

Multiple ring enhancing lesions in a patient with unilateral limb jerking

Case Report

Subhankar Chakraborty*

Department of Internal Medicine, University of Nebraska Medical Center, Omaha, NE, USA

Abbreviation: Small cell lung cancer (SCLC)

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Abstract: Multiple ring enhancing lesions (MREL) in the brain can be caused by a variety of diseases including infections, inflammatory and neoplastic conditions. We present the case of a patient with new onset unilateral jerking movement of the arm who was found to have sixteen ring enhancing lesions (RELs) in the brain on MRI. Further workup revealed a primary small cell lung cancer. The differential diagnosis of multiple ring enhancing lesions is discussed. The astute clinician should be aware of this rare but important radiological finding.

Keywords: Metastasis • Small cell lung cancer • Ring • Necrosis

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1. Case

A 66 yr old man presented to his primary care doctor with complaints of jerking movements of the right arm that began 2 months ago. He had seven episodes of jerking that began suddenly and lasted for 2-3 minutes. During this time, there was no loss of consciousness. Other symptoms included numbness of the right third, fourth, and fifth fingers. Neurological exam revealed increased tone in the right upper extremity. The findings of MRI are shown in Figure 1. What is the differential diagnosis?

Answer: The differential diagnosis of multiple ring enhancing lesions in the brain includes infectious diseases (bacterial, tuberculous, syphilis, fungi like *Nocardia*, *actinomyces*, *histoplasma*, *aspergillus*, *cryptococcus* and *mucor*), parasitic infections (neurocysticercosis, *ameba*, *toxoplasma*), primary brain neoplasms (glioblastoma multiforme and anaplastic astrocytoma), metastatic cancers (lung, breast cancer and melanoma) and demyelinating disorders (multiple sclerosis, sarcoidosis and Whipples) [1,2]. In one study among pediatric patients, a solitary ring enhancing lesion in the parietal lobe was

the most common finding in pediatric neurocysticercosis patients [3]. In another instance, FDG-PET was used to exclude malignancy and support the diagnosis of neurocysticercosis in a patient with REL in the right temporal lobe and seizures [4].

RELs usually appear isointense or hypointense on a non contrast computerized tomography (CT) scan. Upon administration of intravenous contrast, a ring or plate of enhancement appears within this area of hypo or isointensity, sometimes surrounded by an area of vasogenic edema. Clinically, the patients may present with focal neurologic deficits (limb jerking, focal weakness, visual impairment) or symptoms of diffuse brain dysfunction (generalized seizures) or raised intracranial pressure (vomiting, headache, papilloedema).

Primary brain neoplasms (e.g. gliomas) and brain metastases are usually single while abscesses and lesions of multiple sclerosis are usually multiple. Tumors can initially be solid but can become ring enhancing due to necrosis of the central portion. Ring enhancing lesions in the deep white matter are generally either abscesses or primary brain neoplasms. Distinguishing primary glioblastomas from metastatic brain tumors still remains a challenge. In one study of ring enhancing

* E-mail: schakra@unmc.edu

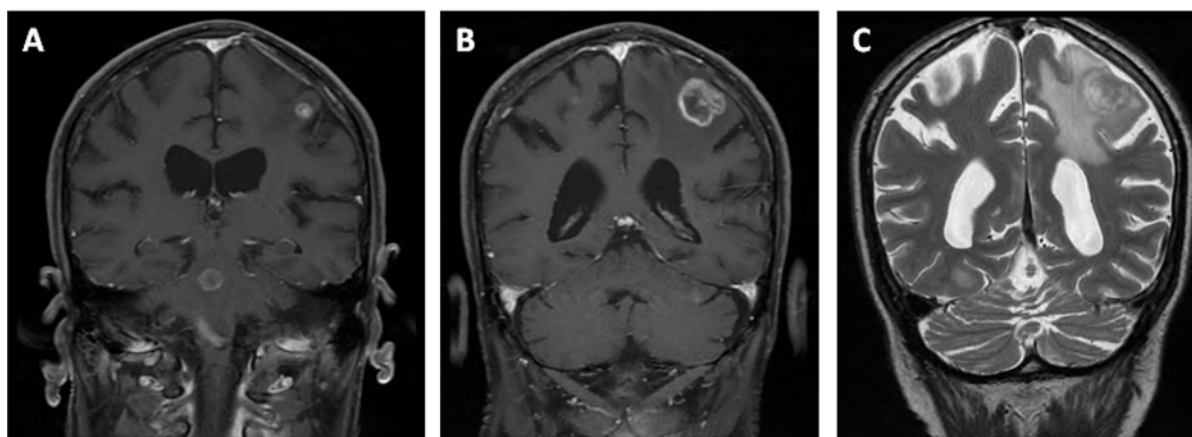


Figure 1. Coronal T1 weighted MRI of the brain reveals multiple ring enhancing lesions in the brain (A,B). A total of sixteen such lesions were identified in all. T2 weighted coronal MRI reveals ring enhancing lesion with surrounding vasogenic edema (C).

lesions, Kamson and colleagues reported that the ratio of tumor to cortex standard uptake value (SUV) was significantly higher in GBM than in metastatic tumors. The SUV value alone could distinguish the two causes for RELs with an accuracy of greater than 90% [5].

The cause underlying ring enhancing lesions is influenced in large part by the immune status of the individual. In immunocompetent individuals, malignancy (primary or metastatic brain tumor) and pyogenic abscesses should be strongly considered. In immunocompromised individuals, lymphomas and toxoplasmosis should definitely be among the top differential diagnoses. Walls of tumors and tuberculomas are generally irregular, while smooth walls are characteristic of cysticercosis, benign or low grade primary brain tumors and abscesses. An incomplete ring suggests a demyelinating disorder. A ring lesion resembling an eccentric target lesion suggests toxoplasmosis. Satellite lesions are common in abscesses, toxoplasmosis and miliary tuberculosis. It is important to keep in mind that immigrants often present with diseases that may have been acquired in their original country of origin. For instance, tuberculosis is more common in tropical countries and should always be in the differential diagnosis of RELs in individuals from these countries [6]. Benign tumors can sometimes present as RELs due to infarction and subsequent increase in size with surrounding edema. In one report, a man with meningioma presented with headaches that were traced to infarction and subsequent increase in size of a meningioma that appeared as an REL on MRI. Resection of the tumor resolved the symptoms [7].

There is no pathognomonic feature of ring enhancing lesions that nails a particular diagnosis. Histopathology continues to be the gold standard. Be it infections like toxoplasmosis or malignancies like glioblastoma, they may appear similar on MRI. Some common

diseases can present with ring enhancing lesions as an unusual manifestation. Non caseating granulomas of neurosarcoidosis in the cerebellum and vermis [8], CNS tuberculosis in an SLE patient receiving immunosuppressive therapy [9] or *Streptococcus intermedius* induced cerebral abscesses detected by sequencing of the 16s ribosomal RNA [10] are some such examples. Immunosuppressed patients present a unique subset in whom the differential diagnosis of multiple ring enhancing lesions includes lymphoma, fungal and toxoplasma infection [11]. Tuberculosis still remains the most common disease presenting as MRELs.

Generally, abscesses produce rings that are uniform while irregular rings are usually found in malignancies with a necrotic center. MRI is an excellent technique to not only identify these lesions but also suggest a cause. A ring enhancing lesion with a bright center on diffusion weighted image usually suggests a tumor while one with a dark center usually suggests pus from an abscess. Blood or proteinaceous material in the center of a lesion however can also give a hyperintense signal on diffusion weighted MRI. Deep white matter lesions especially those surrounded by vasogenic edema are usually either neoplasms or abscesses. Lung, breast cancer and melanoma are the primary tumors most commonly associated with brain metastases. The patient in this case was noted to have a spiculated mass in the left upper lobe and a left hilar mass (Figure 2). Biopsy of the lung mass revealed a differentiated small cell carcinoma (SCLC) of the lung.

Approximately ten percent of patients with SCLC present with brain metastases at the time of diagnosis and another 50% develop it at some time during the course of the disease. Current treatment options are limited and comprise whole brain radiation therapy either alone or in combination with chemotherapy. Survival

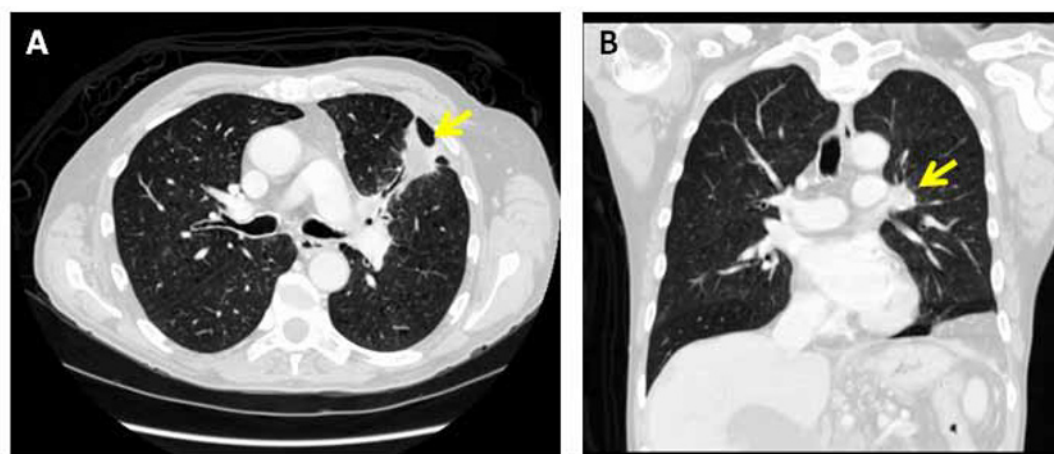


Figure 2. CT scan of the chest with intravenous contrast reveals a spiculated mass in the left upper lobe of the lung (A). Coronal CT scan of the chest reveals a mass in the left hilum (B)

however remains poor [12,13]. The patient described was started on palliative whole brain radiation therapy.

In conclusion, the present case illustrates how malignancies like lung cancer can present as multiple ring enhancing brain lesions that can cause focal neurological symptoms like seizures. MRI is the preferred imaging modality but diagnosis usually requires biopsy of either the brain lesion or a suggestive primary neoplasm. Patients with neoplasms metastatic to the brain do poorly despite chemotherapy and radiation.

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Conflict of interest

The author declares no conflict of interest associated with this work.

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