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Retrospective Evaluation of Imaging Findings in Patients with CNS Lesions: An Observational Study

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ABSTRACT

Background: Central nervous system (CNS) pathologies are a significant cause of mortality and morbidity world-wide. Frequently, structural neuroimaging exams (brain computed tomography (CT) and magnetic resonance imaging (MRI)) are requested as part of the initial medical work-up in patients with CNS diseases. Hence; we planned the present study to retrospectively analyze the imaging findings in patients CNS lesions.

Materials & Methods: The present study included assessment of imaging findings in patients with CNS lesions. Data records of a total of 25 patients were included in the present study. All the data records were obtained from the archives of the department of Radio-diagnosis of the medical institute. MRI findings in all the patients were obtained from their records files. Data in relation to the final diagnosis was also obtained. Compilation of the results was done in Microsoft excel sheet.

Results: A total of 25 patients with mean age of 49.7 years were analyzed. Among these 25 patients, 15 were males while the remaining 10 were females. The various observed in the present study were Lymphoma, CNS Tuberculosis, Cystic brain lesion, Early stage neurocysticercosis, Ischemic tumor like stroke, Brain abscess, Sarcoidosis, Metastasis, Developmental venous anomaly (DVA) and Intraventricular cavernoma.

Conclusion: MRI shows spectrum of pathognomic findings mostly specific for each group of lesions.

Key words: Central Nervous System, Imaging, Magnetic Resonance Imaging.

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INTRODUCTION

Central nervous system (CNS) pathologies are a significant cause of mortality and morbidity world-wide. Today with the availability of excellent antimicrobials, many of these disorders are potentially treatable, making early recognition imperative.[1, 2] Like in other disorders of the CNS, non-invasive imaging based diagnosis is the key as possibility of a tissue diagnosis by means of fine needle aspiration cytology (FNAC) or biopsy is difficult. Early diagnosis will also help to minimize long term complications related to the disease and its treatment.[3] Frequently, structural neuroimaging exams (brain computed tomography (CT) and magnetic resonance imaging (MRI)) are requested as part of the initial medical work-up in patients with CNS diseases.[4, 5] The primary imaging modality, like in most CNS disorders is magnetic resonance imaging (MRI). Peripheral ring-like enhancement is a common finding in CNS imaging. Ring enhancing lesions on conventional MRI sequences have a long list of differentials ranging from infectious processes to high grade necrotic neoplasm.[6,7] Hence; present study was planned to retrospectively analyze the imaging findings in patients CNS lesions.

MATERIALS & METHODS

The present study was planned in the department of radio-diagnosis of our Institute and it included assessment of imaging findings in patients with CNS lesions. Data records of a total of 25 patients were included in the present study.

All the data records were obtained from the archives of the department of Radio-diagnosis of the medical institute.

Exclusion criteria for the present study included:

- Subjects in which complete data was not available,
- Subjects less than 20 years of age,
- Subjects more than 60 years of age

MRI findings in all the patients were obtained from their records files. Data in relation to the final diagnosis was also obtained. We also obtained complete demographic and clinical details of all the subjects.

Compilation of the results was done in Microsoft excel sheet. Analysis was done by univariate regression curve.
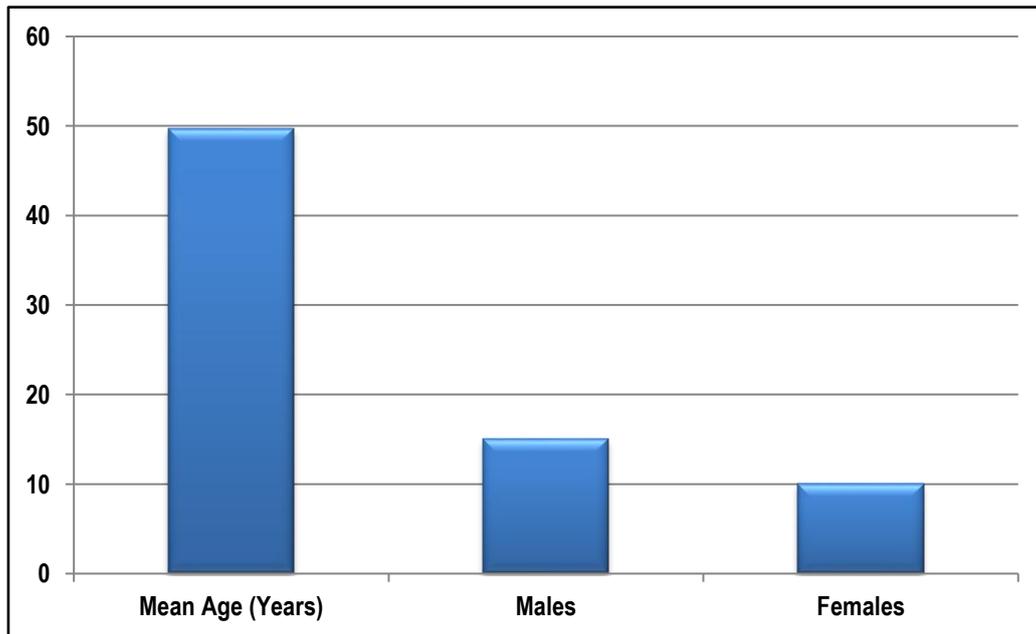
Graph 1: Demographic data of the patients

Table 1: MRI findings of the CNS lesions

S No.	Mean Age	Gender	Diagnosis	No. of patients	MRI findings
1	50.4	Male, Male	Lymphoma	2	Suprasellar location, On T1 sequences, lesion was isointense, On T2 sequences, lesions was mildly hypointense
2	46.3	Male, Female, Male	CNS Tuberculosis	3	Hyperintense on precontrast T1W MT images and show further enhancement on postcontrast T1W MT images
3	48.1	Female, Male	Cystic brain lesion	2	Numerous rounded enhancing lesions of varying sizes in both cerebral and cerebellar hemispheres, Hypointense on T1-weighted images, and hyperintense on T2-weighted
4	51.9	Male, Female, Male	Early stage neurocysticercosis	3	Smooth thin-walled cysts with edema and contrast enhancement. A mural nodule representing the viable larval scolex also present.
5	53.7	Male, Female, Male, Female, Female	Ischemic tumor like stroke	5	Restricted diffusion on DWI and hypoperfusion on PWI
6	55	Male, Female	Brain abscess	2	Core hyperintense, surrounding hypointense edema on T1, with cavity hypointense and surrounding hyperintense edema on T2.
7	46	Female, Male,	Multiple sclerosis	2	Multiple small lesions appearing hypointense on T1, and hyperintense on T2.
8	49.2	Male, Female	Metastasis	2	Hypointense on T1, and hyperintense on T2.
9	47	Male, Female	Developmental venous anomaly (DVA)	2	Multiple tributaries arranged in a radial fashion drain into a larger vein. This sign is best seen on gadolinium-enhanced T1W images.
10	50	Male, Male	Intraventricular cavernoma	2	There were foci of hyperintensity on T1-weighted MR images due to various age of blood products (i.e., methemoglobin). T2 shortening producing a black halo around the lesion represents peripheral hemosiderin.

RESULTS

Data records of a total of 25 patients with mean age of 49.7 years was analyzed. Among these 25 patients, 15 were males while the remaining 10 were females. The various observed in the present study were Lymphoma, CNS Tuberculosis, Cystic brain lesion, Early stage neurocysticercosis, Ischemic tumor like stroke, Brain abscess, Multiple Sclerosis, Metastasis, Developmental venous anomaly (DVA) and Intraventricular cavernoma. MRI findings in intraventricular cavernoma case were foci of hyperintensity on T1-weighted MR images due to various age of blood products (i.e., methemoglobin). T2 shortening producing a black halo around the lesion represents peripheral hemosiderin. MRI findings in Developmental venous anomaly (DVA) case were multiple tributaries arranged in a radial fashion drain into a larger vein. This sign is best seen on gadolinium-enhanced T1W images. Multiple small lesions appearing Hypointense on T1, and hyperintense on T2 was seen in Multiple Sclerosis. Brain abscess showed presence of Core hyperintense, surrounding hypointense edema on T1, with cavity hypointense and surrounding hyperintense edema on T2 in MRI. CNS Tuberculosis on MRI showed Hyperintense on precontrast T1W MT images and showed further enhancement on postcontrast T1W MT images.
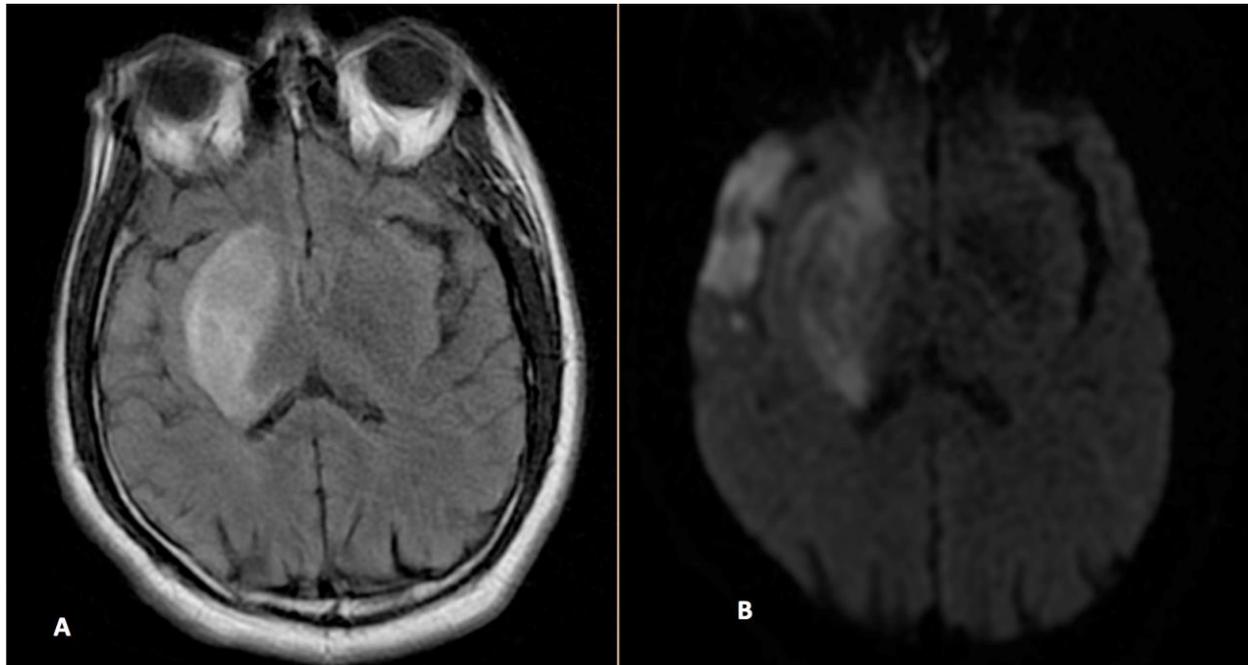

Figure 1: A case of non-hemorrhagic acute infarct. MRI Ax. T2WI (A) hyperintense lesion in right ganglio-capsular region. DWI (B) shows restriction of diffusion in similar region.
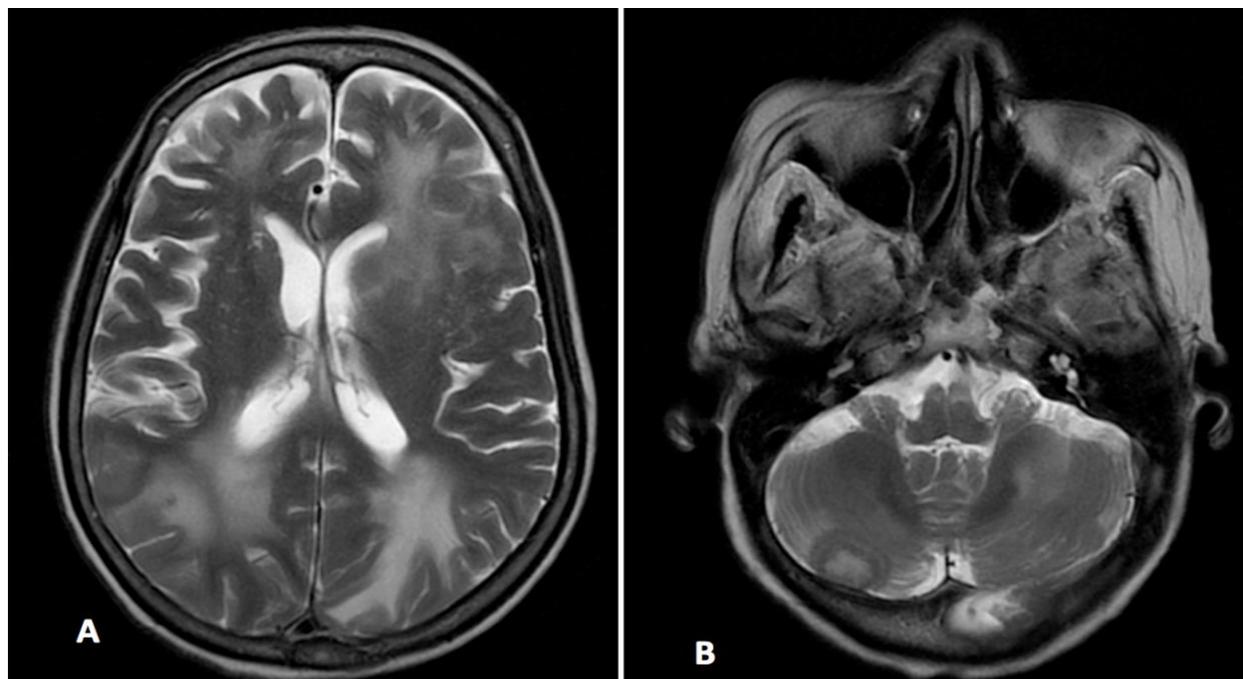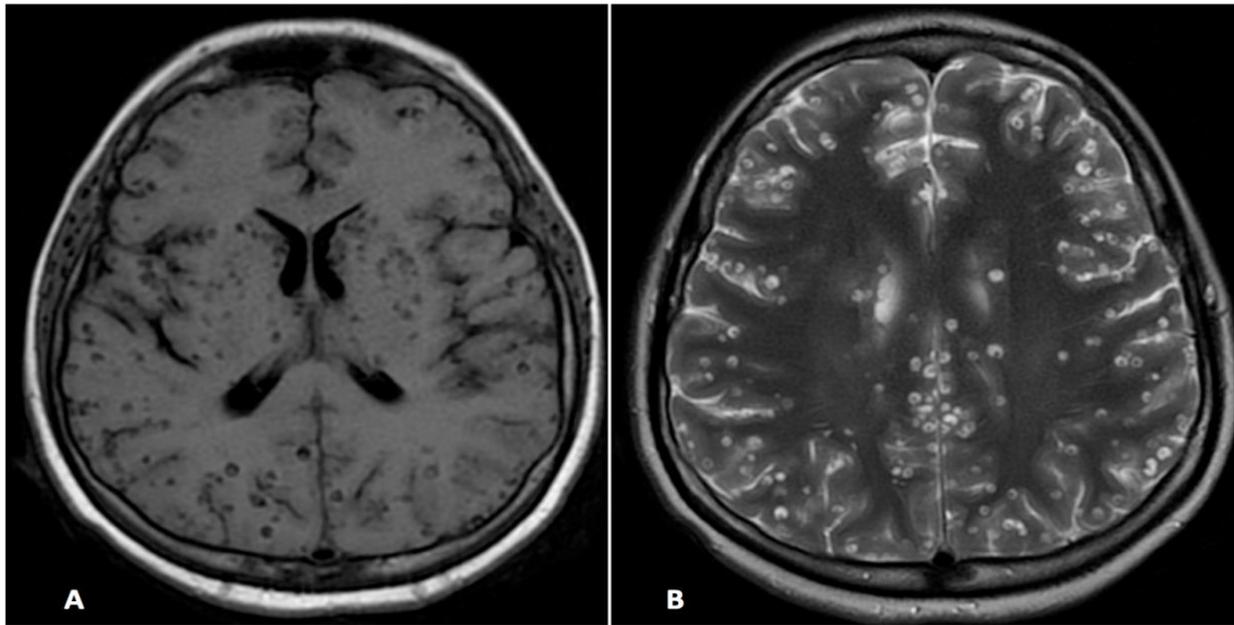

Figure 2: A case of Metastasis. MRI Ax.T2WI (A) shows hypointense lesion in left frontal lobe. Ax.T2WI (B) shows similar morphology lesions in cerebellar hemisphere.

Figure 3: A case of Neurocysticercosis. MRI Ax. T1WI (A) shows multiple tiny hypointense lesions scattered throughout. Ax. T2WI (B) shows multiple tiny hyperintense lesions scattered throughout.

DISCUSSION

In the present study of 25 patients most of the patients were of stroke. Early MRI findings in case of stroke was restriction of diffusion on Diffusion weighted imaging and hypoperfusion on perfusion imaging. Two cases of multiple sclerosis were noted in our study. Multiple hypointense small lesions were noted at callososeptal surface on T1WI and appearing hyperintense on T2WI. Li T et al retrospectively surveyed clinical characteristics and MRI data in Chinese subjects with multiple sclerosis (MS). They conducted a retrospective analysis in 117 patients with MS. The patients were divided into subgroups with optic-spinal form of multiple sclerosis (OSMS; n = 42) and classical multiple sclerosis (CMS; n = 75). Clinical characteristics, MRI finding and expanded disability status scale (EDSS) score were compared between the two groups. In 117 MS patients, 64.1% patients were classified as having CMS and 35.9% OSMS forms. White blood cell counts of OSMS patients were significantly higher than those of CMS patients (P <0.05). The longitudinal fusion lesions of spinal cord on MRI were statistically significant between groups (P <0.05). Spinal cord MRI showed that MS lesions were longer, and revealed spinal cord swelling in patients with CMS, but atrophy in patients with OSMS. The EDSS score at five years was significantly higher in patients with OSMS than in those with CMS (P <0.05). Relapse rates of patients with OSMS were also higher than those of patients with CMS (P <0.01) within one to three years. OSMS accounts for a higher proportion of MS populations in Northern China than in Western countries. MRI showed a longitudinally extensive spinal cord lesion in patients with OSMS and spinal cord swelling at onset.[8]

MRI findings in intraventricular cavernoma case were foci of hyperintensity on T1-weighted MR images due to various age of blood products (i.e., methemoglobin). T2 shortening producing a black halo around the lesion represents peripheral hemosiderin. MRI findings in Developmental venous anomaly (DVA) case were multiple tributaries arranged in a radial fashion drain into a larger vein. They are mostly visible on most sequences but can be subtle and are most easily seen on postcontrast T1 sequences and susceptibility weighted imaging (SWI). If there is an associated cavernous haemangioma, then susceptibility weighted sequences will be most sensitive to this component. Xia S et al correlated the MRI distribution of cryptococcal meningoencephalitis in HIV-1 infection patients with CD4 T cell count and immune reconstitution effect. They analyzed consecutive clinical and neuroimaging data of 55 HIV-1-infected patients with cryptococcal meningoencephalitis collected at multi-HIV centers in China. The enrolled patients were divided into 2 groups based on the distribution of lesions. One group of patients had their lesions at the central brain (group 1, n = 34) and the other group of patients had their lesions at the superficial brain (group 2, n = 21). They explored their MRI characterization of brain. In addition, we also compared their CD4 T cell counts and immune reconstitution effects between the 2 groups based on the imaging findings. No statistical difference was found in terms of age and gender between the 2 groups. Statistical difference of CD4 T cell count was found between the 2 groups (P = 0.023). Thirteen patients in group 1 (13/34) and 12 patients in group 2 (12/21) received highly active antiretroviral treatment (HAART). Patients of group 2 received HAART therapy more frequently than patients of group 1. Central and superficial brain lesions detected by MR imaging in HIV-1-infected patients with cryptococcal meningoencephalitis are in correlation with the host immunity and HAART therapy.[9]

Brain abscess showed presence of central hyperintense, surrounding hypointense edema on T1, with cavity hypointense and surrounding hyperintense edema on T2 in MRI. High DWI signal is usually present centrally. CNS Tuberculosis on MRI showed Hyperintense on precontrast T1W MT images and showed further enhancement on postcontrast T1W MT images. Mansour A et al characterized specific MRI findings seen in immune competent patients with intracranial primary CNS lymphoma (PCNSL) and to determine their value in the management of such patients. Pre-treatment MRI examinations of 21 immunocompetent patients with biopsy-proven PCNSL were retrospectively evaluated. T1 and T2 signal characteristics as well as contrast enhancement features are described in all patients.

Diffusion, perfusion and proton-MR-spectroscopy features are described in a subset of these patients. In the proper clinical and radiologic setting, suggesting the diagnosis of PCNSL can help institute proper treatment in a timely fashion and avoid unnecessary attempts at surgical resection and the associated morbidity.[10]

CONCLUSION
Under the light of above mentioned data, the authors conclude that MRI shows spectrum of pathognomic findings mostly specific for each group of lesions. However; further longitudinal studies are recommended for collecting the data of the imaging findings of various CNS lesions.

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