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# Metastases and Management Evolution: Literature Review

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**Abstract**

**Introduction:** Brain metastases are the most prevalent kind of brain tumor and a frequent side effect of cancer. Brain metastases occur in between 10% and 25% of cancer patients who pass away. A team of medical professionals uses radiation therapy, surgery, and other treatments to treat brain metastases. To lessen the effects of the brain tumor and preserve quality of life, they could combine surgery with additional therapies. Conventional therapy can only cure a small percentage of brain-metastasized tumors, but they can provide palliation and long-term survival with few side effects. This exercise goes over how brain metastases manifest and emphasizes how the multidisciplinary team may help manage them.

**Key Words**: Brain Tumor, Cancer, Metastasis

## Introduction

Brain metastases are the most prevalent kind of brain tumor and a frequent side effect of cancer.[1] Brain metastases occur in between 10% and 25% of cancer patients who pass away.[2, 3] Brain metastases, also known as metastatic brain tumors, occur when cancer spreads from one area of the body to the brain. A team of medical professionals uses radiation therapy, surgery, and other treatments to treat brain metastases. To lessen the effects of the brain tumor and preserve quality of life, they could combine surgery with additional therapies. Conventional therapy can only cure a small percentage of brain-metastasized tumors, but they can provide palliation and long-term survival with few side effects. The term "primary tumor" refers to the initial tumor in primary cancer. Breast, lung, or melanoma malignancies are the primary causes of the majority of brain metastases. When cancer cells spread to the brain, they create one or more additional tumors, sometimes referred to as metastatic lesions or secondary tumors. Where the initial cancer ended up after spreading to the brain determines how the tumors affect the body. As survival rates continue to rise, neuro-cognition and quality of life are increasingly being acknowledged as significant objectives for patients.

### Objectives of Literature Review:

The aim of this literature is to explain the pathogenesis of brain metastases, examination and clinical approach to a patient who has brain metastases, selection and options of the available therapies for brain metastases and describe the ways that multidisciplinary team members can better coordinate care to help patients with brain metastases.



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## Discussion and Review of Literature

The most prevalent type of adult brain tumor is a brain metastasis. According to experts, 10% to 30% of patients with cancer that begins outside the brain are expected to eventually develop a metastatic brain tumor. The likelihood of receiving a diagnosis rises after the age of 45 years, with the majority of cases occurring in those over 65 years.[4, 5] Approximately 0.1 million to 0.2 million instances are thought to occur annually in the United States of America.[6, 7] A number of variables contribute to the increased likelihood of brain metastases.[6] Recent increased usage of novel systemic medicines, including as immunotherapy, has resulted in a longer survival time for patients with systemic metastatic disease. Additionally, the improved detection of tiny, asymptomatic brain metastases has been facilitated by the expanding use of sensitive magnetic resonance imaging techniques.

The primary malignancies of lung, breast and melanoma most frequently spread to brain.[3] A T1-weighted post-contrast MRI images (**Fig. 2 to 5**) use to demonstrate lung cancer and melanoma metastases.[4] Because small-cell lung cancer is so likely to spread to the brain, cranial irradiation is the recommended preventive treatment. Brain metastases are uncommon outcomes of other tumors, such as prostate and head and neck cancers. Other than using type of tumor and subtype, it might be challenging to determine which patients would experience brain metastases.

## Pathogenesis

When the blood-brain barrier is breached, metastatic cancer travels through the bloodstream and penetrates the central nervous system. After that, clonal cells multiply, resulting in local invasion and displacement followed by edema and inflammation. Though distinct histological subtypes tend to have different distributions of location throughout the brain, distribution across the central nervous system is more common in locations of strong blood flow.[8, 9]

## Physical Examination and Clinical Assessment

Focusing on symptoms, length, and intensity, a detail history and physical examination should be conducted. Point to point inquiries should complete regarding nausea, headaches, and blurred vision. A thorough neurologic evaluation ought to be carried out. Strength, sensation, coordination, reflexes, cerebellar function, proprioception, cranial nerve function, speech, cognition, vision, and memory should all be evaluated during this neurological examination. To check for papilledema, a fundus examination should be conducted. To better understand the course of the disease and direct future therapeutic interventions, more data should be obtained, such as age, performance status, and systemic cancer load.

## Investigation and Assessment

A computed tomography scan of the skull enables a rapid evaluation (**Fig 1**). The magnetic resonance imaging of the brain with contrast (**Fig 2 to 5**) is gold standard for neuroimaging in suspected brain metastases.[10] The quantity and anatomical position of tumors, as well as the extent of related edema, can be ascertained using magnetic resonance imaging. It is necessary to conduct a basic laboratory evaluation that includes a liver function test, metabolic panel, and full blood count.

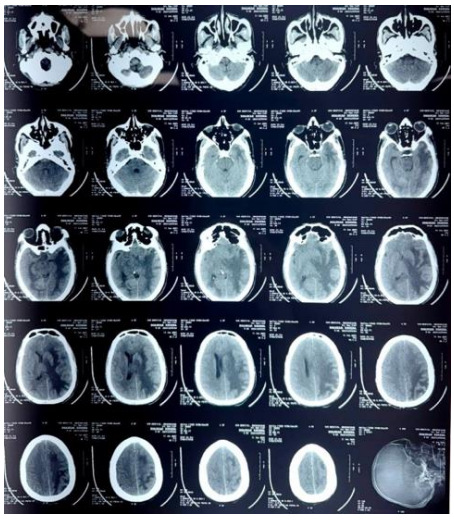

**Figure 1:- CT Brain axial slice shows the lesion and associated edema in a 76-year-old woman with lung cancer that has metastasized to the brain.**

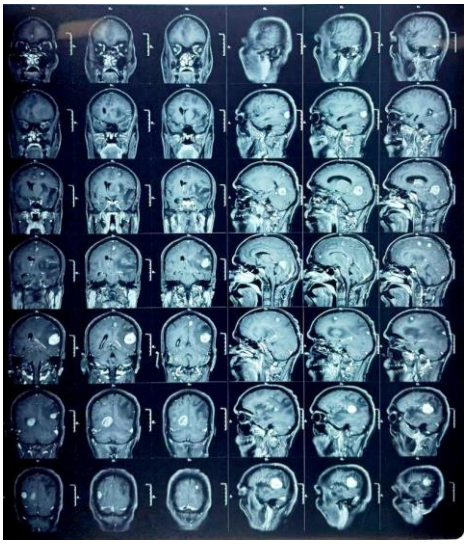

**Figure 2:- MR Scan shows the lesions and associated edema in a patient of lung cancer that has metastasized to the brain.**

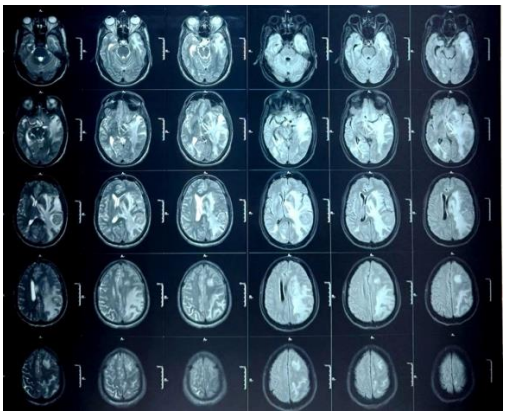

**Figure 3:- MR Scan shows the lesions and associated edema in a patient of lung cancer that has metastasized to the brain.**

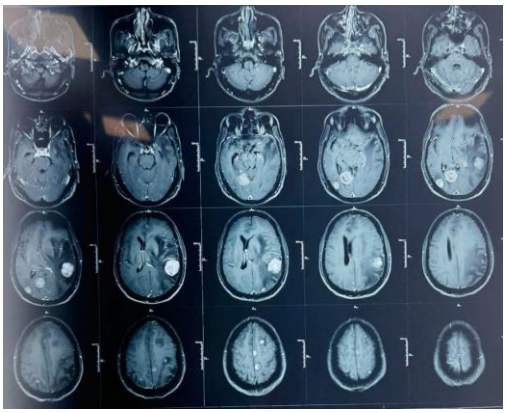

**Figure 4:- MR Scan shows the lesions and associated edema in a patient of lung cancer that has metastasized to the brain.**

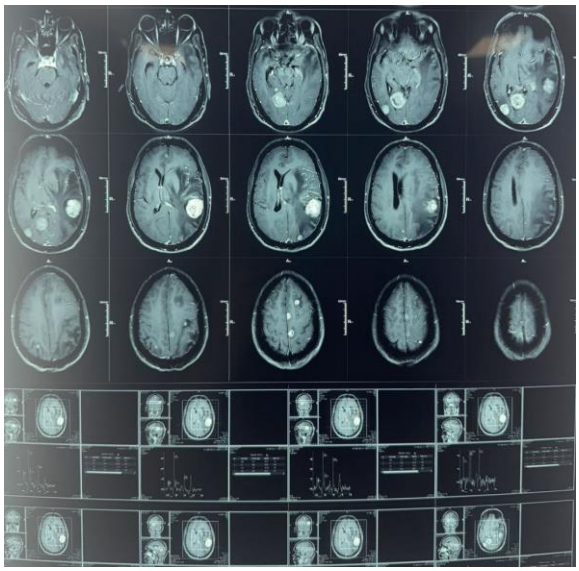

**Figure 5:- MR Scan shows the lesions and associated edema in a patient of lung cancer that has metastasized to the brain.**

## Management of Cerebral Metastases

Treatment of cerebral edema is the initial step in managing recently discovered brain metastases. Steroids, including dexamethasone, are frequently administered orally or intravenously.[11] One treatment schedule is 10 mg IV dexamethasone as a loading dose, followed by 4 mg IV every 6 hours.[12] To prevent many of the negative consequences of long-term high dosage steroid therapy, the dose may be decreased after the initial clinical response. Definitive management may be started once steroids are started. Whole-brain radiation, stereotactic radiosurgery and surgical resection are available treatment options. Targeting the entire brain, whole-brain irradiation is administered with daily radiation treatments. A more accurate type of radiation therapy called radiosurgery applies a high dose to the brain metastasis site, typically in a single fraction.[13] Every one of these treatments has a different profile of side effects in addition to certain benefits. Together with the patient, a multidisciplinary team consisting of a neurologist, neurosurgeon, neuro-anesthetist, radiation oncologist, and oncologist should develop the

treatment plan. Historically, surgical resection has been the norm for patients in good performance status. After surgical excision, few studies reported high local recurrence rate.[14, 15] Whole-brain radiation therapy or post-operative radiosurgery can enhance local control and delay or avoid recurrence of tumor.[14, 15, 16] The amount of non-resected metastases, tumor histology, follow-up, and patient preference should all be considered when recommending postoperative therapy. Compared to postoperative stereotactic radiosurgery, whole-brain radiotherapy after surgically excising brain metastases can improve intracranial control, but the neuro-cognitive results are worse.[16] Stereotactic radiosurgery is a great way to treat a small number of intracranial metastases in patients who are either not eligible for surgical removal of brain metastases or who choose non-surgical therapy. Stereotactic radiosurgery was initially employed to enhance local treatment in conjunction with whole-brain radiotherapy, but it is now frequently utilized as a stand-alone therapy. Lesions smaller than one centimeter have good local control with single-fraction radiosurgery, while the final control of brain metastases depends on dose and lesion size.[17, 18, 19] Multi-fraction treatments are occasionally used for bigger lesions.[20, 21] Although stereotactic radiosurgery is thought to be the norm for patients with one to four brain metastases, new research suggests that patients with ten or more brain metastases may benefit from the procedure.[22, 23] Whole-brain radiation is the mainstay of care for individuals with numerous brain metastases or poor functional status. Whole-brain radiation therapy lowers the chance of brain failure at a new location while also controlling individual brain metastases. Its possible neurocognitive adverse effects, which affect many individuals to differing degrees, must be balanced against these advantages. According to new research, whole-brain radiation therapy may not be much better than steroids alone for patients with very poor performance status.[24, 25] As a result, decisions on therapy for brain metastases must be taken at the patient level, taking into consideration both the acceptable side effect profile and the treatment goals in a given circumstance. Primary tumor like glioma or ependymoma, demyelination of nervous system, brain abscess and CNS parasitic infestation are among the differential diagnosis for cerebral metastases. Prognosis of brain metastases depend upon various factors like patient's age, number and size of metastases, initial tumor location, additional metastatic sites, presence of a mass effect and the tumor's radiosensitivity and chemosensitivity. Multiple complications like mass effect due to size of tumor or edema, brain herniation, seizures, hydrocephalus, spread to surrounding tissue and neurological deficit with high morbidity appear with the progression of disease.

## Conclusion

A multidisciplinary expert healthcare team of a neurosurgeon, oncologist, neurologist, radiation therapist, palliative care specialist, pain consultant, and anesthetist is the most effective way to manage patients with brain metastases. Since the majority of these individuals are weak and have a short lifespan, drastic procedures are not necessary. The optimal strategy should be discussed as a team while considering the patient's life expectancy, comorbidities, and status into consideration. Palliation and pain management are simply beneficial for many of these people.[26, 27, 28] The diagnosis and prognosis should be discussed with the patient. They ought to receive instructions on how to follow the drug schedule and treatment plan including surgery, radiotherapy and chemotherapy.

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