Case report

Progressive multifocal leukoencephalitis of the immunocompromised subject: a case report from Zinder National Hospital.

ABSTRACT

Progressive multifocal leukoencephalitis (PML) is a rare opportunistic infection of HIV-infected individuals. It is a viral infection caused by the John Cunningham (JC) virus, which occurs during the AIDS stage. An elderly patient immunosuppressed by HIV for more than 5 years presented to the HNZ SMIT with headache, vomiting, visual disturbances, speech disorders and numbness of the limbs, all of which had been evolving in a febrile context for more than seven months. Neurological examination revealed left hemiparesis, frontal syndrome, temporal syndrome and homolateral hemianopia. Cerebral computed tomography revealed multiple lesions of leukoencephalitis. PCR revealed JC virus. The patient was put on corticosteroids, rehydration and nursing care. The course was marked by a progressive deterioration in the patient's neurological condition, culminating in death. We report the clinical, biological and CT features of this progressive multifocal leukoencephalitis.

Keywords: PML, JC Virus, HIV

1. INTRODUCTION

Progressive multifocal leukoencephalopathy (PML) is a central nervous system disorder characterized by the destructive infection of oligodendrocytes by a Polyomaviridae, specifically the John Cunningham virus (JC virus), or its reactivation [1,2]. More rarely, BK virus or SV40 virus can be causative agents[3]. The diagnosis of PML can be confirmed by detecting the presence of the JC virus in the cerebrospinal fluid (CSF) using PCR [4]. PML typically occurs in the context of immunodeficiency due to human immunodeficiency virus (HIV) infection, hematologic malignancies, various immunosuppressive and modulatory drugs, and rheumatologic disorders [4,5]. First described by Astrom et al. in 1958 as a disease in patients with lymphoid malignancies [6,7], PML is now recognized as an infection that can occur in immunocompromised individuals due to HIV. Approximately 5-10% of all patients with AIDS may develop PML [1,8]. Thus, PML is considered one of the opportunistic infections with neurological localization in severely immunocompromised HIV patients[9]. The natural progression of the disease involves progressive deterioration, leading to death within a few months if the patient remains immunodeficient. PML causes progressively developing neurological deficits [1]. Initially, there are multiple demyelinating foci, sparsely distributed in the subcortical white matter. As the disease progresses, each focus enlarges as the virus spreads from cell to cell. Typically, PML pathology includes oligodendrocyte hypertrophy and widespread destruction [15]. It is rare for PML to manifest in patients without known predisposing factors in the context of presumed immunocompetence, but it has been described in numerous case reports and series [4,10,11].

2. METHODS

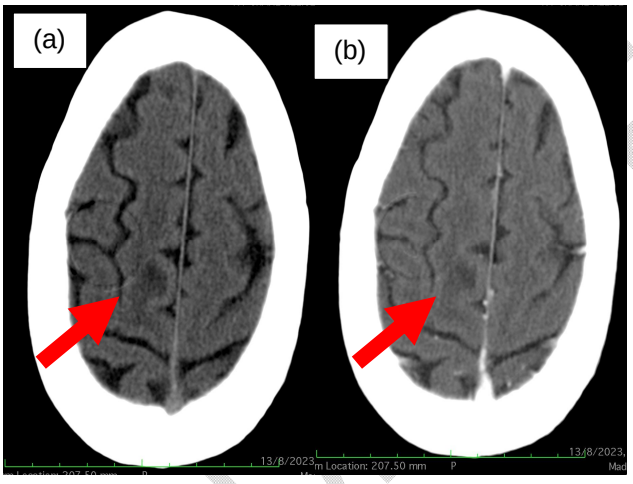
This study examines a case of PML in an HIV-immunocompromised patient at the infectious and tropical diseases department of the National Hospital of Zinder. The study involved the analysis of the medical records of a patient hospitalized in October 2023.

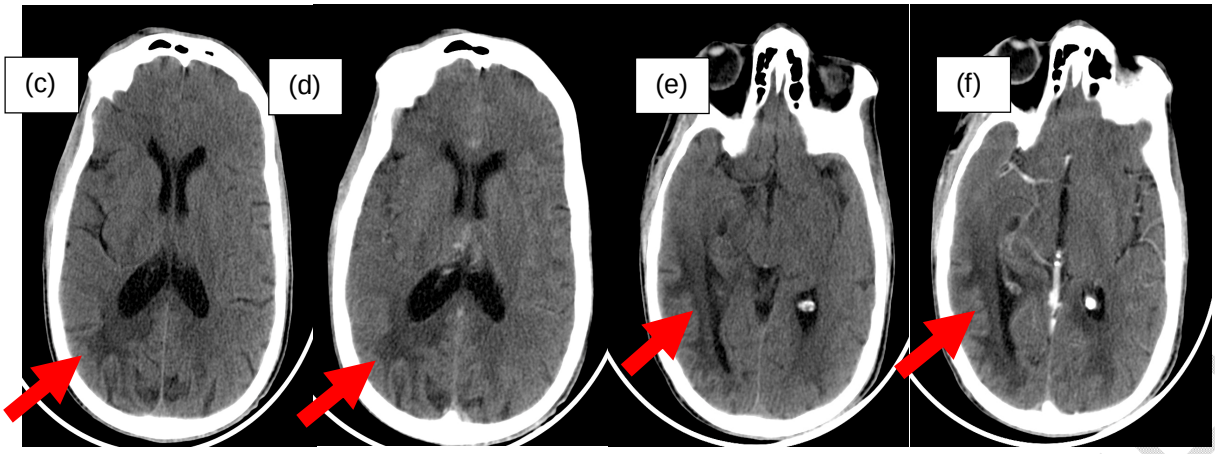
3. CASE PRESENTATION

Mr. HW, a 55-year-old known to be immunocompromised due to HIV for over 5 years, was non-adherent to his TDF+3TC+DTG treatment. He was admitted to the infectious and tropical diseases department of the National Hospital of Zinder. The patient had no history of autoimmune, renal, or hepatic disease, nor any history of alcohol consumption, liver disease, or malignant tumors. The reasons for hospitalization included fever, headaches, visual disturbances, language impairment, and left hemiparesis, all occurring in a non-traumatic context. These symptoms had been progressing over the past 7 months and had worsened 9 days prior to admission with the onset of dyspnea, severe acute headaches resistant to usual analgesics, persistent intense fever accompanied by chills and sweats, diffuse abdominal pain resembling a torsion, food vomiting, and a dry cough. Upon admission, the physical examination revealed a conscious patient with an oxygen saturation (SpO2) of 98%, a weight of 62 kg, a height of 1.80 m, and a BMI of 19.13 kg/m². The clinical neurological examination was significant for spontaneous eye opening, groaning, and the inability to follow or obey commands. The patient exhibited spontaneous eye movements.

Clinical Findings:

1. Infectious syndrome: fever, tachycardia
2. Intracranial hypertension syndrome: headaches, vomiting, and visual disturbances
3. Immunodeficiency syndrome: fever, asthenia, weight loss
4. Frontal syndrome: intellectual dysfunction, impulsivity
5. Temporal syndrome: Aphasia, quadrant hemianopia, mental confusion
6. Parietal involvement: Loss of sensation
7. Occipital involvement: Homonymous hemianopia
8. Left spastic hemiparesis: predominantly affecting the face and arm given the clinical presentation and the context of immunodeficiency, a cranial computed tomography (CT) scan was performed.





Figures 1: The cranial CT images were acquired using helical scanning in parenchymal windows with axial slices, without contrast injection (a, c, e). These images revealed multiple hypodense foci located in the precentral frontal, periventricular, and right temporo-occipital regions, affecting the white matter while sparing the cortex and midline and showing no enhancement with contrast injection (b, d, f). Additionally, cortical and subcortical atrophy were noted.

These CT aspects were therefore indicative of multifocal leukoencephalopathy. A lumbar puncture was indicated and performed, revealing macroscopically clear cerebrospinal fluid with hypocellularity on cytology (03 cells/mm³). Biochemical analysis of the cerebrospinal fluid was not performed. PCR analysis of the cerebrospinal fluid identified the JC virus genome. The diagnosis of PML was definitively established based on anamnesis, clinical, biological, and CT findings. The patient subsequently received corticosteroid therapy, intravenous hydration, and nursing care. The patient's neurological condition progressively deteriorated, and he passed away two months after hospitalization in a state of coma.

3. DISCUSSION

This case suggests that non-adherence to antiretroviral therapy (ART) was a major aggravating factor in this patient's immunodepression, thereby facilitating the onset of PML. However, PML can also occur in other immunodeficiency contexts, such as lymphoid malignancies, post-transplantation, and immunosuppressive therapies [12,13]. It is important to note that cases of PML in immunocompetent individuals have been described by Varun Jain et al. in 2023 [4].

The diagnosis of PML was based on the characteristic appearance of lesions on cranial CT scans, in conjunction with the patient's clinical context. PML is characterized by white matter alterations, predominantly in the parieto-occipital regions, as seen in our patient, and rarely affects the gray matter [14]. In HIV-infected patients, PML often presents with atypical clinical features [13]. The main differential diagnosis was HIV-associated leukoencephalopathy or HIV encephalitis [15].

The CT scan findings strongly suggested PML. This underscores the importance of cranial CT in suspected PML cases, although MRI, which was not performed, could have highlighted T1 hypointense and T2 hyperintense lesions [16]. Biologically, the diagnosis of PML in this case was based on PCR analysis of the cerebrospinal fluid, which identified the JC virus. The most crucial diagnostic criterion is the PCR amplification of the JC virus from CNS tissue and/or cerebrospinal fluid [8]. JC virus infection can also be diagnosed via biopsy, revealing inclusion bodies in the nuclei of affected oligodendrocytes. PCR testing of CSF for the JC virus has revolutionized the diagnosis in recent years [17]. However, this test can yield false negatives. Therefore, it should be repeated if clinical and imaging contexts strongly suggest the diagnosis, given its high sensitivity (up to 93%) and specificity (up to 100%). The diagnosis of PML in this patient was based on anamnesis, clinical, biological, and CT criteria [15]. Besides PML, other JC virus-related neurological conditions include JC virus granule cell neuronopathy, JC virus encephalopathy, and JC virus meningitis [18]. To date, there is no defined treatment for PML, and the prognosis is fatal in most cases [19,20].

4. CONCLUSION

Progressive multifocal leukoencephalopathy is a rare demyelinating brain infection affecting the central nervous system's white matter, predominantly occurring in HIV-immunocompromised patients. No specific treatment has proven effective to date, and death typically occurs within 1 to 9 months after onset.

CONSENT

ALL AUTHORS DECLARE THAT WRITTEN INFORMED CONSENT WAS OBTAINED FROM THE PATIENT FOR THE PUBLICATION OF THIS CASE REPORT AND ACCOMPANYING IMAGES.

ETHICAL APPROVAL

THIS STUDY WAS CONDUCTED BY ETHICAL PRINCIPLES AND RECEIVED APPROVAL FROM THE INSTITUTIONAL REVIEW BOARD (IRB) OF THE FACULTY OF MEDICAL SCIENCES UNIVERSITY OF ZINDER (FSS-UAS), NIGER. THE IRB REVIEWED THE RESEARCH PLAN, ENSURING THAT IT ADHERED TO ETHICAL STANDARDS AND GUIDELINES FOR CONDUCTING RESEARCH INVOLVING HUMAN SUBJECTS. THE APPROVAL FROM THE IRB SIGNIFIES COMPLIANCE WITH THE PRINCIPLES OF CONFIDENTIALITY, INFORMED CONSENT, AND THE PROTECTION OF PARTICIPANTS' RIGHTS.

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