Non Ruptured MCA Aneurysms Presenting with Insular Related Symptoms

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ABSTRACT: Objective: To present a new semiological description of unruptured middle cerebral artery (MCA) aneurysms. Methods: We present a series of three MCA aneurysms presenting with progressive or paroxysmic somatosensory symptoms in combination with visceral, motor, language or autonomic symptoms. Results: A surgical approach was proposed for two aneurysms, and both patients experienced complete resolution of their symptoms. The third aneurysm was successfully excluded by endovascular coiling but the symptoms persisted. Conclusions: To our knowledge this is the first description of unruptured aneurysms presenting with insular-related symptoms.

Unruptured intracranial aneurysms are usually asymptomatic, detected incidentally on brain imaging. Larger unruptured aneurysms however can present with symptoms related to compression. Examples include chiasmatic compression by internal carotid or anterior communicating artery aneurysms, intracavernous aneurysms causing ophthalmoplegia and facial pain, and aneurysms of the posterior communicating artery producing third nerve palsy. We present three cases of middle cerebral artery (MCA) aneurysm who presented with bilateral paresthesiae and autonomic symptoms due to either epileptic activity or mass effect on the insular cortex.

Case 1: A 50-year-old female complained of dry mouth, throat constriction, palpitations and left arm paresthesiae for the previous three days. The paresthesiae progressed over the next five weeks to involve the left leg, perioral area and finally became bilateral, involving the four limbs. Her neurological exam was normal. Cardiac workup was normal. Cerebral magnetic resonance imaging (MRI) and angiography demonstrated a right MCA aneurysm measuring 11 mm lying over the insula. Electroencephalogram (EEG) was not performed. Following surgical clipping of the aneurysm, the patient has been symptom free for four years since surgery, except for one episode of mild left arm paresthesia occurring on the fourth day after surgery (Figure 1).

Case 2: A 55-year-old female presented with a four-year history of daily episodic paresthesiae lasting two to ten minutes, involving mainly the right limbs, less frequently the left limbs and occasionally both sides. Some episodes were severe enough to wake the patient at night. Other symptoms such as nausea, ...
laryngeal constriction and word finding difficulties, occurred less frequently, about once a month. The investigation demonstrated an 11 mm left MCA bifurcation aneurysm imbedded in the insula. A symptom calendar over six weeks showed that paresthesiae were contralateral to the aneurysm 74% of time, ipsilateral in 21% and bilateral in 5%. An EEG was normal. After surgical clipping of the aneurysm, the patient experienced a complete resolution of her symptoms over the four years since surgery, except for a single episode of paresthesia in the past year (Figure 2).

**Case 3:** A 50-year-old male presented with two episodes of perioral paresthesiae and painful right hemiparesthesiae lasting five minutes, one week apart. The MRI revealed a giant unruptured partially thrombosed aneurysm of the left MCA bifurcation (Figure 3). He was initially treated with aspirin for a suspected transient ischemic attack. The aneurysm was eventually treated successfully by endovascular coiling. During the three years of follow-up, the patient continued to experience similar episodes of paroxysmic paresthesiae. The brain MRI remained unchanged and the EEG done during one episode was normal (Figure 3).

**DISCUSSION**

The insula is a highly developed structure hidden deep within the Sylvian fissure and surrounded by the frontal, parietal and temporal opercula. The insula is closely related to the middle cerebral artery, from which it receives its blood supply via 30 to 40 small arteries that spring from the M2 and M3 segments. The insula has wide connections with the neocortex, basal ganglia, thalamus, hypothalamus, limbic structures and olfactory cortex. These numerous connections subserve the complex functional spectrum of the insular lobe that include: (a) somatosensory functions; (b) auditory functions; (c) language functions; (d) a primary visceral/autonomic sensory and motor area, (e) and a supplementary motor area.

We present uncommon manifestations of non-ruptured MCA aneurysms attributed to their location in the insula. Several series have been published on tumors, angiomatas, and arteriovenous malformations in the insular regions. We did not find any publication of aneurysms causing insular-related symptoms. All patients reported somatosensory symptoms. These were accompanied by autonomic (palpitations), visceral (nausea) and language disturbances in Patients 1 and 2 respectively. Somatosensory symptoms could affect one limb or the whole hemibody, mainly contralaterally but ipsilaterally or also bilaterally at times. Some painful limb paresthesias, throat constriction and perioral paresthesias were also frequently described. These symptoms are consistent with data found in the literature on direct stimulation of the human insular cortex using
intracerebral electrodes in epileptic patients. Our group\textsuperscript{26}, similar to Penfield\textsuperscript{27,28} and Isnard et al\textsuperscript{29,30} have shown that somatosensory symptoms were the most frequently evoked responses during human insular cortical stimulation, affecting restricted territories or larger areas, contralaterally, ipsilaterally or bilaterally. In addition, in the Isnard et al series, the majority of patients with seizures originating from the insula had the four cardinal ictal symptoms: perioral paresthesia, throat constriction and lateralized somatosensory or motor symptoms\textsuperscript{29}.

In all the cases, the paresthesia was surprisingly bilateral, with symptoms being more important contra-lateral to the lesion. During electrical stimulation of the insular cortex in awake patients after temporal lobectomy, Penfield noted that sensations were usually contra-lateral, but were on occasion ipsilateral or bilateral\textsuperscript{27}. A similar observation was made by Isnard et al during stimulation by deep electrodes inserted in the insula, where 10\% of somatosensory responses were ipsilateral and 5\% were bilateral\textsuperscript{29,30}. Other less-frequently evoked responses included viscerosensitive, motor, vestibular, auditory and language disturbances.

The exact mechanism by which vascular lesions in the insula become symptomatic is uncertain. Symptoms may be related to epileptic seizures or from direct mass effect. Embolic events or a vascular steal phenomena may be other possibilities. Epilepsy could be the mechanism in Patients 1 and 3 because symptoms were paroxysmal and lasted only for a few minutes. Even though scalp EEG showed no epileptiform discharges during an event, this does not eliminate insular epilepsy. In a recent study, our group has shown that insular seizures (confirmed by intracerebral electrodes) could be missed by scalp EEG recordings possibly due to its deep-seated location\textsuperscript{26}. We have also shown that lesions in the insula are highly epileptogenic\textsuperscript{31}. For example, intractable epilepsy is found in 60\% of low grade gliomas of the insula whereas it is found in only 15\% of low grade gliomas in other cortical regions\textsuperscript{16}. In Case 2, insular compression rather than epilepsy is likely the explanation for the long-lasting somatosensory symptoms (hours to days). In one report of a tumor located in the right insular cortex, the patient had a left arm sensory deficit that disappeared two months after tumor removal\textsuperscript{32}. The author suggested that this may be due to mass effect.

**Conclusions**

Unruptured MCA bifurcation aneurysms can present with a combination of viscerosensitive, motor, language, autonomic and especially somatosensory symptoms. It is possible that these manifestations of symptomatic aneurysms are not uncommon. However, these symptoms may have been overlooked in the past. In addition to securing the aneurysm, dissecting it from the insula could result in symptom resolution.

**References**


