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Evaluation of CNS manifestations in HIV patients on MRI brain study

[1]Dr. VarshaThakare, JR3, Department of Radiodiagnosis, Sassoon General Hospital, Pune.

[2]Dr. Shephali S. Pawar, Head of Department, Department of Radiodiagnosis, Sassoon General Hospital, Pune.

Corresponding Author: Dr. Shephali S. Pawar, Head of Department, Department of Radiodiagnosis, Sassoon General Hospital, Pune.

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Introduction

Patients with AIDS develop a variety of CNS lesions, and the diagnosis of these lesions may require the application several imaging techniques including CT, MRI, single-photon emission computed Tomography (SPECT), or magnetic resonance spectroscopy (MRS). Because the sensitivity of MRI is superior to that of CT and because MRI allows acquisition of images in multiple planes, it has become the "gold standard" in neuroimaging.[1-4]

Patients with AIDS may have CNS lesions due to different pathological processes that occur synchronously or sequentially; occasionally, more than one pathological process is responsible for the lesion.In addition, patients who have developed AIDS as a consequence of intravenous drug addiction remain at risk for developing CNS diseases common to intravenous drug abusers and may have a higher risk of developing AIDS-related CNS diseases.[5-7]

In the differential diagnosis of brain diseases in patients with AIDS, some generalizations about the imaging appearance of CNS lesions are helpful because the clinical presentation of these lesions is often more dependent on their anatomic location than on their etiology. [8]

Central nervous system (CNS) involvement in HIV infection has a significant associated morbidity and mortality if not recognised early. One-third of AIDS-defining illnesses involve the CNS and 40% of patients with HIV suffer from neurological symptoms. Since the introduction of highly active antiretroviral therapy (HAART), HIV/AIDS has become a chronic disorder with marked reductions in mortality and morbidity, not only from the virus itself but also from opportunistic infections and tumours. However, HAART has led to a number of complications not previously seen in HIV medicine, and including immune reconstitution syndrome (IRIS). The major imaging findings of CNS

involvement in HIV-infected patients can be subdivided into the following categories.[9-10]

Aim and objective

1 To evaluate spectrum of imaging findings in asymptomatic and symptomatic HIV positive patients.

2 Classify and characterize the lesions on MRI imaging.

3 To correlate the MRI findings clinically with CD 4 count.

Material and methods

Study design

Retrospective observational study

Study setting

Department of Radiodiagnosis at tertiary care Centre

Study duration

June 2021 to March 2022

Study population

The study population included all Confirmed HIV cases admitted at a tertiary care center and referred to Radiodiagnosis department

Inclusion criteria

1. Patients with clinical findings/biochemical markers findings that are suggestive of CNS lesions.

Exclusion criteria

1. Pregnant patients or those with contraindications to MRI
2. Patients with H/O allergy
3. Patients with deranged RFT
4. Not willing to participate in study

Sample Size: 80

Sampling technique

Convenient sampling technique used for data collection. All patients admitted Radiodiagnosis department of tertiary care center with HIV CNS lesions were included in the study.

Methods of Data Collection and Questionnaire

Predesigned and pretested questionnaire was used to record the necessary information. Questionnaires included general information, such as age, sex, residential address, and date of admission. Medical history- chief complain, past history,

Data on demographic profile of HIV patient, investigation, and personal history, medical past history. The study was approved by institutional ethical committee.

It was a prospective observational study consisting of 80 patients who presented with HIV CNS lesions. It was conducted at a tertiary care medical hospital in an urban area. The patients having history suggestive of CNS lesions.

Study procedure

This study was conducted in Radiology Department of tertiary care center, in patients who satisfied the above said inclusion and exclusion criteria. Patients with clinical /biochemical markers findings suggestive of CNS lesions.MR imaging was performed on a 1.5 T imager . Conventional MR imaging consisted of T1-weighted imaging in axial and saggital plane, T2W imaging in axial and coronal plane, FLAIR axial, diffusion, SWI and post contrast T1W images. For each of the sequences, the section orientation was axial and the section thickness was 5 mm. The overall duration of the Examination was 35 to 40 minutes.

	T1	T2	Flair	Diffusion	SWI
TR	600	6000	8000	3000	27
TE	10	107	116	91	27
TI			2500		
Slice Thickness	5mm	5mm	5mm		5mm

Routine MRI sequences in brain imaging.

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Diffusion and diffusion weighted imaging was performed in axial plane. diffusion was obtained at b 0, 500 and 1000 values.

Spectroscopy was performed in a number of patients using chemical shift imaging at CSI 270 and at 135 ppm. Before planning the spectroscopy and imaging is performed with similar parameters for the planning of spectroscopy. The data collected was then transferred to the post processing software for interpretation and ratios.

Data entry and analysis: The data were entered in Microsoft Excel and data analysis was done by using SPSS demo version no 21 for windows. The analysis was performed by using percentages in frequency tables, classify CNS lesions. $p<0.05$ was considered as level of significance using the Chi-square test

Result and observations

A wide range of central nervous system pathologies can be seen in HIV-positive patients. Neuroimaging is mandatory in accurate diagnosis and in treatment follow-up. There is a much more overlapping of imaging features between the various disease subtypes; therefore, a systematic approach to interpretation is essential. Since MRI is the mainstay imaging modality of the CNS in AIDS, this study concentrates on the MRI appearances.

Table1: Distribution of cases according to Cerebral Abnormality

Sn.	Cerebral Abnormality in Seropositive Patients	No. of Cases N	Percentage %
1	Cerebral Tuberculosis	32	40 %
2	Toxoplasmosis	10	12.5 %
3	HIV Encephalitis/ Dementia	11	13.75 %
4	Cryptococcal Meningitis	5	6.25 %
5	CMV	1	1.25 %
6	Lymphoma	4	5 %
7	PML	7	8.75 %
8	Pyogenic Infections/Abcess	2	2.5 %
9	Cerebrovascular Disease	2	2.5 %
10	HSV Encephalitis	1	1.25 %
11	No Abnormality	5	6.25 %
Total		80	100 %

Table 1 shows Distribution of cases according to Cerebral Abnormality in Seropositive Patients. Amongst 80 seropositive cases 32 were diagnosed with Cerebral Tuberculosis, 10 were diagnosed with toxoplasmosis, 11 were diagnosed with Encephalitis/ Dementia, 7 were diagnosed with PML, 5 with cryptococcal meningitis, 4 with lymphoma, 2 with pyogenic infection, 2 with cerebrovascular disease, 1 with CMV and 1 with HSV encephalitis

Graph 1: Distribution of cases according to Age

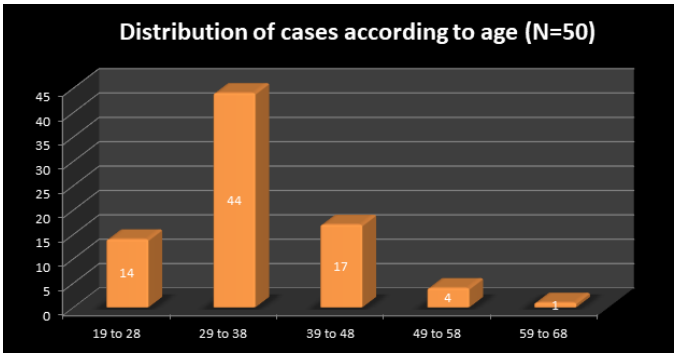

Table 2: Distribution of cases according to Sex

Sn.	Sex	No. of Cases N	Percentage %
1	Male	58	72.5
2	Female	22	27.5
Total		80	100 %

Table 2 shows distribution of cases according to Sex. Amongst 80 seropositive cases 58 were males and 22 were females' cases.

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Table 3: Distribution of cases according to CD4 count

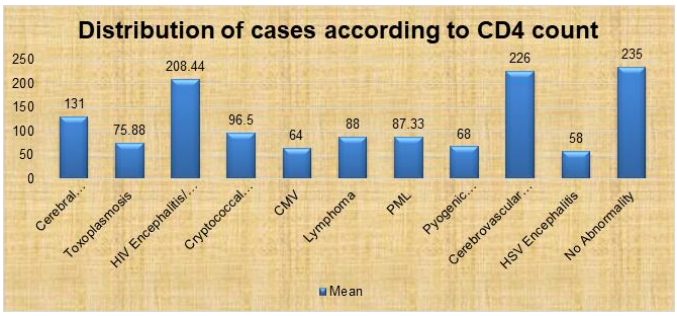
Sr. No.	Cerebral Abnormality in Seropositive Patients	No. of CasesN	Mean	SD	SEM	Median	25 %	75 %
1	Cerebral Tuberculosis	32	131.00	65.65	20.76	115.00	90.00	140.00
2	Toxoplasmosis	10	75.88	29.82	10.54	75.00	61.50	102.00
3	HIV Encephalitis/ Dementia	11	208.44	22.93	7.64	206.00	188.50	222.50
4	Cryptococcal Meningitis	5	96.50	22.71	11.35	98.00	78.00	115.00
5	CMV	1	64.00	0.00	0.00	64.00	64.00	64.00
6	Lymphoma	4	88.00	54.15	31.26	64.00	53.50	128.50
7	PML	7	87.33	18.27	7.46	86.00	70.00	104.00
8	Pyogenic Infections/Abcess	3	68.00	0.00	0.00	68.00	68.00	68.00
9	Cerebrovascular Disease	2	226.00	0.00	0.00	226.00	226.00	226.00
10	HSV Encephalitis	1	58.00	0.00	0.00	58.00	58.00	58.00
11	No Abnormality	4	235.00	49.50	35.00	235.00	200.00	270.00

Table 3 shows distribution of cases according to CD4 count. In patients with cerebral tuberculosis mean CD4 count was 131, in patients with Toxoplasmosis mean CD4 count was 75.88, in patients with

HIV Encephalitis/ Dementia mean CD4 count was 208.44, in patients with Cryptococcal Meningitis mean CD4 count was 96.50, in patients with CMV mean CD4 count was 64.00, in patients with Lymphoma mean CD4 count was 88.00, in patients with PML mean CD4 count was 87.33.

in patients with Pyogenic Infections/Abcess mean CD4 count was 68.00, in patients with Cerebrovascular Disease mean CD4 count was 226.00, in patients with HSV Encephalitis mean CD4 count was 58.00 and amongst seropositive patients with no abnormality mean CD4 count was 235.00

Graph 2:



Discussion

MRI though can be used as a modality for screening asymptomatic patients, it would be low yielding. Earlier studies by M. Judith Donovan , Joseph R. Bergen, and Robert M. Quencenconcluded that MR imaging can show indirect evidence of HIV infection early in the disease, but abnormalities will be minor and seen only in a small minority of neurologically asymptomatic subjects; however AJ Wilson and RF Miller study revealed early MRI would avoid unnecessary duplication of scanning modalities, reduce radiation exposure and is more likely to provide the best image for diagnosis and future comparison.

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The CD4 counts in all the patient were below 500 cells/mm$^{3.}$ Also noted was that there was considerable overlapping of CD4 count amongst different diseases of the CNS in HIV patients. However, the lowest CD 4 count was found in patients with toxoplasma, cerebral abscess and PML. Wide variation was noted in CD 4 counts of patients with tuberculosis and other infections. Previous studies by J Salam, et al. showed similar results

Table 1 shows Distribution of cases according to Cerebral Abnormality in Seropositive Patients. Amongst 80 seropositive cases 32 were diagnosed with Cerebral Tuberculosis, 10 were diagnosed with toxoplasmosis, 11 were diagnosed with Encephalitis/ Dementia, 7 were diagnosed with PML, 5 with cryptococcal meningitis, 4 with lymphoma, 2 with pyogenic infection, 2 with cerebrovascular disease, 1 with CMV and 1 with HSV encephalitis. Similar finding observed in the study conducted by Jarvik JC et al (1993) 22 another study conducted by Suwanwelaa N et al (2000) [11]

Table 2 shows distribution of cases according to Age. Amongst 80 seropositive cases maximum cases were from age group 29 to 38 i.e., 44 followed by 17 in age group 39 to 48, 14 in 19 to 28, 4 in 49 to 58 and 1 in age group 59 to 68. Similar result reported by Gupta R et al (2002)[12]

Table 3 shows distribution of cases according to Sex. Amongst 80 seropositive cases 58 were males and 22 were female's cases. Similar observations found in the study by AJ Wilson et al (2009) [13]

Table 4 shows distribution of cases according to CD4 count. In patients with cerebral tuberculosis mean CD4 count was 131, in patients with Toxoplasmosis mean CD4 count was 75.88, in patients with HIV Encephalitis/ Dementia mean CD4 count was 208.44, in patients with Cryptococcal Meningitis mean CD4 count was 96.50, in patients with CMV mean CD4 count was 64.00, in patients with Lymphoma mean CD4 count was 88.00, in patients with PML mean CD4 count was 87.33, in patients with Pyogenic Infections/Abcess mean CD4 count was 68.00, in patients with Cerebrovascular Disease mean CD4 count was 226.00, in patients with HSV Encephalitis mean CD4 count was 58.00 and amongst seropositive patients with no abnormality mean CD4 count was 235.00. Similar finding observed in the study by Trivedi R et al (2009)[14]and Balakrishnan J et al (1990)[15]

Conclusions

HIV infections in CNS has varied manifestations and their accurate diagnosis is key to effective patient management. MRI is a noninvasive radiation free tool with multiplanar capabilities to effectively differentiate and characterize these various brain lesions. Diffusion weighted imaging and MR Spectroscopy further help to increase the sensitivity in identifying these lesions and arrive at the final diagnosis. There is significant overlap in the CD 4 counts of the varied HIV CNS lesions and cannot be always relied upon.

Familiarity with these various imaging presentations of HIV lesions in CNS is of key importance for the differential diagnosis of various infections for further management, thereby reducing the morbidity and mortality of this potentially life-threatening disease.

References

1. Jared Narvid, Andrew Callen, Jason Talbott, Alina Uzelac, Sara M. Dupont, Felicia Chow, Richard W. Price,Bhavya Rehani Brain MRI Features of CSF Human Immunodeficiency Virus Escape J Neuroimaging 2018;0:1-7.

2. P.Satish Chandra,ANalini,MGaurieDevi,NeelamKhanna,Vani

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Santosh V Raavi Anita Desai,AChandramukhi,P N Jaykumar and S K Shgankar Profile of neurological disorders associated with HIV/AIDS from Bangalore South India(1989-96) Indian J Med Res 111,January 2000

3. Gang Cheng1 &Jianning Zhang1 Imaging features (CT, MRI, MRS, and PET/CT) of primary central nervous system lymphoma in immunocompetent patients Institute of Neurosurgery, Navy General Hospital, Beijing 100048, China 22/12/2018

4. N A SIBTAIN and R J S CHINN Imaging of the central nervous system in HIV infection Imaging, 14 (2002), 48–59 *E* 2002 The British Institute of Radiology.

5. Gupta R. Magnetization transfer MR imaging in central nervous system infections. Indian J Radiol Imaging 2002; 12:51-8.

6. AJ Wilson, RA Sayer and RF Miller, A comparison of MRI versus CT brain imaging in HIV-positive inpatients presenting with neurological symptom. UK HIV Med 2009 Apr 1-3; 10(Suppl. 1):48 (abstract no. P114).

7. Post MJ, Berger JR, QuencerRM.Asymptomatic and neurologically symptomatic HIV-seropositive individuals: prospective evaluation with cranial MR imaging. Radiology 1991; 178:131-139

8. Simone IL, Federico F, Tortorella C, et al. Localised H-MR spectroscopy for metabolic characterization of diffuse and focal brain lesions in patients infected with HIV. J NeurolNeurosurg Psychiatry 1998; 64:516–523

9. Laubenberger J, Haus singer D, Bayer S, Thiele Mann S, Schneider B, Mun dinger A, et al. HIV-related metabolic abnormalities in the brain (Depiction withproton MR spectroscopy with short echo times).Radiology. 1996; 199:805–810

10. Descamps M, Hy are H, Zerizer I, J A Ger H. Lyshom.Neuroimaging of CNS involvement in HIV. J HIV Ther. 2008 Sep;13(3):48-54.

11. Suwanwelaa N, Phanuphak P, Phanthumchinda K ,et al .Magnetic resonance spectroscopy of the brain in neurologically asymptomatic HIV-infected patients.Magnetic Resonance Imaging, Volume 18, Issue 7, Pages 859-865, September 2000

12. Gupta R. Magnetization transfer MR imaging in central nervous system infections. Indian J Radiol Imaging 2002; 12:51-8.

13. AJ Wilson, RA Sayer and RF Miller, A comparison of MRI versus CT brain imaging in HIV-positive inpatients presenting with neurological symptom. UK HIV Med 2009 Apr 1-3; 10(Suppl. 1):48 (abstract no. P114).

14. Trivedi R, Saksena S, Gupta RK.Magnetic resonance imaging in central nervous system tuberculosis. Indian J Radiol Imaging 2009; 19:256-65

15. Balakrishnan J, Becker PS, Kumar AJ, Zinreich SJ, McArthur JC, Bryan RN.Acquired immunodeficiency syndrome:correlation of radiologic and pathologic findings in the brain. Radiographics 1990; 10:201–215.

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