



Carbonic-Anhydrase Inhibiting Medications and the Sodium Amobarbital Procedure: A Potential Interaction in Pediatric Patients with Epilepsy

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INTRODUCTION

The intracarotid sodium amobarbital procedure (Wada) has traditionally been utilized as a method of assessing language dominance in patients diagnosed with a seizure disorder who are preparing for epilepsy surgery. Currently, the assessment of memory has become an integral part of the procedure at numerous epilepsy centers. Across the United States and abroad, the sodium amobarbital procedure varies from site to site, as there is no gold standard for the administration. These differences largely reflect the training of the examiners, and can include discrepancies in the drug administration, dosage of the drug, types of materials used, and the timing of the object presentation. Even though these disparities exist sodium amobarbital procedure can provide useful information regarding the laterality of language and memory.

Complications of the procedure, including inconclusive findings, are rare. Recently, anesthetization failures have occurred within the adult population undergoing the procedure. Bookheimer and colleagues (2005) found a potential interaction between the sodium amobarbital and carbonic-anhydrase inhibiting medications (CAI's), including topiramate and zonisamide. This interaction is thought to account for the anesthetization failures. The current study sought to investigate the association between inconclusive findings and a potential interaction between the sodium amobarbital and CAI's in children who have been diagnosed with a seizure disorder and are preparing for epilepsy surgery.

METHODOLOGY

Participants:

Ninety-four children and young adults with a primary diagnosis of intractable epilepsy.

Patients taking medications with CAI properties:

Total: 31
 Topiramate = 24
 Zonisamide = 7
 Monotherapy = 7 (TPM = 5; ZNS = 2)
 Polytherapy = 24

Patients taking medications without CAI properties:

Total: 63
 Monotherapy = 24
 Polytherapy = 34
 None = 5

Procedure: An archival review of ninety-four patients who underwent the sodium amobarbital procedure between 1999 and 2007 at two separate hospitals in the southeastern United States was conducted.

- ❖ All patients ranged in ages from 7 to 21 years (mean age: 14.9 years)
- ❖ All patients had been diagnosed with a seizure disorder and were selected for epilepsy surgery
- ❖ Only those patients with a complete examination (i.e. both hemispheres injected) were included in the analysis

Record Review: Both inpatient and outpatient medical notes were utilized to obtain patient's medication information and demographics.

Neurological Status During the Sodium Amobarbital Procedure: Both hospitals used different measures to assess the neurological status of the patients. Collectively, either of the following characterized each patient's status: grip strength or EEG slowing in the contralateral hemisphere. Approximately half of the patient's neurological status was determined solely by grip strength.

Results: 13 subjects (13.4%) of patients had inconclusive findings on the sodium amobarbital procedure. Of these eleven were taking TPM and two were taking ZNS. Stated differently, of the patients with inconclusive findings, 100% were taking a CAI medication at the time of the procedure. However, it should be noted that 58% of the patients on a CAI medication produced conclusive findings. The results of the procedure are shown here.

	Those Taking CAI medications	Those Not Taking CAI medications
Conclusive Results	18	63
Inconclusive Results	13	0

DISCUSSION

Inconclusive findings associated with concurrent use of CAI Drugs: In exploring the mechanism of action for anti-epileptic medications (AED's), TPM and ZNS are the only two AED's with CAI properties. It should be noted that taking a medication with CAI properties did not consistently produce inconclusive findings. In fact, 58% of the pediatric patients sampled who were taking CAI medications demonstrated conclusive findings on the sodium amobarbital procedure.

Mediating factors: The authors investigated whether or not specific anti-epileptic medications in combination with TPM or ZNS are contributing to the inconclusive findings during the sodium amobarbital procedure. For TPM, 21 patients were receiving polytherapy and three were only on TPM. Of those 21 patients, a variety of anti-epileptic medications were prescribed in combination. For the patients with inconclusive findings, three (27%) were on monotherapy for TPM; whereas eight patients were receiving polytherapy with a variety of AED's in combination.

In terms of ZNS, two patients were on monotherapy, while four patients were taking numerous AED's. One patient taking ZNS/LTG and ZNS/TPM produced inconclusive findings. Taken collectively, there does not appear to be a specific combination of AED medications, that when prescribed with TPM or ZNS, has a higher risk for inconclusive findings.

Support for research in the adult epileptic population: The results from this study lends credence to

the research conducted by Bookheimer and colleagues (2005), where robust evidence for a probably interaction between CAI medication and reduced anesthetization during the sodium amobarbital procedure was indicated in the adult population. In the current study, while only a minority of children demonstrated inconclusive findings during the procedure; overall, the results reveal the sensitivity of the CAI medications, as opposed to specificity, to a potential interaction with sodium amobarbital.

CONCLUSION

There is evidence to suggest that a potential interaction between sodium amobarbital and CAI medications (specifically TPM and ZNS), as exhibited by inconclusive findings during the Wada procedure in pediatric epilepsy patients. One way to lessen the opportunity for inconclusive findings is to taper off any CAI medication prior to the procedure. Bookheimer and colleagues (2005) recommend tapering off at least 8 weeks prior to the procedure. However, this recommendation was based on their adult findings and 8 weeks may or may not be sufficient for pediatric patients.

Recently, clinicians have turned toward non-invasive measures as a way of assessing language and memory lateralization prior to the epilepsy surgery. The following are some of the new measures being utilized: anatomical and functional magnetic resonance imaging (fMRI), positron emission tomography (PET), single-photon emission computed tomography (SPECT), and transcranial magnetic stimulation.

Reference

Bookheimer, S., Schrader, L.M., Rausch, R., Sanker, R., Engel, J. (2005). Reduced anesthetization during the intracarotid amobarbital (Wada) test in patients taking carbonic anhydrase-inhibiting medications. *Epilepsia*, 46, 236-243.