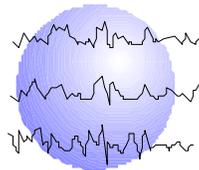


INSIGHT AND MEMORY PERFORMANCE IN THE INTRACAROTID AMOBARBITAL PROCEDURE

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REVISED ABSTRACT

The Intracarotid Amobarbital Procedure (IAP) is the primary method for estimating memory capacity in each hemisphere prior to temporal lobe surgery. The present investigation explores the relationship of conscious awareness to memory performance during the IAP. Sixty-two candidates for focal cortical resection to treat chronic epilepsy or brain tumor underwent bilateral amobarbital injections on the same day. All cases were left-hemisphere dominant for language. Only memory items presented prior to first motor recovery were included. Insight or conscious awareness of the procedure was rated as positive if patients demonstrated either free recall of any memory item, recall of aphasia or hemiparesis, or spontaneous recall of any specific event during maximum drug effect. Memory scores were compared for patients with positive versus negative insight ratings for each injection using a one-way ANOVA. Fourteen patients (23%) had positive insight following left injection, while 17 (27%) were lucid for right injection. Patients with insight obtained higher memory scores following both injections ($p < .001$). Full scale IQ was not significantly different for positive versus negative insight groups. Despite failure to consciously recall the procedure, intact memory performance ($\geq 75\%$ correct) was recorded in 21% of injections with negative insight. Conscious awareness of events during the IAP is associated with higher memory scores for items presented during maximum drug effect in both hemispheres. Cases of negative insight associated with intact memory performance suggest a possible dissociation of episodic memory and semantic learning. Relationship to lesion lateralization will be discussed.

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INTRODUCTION

Unilateral memory performance in the IAP has traditionally been used to determine both the risk of amnesic outcome following temporal lobectomy, and to identify relative memory impairment that might correlate with a lateralized seizure focus. Direct comparison of memory scores in the two hemispheres has been confounded by a frequently reported advantage for the dominant hemisphere that may override side of seizure onset (lesion effect) and stimulus type. In the present investigation, we explore another variable that appears to influence memory outcome, that of post recovery awareness or insight into IAP events.

METHODS

The subjects were 62 candidates for focal cortical resection for treatment of chronic epilepsy or brain tumor. Age and IQ data are presented in Table 1. Each patient underwent bilateral 125 mg amobarbital injections on the same day. Only patients who were left hemisphere dominant for language were included in the study. Memory items included 8 colored pictures of common objects, 4 single words and 4 abstract designs. Post recovery recognition memory was scored only for stimulus items presented prior to first motor recovery. Following each injection, insight or conscious awareness of the procedure was rated as positive or negative. To obtain a positive rating, patients were required to demonstrate at least one of the following:

- free recall of any memory item
- recall of aphasia or hemiparesis on questioning
- recall of any other specific event during maximum drug effect.

Memory scores were compared for patients with positive versus negative insight ratings. Data were analyzed using a one-way ANOVA based on side of injection, side of seizure onset and material specific nature of memory items.

RESULTS

Fourteen patients (23%) had positive insight ratings following left injection, while 17 (27%) were lucid for right injection (Table 2). Patients with insight scored significantly higher on recognition memory following both injections (Figure 1; $p < .001$), although right injection scores were higher than left for both positive and negative insight conditions. When patients with left seizure onset were examined separately, a similar effect was observed (Figure 2; $p < .05$); however, there was no memory advantage for patients with right seizure onset and positive insight following right injection. Left injection data could not be analyzed for lesion effects since only one right onset patient had insight following left injection.

The effect of insight was also examined for material specific recall appropriate to each hemisphere. Following left injection, recall of abstract designs was significantly better for patients with insight (Figure 3; $p < .01$); however, recall of words was intact following right injection, regardless of insight.

Finally, patients were identified who obtained intact memory scores (? 75 correct) in spite of negative insight ratings. Demographic data for this group is presented in Table 3. These patients did not differ from other subjects in age and IQ, however, all four cases of intact memory with negative insight following left injection were male.

CONCLUSIONS

- ❖ Conscious awareness of events during maximum drug effect in the IAP occurs in about 25% of all injections and is equally likely following left (dominant) and right (nondominant) hemisphere procedures.
- ❖ Memory performance is consistently higher for “insight” versus “no insight” injections regardless of hemisphere injected.
- ❖ This “insight effect” appears to be greater for patients with left hemisphere seizure onset and for recall of material-specific visual memory items following the left injection.
- ❖ About 1 in 5 injections with negative insight are associated with intact memory performance. This is more likely to occur with right (nondominant) injections (80%) underscoring the left hemisphere advantage for memory processing.

Table 1

PATIENT DEMOGRAPHICS

N	Sex	Age	FSIQ
62	31M, 31F	\bar{X} 33.8 s.d. 13.0	93.9 15.5

Table 2

INSIGHT DURING IAP

	Yes	No
Left Injection	23% (n=14)	77% (n=48)
Right Injection	27% (n=17)	73% (n=45)

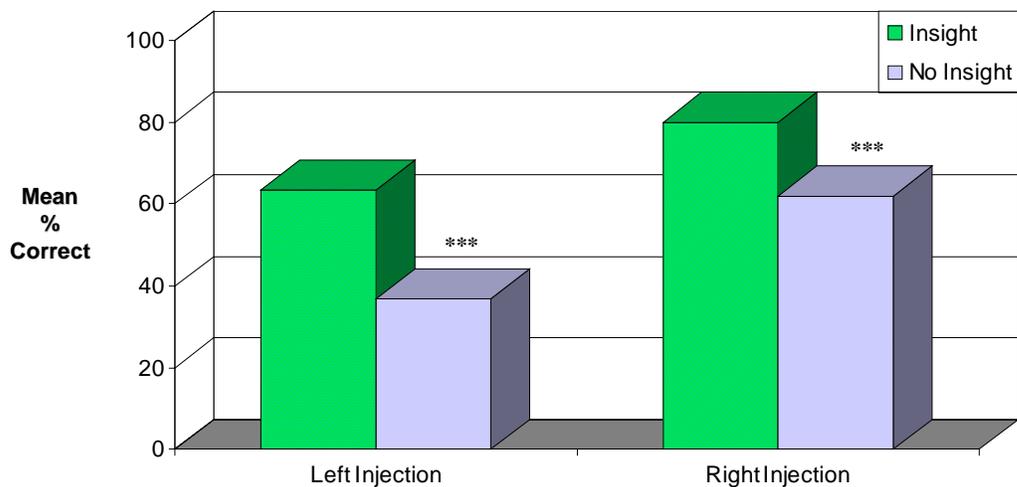
Table 3

INTACT MEMORY WITH NO INSIGHT

	N	Sex	Age	IQ	Memory Score
Left Injection	4	4M, 0F	\bar{X} 33.2 s.d. 11.6	89 25.6	90.7 10.3
Right Injection	16	8M, 8F	\bar{X} 31.1 s.d. 8.5	89 17	87.2 9.0

Fig. 1

IAP MEMORY PERFORMANCE BY INSIGHT RATING



*** p < .001

