Sphenoid Ridge Meningioma Presenting as Acute Cerebral Infarction

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A previously healthy 52-year-old man presented to the emergency room with acute onset left hemiparesis and dysarthria. Brain computed tomography and magnetic resonance examinations revealed acute cerebral infarction in the right middle cerebral artery territory and a sphenoid ridge meningioma encasing the right carotid artery terminus. Cerebral angiography demonstrated complete occlusion of the right proximal M1 portion. A computed tomography perfusion study showed a wide area of perfusion-diffusion mismatch. Over the ensuing 48 hours, left sided weakness deteriorated despite medical treatment. Emergency extracranial-intracranial bypass was performed using a double-barrel technique, leaving the tumor as it was, and subsequently his neurological function was improved dramatically. We present a rare case of sphenoid ridge meningioma causing acute cerebral infarction as a result of middle cerebral artery compression.

Key Words: Acute cerebral infarction · Meningioma · Middle cerebral artery · Occlusion.
DISCUSSION

The rate at which meningiomas present with symptoms of cerebral ischemia is unknown. Komotar et al. 13) retrospectively reviewed the medical records of 1617 patients with meningiomas evaluated by the surgical neuropathology service at their institution from 1985 to 2001 and estimated an incidence of meningioma-related cerebral ischemia by carotid artery compression of only 0.19% (3 of the 1617 tumors).

Previous reports have suggested that ICA compression by meningioma located in the skull base may produce transient neurological symptoms, such as, loss of consciousness, hemipa-
resis, paresthesias, and global amnesia\(^{13,15,17}\). Nevertheless, the incidence of complete cerebral infarction resulting from arterial occlusion or obstruction related to meningioma is extremely rare\(^{9,11,13,19}\). We have summarized the reported cases from English literature of complete cerebral infarction caused by a meningioma in Table 1. Typically these tumors do not change vascular patency even when they completely encase the ICA and its bifurcation, because of their slow growth rates and non-invasive nature, and because of the high arterial pressure. Even when obstruction of the artery occurs due to compression, this is well compensated for by collateral flow through the circle of Willis. On the other hand, cortical veins and dural sinuses, which are low pressure compartments with thin walls, are frequently compromised by meningioma\(^{9}\). However, the slow growth rate of the tumor allows the development of substantial collateral drainage, and as a result, cortical infarction due to venous insufficiency has only been reported postoperatively after injury to these compensatory pathways\(^{12}\). In the present case, the meningioma, encased and occluded the right ICA terminus, and could have caused acute infarction of the MCA territory. Judging from the pattern of infarction observed by magnetic resonance examination, in which infarction included not only watershed zone but also cerebral cortex, the stroke was probably attributable to both hemodynamic hypoperfusion resulted from external compression by the meningioma, as well as artery to artery thromboembolism secondary to thrombus formation in stenotic artery. Furthermore, initial cerebral angiography suggested stump thrombosis at the ICA terminus. The patient had no evidence of vasculopathy or any other known stroke etiology.

Despite the discouraging results of the international randomized EC-IC bypass study in 1985 and the carotid occlusion surgery study randomized trial in 2011\(^{6,17}\), we believe that surgical revascularization may be effective in some patients who have experienced a medication-resistant hemodynamic stroke even in the acute stage, and thus, we have continued to perform the EC-IC bypass procedure in selected patients with good results. Actually, the safety of an early EC-IC bypass in the treatment of acute ischemic stroke has not yet been fully discussed. Traditionally, surgical revascularization has been thought to be contraindicated in the presence of an acute cerebral ischemia because of reperfusion-induced hemorrhages and increased stroke rates after early revascularization. Nonetheless, there are patients who require or may benefit from early EC-IC bypass. More recent publications report promising outcomes in a subset of patients with primarily hemodynamic failure, rendering the efficacy of early EC-IC bypass contentious\(^{9,13,19}\). In patients with a relatively small infarction, increased perfusion/diffusion mismatch, and fluctuating or progressive symptoms resistant to medical or endovascular therapy, like the present case, early low-flow bypass may be more useful to augment blood flow in the ischemic brain while minimizing the risk of a reperfusion-related hemorrhagic complication. Furthermore, we do not hesitate to use both branches of the superficial temporal artery as donors to enhance overall hemispheric augmentation by increasing the total effective flow delivered when the ischemic penumbra area is expansive.

**CONCLUSION**

We present a case of acute cerebral infarction resulting from MCA compression by a sphenoid ridge meningioma that was successfully treated by double barrel bypass, and include clinical features and a review of the literature.

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**Table 1. A summary of the reported cases of complete cerebral infarction caused by a meningioma**

| Authors & year | Age (years) | Sex | Location of meningioma | Compressed artery | Infarction area |
|----------------|-------------|-----|------------------------|-------------------|-----------------|
| Komotar et al.\(^{13}\), 2003 | 49 | M | Right cavernous sinus | Right cavernous ICA | Right MCA watershed |
| | 31 | M | Right olfactory groove | Right distal ICA | Right MCA cortical |
| Heye et al.\(^{9}\), 2006 | 48 | F | Right sphenopetrosclival | Right cavernous ICA | Right MCA watershed |
| Masuoka et al.\(^{13}\), 2010 | 31 | M | Planum sphenoidale | Right A2 | Right ACA total |
| Cheng et al.\(^{9}\), 2011 | 58 | M | Right sphenoid ridge | Right M1 | Right MCA cortical |
| Current case | 52 | M | Right sphenoid ridge | Right M1 | Right MCA watershed |

ICA : internal cerebral artery, MCA : middle cerebral artery, ACA : anterior cerebral artery, A2 : second segment of ACA, M1 : first segment of MCA
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