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Vascular

Intra-arterial verapamil–induced seizures: case report and review of the literature

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Abstract

Background: Intra-arterial verapamil infusion with or without balloon angioplasty is a common therapy for patients with hypertensive, hypervolemic, and nimodipine-refractory vasospasm following aSAH. Seizures occurring from IA infusion of verapamil are rare.

Case Description: A 24-year-old Korean-American woman presented with aSAH from the rupture of a 5-mm ICA bifurcation aneurysm. The aneurysm was secured with clip ligation through a craniotomy, and the patient was treated with HHH therapy in the neurosurgical ICU. Routine postoperative cerebral angiography was performed to confirm occlusion of the treated aneurysm and assess for vasospasm. In the first angiogram, vasospasm was detected in the supraclinoid portion of the ICA. Intra-arterial verapamil was started; during this treatment, the patient developed right-sided focal motor seizures. The infusion was terminated and the seizures were halted with midazolam. The patient's course was unremarkable until postoperative day 7, when she developed expressive aphasia, for which she was taken for emergent cerebral angiography under anesthesia. Marked focal spasm was identified in the distal supraclinoid ICA and the left A1. The patient was treated with 25 mg of superselective verapamil infusion. Upon emerging from anesthesia, her aphasia had resolved; however, 90 minutes after angiography, she experienced generalized seizures while she was in the ICU.

Conclusions: Seizures are a rare complication during cerebral angiographic procedures. Intra-arterial verapamil–induced seizures are infrequently reported. Cognizance for the potential of seizures to occur is advised during verapamil infusion for the treatment of refractory vasospasm in certain individuals.

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Keywords: Cerebral angiogram; Aneurysm; Vasospasm; Seizures; Tonic-clonic seizures

1. Introduction

Vasospasm is a common occurrence following SAH from ruptured aneurysms; it reportedly occurs in up to 70% of patients [8]. Seizures occurring during the infusion of vasodilating agents are rare [5]. Usually given intravenously, verapamil is an antiarrhythmic agent and is usually given intravenously. This class of drugs has been implicated in drug-induced seizures [16]. However, most adverse effects of verapamil reported are QT prolongation, AV block, dyspnea, rash, and flushing in approximately 1% to 2% of verapamil administrations [10].

Occasional seizures with intravenous verapamil have been reported according to the manufacturer's package insert (American Regent, Inc [a Luitpold Pharmaceuticals, Inc, company]). Generalized convulsions have been reported to occur after a 300-mg IA infusion of papaverine

Abbreviations: A1, anterior cerebral artery A1 segment; aSAH, aneurysmal subarachnoid hemorrhage; AV, atrioventricular; Ca^{2+}, Calcium ion; HHH, hypervolemic-hemodilution-hypertensive; IA, intra-arterial; ICA, internal carotid artery; ICU, intensive care unit; K^{+}, Potassium ion; M1, middle cerebral artery M1 segment; MCA, middle cerebral artery; MeSH, medical subject heading; Na^{+}, sodium ion; SAH, subarachnoid hemorrhage.

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for vasospasm [6]. Feng et al [7] studied 29 patients over a 2-year period who received IA verapamil in 34 procedures for the treatment of vasospasm following aSAH and concluded that the IA infusion of low-dose verapamil is safe in patients with cerebral vasospasm. We describe the case of a patient who developed recurrent seizures on 2 occasions after being treated with IA verapamil infusion for angiographic and clinical vasospasm following aSAH. We also present a brief review of the literature.

2. Case report

A 24-year-old right-handed Korean-American woman presented with SAH from an aneurysm rupture. Her symptoms included sudden onset of severe headache, along with nausea and emesis. There was no report of recent trauma, loss of consciousness, and any history of seizure activity. The patient had no significant past medical history. Her father had died of aSAH complications. Her social history was unremarkable. She was not taking any medication, nutritional supplements, or contraceptives. On physical examination, she appeared to be in no apparent distress and had no focal neurologic deficit.

Computed tomography scan without contrast revealed diffuse SAH with mild ventriculomegaly consistent with Hunt-Hess grade 1 and Fisher grade 2 SAH. Computed tomography angiography with 3-dimensional reconstruction demonstrated a left ICA aneurysm measuring 5 × 5 × 5 mm. A small bleb at the inferior aspect of the lesion was visible as well.

The lesion was surgically treated based on its location, anterior projection, and broad-based nature on radiographic imaging as well as on the patient's clinical presentation. Phenytoin therapy was started for seizure prophylaxis, with daily morning-level assessment for proper titration. A left pterional craniotomy was carried out for clip ligation with lumbar drain placement and third ventriculocisternostomy. The patient tolerated the procedure without any neurologic or postanesthesia complication. She was managed with HHH therapy and nimodipine (60 mg, 3 times a day) for vasospasm prevention.

During postoperative diagnostic angiography on day 7, there was significant vasospasm identified in the supraclinoid portion of the left ICA, with less severe vasospasm in the M1 (Fig. 1A). An infusion of verapamil was started; however, after slow infusion of 15 mg of verapamil, the patient developed right-sided focal motor seizures, with deviation of the eyes to the left, for 25 seconds. (We used concentrations of 5 mg/10 mL: 25 mg of verapamil diluted with 10 mL of normal saline.) Prompt cessation of verapamil infusion and administration of 1 mg of midazolam abated the seizure. Despite the early withdrawal of verapamil infusion, the patient experienced almost 50% reversal of vasospasm in the supraclinoid ICA (Fig. 1B). A review of records revealed that her phenytoin levels had been subtherapeutic at 9.1 on the morning of the cerebral angiography. Increased boluses of phenytoin had been administered starting 2 days before the event, and her daily dose was increased from 200 to 400 mg.

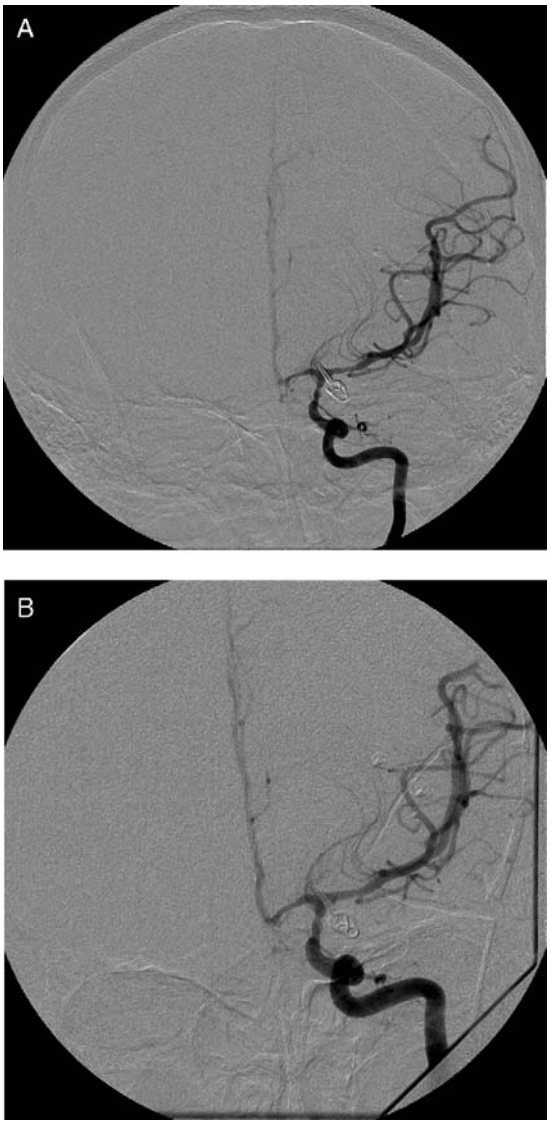

Fig. 1. A: Left ICA injection angiogram (anteroposterior projection) demonstrating severe vasospasm in the supraclinoid portion of the left ICA, with less severe vasospasm visible in the M1. B: Left ICA angiogram (anteroposterior projection) after infusion of 15 mg of IA verapamil induced right-sided focal motor seizures. Variable reversal of vasospasm is visible in the supraclinoid ICA, M1, and A1.

No seizure was noted in the days after this procedure; however, the patient developed expressive aphasia with mild right-sided hemiparesis 7 days later. Emergent cerebral angiography was performed with the patient under anesthesia, and marked focal spasm was demonstrated of the distal supraclinoid ICA as well as the left A1 and mild vasospasm of the left M1 (Fig. 2A). Twenty-five milligrams of verapamil was slowly infused; improvement was noted in the left A1, left M1, and supraclinoid ICA, with

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