Paradoxical Clustering of Brain Metastases in an Underperfused Cerebral Hemisphere

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Objective: To describe a patient with a predominantly unilateral intracranial arterial stenosis who then developed metastatic lung cancer to the brain, with the tumors preferentially depositing in the underperfused cerebral hemisphere.

Design: Case report.

Setting: Inpatient neurology ward at a university medical center.

Patient: A 68-year-old woman with intracerebral arterial stenosis who then developed lung cancer with multiple metastases to the brain in an asymmetric arrangement.

Main Outcome Measure: The location of metastatic tumor deposits in relation to intracerebral arterial stenosis in the cerebral hemispheres of our patient.

Results: In this patient, most of the metastatic tumors were located in the underperfused cerebral hemisphere.

Conclusions: This case demonstrates the concept that emboli washout by vigorous circulation is more important than direct delivery of embolic material in determining whether tumor cells will implant and grow in the brain.

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Such knowledge as we have of these steps is derived from casual glimpses afforded when, as the outcome of one of nature’s experiments, some particular line is interfered with. . . .

E. Garrod, Inborn Errors of Metabolism

We evaluated a 68-year-old African American woman with hypertension, hypercholesterolemia, and peripheral vascular disease for recurrent transient episodes of weakness involving the right arm and leg. She had a left frontal lobe infarct on computed tomography. Magnetic resonance angiography showed severe stenosis of the intracranial portion of her left internal carotid artery and left middle cerebral artery that was the cause of her recurrent left hemisphere brain ischemic attacks (Figure 1). The right anterior circulation and posterior circulation arteries did not show important compromise. The patient was treated with antiplatelet agents.

One year later, a lung mass was discovered. Biopsy showed a poorly differentiated adenocarcinoma of the lung. Soon after diagnosis, the patient presented with nonfluuent aphasia and right hemiparesis. Both noncontrast head computed tomography and contrast-enhanced magnetic resonance imaging did not show any new infarcts but did show multiple gadolinium-enhancing intracerebral metastases from her lung cancer. The metastases were predominantly in the left cerebral hemisphere (6 left, 1 right) (Figure 2 and Figure 3).

Brain metastases from the lung are bloodborne. Do tumor implantation and growth depend on the relative amount of delivery of blood containing tumor emboli or on the clearance of tumor emboli? Under normal circumstances, each cerebral hemisphere contains about two-fifths of cerebral metastases and abscesses while about one-fifth of brain metastases and brain abscesses are found in the posterior circulation, matching the relative quantity of intracranial blood flow. If delivery is postulated to be the important factor, this patient should have had fewer metastases in her underperfused left cerebral hemisphere. Instead, she had many more tumors growing there.

Transcranial Doppler monitoring of patients with potential embolic sources has shown that many emboli are detectable in intracranial arteries but few cause symptoms or brain infarcts. These emboli are
normally cleared (washed out) if brain blood circulation is vigorous. Studies of patients with cervicocranial arterial stenoses show that clearance of brain emboli is decisive in explaining the frequency and location of brain infarcts in underperfused cerebral hemispheres.\(^1,2,3\) This case, an experiment of nature, adds evidence that clearance of emboli is more important than delivery in explaining the outcome of brain embolism.

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REFERENCES