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Case report: Death associated with stroke following intracarotid amobarbital testing

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ABSTRACT

Objective: One previous accidental death during intracarotid amobarbital testing (IAT) associated with cerebral angiography (CA) has been reported in the literature. The objectives of this article are to briefly review morbidity and mortality risks for patients undergoing diagnostic CA and to describe a case with a fatal outcome.

Method: The case of a 38-year-old man who had a right middle cerebral artery stroke while undergoing IAT is described. The patient was not high risk by Centers for Medicare and Medicaid Services criteria or invasive procedures; neither did he have risk factors for embolic stroke.

Conclusions: A problem noted is that IAT procedures vary from center to center and that IAT may increase the risk for individual patients because of differences between IAT and other CA interventions.

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1. Introduction

The general risk of neurological morbidity resulting from complications during diagnostic cerebral angiography (CA) is 2.63%, and the incidence of death is 0.06% [1; Kaufmann T. Personal communication with the author. February 2009]. Epilepsy centers performing 1423 tests between 2001 and 2005 reported a complication rate of 1.09% with no deaths. Centers performing intracarotid amobarbital testing (IAT) vary in technique, with 73% performing the procedure bilaterally to evaluate both hemispheres [2].

Carotid artery dissection is a complication of IAT that can cause ischemic stroke by occlusion or thromboembolism during navigation of guide wires into the carotid artery. The dissection rate has been reported to be higher during IAT (0.7%) than during conventional angiography (0.1–0.6%) despite the younger age of patients [3]. Plausible mechanisms for this finding include intravascular manipulation, movements of the patient's head and neck during IAT (due to cognitive testing), and vasospasm caused by the amobarbital injection. Two case reports of death during IAT associated one case with CA and one with accidental injection of hypertonic saline [4]. More often case reports of complications during IAT describe older patients presenting with risk for atherosclerotic complications [5].

2. Case report

The patient, a 39-year-old left-handed man, had a history of chronic partial onset seizures which began at the age of 19, three

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months after a pedestrian-motor vehicle accident in which he received multiple injuries including a traumatic brain injury with subdural hematoma and subsequent left frontal craniotomy. His medical history was also remarkable for congenital nystagmus, morbid obesity (319 pounds), and obstructive sleep apnea. Seizures included tonic-clonic seizures without loss of consciousness and tonic seizures followed by generalized tonic-clonic seizures and loss of consciousness. Prior trials of multiple antiepileptic drugs had not reduced seizure frequency. Video/EEG monitoring captured three partial onset seizures referable to the left frontal region. MRI demonstrated areas of left frontal and temporal encephalomalacia and, to a lesser extent, areas of right frontal encephalomalacia. High-risk criteria associated with carotid dissection, clotting dysfunction, or embolic stroke were not present. Neuropsychological evaluation described average range intellectual abilities with deficits referable to the left hemisphere, including verbal memory impairment, moderate expressive language deficits, right upper extremity slowing, and mild levels of executive impairment.

A widely accepted IAT protocol [6] was used. Following injection of the left cerebral hemisphere with a bolus of 130 mg of sodium amobarbital, the patient experienced speech arrest lasting 1 min, and language functions were determined to be associated with the left cerebral hemisphere; object memory was acceptable (6/8). Two minutes 30 s following injection of 130 mg of sodium amobarbital into the right cerebral hemisphere, the patient rapidly obtunded and became unresponsive and angiography was discontinued. No ictal activity was seen on concurrent EEG recording, only a significant loss of amplitude and loss of faster frequency activity over the right hemisphere. MRI revealed a stroke involving the distribution of the right middle cerebral artery. The family



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opted to discontinue life support 2 days following the massive stroke and declined a postmortem examination.

3. Conclusion

The rationale for subsequent injection of the right hemisphere was to obtain concurrent testing of language and memory in each hemisphere and identify the dominant hemisphere for language while assessing the residual memory capacity of the planned surgical hemisphere, as successful lateralization of language and memory capacity reduces the risk of aphasia or amnesia postsurgically [1]. Placement of the catheter in the right femoral artery was prolonged because of technical difficulties (attributed to the patient's obesity). This prolongation resulted in embolization of a thrombus from the catheter which is believed to be the reason for the development of the stroke.

4. Recommendations

IAT remains the standard for language and memory assessment for presurgical epilepsy evaluation. Utilization of standard IAT protocols across epilepsy centers would increase knowledge of risk factors that are unique to IAT. Noninvasive imaging techniques as alternatives to the IAT are currently being investigated and include magnetic source imaging (MSI) and magnetoencephalography (MEG) [7].

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