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Original Research Paper

Anatomy

BEHAVIORAL CHANGES IN AIDS PATIENTS IN CO-RELATION WITH THE CD4 COUNT AND CT FINDINGS IN BRAIN.

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ABSTRACT In AIDS patients brain is damaged due to the immunological deficiency and it could be measured by CD4 count in HIV positive patients. Behavior of the patients depends on the status of brain. Total 43 seropositive hospital admitted patients were studied from July 2008 to September 2010. Their CT findings were corroborated with the CD4 count and behavioral changes. Patients with CD4 count < 100cells/μL (16) were affected mostly along with the gross CT changes in brain. Memory loss, cognitive disorders or minor symptoms like confusion, headache with CT changes were clearly related with the CD4 count.The study was planned to co-relate the behavioral pattern of AIDS patients with the CT changes in brain and immunity status determined by CD4 count. It might be helpful in prognosis of AIDS patients and in study of formalin fixed HIV affected brain in future.

KEYWORDS : Behavior, CT Changes In Brain, CD4 Count, AIDS.

INTRODUCTION

Acquired immune deficiency syndrome (AIDS) is affecting the immune system in our body. Along with the other organs human brain is also affected by Human immunodeficiency virus (HIV). The neurological manifestations are due to the involvement of brain tissues in the course of the disease[1]. Like other lentiviruses the HIV has also the tendency to infect the nerve cells of central nervous system (CNS) early in the course of the disease[2]. Neuronal dysfunctions are due to viral proteins and consequent release of microglial neurotoxic factors such as cytokines,free radicles, derivatives of arachidonic acid, quinoleic acid etc[3]. These neurotoxin in blood will lead to the damage of blood-brain barrier (BBB)[4]. The toxins produced by the infected immune cells are causing death of brain or neuronal cells like apoptosis[5]. An increase in the number of perivascular macrophages or microglial cells including the hypertrophy of astrocytes are occurred in HIV infected brain [6]. The loss of brain tissues will lead to several behavioral changes like apathy, depression, later on motor and cognitive disorders or slowing like memory loss, lack of concentration depending on the state of brain tissue loss. Several studies have been done to find out the relationship of neuronal apoptosis with the stage of the disease, dementia, blood-brain barrier and axonal damage [7].

Dementia is very much common in AIDS patients and is called AIDS dementia complex (ADC). The histological appearance of brain is diagnostic only by brain biopsy in living or after collection of brain after death due to HIV. A number of changes occurring in the brain are the reasons for the development of ADC. The changes are like HIV-encephalitis, diffuse white matter pallor called HIV-Leukoencephalopathy reflecting loss of blood-brain barrier or involvement of grey matter called Diffuse Poliodystrophy with neuronal loss will result in programmed cell death (apoptosis), myelin loss or axonal damage[8,9]. The loss of brain tissue will lead to cortical thinning and increased in ventricular volume of brain[10,11]. The changes are very much diagnostic by CT or MRI. Other than the atrophy of brain radiologically there may be non-specific hypodense (CT) or hyperintense(MRI) foci or bilateral white matter infiltrate or larger diffuse focal lesions in the internal capsule or lentiform nucleus or thalamus etc[12]. The CSF-PCR is also might be helpful in AIDS diagnosis[13].

The CD4 count or monocytes- macrophage cell count will speak the body immune system. So these cells can be used for the prognosis as well as biological markers of the neuropathogenicity. It will be helpful in early detection, starting of antiretroviral therapy and its maintenance[14]. Depending on the CD4 count the severity of ADC was categorized by Price in mild, moderate and severe(Price's classification). Beta-2 microglobulin and CD4 count (in blood and cerebrospinal fluid) can be used as predictive markers to identify the patients those are at risk for ADC development and for optimization of antiretroviral doses[15].

MATERIALS AND METHODS

43 HIV positive hospital-indoor admitted patients were studied in between July 2008 to September 2010. Only newly positive or first time detected patients were included as they were not given antiretroviral therapy yet and below 18 age group patients were excluded. Both males and females were studied. They were asked, carefully observed to get the symptoms at presentations in the indoor and to find out any behavioral changes. Everybody was asked the same questions to find out the memory, attention or concentration as cognitive functions. They were asked about the number of their family members in their childhood, name of the place of birth to detect past memory and with whom they reach the hospital presently to detect the recent memory. In case of literate people they were asked to write his or her name in their preferred language on a shit of white paper and it was handed over to the patient to maintain the privacy of them after observations. CD4 counts of the admitted patients were noted. CT scan done of all those patients were either for the clinical diagnosis as per the symptoms or for the academic interests. CT findings were thoroughly studied and recorded. Opportunistic infections due to AIDS or neoplasm of brain were not included in our study.

RESULT

The AIDS patients were primarily categorized in three groups as per the CD4 count after admission. First group was above 500 cells/μL, second group in between 100cells/μL and 500cells/μL, and the last or third group was below 100cell/μL cells. Out of total 43 AIDS patients 9 patients in first group were presented with headache and depression, 18 patients in the second group presented with apathy, withdrawal from regular activities, headache and depression. 16 patients in third group were presented with inertia, cognitive slowing like memory loss, lack of attention and concentration, apathy, depression. **(Fig.1)**

CT scan of patients with CD4 count > 500 cells/μL (first group)

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revealed no changes in 6 patients and cerebral edema in 3 patients. 2 patients had no changes, 10 patients had cerebral edema and 6 cases had central and cortical atrophy of brain as seen in CT scan of the second group (CD4 count 100cells/μL-500cells/ μL). Out of 16 patients in third group (CD4 count <100cell/ μL) 7 patients shown atrophy of cortical and central brain, 9 patients were having generalized involvement of brain including internal capsule, lentiform nucleus, thalamus. In these patients there were increased volume of ventricles along with cerebral edema noted in most of the cases.**(Fig.2)**

DISCUSSION

Brain is affected in HIV infection along with the other organs and almost all organs will be affected due to the changes in immunological system. The changes in the anatomy of brain are very slow to appear and may take years to make the HIV patient immobile in all aspects.[3] Initially the patients were having mild headache, depression like symptoms and some of them also met their doctors for a relief, as per the history. After several treatments and investigations suddenly came to know that they became AIDS positive. Loss or damage of brain tissue will lead to abnormality in behavioral pattern is very much diagnostic of the prognosis of AIDS. In the present study the patients are primarily having the headache, confusion and mild depression due to the cerebral or intracranial edema (Fig.3,4) where the CD4 count is above 500cells/μL. Their cognitive functions are intact in 6 patients but could not be detected in 3 illiterate patients. Among these 3 illiterate patients 2 were having cerebral edema and 1 with no changes in brain as per the CT findings. But in patients with CD4 count in between 100-500cells/μL (second group) the performance is affected more than the first group. In this group brain is badly affected by cerebral atrophy with gross edema in 6 patients (Fig.5) and cerebral oedema in 10 patients (Fig.6). In the 2nd group 3 patients with cortical atrophy and 1 with cerebral oedema did not respond (total 4). There was loss of memory in 6 patients. Among them 1 with atrophy of brain who had responded, and, 2 patients with no changes and 3 cerebral edema (total 6) as per the CT findings. In 2nd group it was seen that 2 patients with no changes and 3 with the cerebral edema had the cognitive function intact (total 5). In total 13 patients it was difficult to determine the cognitive functions in illiterate patients (3) and could not be detected in those patients who were either not responding (4) or had memory loss (6). In our study HIV positive patients with CD4 count less than 100 cells/μL were badly affected by cerebral atrophy with edema (Fig.7) in 7 patients and only 3 patients could recapitulate their memories. 2 patients were able to read and tried to write. In this group 9 patients had the generalized affection of brain including the lentiform nucleus, thalamus or internal capsule by atrophy and edema also (Fig.8). Out of those 9 patients, 7 were not responding to us at all and 2 patients had memory loss. Increased ventricular volume along with the loss of cortical tissues corroborative with the study of Oster. [10]

Through the present study it is conclusive that there is an ascending graph of deterioration of neurological symptoms as the disease progresses or CD4 count reduces. Initial headache and depression will lead ultimately to apathy, inertia, withdrawal from all activities, memory loss, loss of reading and writing capacity etc. The reason behind this deterioration is mainly the loss or atrophy of brain. In the study it is proved that with the CD4 count reduction the loss of brain tissue is also increased detected by CT. As a result of this cerebral atrophy along with edema patients are suffering from ADC and /or cognitive disorders. As the brain atrophy progresses to the generalized involvement of brain such as involvement of internal capsule or lentiform nucleus or thalamus other motor activities are affected. **Raininko**[12] had shown the involvement of brain along with the progression of the disease process radiologically.

The present study was aimed to find out the anatomical changes of brain in correlations with CD4 count and behavioral status of the HIV positive patients before starting the antiretroviral drugs. The present study could be helpful in the prognosis of the AIDS patients after starting the therapy. But the study should be completed one if we can study the anatomical changes in brain after death due to AIDS following proper tissue processing and staining.

CONCLUSION

AIDS is now such a worldwide problem that will ultimately lead to death by loss of thinking as well as all motor performances slowly one by one because of the atrophy of brain. Brain atrophy will result in the behavioral changes of the HIV patients and will force the patients to remain confined within bed. Early diagnosis and the early start of the proper treatment can most probably modify the disease progression in AIDS patients. The study is done primarily to correlate the behavioral changes with the immunity status in our body. The knowledge could be helpful in early diagnosis in cases of long term headache or other neurological problems. The study might inspire us to see the anatomical changes in brain of AIDS positive cadavers..

LEGENDS

Fig.1- Bar diagram showing correlations in between the cognitive changes and the CD4 count.

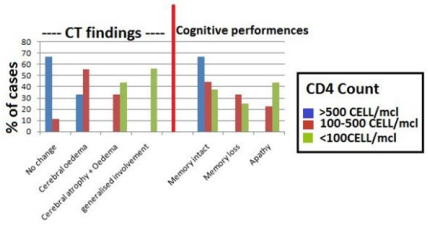


Fig.2- Pie chart showing the correlations in between the CT changes and CD4 count.

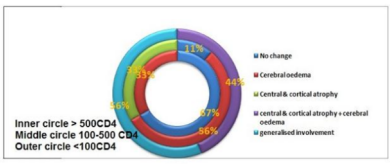


Fig. 3- Axial CT scan of brain at the level of central fissure in an HIV patient (CD4 count > 500cell/μL) shows gross edema, focal hypodense lesions in occipital lobe (left) and other areas.

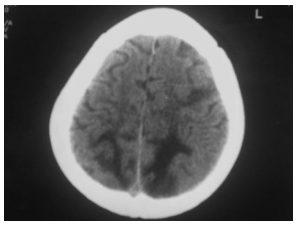


Fig. 4- Axial CT scan of brain at the level of supraventricular level in an HIV patient (CD4 count>500cell/μL) shows hypodense areas affecting grossly both the lobes.

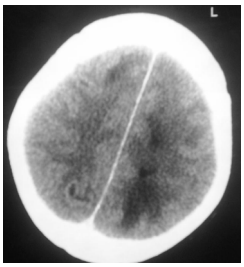


Fig. 5- Axial CT scan of brain at the lateral ventricles level in an HIV patient (CD4 count 100 cell/μL -500cell/μL) shows gross bilateral involvement of brain by hypodense lesion and enlarged lateral ventricles.

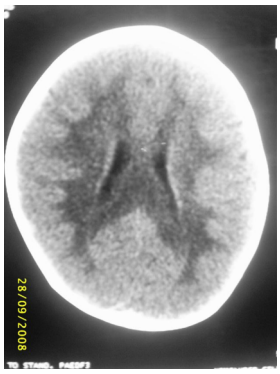


Fig. 6- Axial CT scan of brain at the level of basal ganglia in an HIV patient (CD4 count 100 cell/μL -500cell/μL) shows cerebral edema, hypodense lesions affecting the internal capsule, caudate nucleus and occipital lobes.

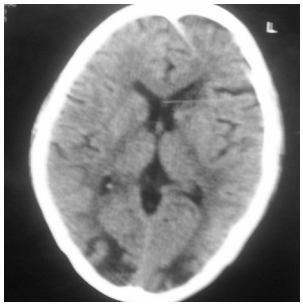


Fig. 7- Axial CT scan of brain at the supraventricular level in an HIV patient (CD4 count< 100 cell/μL) shows bilateral hypodense lesions affecting both lobes grossly.

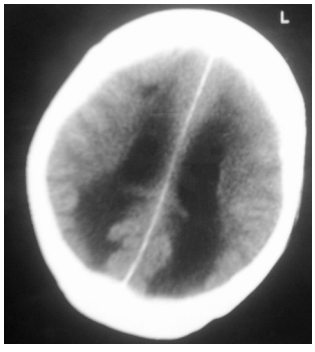
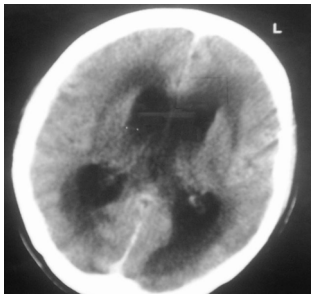


Fig. 8- Axial CT scan of brain at the level of lentiform nucleus in an HIV patient (CD4 count <100 cell/μL) shows enlarged ventricles and generalized involvement of both lobes by hypodense lesions affecting cudate nucleus, basal ganglia, internal capsule.



REFERENCES

1. Everall IP, Luthert PJ, Lantos PL. Neuronal loss in the frontal cortex in HIV infection. Lancet. 1991 May; 337(8750): 1119-21.
2. Bardi SJ. AIDS and the Brain. News & Views. 2001 Feb; 1(3).
3. Gray F.Dementia and human immunodeficiency virus infection. Rev Neurol(Paris). 1998;154 suppl 2: S91-8.
4. Gabuzda D. Nerve cell "Suicide" in AIDS Dementia. ON THE BRAIN- The Harvard Mahoney Neuroscience Institute Letter. Winter 1996; 5(1).
5. Adle-Biassette H, Wingertsmann L, Authier FL, et al.Neuronal apoptosis in the central and peripheral nervous system in HIV infection. Arch Anat Cytol Pathol. 1997; 45(2-3): 86-93.
6. Power C, Kong PA, Crawford TO, et al. Cerebral white matter changes in acquired immunodeficiency syndrome dementia: alterations of blood- brain barrier. Ann Neurol. 1993 Sep; 34(3): 339-50.
7. Gray F, Adle-Biassette H, Brion F et al. Neuronal apoptosis in human immunodeficiency virus infection. J Neurovirol. 2000 May; 6 Suppl: S38-43.
8. Gray F, Gherardi R, Keohane C, et al. Pathology of the central nervous system in 40 cases of acquired immune deficiency syndrome(AIDS). Neuropathol Appl Neurobiol. 1988 Sep-Oct; 14(5): 365-80.
9. Flores R, Salvato P, Thompson C, Stroud S; International Conference on AIDS. CD4 count and AIDS dementia complex. Int Conf AIDS. 1992 July; 8: 79: 19-24.
10. Oster S, Christoffersen P, Gundersen P, et al.Cerebral atrophy in AIDS patients: A stereological study. Acta Neuropathol. 1993; 85(6): 617-22.
11. Korbo L, Praestholm J, Skot J. Early brain atrophy in HIV infection: a radiological- stereological study. Neuroradoiology. 2002 Apr;44(4): 308-13.
12. Raininko R, Elovaara I, Virta A, et al. Radiological stage of the brain at various stages of human immunodeficiency virus infection: early development of brain atrophy. Neuroradiology. 1992; 34(3): 190-6.
13. d'Arminio Monforte A, Cinque P, Vago L, et al. A comparison of brain biopsy and CSF-PCR in the diagnosis of CNS lesions in AIDS patients. J Neurol. 1997 Jan; 244(1): 35-9.
14. Sanchez-Ramon S, Bellon JM, Resins S, et al. Low blood CD8+ T-lymphocytes and high circulating monocytes are predictors of HIV associated progressive encephalopathy in children. Pediatrics.2003 Feb;111(2): E 168-75.
15. Brew J, Dunbar N, Pemberton L et al. Predictive markers of AIDS dementia complex: CD4 cell count and cerebrospinal fluid concentration of beta 2-microglobulin and neopterin. J Infect Dis. 1996 Aug; 174(2): 294