Major Cerebral Infarction from Tumor Embolus

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SUMMARY A major right hemispheric infarct developed in a 31-year-old man within forty-eight hours of lung resection for metastatic synovial-cell sarcoma. Post mortem exam revealed tumorous occlusion of the right internal carotid artery. Major stroke from cerebral tumor embolus should be seriously considered in patients with primary or metastatic lung cancer who have had a very recent pneumonectomy, especially when there are symptoms and signs of multi-organ or extremity ischemia.

MAJOR CEREBRAL INFARCTION in patients with malignant solid tumors is usually secondary to a hypercoagulable state or emboli from infectious or nonbacterial thrombotic endocarditis.1-4 Tumor emboli that occlude major cerebral vessels are rare and, except for atrial myxoma, are often not emphasized in the differential diagnosis of nonatherosclerotic stroke.5-7 or of CNS vascular disease in cancer patients.2-4 Occasionally, tumor mucin can embolize to cerebral vessels5-9 and multiple microscopic tumor emboli to smaller vessels may present as an encephalopathy.3,10 Here, we present a case of synovial-cell sarcoma with a tumor embolus resulting in total internal carotid occlusion shortly after a partial pneumonectomy.

Report of a Case

This 31 year old black man developed swelling under his right toe in March of the year of admission. In mid-June, biopsy of the lesion revealed "clear-cell sarcoma of the tendon". At that time there was no evidence of metastatic disease on bone and gallium scans, or on chest x-ray.

Three weeks later, chest x-ray revealed two large nodular densities in the left lower lobe. He underwent a right below the knee amputation, and 12 days later, a left lower lobectomy with five wedge resections of the left upper lobe. Pathologic examination of the lung tissue confirmed metastatic synovial sarcoma with extensive vascular invasion. On the same day, he had a bone marrow storage procedure in preparation for intensive chemotherapy.

Two days after the pneumonectomy, he developed a dense left hemiplegia, hemianesthesia, and hemianopia with left sided hyperreflexia and an extensor plantar response, but remained alert. There was no clinical evidence of emboli to viscera, skin or limbs. On the day of this event, head CT with and without contrast was normal; however, repeat scan, four days later, revealed a non-enhancing low-density lesion in the distribution of the right middle cerebral artery. The patient did not improve neurologically.

Subsequently, he developed melena and his hematocrit fell from 33 to 27. Radiological studies revealed partial small bowel obstruction by metastatic nodules just distal to the duodeno-jejunal junction. He became febrile and died one month after his pneumonectomy.

Postmortem Examination

The patient had extensive spread of synovial-cell sarcoma. A metastatic deposit in the jejunum had perforated, with resulting peritonitis and abscess formation. Additional metastases were present in other bowel areas, lungs, spleen, both kidneys and adrenal glands. No major visceral or limb arteries were occluded by tumor emboli.

Neuropathologic examination showed the intradural portion of the right internal carotid artery to be completely occluded by firm, yellowish-white tissue (fig. 1). The occlusion extended into the first three centimeters of the right middle cerebral artery. Microscopic examination of the occluding material showed that it consisted of synovial-cell sarcoma (fig. 2). The anterior portion of the right temporal lobe, basal ganglia, and internal capsule showed infarction with early liquefactive necrosis. In addition, two hemorrhagic metastatic lesions, 3 cm² in size, were present in both frontal lobes; there was one smaller non-hemorrhagic metastasis in the right occipital lobe.

Comment

Fifteen prior cases of major cerebral infarction from malignant tumor emboli were reviewed (table 1).3,11-23
Fourteen patients had involvement of lung from primary or metastatic tumor. As in our patient, the stroke occurred within two days post-pneumonectomy for tumor excision in eight. In the majority of the remaining cases, there was obvious pulmonary venous or left atrial invasion on postmortem exam. Several of the patients with tumorous cerebral infarction, also had concurrent signs of emboli to other organs or the extremities. Surgical manipulation of the lung undoubtedly promotes release of emboli, especially when there is vascular tumor invasion in the lung. The single case free of lung

Table 1: Reported Cases of Malignant Cerebral Tumor Emboli

<table>
<thead>
<tr>
<th>Case</th>
<th>Tumor type (age/sex)</th>
<th>Reference</th>
<th>CNS signs</th>
<th>Occluded vessels</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Malignant testicular carcinoma (39/F)</td>
<td>Thompson and Evans, 1929</td>
<td>Left hemiplegia</td>
<td>Right middle cerebral artery</td>
<td>Cardiac mural tumor with a patent foramen ovale, no pulmonary involvement</td>
</tr>
<tr>
<td>2</td>
<td>Primary anaplastic squamous cell lung carcinoma (61/M)</td>
<td>Eason, 1950</td>
<td>Dysarthria, left hemiparesis</td>
<td>Right middle cerebral artery</td>
<td>CNS symptoms immediately post-pneumonectomy</td>
</tr>
<tr>
<td>3</td>
<td>Bronchial carcinoma (52/M)</td>
<td>Aylwin, 1951</td>
<td>Signs of a &quot;right cerebral catastrophe&quot;</td>
<td>Right middle cerebral artery; right axillary artery</td>
<td>Stroke and right upper extremity ischemic signs within hours after pneumonectomy for metastases</td>
</tr>
<tr>
<td>4</td>
<td>Primary pulmonary myxosarcoma (52/F)</td>
<td>Miller and Jackson, 1954</td>
<td>Left hemianesthesia and hemiparesis</td>
<td>Multiple right hemispheric vessels</td>
<td>Pulmonary vein involvement extending into the left atrium</td>
</tr>
<tr>
<td>5</td>
<td>Adrenal cortical carcinoma (56/F)</td>
<td>Probert, 1956</td>
<td>Death</td>
<td>Right superior pulmonary vein, innominate and left common carotid</td>
<td>Cardiac arrest and death during pneumonectomy for metastases</td>
</tr>
<tr>
<td>6</td>
<td>Bronchial carcinoma (64/F)</td>
<td>Dickens, 1961</td>
<td>Absent brainstem functions</td>
<td>Basilar artery</td>
<td>Tumorous invasion of a pulmonary vein</td>
</tr>
<tr>
<td>7</td>
<td>Anaplastic adenocarcinoma of lung (57/M)</td>
<td>Taber, 1961</td>
<td>Left hemiparesis</td>
<td>Abdominal aorta; right middle cerebral artery</td>
<td>Ischemic signs in lower extremities requiring aortotomy and stroke within hours post-pneumonectomy</td>
</tr>
<tr>
<td>8</td>
<td>Bronchial carcinoma (64/M)</td>
<td>Balas, 1971</td>
<td>Right hemiplegia</td>
<td>Aortic bifurcation and femoral arteries; left carotid artery</td>
<td>Ischemic lower extremities treated with Fogarty catheter embolectomy and stroke within hours post-pneumonectomy</td>
</tr>
<tr>
<td>9</td>
<td>Thyroid carcinoma (60/F)</td>
<td>Banerjee, 1972</td>
<td>Right hemiparesis and aphasia</td>
<td>Left middle cerebral artery</td>
<td>Multiple metastatic pulmonary nodules present</td>
</tr>
<tr>
<td>10</td>
<td>Adenocarcinoma of colon (72/F)</td>
<td>Greene, 1974</td>
<td>Unresponsive Cheyne-Stokes respirations; bilateral extensor plantar responses</td>
<td>Left internal carotid; left posterior cerebral arteries; coronary arteries</td>
<td>Ischemic EKG changes noted at same time as CNS disease metastatic lung tumor invading right pulmonary vein</td>
</tr>
<tr>
<td>11</td>
<td>Epidermoid carcinoma of lung (67/M)</td>
<td>Miranda, 1975</td>
<td>Left hemiparesis</td>
<td>Right middle cerebral artery</td>
<td>Stroke immediately post-pneumonectomy; tumor noted invading pulmonary vein at surgery</td>
</tr>
<tr>
<td>12</td>
<td>Bronchial carcinoma</td>
<td>Henson and Urich, 1982</td>
<td>Dense hemiplegia</td>
<td>Carotid siphon</td>
<td>Stroke immediately post-pneumonectomy</td>
</tr>
<tr>
<td>13</td>
<td>Chondrosarcoma of femoral head (27/M)</td>
<td>Kornfeld, 1983</td>
<td>Left hemiparesis, headache, lethargy, right gaze preference</td>
<td>Right vertebral and multiple smaller cerebral vessels</td>
<td>Tumorous invasion of pulmonary veins from lung metastases</td>
</tr>
<tr>
<td>14</td>
<td>Osteogenic sarcoma</td>
<td>Graus, 1985</td>
<td>Focal signs</td>
<td>Middle cerebral artery</td>
<td>Post-pneumonectomy for lung metastases</td>
</tr>
<tr>
<td>15</td>
<td>Breast carcinoma</td>
<td>Graus, 1985</td>
<td>Focal signs</td>
<td>Middle cerebral artery</td>
<td>Lung metastases present</td>
</tr>
<tr>
<td>16</td>
<td>Synovial-cell sarcoma (31/M)</td>
<td>Present case</td>
<td>Left hemiplegia, hemianesthesia, and hemianopsia</td>
<td>Right internal and middle cerebral artery</td>
<td>Stroke two days post-pneumonectomy</td>
</tr>
</tbody>
</table>
involvement was a patient who had paradoxical tumor embolism via a patent foramen ovale.11 Lung and lymph nodes are the most common sites of metastases of synovial-cell sarcoma; brain metastases have been rare.24-28 Our patient had a normal CT two days after his pneumonectomy. However, upon his death four weeks later, autopsy revealed bilateral frontal and right occipital metastases. It is quite possible that these metastases began as micro-emboli released at pneumonectomy which grew to macroscopic site prior to the patient's death.

Major vessel tumorous cerebral infarction is rare. In Graus et al1 review of 256 patients with known systemic cancer and major cerebral infarction, only two had tumor embolus as the etiology. Despite its rarity, major tumor embolus should be suspected when a patient, especially in the appropriate clinical setting. We conclude that major cerebral artery embolism via a patent foramen ovale.

FIGURE 1. Intradural portion of right internal carotid artery occluded by tumorous embolus.

FIGURE 2. Microscopic examination of the occluding material in the right internal carotid artery revealing synovial cell sarcoma (hematoxylin-eosin × 80). Insert, right upper corner shows cellular appearance of the embolus (hematoxylin-eosin × 400).


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