

A Clinico-Radiological And Histopathological Characteristics Of Metastatic Brain Tumour In A Tertiary Care Center

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I. INTRODUCTION:

Approximately 40% of patients with metastatic cancer have brain metastases, a common complication of the disease. Within the brain's parenchyma, metastases are typically seen to grow in a distinct pattern¹. based on their neuroradiological presentation, which shows contrast-enhancing lesions to be more clearly delineated than malignant gliomas, this assumption is made. Even though infiltrative behavior has been observed on occasion^{2,3}, no studies have examined the histological patterns of invasion in brain metastases to date. The vast majority of brain metastases go unreported. Lung cancer and breast cancer are the two most common sources of brain metastasis^{4,5} the number of brain metastases reported in India is just the tip of the iceberg. Clinical trials for brain metastasis require a better understanding of the mechanisms of the metastatic brain cascade and precise patient selection based on survival prognosis

II. Aims and objectives:

1. To know the clinical characteristics at the time of diagnosis of Brain Metastases.
2. Correlating radiological findings with tissue-based characteristics Brain Metastases.

III. Materials and Methods:

The present study is a prospective observational study conducted in Department of Neurosurgery in Andhra Medical College in Visakhapatnam over a period of one year. All patients attending outpatient and inpatient units of dept of neurosurgery meeting inclusion criteria are included. Details of cases like complete history, symptoms, signs of cerebral metastasis, clinical examination, the treatment offered are collected with a help of detailed standardized proforma. The patients are subjected to routine blood investigations, peripheral smear and Bence Jones proteins (wherever applicable), and radiological investigations like ultrasound neck, chest, abdomen and pelvis, MRI brain with/without contrast, HRCT chest, CT abdomen, and pelvis. Biopsy and histopathological evaluation were studied and analyzed.

Inclusion Criteria:

1. Patients presenting with features suggestive of brain metastasis clinically, radiologically, or with histopathological confirmation.
2. Brain metastasis can be single or multiple.
3. Primary can be solid tumors and non-solid tumors.
4. Brain metastasis with known/ unknown primary.

Exclusion Criteria:

1. All patients with neither the primary nor the secondary proven by biopsy were excluded from the study.
2. Patients with primary brain tumors.
3. Those who did not give consent for participating in the study.

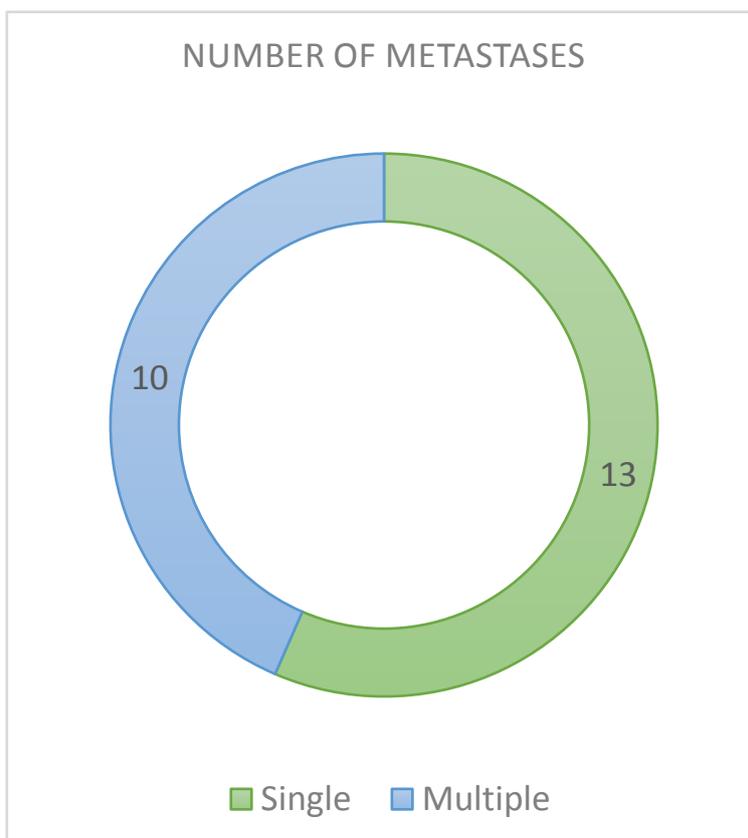
IV. Results:

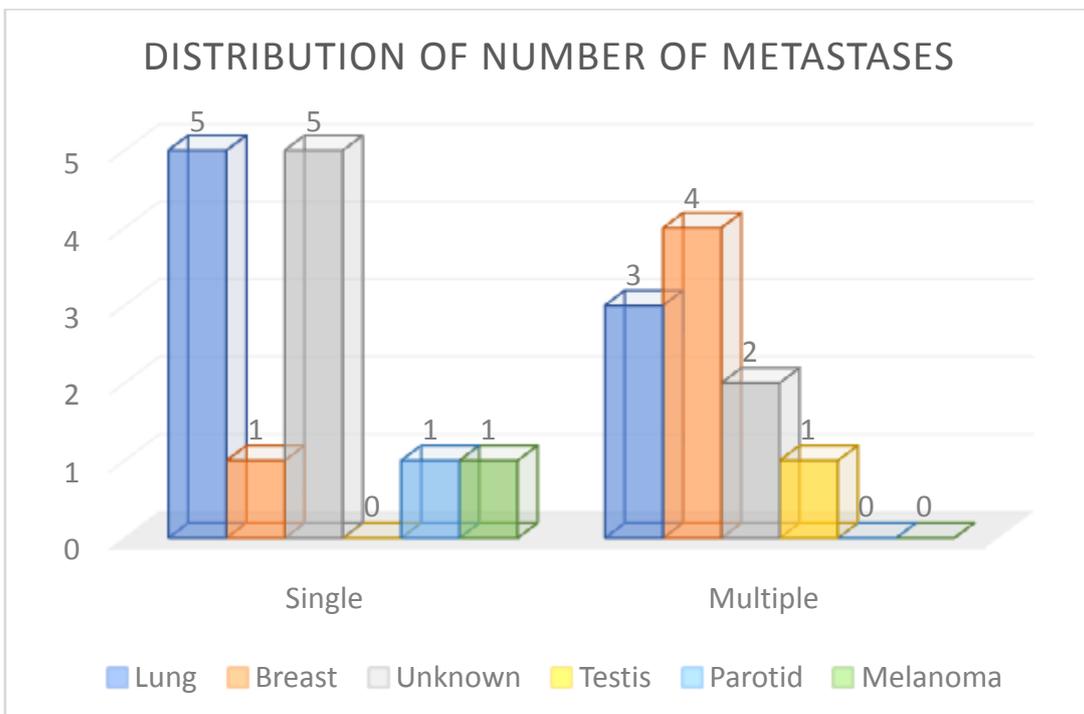
Total 23 patients included, male 14 and female 9. The youngest person in the study was 27 years old, with unknown primary and one more of age 30 years with testicular germ cell tumour. The oldest person was aged 72 years and he was a case of brain metastases with unknown primary. There were only 2 (8.69%) patients in the less than 40 age group and 17

(73.91%) patients in the 40 to 60.4(17.39%) patients in the above 60 age group. The common clinical presentation is a headache in 15, motor complaints in 11, altered sensorium in 9, seizures in 8, vomiting in 8 cases, cerebellar features in 1 case. Out of the 23 cases, 13 were single metastasis and 10 multiple metastases. In lung primary, metastasis was single in 5 cases and multiple in 3 cases, and in breast primary, one case had single metastasis and four cases had multiple metastases. Similarly in unknown primary, 5 cases had single metastasis and 2 cases had multiple metastases. Single lesions are more common with lung and unknown primary but in the breast, it's more of multiple metastases. Among single metastasis, only one lesion has less than 3 cm and 11 lesions have more than 3 cm in size. In multiple metastases, four have less than 3 cm and six have more than 3 cm in size.

Primary	Single	Multiple	No.
Lung	5	3	8
Breast	1	4	5
Unknown	5	2	7
Testis	0	1	1
Parotid	1	0	1
Melanoma	1	0	1
Total	13	10	23

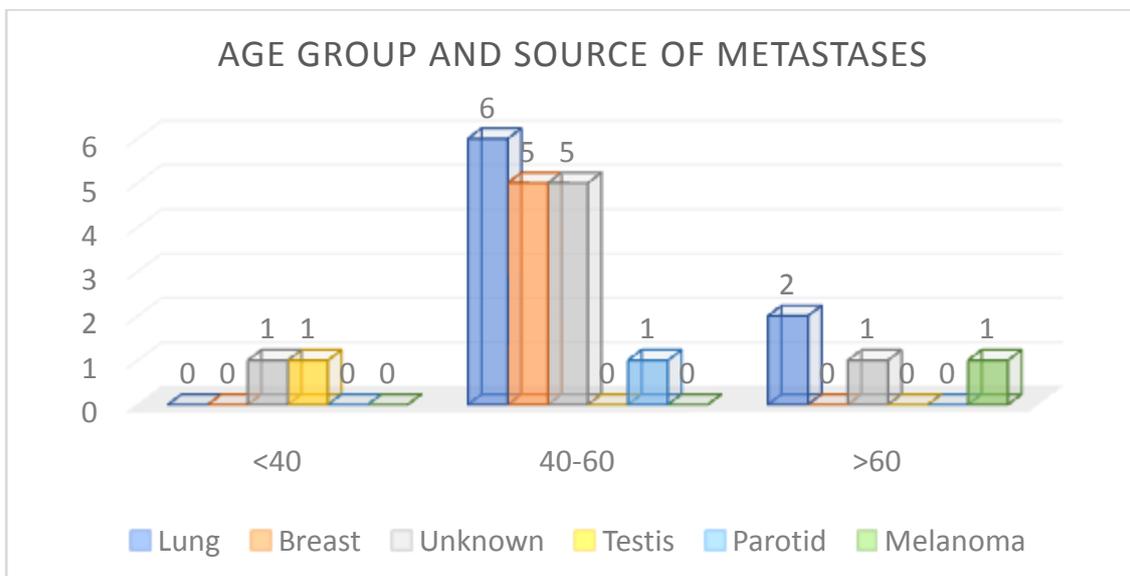
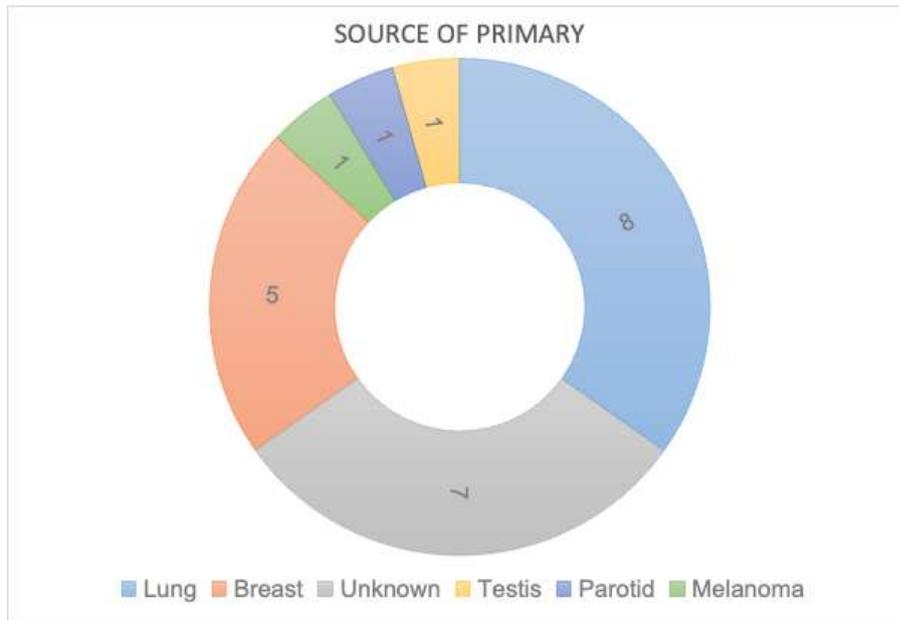
Size of the Lesion	Single	Multiple	Total
< 3cm	1	4	5
>3cm	12	6	18
Total	13	10	23





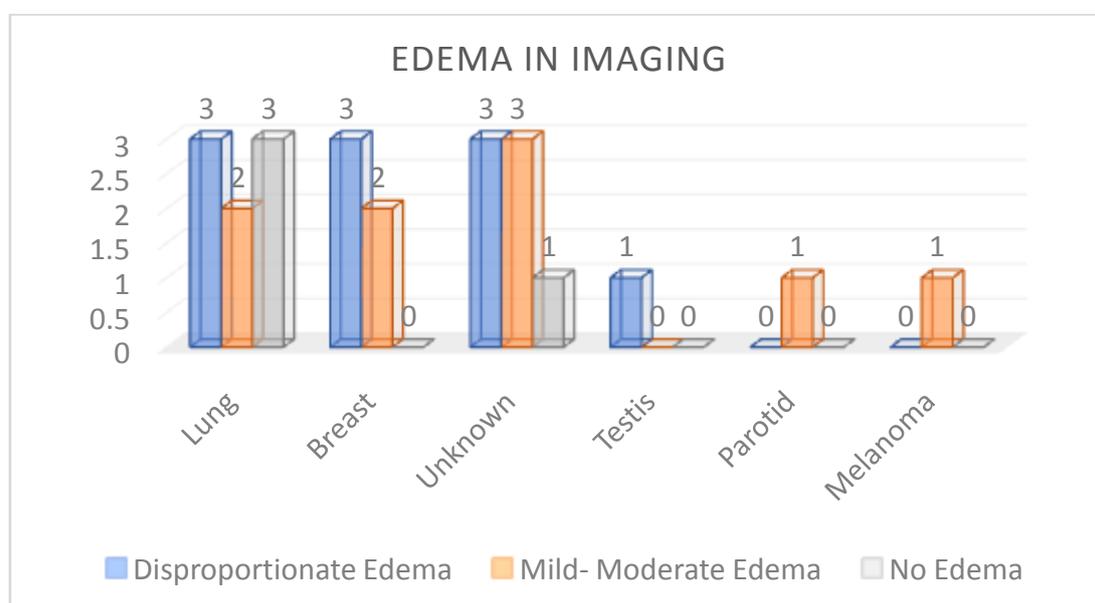
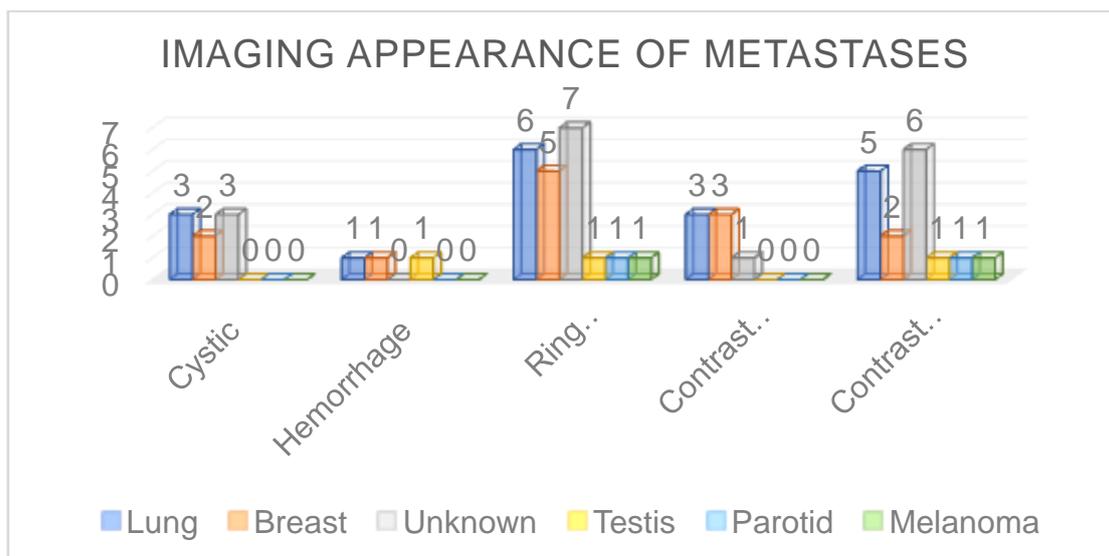
SOURCE OF PRIMARY:

The most common source of primary is lung cancer (8), followed by unknown primary (7) and breast cancer (5). The lung is the most common source of primary overall and in males but in females, it is from the breast.



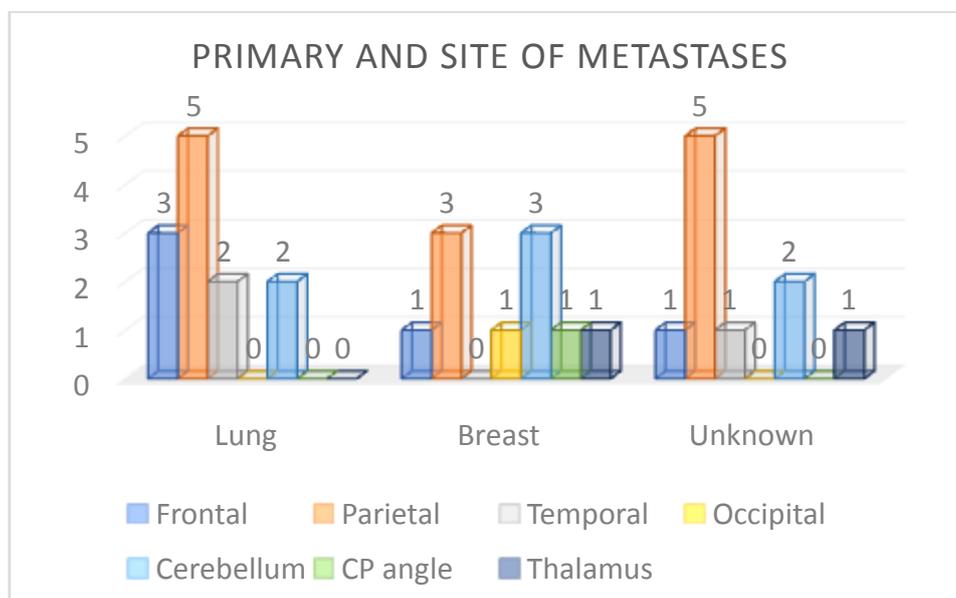
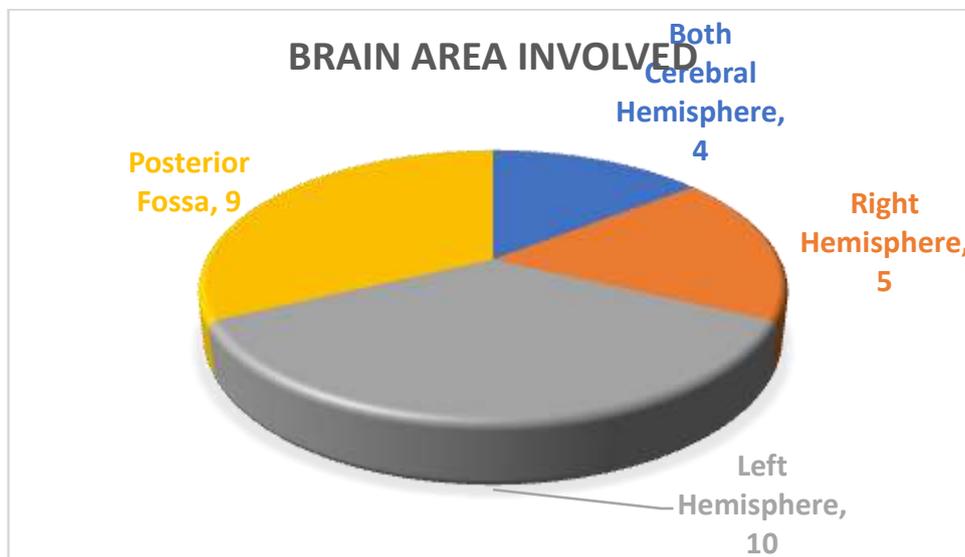
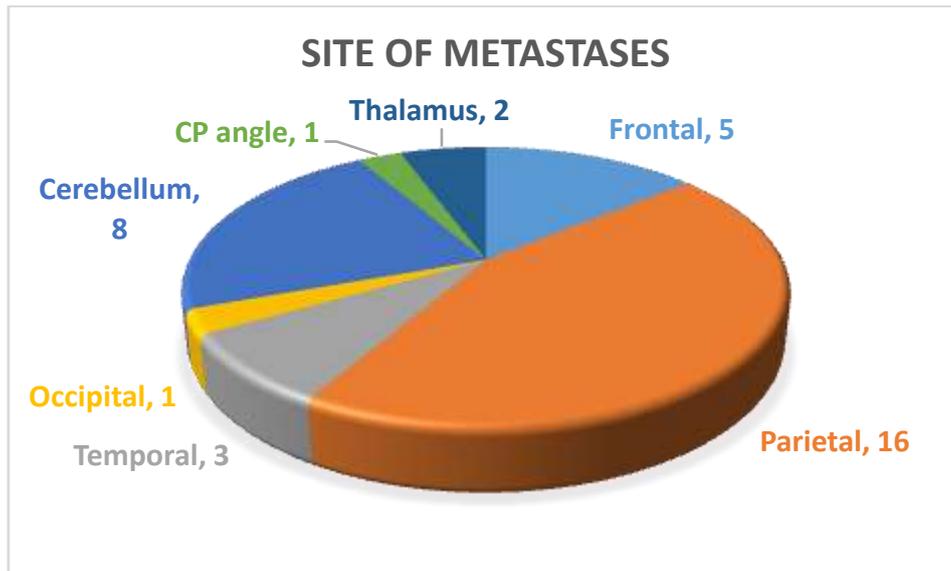
IMAGING APPEARANCE

The imaging features of all patients were studied. MRI was done in all the patients. Ring lesion is the common appearance of metastasis with 21 cases appearing as ring-enhancing lesions. Metastasis had a cystic appearance in 8 cases and hemorrhagic appearance in 3 cases. Most of the cases showed heterogeneous contrast enhancement (16), while only 7 cases showed homogenous intense contrast enhancement. Disproportionate edema (severe edema) was found in 10 cases and minimal to no edema in 4 cases.



SITE OF METASTASES:

The frontal lobe was involved in 5 cases, parietal lobe in 16 cases, temporal lobe in 3 cases, occipital lobe in only one case, cerebellum in 8 cases, and other locations like cerebellopontine angle 1, thalamus 2, in total three cases. The most common location is the parietal followed by the cerebellum, frontal, temporal, and occipital. The hemispheric involvement was more seen on the left side compared to the right side. In 4 cases, both cerebral hemisphere was involved and in 10 cases, posterior fossa involvement is seen.



V. Discussion:

Brain metastases significantly impact the disease course of multiple cancer sites. They are expected to have a rising incidence given improved systemic therapies and more prolonged survival.

Our study found that the most common age group is 40-60 years. A study by Singh, Raj, et al.⁷, in the US, shows the most common age group in which a diagnosis of brain metastasis was made was from 60 to 69 years old (33%). A regional study in Scotland found that the highest incidence of brain metastases occurred in persons 65 to 74 years of age⁸.

In all, 20–40% of patients initially present with focal neurologic symptoms (Cohen et al., 1988; Glantz et al., 1996; Forsyth et al., 2003). Headaches present in more than half of patients with metastases and can be more severe with multiple lesions (Argyriou et al., 2006). Seizures are the presenting symptom in 10–50% of metastatic brain tumour patients (Glantz et al., 2000; Lynam et al., 2007). Similar to what is described in previous studies, headache is the most common symptom followed by motor deficit and seizures in that order. There was not much difference between what is observed in this study and the literature.

In 2700 cases from the Memorial Sloan-Kettering Cancer Center in New York, the distribution of primary cancers was 48% lung, 15% breast, 9% melanoma. In our study, the most common primary source is lung cancer, followed by unknown primary and breast cancer. The lung is the most common source of primary (34.78%) overall. melanoma is rare in this study.

In this study, the incidence of single and multiple metastases is almost similar overall (1.3:1) and in the lung, but breast primary multiple metastases are common. In unknown primary single metastasis (71.42%) is more common than multiple metastases (28.57%).

Imaging characteristics of metastases may suggest an underlying pathologic diagnosis. Metastases that classically haemorrhage include melanoma, choriocarcinoma⁹, renal cell carcinoma, and thyroid cancer. Lung metastases are also known to hemorrhage¹⁰. In this study, hemorrhagic lesions are in three cases of lung, breast, and testicular tumour as primary. In our study, the majority of lesions exhibited heterogeneous and moderate contrast enhancement. Intense homogenous contrast enhancement is seen in 30.43% and does not show source specificity. Severe or disproportionate edema was present in 43.47% of cases, whereas, in previous studies, it was found that cerebral metastases had disproportionate edema¹¹

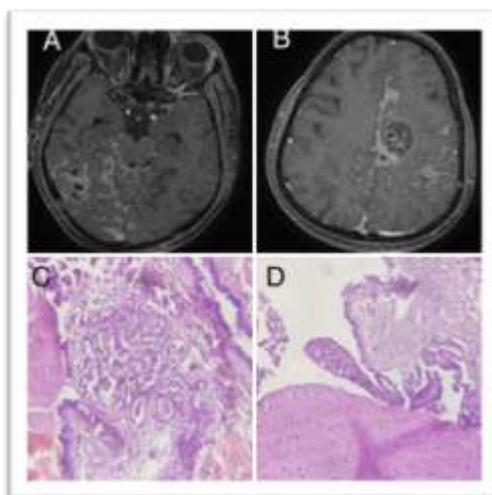
Site of Metastases:

Brain metastases tend to be located at the grey-white junction and border zones between major arterial vascular territories. Brain metastases were more frequent in frontal and parietal lobes than in occipital and temporal lobes, probably related to the respective mass of these structures⁶. The cerebral hemispheres receive the majority of blood flow and are the site of approximately 80% of brain metastases. The cerebellum is the site of 15% of cases, and the brainstem is the site of 5%⁶

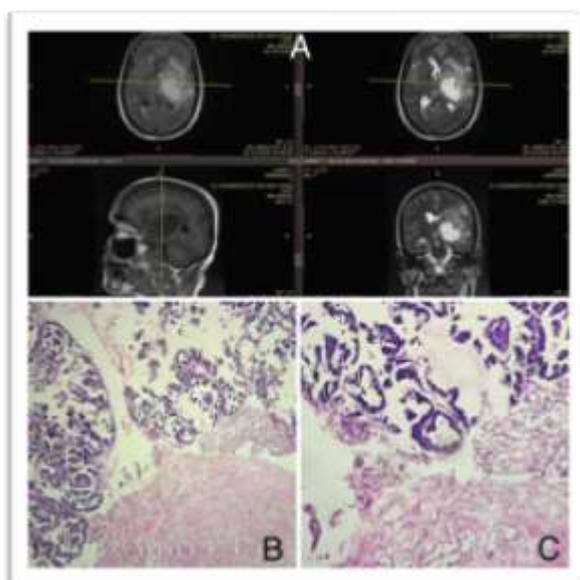
Histopathological Examination (HPE):

There was no significant correlation between primary image findings and HPE reports in our study. 19/23 reports show metastatic adenocarcinoma deposits irrespective of the primary lesion. And 3/5 reports show metastatic ductal carcinoma of the breast as the primary.

A few of the brain imaging findings don't correlate with HPE reports. As MRI suggests high-grade glioma or Koch's aetiology, HPE reports say metastatic deposits are confirmed with IHC markers. The majority of these are of unknown primary origin.



MRI shows multiple lesions suggestive of Koch's aetiology but HPE photos suggestive of metastatic adenocarcinoma tumour



MRI depicts features suggestive of left thalamic glioma, but HPE report say metastatic adenocarcinoma deposits.

VI. CONCLUSION:

The following conclusions were derived in this study of 23 patients with brain metastases.

1. Brain Metastases is expected in the 40-60 age group.
2. It has more male predominance than females; no female patients are seen below 40 years of age.
3. Headache is the most common symptom, followed by a motor deficit. Clinical evidence is seen in 25% of cases with actual incidence of cerebellar involvement.
4. Lung is the most common primary source in both sexes and all age groups except in less than 40 age.
5. Majority of brain metastases are ring-enhancing with heterogeneous intensity. Cystic or hemorrhagic appearance is less common and doesn't show specificity towards primary.
6. Parietal lobe is the most common site of metastases, and the left cerebral hemisphere is more involved than the right. The location of intracranial metastases is not specific to primary.
7. The incidence of single or multiple metastases is almost equal overall, but with breast primary, most are multiple lesions.
8. All the patients except one underwent surgical excision followed by radiotherapy. Steroid therapy was given to all the patients.
9. Not all radiological characteristics of metastatic brain lesions correlate with histopathological examination findings.

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