [F(1,59)=5.15, p=.027], HVLT-R DR [F(1,29)=4.89, p=.035], and Naming [F(1,57)=5.98, p = .018]. Follow-up comparisons of significant interactions revealed that LTL patients showed greater decline than the RTL group on these measures. While decline was common in both groups, approximately 25% of all patients remained stable or improved across all core measures of verbal learning (HVLT-R TR), executive functioning (TMTB), and confrontation naming (Naming).

## Conclusions

NCF tends to decline following surgical resection of temporal lobe glioma, in immediate postoperative period. Patients with LTL lesions appear to decline greater than RTL patients, particularly on measures of verbal memory, language, and executive functioning. Nonetheless, a sizable proportion remains stable or improved. Further study is needed to identify characteristics that decrease risk of NCF decline.

## References

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