Case Report : Progressive Multifocal Leukoencephalopathy in an AIDS patient.

ARTICLE INFO

ABSTRACT

Background: Progressive multifocal leukoencephalopathy (PML) is a rare and devastating opportunistic infection caused by JC virus reactivation in immunocompromised individuals.

Aim: To report a case of PML in an HIV-positive patient and highlight the importance of prompt recognition and diagnosis.

Case summary: A 34-year-old HIV-positive male presented with progressive disturbances of consciousness and movement. MRI revealed multifocal white matter lesions, and JC virus DNA was detected in cerebrospinal fluid. Despite combination antiretroviral therapy (cART), the patient's condition deteriorated.
Conclusion: PML remains a significant concern in HIV patients, emphasizing the need for vigilant monitoring, prompt diagnosis, and effective management strategies. This case highlights the importance of considering PML in HIV patients with progressive neurological symptoms.
Keywords: Progressive multifocal leukoencephalopathy (PML), JC virus, HIV, immunocompromise, neurological symptoms

INTRODUCTION

Progressive multifocal leukoencephalopathy (PML) is a rare and debilitating opportunistic infection caused by the JC virus (JCV), a human polyomavirus characterized by its tropism for oligodendrocytes and astrocytes in the central nervous system (CNS) [1]. With an estimated seroprevalence of 80% in the global population, JCV typically remains latent, only reactivating in individuals with severe immunocompromise, including those with advanced HIV disease (CD4 count <200 cells/μL), hematological malignancies, and organ transplant recipients [2-4).

The pathogenesis of PML involves JCV reactivation, leading to lytic infection of oligodendrocytes, which results in widespread demyelination and axonal damage in the CNS [5]. This process is facilitated by the virus's ability to evade the host immune response through mechanisms such as immune suppression, genetic variation, and molecular mimicry [6-8].

Clinically, PML presents with a diverse range of symptoms, including progressive weakness, cognitive decline, vision loss, ataxia, and dysarthria, reflecting the multifocal nature of the disease [9-11]. Diagnostic evaluation involves a combination of:

1.Neuroimaging (MRI): Characteristic multifocal white matter lesions.

2.Laboratory testing: JC virus DNA detection in cerebrospinal fluid (CSF) via polymerase chain reaction (PCR).

3.Clinical assessment: Progressive neurological deterioration.

Despite advancements in diagnostic techniques and therapeutic interventions, PML remains a life-threatening condition, with a median survival rate of approximately 2 years and significant morbidity [12-13]. The widespread use of combination antiretroviral therapy (cART) has improved survival rates among HIV-infected individuals; however, PML incidence remains unchanged, highlighting the need for novel therapeutic strategies and improved patient outcomes.

This case report highlights the importance of prompt recognition and diagnosis of PML in HIV patients presenting with progressive neurological symptoms, emphasizing the need for continued research into effective treatment strategies and improved patient outcomes.

CASE REPORT

Clinical Presentation:

A 34-year-old male presented with a 1-day history of fever (38.5°C), abnormal body movements (choreoathetosis), and altered sensorium (confusion, disorientation). Physical examination revealed stable vital signs, with no localizing neurological signs.

Laboratory Findings:

1. HIV-1 RNA level: 1.2 × 10^3 copies/mL (bDNA assay)

2. CD4+ T-cell count: 41 cells/μL (flow cytometry)

3. Tumor markers (CEA, CA 19-9, AFP): Negative

4. Blood cultures (aerobic, anaerobic, fungal, mycobacterial): Negative

5. CSF analysis:

- KOH mount: Negative (no fungal elements)

- Gram stain: Negative (no bacteria)

- Aerobic culture: Negative

- Mycobacterium DNA culture (PCR): Negative

- India Ink preparation: Negative (no cryptococcal antigens)

- JC Viral DNA (PCR): Not performed (logistical issues)

Neuroimaging Findings:

MRI Brain (1.5 Tesla):

1. Multifocal patchy areas of white matter signal abnormality in bilateral cerebral hemispheres

2. Predominant involvement of left frontal lobe

3. Lesions characterized by:

- Hypointensity on T1-weighted images

- Hyperintensity on T2-weighted and T2 FLAIR images

- Restricted diffusion on Diffusion-Weighted Imaging (DWI)

- Corresponding defect in Apparent Diffusion Coefficient (ADC) maps

- No associated mass effect or discrete lesion

Diagnosis:

Based on clinical features, positive HIV status, severe immunocompromise (CD4 count: 41 cells/μL), and characteristic MRI findings, the patient was diagnosed with:

1. Viral Encephalitis

2. Progressive Multifocal Leukoencephalopathy (PML) in a Person Living with HIV/AIDS (PLWHA)

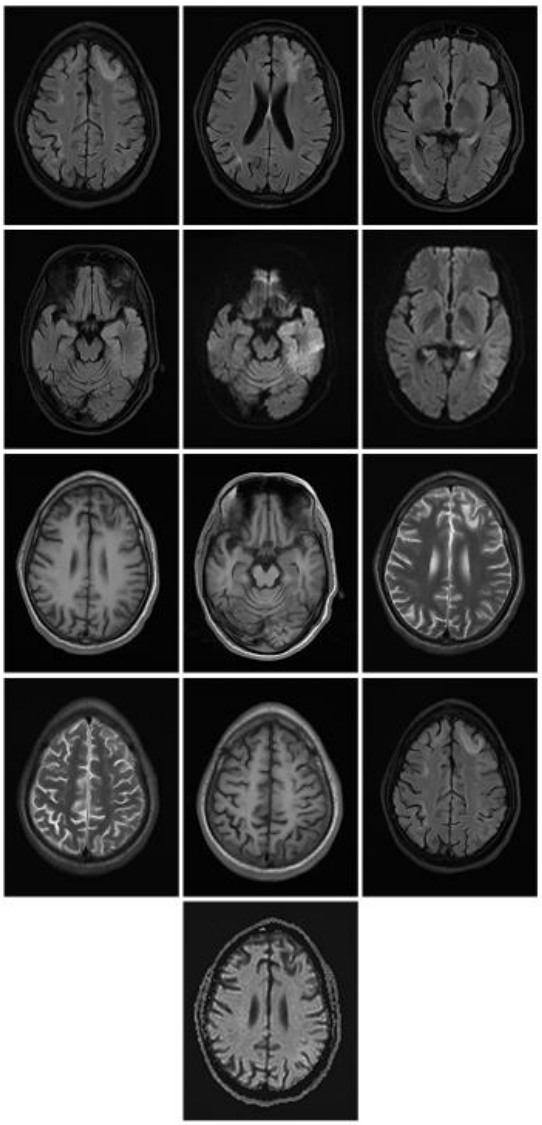

Figure 1. MRI Brain

HOSPITAL COURSE

Day 1: Admission

A 34-year-old male presented to the emergency department with:

- Fever (38.5°C)
- Abnormal body movements (choreoathetosis)
- Altered sensorium (confusion, disorientation)

Physical examination revealed:

- Stable vital signs
- No localizing neurological signs

Day 2-3: Diagnostic Workup

Laboratory findings:

- HIV-1 RNA level: 1.2 × 10^3 copies/mL (bDNA assay)
- CD4+ T-cell count: 41 cells/μL (flow cytometry)
- Tumor markers (CEA, CA 19-9, AFP): Negative
- Blood cultures (aerobic, anaerobic, fungal, mycobacterial): Negative

CSF analysis:

- KOH mount: Negative (no fungal elements)
- Gram stain: Negative (no bacteria)
- Aerobic culture: Negative
- Mycobacterium DNA culture (PCR): Negative
- India Ink preparation: Negative (no cryptococcal antigens)

Neuroimaging findings:

- MRI Brain (1.5 Tesla): Multifocal patchy areas of white matter signal abnormality in bilateral cerebral hemispheres

Day 4-5: Clinical Deterioration

- Patient's fever persisted (38.2°C)
- Abnormal body movements worsened
- Altered sensorium progressed to stupor

Day 6: JC Virus DNA Detection

- CSF JC Viral DNA (PCR): Positive (performed at an external laboratory)

Day 7-10: Diagnosis and Management

- Diagnosis confirmed: Progressive Multifocal Leukoencephalopathy (PML) in a Person Living with HIV/AIDS (PLWHA)
- Initiated combination antiretroviral therapy (cART)
- Supportive care: Antipyretics, hydration, and nutritional support

Day 11-14: Further Deterioration

- Patient's condition continued to deteriorate
- Developed severe neurological deficits: hemiparesis, dysarthria, and cognitive decline

Day 15-28: Recovery Initiation

- *Day 15:* Patient transferred to ICU for close monitoring; cART regimen optimized.

- *Day 16:* Fever resolved (36.5°C); abnormal body movements decreased.

- *Day 17:* Altered sensorium improved; patient responsive to verbal commands.

-*Day 18-20:* Gradual improvement in neurological deficits; hemiparesis reduced.

- *Day 21:* Patient able to perform simple tasks; cognitive function improved.

- *Day 22-25:* Continued neurological recovery; dysarthria resolved.

- *Day 26-28:* Patient ambulatory with assistance; independent in daily activities.

Day 29-42: Consolidation of Recovery

- *Day 29-35:* cART regimen continued; JC Virus DNA levels decreased.

- *Day 36-40:* Neurological examination revealed significant improvement.

- *Day 41:* Patient discharged from ICU to rehabilitation unit.

- *Day 42:* Patient independent in daily activities; planned for outpatient follow-up.

Day 43-60: Outpatient Follow-up

- *Day 43-50:* Regular outpatient visits; cART regimen continued.

- *Day 51-55:* JC Virus DNA levels undetectable.

- *Day 56-60:* Patient regained full independence; returned to work.

Outcome: Successful Recovery

The patient's prompt diagnosis, initiation of cART, and supportive care led to successful recovery from PML. Regular follow-up and adherence to cART regimen ensured sustained viral suppression and improved quality of life.

DISCUSSIONS

JC virus, a human polyomavirus, is the etiological agent responsible for progressive multifocal leukoencephalopathy (PML), a devastating opportunistic infection affecting individuals with advanced immunosuppression, particularly those with AIDS [2]. Despite a high seroprevalence of JC virus antibodies (~80%) in the adult population, indicative of prior exposure, active viral replication is rare (<10%) in healthy individuals [1).

PML is the sole clinical manifestation of JC virus infection, occurring in approximately 1-4% of AIDS patients [3]. Notably, it is a late-stage complication, often presenting with severe immunocompromise [7].

Diagnostic approaches:

- Measurement of JC virus DNA levels in cerebrospinal fluid (CSF) offers high sensitivity (76%) and specificity (near 100%) [6]

- Characteristic brain MRI features: asymmetric white-matter lesions [11]

Treatment and outcomes:

- No specific treatment exists for PML [12]

- Combination antiretroviral therapy (cART) improves survival, with median survival rates of 2 years and reports of >15-year survival [4, 10]

- Neurological improvement occurs in approximately 50% of patients with HIV-associated PML receiving cART [13]

Paradoxical effects:

- Initiation of cART can trigger immune reconstitution inflammatory syndrome (IRIS), worsening PML symptoms [14]

Our case report highlights the importance of considering PML in HIV patients presenting with progressive disturbances of consciousness and movement, particularly when fever and altered sensorium are prominent. Differential diagnoses, such as cerebral toxoplasmosis and tubercular meningitis, should be considered [9].

Key takeaways:

- PML remains a significant concern in HIV patients, despite widespread cART use [3]

- Prompt recognition and diagnosis are crucial for optimal management [3]

- Characteristic brain MRI features and JC virus DNA detection in CSF are essential diagnostic tools [5]

- cART remains the cornerstone of treatment, improving survival and neurological outcomes in select patients

CONCLUSION

This case report highlights the importance of prompt recognition and diagnosis of Progressive Multifocal Leukoencephalopathy (PML) in individuals living with HIV/AIDS (PLWHA). Despite severe immunocompromise, the patient's outcome demonstrates the potential for successful recovery with:
1. Timely initiation of combination antiretroviral therapy (cART).
2. Supportive care, including antipyretics, hydration, and nutritional support.
3. Close monitoring and optimization of cART regimen.

Key takeaways from this case include:
1. PML remains a significant concern in PLWHA, emphasizing the need for vigilant monitoring.
2. JC virus DNA detection in CSF via PCR is crucial for diagnosis.
3. MRI findings of multifocal white matter lesions are characteristic.
4. cART regimen optimization and adherence are critical for viral suppression.
5. Regular follow-up and outpatient care ensure sustained recovery.

The patient's recovery underscores the importance of:
1. Early diagnosis and intervention.
2. Multidisciplinary care involving neurology, infectious diseases, and rehabilitation experts.
3. Patient education and adherence to cART regimen.

Limitations of this case report include:
1. Single-case observation.
2. Lack of control group for comparison.

Future directions for PML management include:
1. Investigating novel therapeutic strategies.
2. Developing biomarkers for early diagnosis.
3. Improving JC virus-specific immune responses.

In conclusion, this case report demonstrates the potential for successful recovery from PML in PLWHA through prompt diagnosis, optimal cART regimen, and supportive care. Healthcare providers should remain vigilant in monitoring PLWHA for PML symptoms, ensuring timely intervention and improved patient outcomes.

RECOMMENDATIONS

1. Regularly monitor PLWHA for PML symptoms.
2. Perform JC virus DNA detection in CSF via PCR for suspected PML cases.
3. Optimize cART regimen and ensure adherence.
4. Provide supportive care, including antipyretics, hydration, and nutritional support.
5. Conduct regular follow-up and outpatient care.

By implementing these recommendations, healthcare providers can improve outcomes for PLWHA diagnosed with PML.

DECLARATIONS

- Informed Consent: Written informed consent was obtained from the patient.

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