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Case report on lung cancer presenting with cerebral metastases and overview of treatment of lung cancer and brain metastases

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Abstract

Background: Metastasis to the brain parenchyma is the single most frequent neurologic complication of several common neoplasms, including lung cancer, breast cancer, and melanoma. Case summary: A 50 year old male presented with right sided weakness with severe headache and mild respiratory distress. This patient presented with mainly symptoms of cerebral metastasis of lung carcinoma. He had some minor symptom of lung carcinoma that is exertional breathlessness which was so minor complaint that patient did not report it. CT scan revealed metastatic brain lesion. CT Scan of Chest revealed neoplastic lesion in the chest. CT guided FNAC confirmed the malignancy. Conclusion: Initially patient presented with hemiplegia which is not very common. Brain metastases often have a devastating impact on patients' quality of life and are fatal if not controlled.

Keywords: Hemiplegia, Cerebral metastasis, Headache, Lung carcinoma

1. Introduction

Despite major treatment advances in recent decades, almost 25% of deaths in the United States are cancer related, and cancer remains the second leading cause of death. ¹ Brain metastases are among the most feared complications of cancer because they often cause profound neurologic symptoms that severely impair quality of life. ² They represent a common complication, occurring in 10–30% of cancer patients. The prevalence of brain metastases in cancer patients has been rising over the past three decades. Factors contributing to this increase include improved survival of cancer patients as a result of more effective systemic therapy, the aging of the population, and enhanced detection of clinically silent lesions with magnetic resonance imaging (MRI). Among adults, the most common origins of brain metastasis include lung cancer (50%), breast cancer (15–20%), and melanoma (10%). The next most frequent sources include renal cancer, colorectal cancer, lymphoma, and tumors of unknown primary. ^{2,4,5} Metastases from breast, colon, and renal cell carcinoma are often single, while melanoma and lung cancer have a greater tendency to produce multiple metastases. ^{6,7} MRI studies suggest that single metastases account for one third to one quarter of patients with brain metastases. ⁸ This is important because stereotactic radiosurgery (SRS), an increasingly valuable therapeutic modality, is effective only in patients with a limited number of metastases. Because physical factors contribute to the deposition of tumor cells, the distribution of metastases generally occurs in proportion to blood flow. Thus, about 80% of metastases are located in the cerebral hemispheres, 15% in the cerebellum, and 5% in the brainstem. As a brain metastasis grows and edema develops, the majority of patients present with a progressive focal neurological deficit such as hemiparesis, aphasia, or visual field defect. Other typical features include headache, seizure, and cognitive dysfunction. Approximately one third of brain metastasis is not detected when the person is alive. ^{5,9}

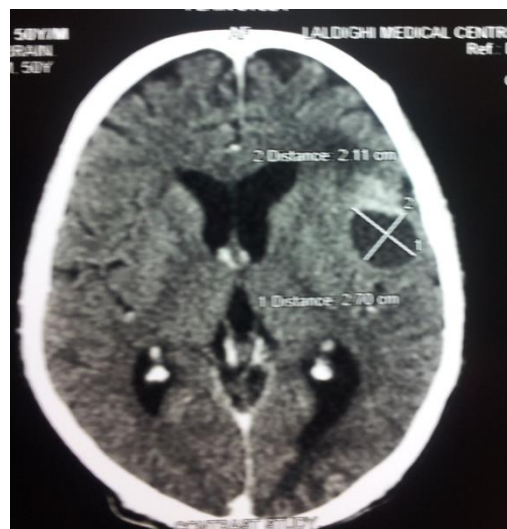
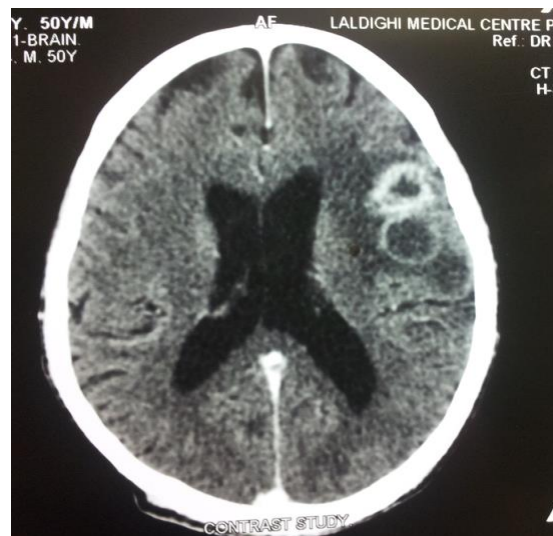
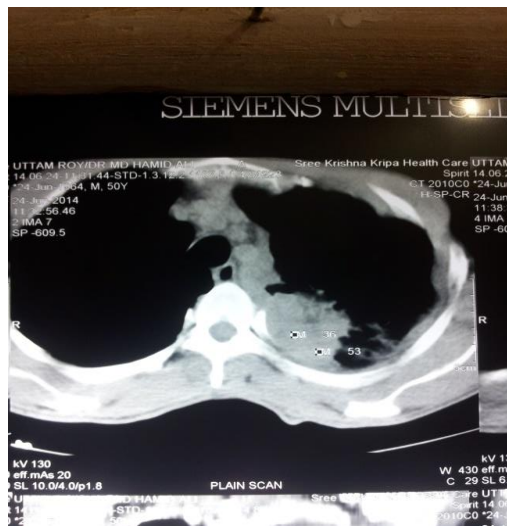
Case summary

Mr U.R, a 50 year old male presented with right sided weakness with severe headache and mild respiratory distress. This patient presented with mainly symptoms of cerebral metastasis of lung carcinoma. He had some minor symptom of lung carcinoma. Patient suddenly developed severe headache & loss of consciousness. On admission patient had hemiplegia. CVA was provisional diagnosis. But later patient found to have cerebral metastases from lung carcinoma which was clinically almost silent.

Investigation summary

On routine investigation patient was found to have non anemic (Hb-11.5%), normoglycemic (PPBS-119mg %), mild Renal failure (Creatinine-2.5mg/dl) with normal liver function. X-Ray of chest PA showed opacities in left upper and lower zone, left sided pleural effusion and nodular opacities in right lung (?Secondaries). CT Scan of Thorax revealed a pleural based heterogeneously enhancing lesion (4.69-3.49cm) containing a central air pocket seen in apicoposterior segment of left upper lobe. In addition multiple nodular lesions seen in left upper lobe and both lower lobes. Bilateral Emphysematous changes, florid confluent left paratracheal,prevascular,pre and subcarinal,superior pericardial recess and aorto-pulmonary

window lymphnodes seen, Moderate left sidedpleural effusion seen causing left lower lobe collapse.Pleural fluid cytology shows- cell count-900/cmmwith reactive lymphocyt5-6%, Neutrophil-35%, mesothelial cells-06%, no malignant cells seen. On CT guided FNAC from Left lung mass showed poorly differentiated adenocarcinoma. To find the distant metastasis USG done and that showed only increased renal parenchymal echogenicity. CT scan of Brain revealed two ring enhancing lesion are seen in left temporal region suggestive of Secondaries. Diagnosis of poorly differentiated adenocarcinoma of the lung Peculiarities of this case is that lung cancer is presenting with signs and symptom of cerebral metastases which is very rare manifestation.



CXR and CT Scan of Thorax showing the mass lesion.CT Scan brain showing 2 ring shaped metastatic lesion

Discussion

More than two thirds of patients with brain metastases have some neurologic symptoms during the course of their illness. Over 80% of brain metastases are discovered after the diagnosis of systemic cancer has been made (metachronous presentation).

The frequency of NSCLC is 80.4% compared to 16.8% of cases of SCLC. Other types of lung cancers (carcinoid, sarcoma and unspecified lung cancers) are less than 3%. Surgery, chemotherapy, and radiotherapy are possible treatments. The NCI states that the five year survival rate is 15% with treatment. SCLC has the poorest prognosis of

lung cancer because it is the fastest growing and has usually metastasized by the time a diagnosis is made. Although lung cancer can metastasize anywhere in the body, the most common sites are the lymph nodes, lungs, bones, brain, liver, and the adrenal glands. Metastases from lung cancer can cause additional difficulties such as breathing problems, bone pain, abdominal or back pain, headache, weakness, seizures, and/or speech difficulties. Lung tumors can release hormones that result in chemical imbalances, such as low blood sodium levels or high blood calcium levels, but this is uncommon (NCI, 2008).

Staging of small cell lung cancer

Because almost all small cell lung cancer has spread outside the lung when discovered, very few patients with small cell lung cancer are treated with surgery, and all receive chemotherapy. Some patients with small cell lung cancer can benefit from radiation therapy. The staging for small cell lung cancer helps identify which patients can be treated with radiation therapy in addition to chemotherapy. Small cell lung cancer is classified as either limited stage or extensive stage: Limited stage means the cancer is located on one side of the chest and involves a single region of the lung and adjacent lymph nodes. This region can be treated in its entirety with radiation therapy. About 30% of patients have limited stage. Extensive stage means the cancer has spread to other regions of the chest, or outside of the chest, and cannot be treated completely with radiation therapy. Most patients (70%) have extensive stage disease and are treated with chemotherapy only. Both small cell lung cancer and non-small cell lung cancer commonly spread (metastasize) to the brain. Small cell lung cancer can spread to the brain rapidly, often before the diagnosis of lung cancer is made. When small cell lung cancer has spread to the brain it is classified as extensive stage small cell lung cancer. Non-small cell lung cancer can spread to the brain as well, though often later in the disease. When non-small cell lung cancer has spread to the brain it is classified as stage 4 (metastatic) non-small cell lung cancer.

Symptoms of Lung Cancer that has spread to the Brain

Lung cancer that has spread to the brain can cause symptoms both by destroying brain tissue, and by creating inflammation and swelling that place pressure on structures in the brain. The symptoms of lung cancer spread to the brain can vary, depending upon the part of the brain that is affected, how many tumors are present in the brain, and general health status. *About a third of people have no symptoms when they have brain metastases.* Some of the symptoms that suggest lung cancer may have spread to the brain include: Headache, seizures, Loss of balance, Nausea and vomiting, Difficulty walking, Loss of coordination, Speech problems, Vision changes, such as loss of vision or double vision, Weakness of one side of the body, Memory loss, Personality changes, Fatigue. **Diagnosis of Lung Cancer Spread to the Brain:** In many cases, an MRI is more accurate in looking for brain metastases, but may not be possible if devices (such as pacemakers) are present in your body that could interfere with the magnetic field. PET scan, a type of radiological study that looks for actively growing cancer cells, may be done to decide if a suspicious area in the brain is due to cancer or scar tissue. Sometimes a biopsy is done to look at the cells present in the brain, especially if it is uncertain where the cancer began.

Treatment of small cell lung cancer

Treatment options for patients with brain metastases include surgical resection, whole-brain radiation therapy, stereotactic radiosurgery, and in some cases chemotherapy or molecularly targeted therapy. The treatment of small cell lung cancer depends on the stage. Small cell lung cancer spreads quickly, so systemic chemotherapy is the primary treatment for all patients. The most commonly used chemotherapy regimen is etoposide plus cisplatin or carboplatin. Patients with limited stage small cell lung cancer are best treated with simultaneous chemotherapy

plus radiation therapy to the chest given twice a day. Radiation therapy is best when given during the first or second month of chemotherapy. Patients with extensive stage cancer are treated with chemotherapy only. Chemotherapy is given for three to six months. Surgery is rarely appropriate for patients with small cell lung cancer and is only considered for patients with very early-stage disease, such as a small lung nodule. In those cases, chemotherapy, with or without radiation therapy is given afterwards. In patients whose tumors have diminished after chemotherapy, radiation therapy to the head cuts the risk that the cancer will spread to the brain. This preventative radiation to the head is called prophylactic cranial irradiation (PCI) and has been shown to extend the lives of these patients. Like patients with advanced NSCLC, patients with small cell lung cancer of any stage face the risk that the cancer can return, even when it is initially controlled. All patients with small cell lung cancer must be followed closely by their doctors with x-rays, scans, and check-ups.

Radiation therapy

Radiation therapy is the use of high energy x-rays or other particles to kill cancer cells. Radiation therapy is performed by a specialist called a radiation oncologist. Like surgery, radiation therapy cannot be used to treat widespread cancer. Radiation only kills cancer cells directly in the path of the radiation beam. It also damages the normal cells caught in its path, and for this reason, it cannot be used to treat large areas of the body. Patients with lung cancer treated with radiation therapy often experience fatigue and loss of appetite. If radiation therapy is given to the neck, or center of the chest, patients may also develop a sore throat and have difficulty swallowing. Skin irritation, like sunburn, may occur at the treatment site. Most side effects go away soon after treatment is finished. If the radiation therapy irritates or inflames the lung, patients may develop a cough, fever, or shortness of breath which may begin months or years after the radiation therapy. This condition occurs in about 15% of patients and is called radiation pneumonitis. If it is mild, radiation pneumonitis does not require treatment and resolves on its own. If it is severe, radiation pneumonitis may require treatment with steroid medications, such as prednisone. Radiation therapy may also cause permanent scarring of the lung tissue near the site of the original tumor. Typically, the scarring does not lead to symptoms. Widespread scarring can lead to permanent cough and shortness of breath. For this reason, radiation oncologists carefully plan the treatments using CT scans of the chest to minimize the amount of normal lung tissue exposed to the radiation beam.

Chemotherapy

Chemotherapy is the use of drugs to kill cancer cells. Systemic chemotherapy is delivered through the bloodstream, targeting cancer cells throughout the body. Chemotherapy is given by a medical oncologist. Most chemotherapy used for lung cancer is given intravenously. The side effects of chemotherapy depend on the individual and the dose used, but can include fatigue, risk of infection, nausea and vomiting, loss of appetite, and diarrhea. Nausea and vomiting are often avoidable. Treatment. These side effects usually go away once treatment is finished. Chemotherapy may also damage normal cells in the body, including blood cells, skin cells, and nerve cells. This may

result in low blood counts, an increased risk of infection, hair loss, mouth sores, and/or numbness or tingling in the hands and feet. Your medical oncologist can often prescribe drugs to help provide relief from many side effects. Hormone injections are also used to prevent white and red blood cell counts from becoming too low.

Brain metastases are associated with a poor prognosis. Depending on the patient's age, functional status, extent of systemic disease, and number of metastases, median survival ranges from 2.3 to 13.5 months.¹⁰ Management consists of supportive care and definitive therapy. Supportive care addresses brain edema, seizures, deep venous thrombosis, gastrointestinal complaints, psychiatric complications, and side-effects of treatment. Definitive therapy is intended to restore neurological function, improve quality of life, and extend survival. Therapeutic modalities that may be used singly or in combination include surgery, stereotactic radiosurgery (SRS), whole brain radiotherapy (WBRT), and chemotherapy.¹¹

The optimal combination of therapies for each patient depends on careful evaluation of various factors including the location, size, and number of brain metastases; patient age, general condition, and neurological status; extent of systemic cancer; and the tumor's response to past therapy and its potential response to future treatments.¹²

Headache is the single most common symptom of brain metastases, although a minority of patients never develop headach. Approximately 15% of patients have seizures as a presenting symptom of the metastasis, with another 10% of patients developing seizures subsequently. Anywhere from 5% to 10% of patients present with acute neurologic symptoms caused by hemorrhage into, or sudden expansion of, the metastasis. Hemorrhage into a metastasis is particularly common with choriocarcinoma and melanoma.^{13,14,15}

Conclusion

Few patient may presented with signs & symptoms of CVA which may be the sole clinical manifestation of underlying lung disease that is lung carcinoma. Therefore it is very much necessary to exclude primary or secondary malignant diseases of brain. Common cause of secondary malignant brain diseases is lung carcinoma which may present as CVA.

In the last decade, the emergence of SRS as a primary treatment modality for patients with good prognostic factors and one or a few small metastases has been a significant development. Promising therapies currently under investigation include chemotherapeutics that effectively cross the BBB, targeted molecular agents, radiation sensitizing agents, and oncolytic viruses. Because brain metastases present varied signs and symptoms, their presence should be suspected in all patients with known systemic cancer in whom any new neurologic findings develop

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