VERBAL MEMORY IN TEMPORAL LOBECTOMY PATIENTS WITH BILATERAL LANGUAGE: IMPLICATIONS FOR POSTOPERATIVE COGNITIVE OUTCOME

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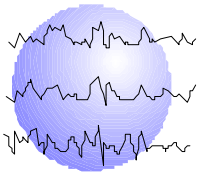

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REVISED ABSTRACT

RATIONALE

Little is known about the lateralization of verbal memory in patients found to have some degree of bilateral language representation based on the intracarotid amobarbital procedure (IAP). The presence of some verbal memory capacity in the right hemisphere may be a positive prognostic indicator for verbal memory outcome following left temporal lobectomy. The objective of the present study was to review the evidence for right hemisphere verbal memory in bilateral language patients undergoing left temporal resection.

METHODS

The subjects were 22 adult chronic seizure patients who underwent left temporal lobectomy including resection of the hippocampus. All patients had definitive language lateralization per IAP. Fifteen (7M, 8F) were exclusively left hemisphere dominant for language, while 7 (3M, 4F) demonstrated some language capacity in the right hemisphere. Mean age at surgery and baseline IQ did not differ for the 2 groups. Verbal recall performance during IAP and pre- and postoperative delayed retention and recognition on a verbal selective reminding test were compared for the two groups using t-tests for independent samples.

RESULTS

Mean verbal performance during IAP left injection was higher for patients with bilateral language (B) compared to left dominant patients (L) (B=74% correct; L=27% correct; p=.01). Mean verbal recall following right injection showed a trend favoring the left dominant group (B=44%; L=64%). Pre- to postoperative difference scores in delayed retention showed a greater decline for left dominant patients (-30%) compared to bilateral language cases (-15%). Recognition scores (adjusted for intrusion errors) also demonstrated a greater loss for the left dominant group (L=-13%; B=-2%). These differences did not reach statistical significance.

CONCLUSIONS

These results suggest that patients with partial duplication of language functions in the right hemisphere may have developed some verbal memory capacity on the right side as well. These patients may be at lower risk for significant verbal memory decline following left temporal lobectomy with hippocampal resection. Suggested criteria for establishing bilateral language in the IAP will be discussed.

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INTRODUCTION

Little is known about the lateralization of verbal memory in patients found to have some degree of bilateral language representation based on the intracarotid amobarbital procedure (IAP). We previously reported relative sparing of verbal memory functions following left temporal lobectomy in a group of patients with atypical language lateralization, including those with variable degrees of bilateral language as well as right hemisphere language dominance (Risse et al., 1993). In a later study, patients with bilateral language tended to obtain higher recall scores following electrical stimulation of the left hippocampus and obtained higher memory scores postoperatively compared to left language dominant patients (Risse et al., 1997). The objective of the present investigation is to review the evidence for right hemisphere verbal memory in bilateral language patients undergoing left temporal resection in an effort to more accurately predict memory outcome. In addition, this report will suggest definitive criteria for establishing the presence of bilateral language.

METHODS

The subjects were 22 adult chronic seizure patients who underwent left temporal lobectomy including resection of the hippocampus. All patients had definitive language lateralization per IAP. Fifteen (7M, 8F) were exclusively left hemisphere dominant for language, while seven (3M, 4F) demonstrated some language capacity in the right hemisphere. The specific criteria used to establish the classification of bilateral language in the IAP included:

1) Correct responding to language testing in at least one modality (e.g. naming, automatic speech, comprehension) following both injections.
2) Only responses that occur prior to first evidence of motor recovery are scored.

In this method, bilateral speech arrest or number of paraphasic responses are not considered adequate to diagnose bilateral language. Demographic variables describing the two groups are presented in Table 1. Age, full-scale IQ, and gender ratio did not differ between the two groups. Those patients with bilateral language were found to have an earlier age of seizure onset ($\bar{X}$=6.9 years) compared to left language dominant patients ($\bar{X}$=15 years), and this difference approached statistical significance. Figure 1 describes the language performance of patients in the bilateral language group following both left and right injections of sodium amobarbital. All language scores included in this analysis were obtained before any return of contralateral motor function.

All patients underwent a preoperative neuropsychological evaluation that included the Verbal Selective Reminding Test (VSRT) followed by postoperative re-evaluation approximately six months after surgery. Performance of the two language groups was compared on pre- and postoperative verbal memory variables and on verbal recall performance during IAP using t-tests for independent samples.

RESULTS

Verbal recognition memory scores following left injection of amobarbital in the IAP were significantly higher for patients with bilateral language representation ($\bar{X}$=74% correct) compared to those with exclusive left hemisphere language dominance ($\bar{X}$=27% correct; p=.01). A trend in the reverse direction was noted following right injection (i.e., better verbal memory performance for the left dominant group; Figure 2). Only memory items presented prior to any motor recovery were included in the analysis. When the two groups were compared for total memory scores, including recognition of both verbal and visual items combined, there were no differences between the groups following either injection (Figure 2).

Prior to surgery, delayed recall and delayed recognition scores on the VSRT were not different for the two groups, the absolute level of performance considered mildly impaired. Postoperatively, delayed free recall declined for both groups, resulting in absolute retention scores in the significantly impaired range (Figure 3). However, decline appeared to be greater for patients in the left dominant group. This is illustrated by the mean pre- to postoperative difference scores for the two groups (Figure 4). On the delayed recognition task, no change is seen postoperatively for the bilateral group with absolute performance levels within normal limits, while the left dominant patients demonstrated normal recognition scores preoperatively with a suggestion of mild decline following surgery (Figures 3 & 4).

DISCUSSION

These findings suggest that there may be greater potential for verbal memory processing in the right hemisphere of seizure patients who demonstrate some degree of bilateral language representation. Furthermore, our memory outcome data suggest that these patients may experience less decline in material specific verbal memory following left mesial temporal resection. In these cases, residual verbal memory function obviously must be present in the left hemisphere as well, as evidenced by impaired verbal memory function preoperatively and further decline following left sided surgery, at least for free recall of a word list. However, our data suggest that the presence of bilateral language may lessen the impact of this material specific memory loss. Additional cases are needed for further analysis, particularly patients with clearly established bilateral language representation as defined by objective criteria.

CONCLUSIONS

- Material specific verbal memory items in the IAP may allow more accurate prediction of verbal memory outcome following dominant temporal resection.
- Patients with bilateral language representation are more likely to demonstrate some right hemisphere capacity for verbal recognition memory in the IAP.
- The diagnosis of bilateral language representation should be based on demonstrated language ability by each hemisphere rather than bilateral speech arrest or number of paraphasic responses.
- While a majority of left temporal lobectomy patients demonstrate some decline in verbal memory performance postoperatively, the presence of bilateral language representation appears to lessen the impact of the surgery.

REFERENCES

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Table 1

Language Dominance	N	Age	% Female	Age of Sz Onset	FSIQ
Left	15	X = 30.3	53%	X = 15.0	X = 93.9
Bilateral	7	X = 28.1	57%	X = 6.9	X = 95.4

Figure 1

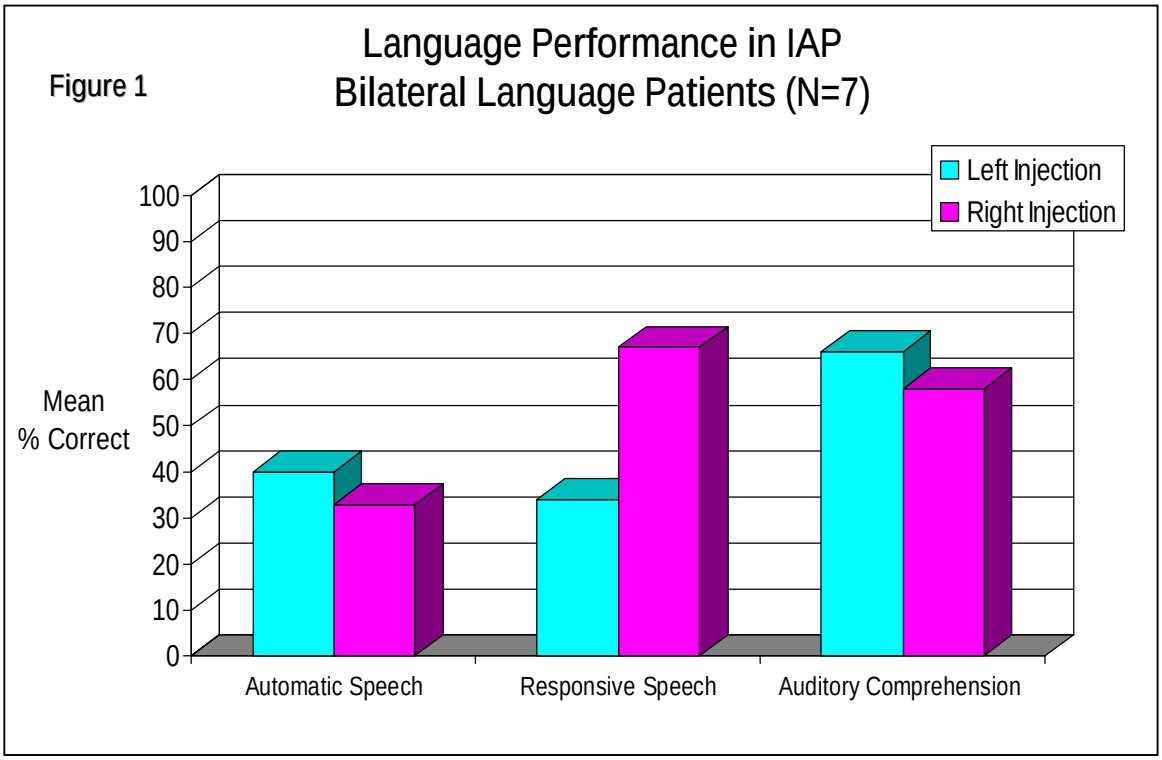

Figure 2

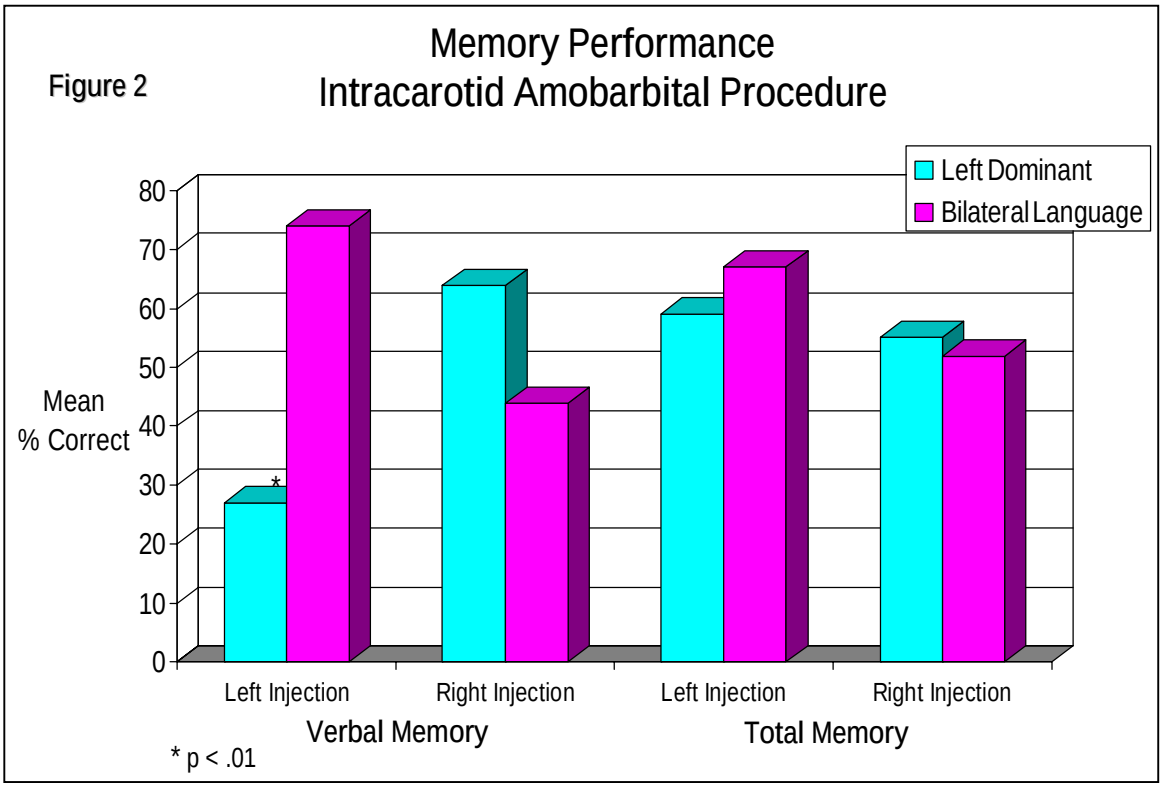

Figure 3

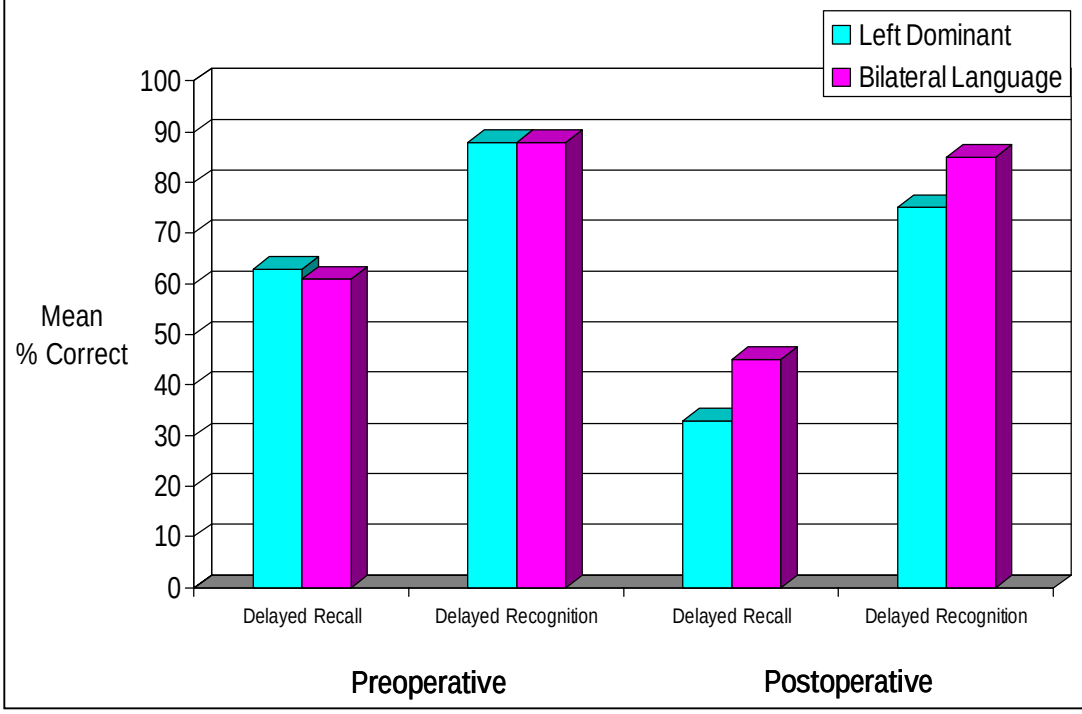

Figure 4