Image of the Month

The patient underwent initial precontrast computed tomography (CT) in the emergency department. This scan demonstrated a roughly 3-cm hyperdense mass that was centered on the right cavernous sinus. Associated vasogenic edema surrounded the mass. Additional foci of hypodensity were seen in the right centrum semiovale, said Dr. Gautam R. Mirchandani, director of neuroradiology at New York Methodist Hospital.

Pre- and postcontrast magnetic resonance imaging (MRI) on the next day demonstrated a heterogeneously—but avidly enhancing—extra-axial mass that corresponded with the CT finding. Regions of hypodensity seen on CT matched areas of restricted diffusion on diffusion-weighted imaging—representing acute infarction.

Magnetic resonance angiography (MRA) did not show the middle cerebral artery in that region because of the surrounding hypervascular lesion, which degrades the signal from that region. Flow-related enhancement was seen in more distal branches, suggesting that the middle cerebral artery was not occluded within the mass, but its branches were compromised. Of note, the regions of acute infarction correspond to the vascular territory of perforating vessels that arise from the proximal middle cerebral artery.

Further assessment of the mass was performed with CT angiography (CTA) to evaluate the relationship of the middle cerebral artery to the mass and to the regions of infarction. CTA demonstrated that the middle cerebral artery was not occluded within the lesion, although it was narrowed somewhat. Perforating vessels arising from the middle cerebral artery were also narrowed, likely causing her symptoms.

Based on the imaging characteristics, the clinical team was fairly confident that the avidly enhancing, extra-axial mass represented a meningioma, and surgical resection was planned.

Intraoperatively, frozen sections revealed histology consistent with adenocarcinoma, not with meningioma. Several specimens were sent to confirm this unexpected finding.

On postoperative review of the images, the two in-house neuroradiologists separately concurred that the imaging findings were still most consistent with a meningioma. "Even on re-review, I think it was reasonable to say that this looks like a meningioma," said Dr. Mirchandani.

This conclusion was primarily based upon the extra-axial location and the avid enhancement. In addition, the tumor mass encased the near-by vessels, rather than occluding them. There was also no evidence of local osseous erosion, which is sometimes seen with other, more aggressive tumors. The absence of a known primary tumor made the possibility of a dural-based metastasis yet less likely.

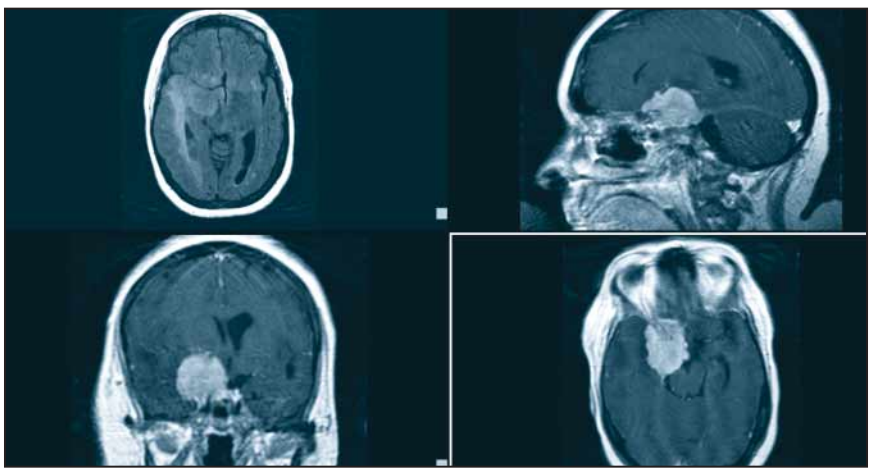
Afterward, the patient was found to have a primary lung carcinoma, which had metastatically spread to the brain.

The patient arrested during the resection and underwent a prolonged resuscitation effort. She is currently intubated and on a ventilator. The patient is receiving supportive care, as she is still too ill for removal of the lung mass or undergo chemotherapy, said Dr. Susanna Horvath, director of the stroke program at New York Methodist Hospital.

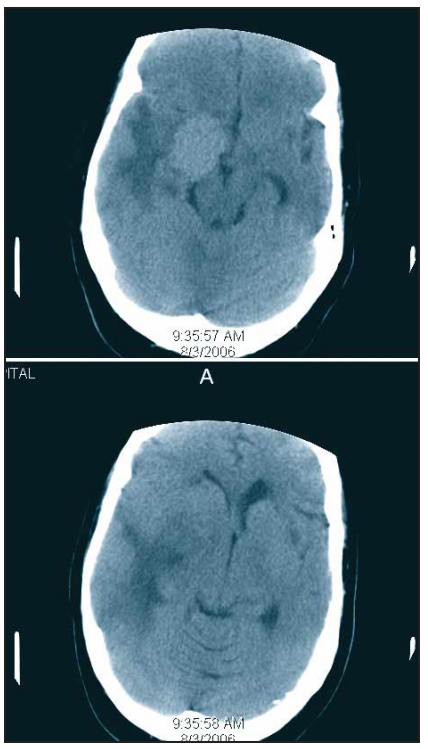
"I think the teaching point in all this is that you have to look at the whole clinical scenario," said Dr. Horvath.

By a large margin, enhancing, extra-axial masses represent meningiomas. Dural-based metastatic deposits, while possible, are seen much less often. Angiographic imaging can be very helpful in the evaluation of ischemic disease within the brain.

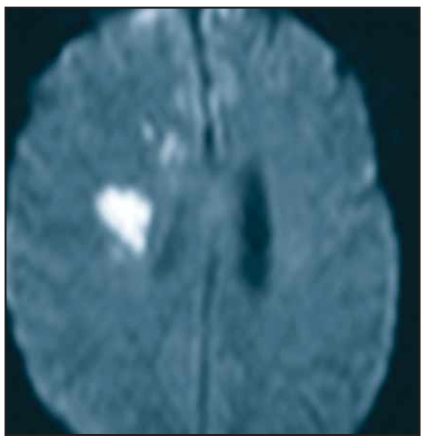
—Kerri Wachter



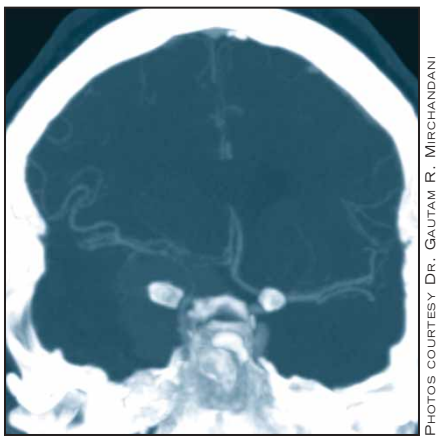
Postcontrast T MRI shows the mass to be extra-axial and avidly enhancing. White matter hyperintensity corresponds to the hypodensity on CT.



Precontrast CT shows a 3-cm mass near the right cavernous sinus.



DWI shows two foci of acute infarct on the right that are also visible on CT.



CTA demonstrates that the MCA within the mass is narrowed.

Photos courtesy Dr. Gautam R. Mirchandani

Whole-Brain Radiation Preserved Neurocognitive Function

BY JANE SALODOF MACNEIL
Southwest Bureau

ATLANTA — Whole-brain radiation therapy can preserve neurocognitive function in patients with brain metastases, according to a 135-patient study presented at the annual meeting of the American Society of Clinical Oncology.

Dr. Jing Li reported that patients lived longer and had better neurocognitive function if their tumors shrank more than 45% during the 2 months after whole-brain radiation therapy (WBRT).

These "good responders" scored better on all eight neurocognitive tests used in the study, compared with "poor responders" with less than 45% tumor shrinkage at the 2-month mark. The effects were statistically significant over the course of the study on tests of executive function and fine motor coordination.

The effects were most dramatic in a small group of 7-9 long-term survivors who demonstrated cognitive improvement when tested 15 months after receiving WBRT.

Magnetic resonance imaging at 4 months showed that brain tumors had shrunk 80% on average from baseline by then in patients who would survive 15 months.

"Neurocognitive function is stable or improving over time in long-term survivors," said Dr. Li of the University of Wisconsin at Madison. "It appears that the adverse impact of tumor growth on neurocognitive function is greater than that of whole brain radiation therapy. Therefore, improving response is a worthy aim in this patient population."

The preservation of neurocognition associated with whole-brain radiation was limited to those patients whose tumors shrank at least 45% in response to therapy.

Although WBRT is used to reduce neurologic symptoms caused by brain metastases, she said the treatment's effects on neurocognitive skills have up to now gone "largely unstudied." The lack of data was attributable, she suggested, to inadequate assessment tools and the poor prognosis (4-6 months median survival) in the 10%-30% of cancer patients who develop brain metastases.

For this study, Dr. Li and her colleagues selected 135 of 208 patients in the control arm of a prospective, randomized, multicenter trial that compared WBRT alone with WBRT with motexafin gadolinium enhancement. Only those who survived until the first follow-up magnetic resonance image was taken 2 months later were eligible for the neurocognitive study. All neurocognitive participants had received 30 Gy of radiation in 10 fractions without motexafin gadolinium.

The investigators determined that median tumor shrinkage was 45% at two months for the entire population. They classified patients as good or poor responders based on their relationship to the median.

To determine changes in neurocognitive function, the researchers administered eight tests that had been validated in another pilot study and could be completed within 30 minutes.

The eight tests covered three neurocognitive domains: memory, executive function (decision-making capacity), and fine motor coordination.

Poor responders had a shorter time to neurocognitive deterioration on all eight tests, compared with the good responders, according to Dr. Li. She said this difference was statistically significant on two pegboard tests used to measure fine motor coordination (287 vs. 380 days and 291 vs. 401 days) and the Trail B test of executive function (331 vs. 462 days).

In a discussion of Dr. Li's presentation, Dr. Jeff A. Sloan suggested the differences might have been statistically significant on all eight tests had the investigators chosen a less stringent definition of neurocognitive deterioration. The criterion used was a decline of two standard deviations from baseline on two consecutive measurements or on the last follow-up visit before death.

"Two standard deviations is a huge change, a profound change," Dr. Sloan of the Mayo Clinic in Rochester, Minn., said, praising the study for its rigor. "… [T]he bar was set so high, it is not surprising that only three of these eight [findings] were significant." ■