Stroke Associated with Severe Cerebral Vasospasm after Petrocclival Meningioma Resection

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Objective: We report a rare case of stroke associated with delayed severe vasospasm following resection of a petroclival meningioma.

Background: Diffuse cerebral vasospasm is a frequent complication following aneurysmal subarachnoid hemorrhage or after severe traumatic brain injury; however, symptomatic cerebral vasospasm following intracranial tumor resection is a rare and under recognized condition.

Design/Methods: A 55-year-old woman with a petroclival meningioma, presented with intractable seizures and decreased right hand dexterity. She underwent a nine-hour-long procedure for resection of the mass and was discharged home on POD 2 with mild ataxia and visual 4th nerve palsy. She was re-admitted on POD 211 for evaluation of a four-day history of staring speech and lethargy.

Results: MRI showed acute infarcts in the left posterior frontal, parietal and occipital lobes, peritumoral right temporal lobe, and bilateral periventricular white matter. MRA showed bilateral occlusion of the left MCA, ACA and M1, and M1-ACA segments bilaterally. Four-vessel angiogram confirmed the findings. Patient was subsequently treated with balloon angioplasty and intraarterial nicardipine, with marked improvement in symptoms.

Conclusions: Vasospasm is a rare but important cause of neurological deterioration following brain tumor resection, and warrants prompt diagnosis and aggressive management. Supported mechanisms for the development of vasospasm include presence of blood in the basilar cisterns, vessel manipulation, and tumor-related inflammatory mediators.

Introduction: Cerebral vasospasm (CV) is a well-recognized complication of aneurysmal subarachnoid hemorrhage (SAH). Although the presence of blood in subarachnoid space has been implicated as the strongest predictor of vasospasm, the pathophysiological mechanisms remain elusive. CV has been reported in a variety of pathophysiological states such as traumatic SAH, intraventricular hemorrhage from non-aneurysmal natures, head trauma without SAH, perioperative clipping or capping of unsecured aneurysms, meningioma, and even pericraniotomies. Recently, there is a body of literature reporting cerebral vasospasm after tumor resection. Reports of CV in the setting of intracranial tumors are essential for better understanding the serious condition, which may lead to strokes, and permanent disability. This is particularly important since the incidence of vasospasm for vasospasm following brain tumor resection is extremely low. We present a case of delayed severe symptomatic diffuse vasospasm following meningioma resection, which required aggressive management with induced hypertension and intravascular balloon angioplasty.

Case Report: A 55-year-old woman with a known left petroclival mass, followed conservatively over years, presented with left facial twitching and difficulty writing with her right hand. As the MRI of the brain revealed an interval increase in the size of the mass fronto-temporally, and the patient was now symptomatic, the decision was made to resect the lesion. Preoperatively the patient had a non-local neurologic exam. The patient underwent a minimally invasive, using a left posterior temporal approach. A gross total resection was performed, with only a small cuff of tumor left surrounding the left 5th and 6th cranial nerves to limit cranial neuropathy. The final estimated blood loss was 350 ml. Pathology was consistent with meningiomas with pigmented spindles (WHO grade).

On POD 2 the neurological exam was not without local deficits. On POD 3 to POD 8, the patient was noted to have mild ataxia speech and CN VI palsy, but was not significantly changed, and she was discharged home. On POD 9, the patient was brought to the emergency room after two days of progressively decreasing consciousness and mutism. On exam, the patient was lethargic and oriented only to self but was not following commands. The patient had bilateral VI and VII cranial nerve weakness. She was intubated for airway protection, and admitted to the neuro ICU. Brain MRI revealed superficial petrosal acute infarcts in the left posterior frontal, parietal, and occipital lobes, peritumoral right temporal lobe, and bilateral periventricular white matter. MRA showed bilateral occlusion of the left MCA, ACA and M1, and M1-ACA segments bilaterally. Four-vessel angiogram confirmed the findings. Patient was subsequently treated with balloon angioplasty and intraarterial nicardipine, with marked improvement in symptoms.

Discussion: Vasospasm, commonly described after aneurysmal SAH, is very rare following tumor resection. The overall incidence is 1.9%. This occurs when the index of suspicion is low and the diagnosis is missed.

The pathophysiologic basis of vasospasm in the setting of tumor resection is obscure. In a large series of skull-base surgeries, the authors found nine patients with evidence of postoperative vasospasm; eight of whom were symptomatic. After correlating clinical variables, they concluded that patients with large tumors (more than 4 cm), with vascular component with encasement and narrowing of major vessels, or those that took longer to resect, were more likely to develop vasospasm. The possibility that manipulation of the major vessels of the basal cisterns produced the observed phenomenon cannot be ruled out, however. It is unlikely that the mechanism led to vasospasm in our patient, since there was no significant vessel encasement in this patient, and thus little vessel manipulation occurred in this patient. Additionally, there was diffuse rather than regional vasospasm which would suggest diffuse vasospasm rather than the focal local vasospasm from mechanical irritation of arteries. Our case further highlighted whether vasospasm developed in the vessel that was encased or in the distant vessels.

While one may argue that blood in perimesencephalic cisterns could independently induce vasospasm, we do not believe this is the case in our patient. Given the constellation of symptoms and radiographic changes, the patient underwent urgent four vessel cerebral angiogram revealing extensive bilateral vasospasm in the anterior and posterior circulation limited to the distal intracranial vessels.

The patient subsequently underwent angioplasty and received intraarterial nicardipine. Concomitantly, patient was started on hypertensive therapy. Her exam gradually improved, and blood pressure allowed to normalize. The patient was discharged on POD 2, and subsequently transferred to the floor. She was discharged to inpatient rehabilitation a week later, and had marked improvement by discharge with near complete resolution of aphasia and only slight weakness of right upper extremity and left VI nerve palsy.

References:

Fig.1

Fig.2. upper Row : DWI; Lower ROW : ADC

Fig.3