Fourth Ventricle Brain Metastases from Primary Lung Adenocarcinoma with Intestinal Differentiation

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Abstract

A 51-year-old male presented with three months history of shoulder pain followed by frequent occipital headaches associated with gait imbalance and vomiting. PET scan, done after shadowing was seen in left middle and lower lung on chest X-ray, revealed left lung mass metastatic to the infracarinal lymph nodes, left adrenal gland, along with diffuse bone metastasis. MRI brain showed a lobulated mass in the fourth ventricle. The patient underwent sub-occipital craniotomy for resection of the fourth ventricle lesion. A mucoid soft mass was resected, and histopathological examination showed adenocarcinoma with intestinal differentiation. CT guided biopsy of the lung lesion was inconclusive, and upper and lower GI endoscopies were negative for malignancy. To the best of our knowledge, this is the first case reported in literature of lung adenocarcinoma with intestinal differentiation with metastasis to the fourth ventricle.

Keywords: Fourth ventricle metastasis; Lung adenocarcinoma; CT; MRI

Case Presentation

A 51-year-old male, heavy smoker, known to have hypertension and diabetes mellitus type 2 presented with three months history of shoulder pain followed by frequent occipital headaches associated with gait imbalance and vomiting. The patient denied any history of loss of consciousness, seizures, weakness or other neurologic deficit.

On neurological examination, the patient was conscious, alert and fully oriented. He had full motor power in all extremities and no sensory deficits. Cranial nerves were intact and the pupils were 2 mm in size and equally reactive. He had gait imbalance but no dysmetria nor dysdiadokinesia.

The patient was first investigated by chest x-ray that showed an increased shadowing in the left middle and lower lung field. This was followed by PET scan that revealed left lung mass metastatic to the infracarinal lymph nodes, left adrenal gland, along with diffuse bone metastasis. MRI brain showed a lobulated mass in the fourth ventricle (Figure 1).

The patient underwent sub-occipital craniotomy for resection of the fourth ventricle lesion. The tumor was mucus-like and it was dissected and resected off the cerebellum and the brain stem. On gross pathologic examination, the tumor was soft, predominantly mucoid in consistency with a focal solid yellow area. On histologic examination, there were numerous irregular glandular structures lined by large cells having irregular nuclei and abnormal vacuolated cytoplasm. Mucin was abundant. The tumor was strongly positive for CK7 and CK20, weakly positive for CDX-2, and negative for TTR, TTF-1 and synaptophysin (Figure 2).

The patient underwent then CT guided biopsy for the left lung lesion and the histology revealed normal tissue. Most likely the target was missed and the procedure was not repeated as it was complicated by pneumothorax.

A multidisciplinary meeting was held and included the neurosurgery, oncology, pulmonary and gastroenterology teams. In order to exclude primary gastro-intestinal cancer, upper and lower...
gastro-intestinal endoscopies were done and showed multiple small diverticulae in the large intestine and a polyp in the ascending colon but the rest of the exam was otherwise normal. The polyp was resected and turned out to be benign in nature.

The patient left the operating room with no complications and discharged home on post-operative day 4 with no new neurologic deficit. The patient was sent to the oncology service for further therapy.

**Discussion**

Brain metastases are the most common cause of intra-cranial tumors and lung cancer is responsible for 40% to 60% of all brain metastases. In general, the majorities of brain metastases are multiple and occur in the parenchyma and rarely occur in the ventricular system [1]. Most of these intra-ventricular metastatic lesions were located in the lateral ventricle and a careful literature review revealed studies of fourth ventricle metastases were only limited to two case reports and rare examples in large series of brain metastases.

In a published series of intracranial metastatic tumors from the brain tumor registry in Japan in 1991, 0.4% only was located in the fourth ventricle [2]. Few years later, Spetzger et al. [3] reported a case of a woman with history of renal cell carcinoma who presented with intraventricular and subarachnoid hemorrhage after 1 week of progressive headache, vomiting and vertigo. Diagnostic angiography showed bilateral posterior communicating arteries aneurysms for which she underwent bilateral pterional craniotomies for clipping. After 5 months, a follow up MRI brain showed a lesion in the fourth ventricle. Histopathologic examination of the resected lesion was reported as hypernephroma metastases. Aslan et al. [4] reported the case of a 52 years old gentleman with 2 years history of colorectal carcinoma, who presented with cerebellar symptoms. He was operated upon and adenocarcinoma was found. Later, Ferguson et al. [5] reported a large single institution cohort of fourth ventricle tumors over 18 years. Only less than 10% were metastatic in nature from tumors outside the brain.

In our case, given the high uptake of the lung lesion on PET scan and normal upper and lower gastrointestinal endoscopies, the patient was diagnosed with primary lung adenocarcinoma with intestinal differentiation despite unsuccessful primary lesion biopsy. Fourteen cases of pulmonary adenocarcinoma with intestinal differentiation were reported in the literature that have the same histopathologic and immunophenotypic finding as our case [6]. All cases demonstrated diffuse positivity for Cytokeratin (CK) 20 and CDX-2 in neoplastic cells with negative staining for CK7 and thyroid transcription factor-1.

Given the fact that metastatic fourth ventricle lesions are rare, there are no clear guidelines about the management of this entity. Hassaneen et al. [7] reported the surgical management of 29 cases of lateral ventricle metastases in MD Anderson. Patients in this study were managed based on prospective studies demonstrating the superiority of surgical resection followed by whole brain radiation therapy over radiation therapy alone in single brain metastases. The lateral ventricle lesions were surgically resected followed by radiation therapy. Also, this study demonstrated that the method of resection was a statistically significant predictor of survival. Patients undergoing
en bloc resection had better survival than those undergoing piece meal resection. Fourth ventricle metastases treatment method can be extrapolated from this study.

Stereotactic radiosurgery might also be considered in selected cases. Farnia et al. [8] reported 93% local control and acceptable treatment related toxicity for intraventricular metastases with a median follow up of 11.4 months. Nevertheless, surgery remains the mainstay treatment for patient with significant mass effect, ventricular obstruction, or severe neurological deficit.

**Conclusion**

In conclusion, fourth ventricle metastasis from lung adenocarcinoma with intestinal differentiation has not been previously reported. Despite the rarity of metastases to the fourth ventricle, it must be considered in the differential diagnosis of an intraventricular mass. Radical surgical resection seems to be the most relevant option for patients with fourth ventricle metastases followed by radiation therapy.

**References**