Silent Devastation: Acute Marchiafava-Bignami Disease Unmasked by Chronic Alcoholism in a 24-Year-Old Male: A Case Report

Dr. M. Isabella Rita [1*], Dr. P. Anandan [2], Dr. Saketh Ramineni [3]

[1]*Junior Resident, Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India.*
Email: drisabelrita@gmail.com, ORCID ID: 00004438450X
[2]*Associate Professor, General Medicine, Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India,*
Email: anandanpdr.s@gmail.com, ORCID ID: 0000-0002-1830-1288
[3]*Senior Resident, General Medicine, Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India,*
Email: rsaketh1992@gmail.com, ORCID ID: 0000-0002-0872-5191
**Corresponding Author: Dr. Isabella Rita M*

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ABSTRACT
Marchiafava-Bignami disease (MBD) is an uncommon condition that is mainly linked to prolonged alcoholism and nutritional deficits. It is characterised by necrosis and demyelination of the corpus callosum. Due to its rarity and vague clinical signs, this disorder can frequently be misdiagnosed. It manifests as a range of neurological symptoms, from altered awareness to motor impairments. We present a 24-year-old man in this case report who has a history of intravenous drug use, chronic alcohol intake, and recent binge drinking.He presented with a 10-day history of constipation, vomiting, and a high-grade continuous fever. Over two days, the patient's condition deteriorated into a drowsy state with abdominal pain.
On examination, the patient was drowsy but arousable, with stable vital signs except for hypertension. Neurological findings indicated reduced deep tendon reflexes, hypotonia, and neck stiffness. A systemic workup revealed normal brain CT findings, however, diffusion limitation was seen in the corpus callosum's splenium on MRI, along with mild oedema and T2/FLAIR hyperintensity. The lumbar puncture showed lymphocytic predominance, low CSF glucose, and elevated protein levels suggestive of a possible CNS infection. The differential diagnosis included Marchiafava-Bignami disease (MBD) and cytotoxic lesions of the corpus callosum (CLOCCs).
The patient was managed with intravenous steroids, empirical antitubercular therapy (ATT), broad-spectrum antibiotics, and supportive care, including airway protection via intubation. Despite the late diagnosis, the clinical history of chronic alcoholism, recent binge, and imaging findings confirmed MBD. Early recognition and treatment of this disorder can improve neurological outcomes. The present study emphasises how crucial it is to take MBD into account when making a differential diagnosis for alcohol-related encephalopathies, especially in individuals who have neurological decline and prolonged alcohol consumption.

1. Introduction

Chronic alcoholism is the main cause of Marchiafava-Bignami disease (MBD), a rare and dangerous neurological condition. Demyelination and necrosis of the corpus callosum are hallmarks of the condition, which was initially identified by Italian pathologists Marchiafava and Bignami in 1903 and causes severe neurological disability. The exact pathophysiology of MBD is unknown, but it is believed to be linked to malnutrition, particularly thiamine deficiency, and chronic alcohol toxicity, which together result in damage to the central nervous system.

MBD can present in both acute and chronic forms, with symptoms ranging from altered mental status, motor weakness, seizures, and coma. The clinical manifestations of MBD are often nonspecific, making early diagnosis challenging. Imaging, particularly magnetic resonance imaging (MRI), plays significant role in diagnosing this condition. MRI findings typically show lesions in the corpus callosum, particularly in the splenium, with associated edema and hyperintensity on T2/FLAIR sequences.

Given the rarity of MBD, it is often misdiagnosed or underdiagnosed, especially in patients who present with symptoms that overlap with other alcohol-related encephalopathies such as Wernicke's encephalopathy or hepatic encephalopathy. The purpose of this case study is to emphasise the diagnostic approach, clinical presentation, and management of MBD in a young male with chronic alcohol abuse, and to emphasize the importance of considering this diagnosis in similar clinical scenarios.

2. Case Discussion

A drowsy 24-year-old man was taken by his attendants to the casualty department. According to the history provided, the patient had been vomiting intermittently for the past 10 days, with two episodes containing food particles. He also complained of constipation, which persisted for the same duration. Four days prior to admission, he developed a high-grade continuous fever and, over the past two days, his condition deteriorated, with increased drowsiness and abdominal pain.

A recent binge event occurred four days before the patient's presentation, and they had a history of chronic daily alcohol usage for the previous five years. In addition, he had a history of intravenous drug usage and smoking.

Upon evaluation, the patient's Glasgow Coma Scale (GCS) score was 12/15, indicating that they were arousable yet sleepy. Vital signs showed a temperature of 98.5°F, a pulse rate of 91 beats per minute, a blood pressure of 160/100 mmHg, and an oxygen saturation of 99% on room air. Neurological examination showed reduced deep tendon reflexes, hypotonia in all four limbs, and neck stiffness, raising concerns for a central nervous system (CNS) pathology. The results of the abdominal, respiratory and cardiovascular investigations were generally unremarkable, except for abdominal distension and sluggish bowel sounds.

Serum electrolytes, liver and renal function tests, and total blood counts were all within normal ranges according to the results of the initial laboratory testing (Fig. 1). An abdominal CT scan revealed the suggestive findings of pyelonephritis, prostatomegaly, and fecal distension in the ascending colon. However, the brain CT scan was unremarkable. Given the neurological symptoms, an MRI of the brain was performed, which revealed an area of diffusion restriction in the splenium of the corpus callosum, extending into the region of the body, with subtle T2/FLAIR hyperintensity and edema. These findings were suggestive of Marchiafava-Bignami disease (MBD) (Fig.2, 3).

Hb	14.0	
PLT	2.42	
TC	8200	
Na	124	133
K	**3.0**	4.4
Cl	100	93.6
UREA	19.6	
CREATININE	0.9	
T.B	1.2	
SGOT/SGPT	80/28	
GGT	256	
ALBUMIN	3.7	
CRP	4.0	
AMYLASE	136	
LIPASE	76	
Sr.AMMONIA	**239.1**	
INR	**1.28**	
Sr LACTATE	**1.16**	

Fig.1: Laboratory Investigations

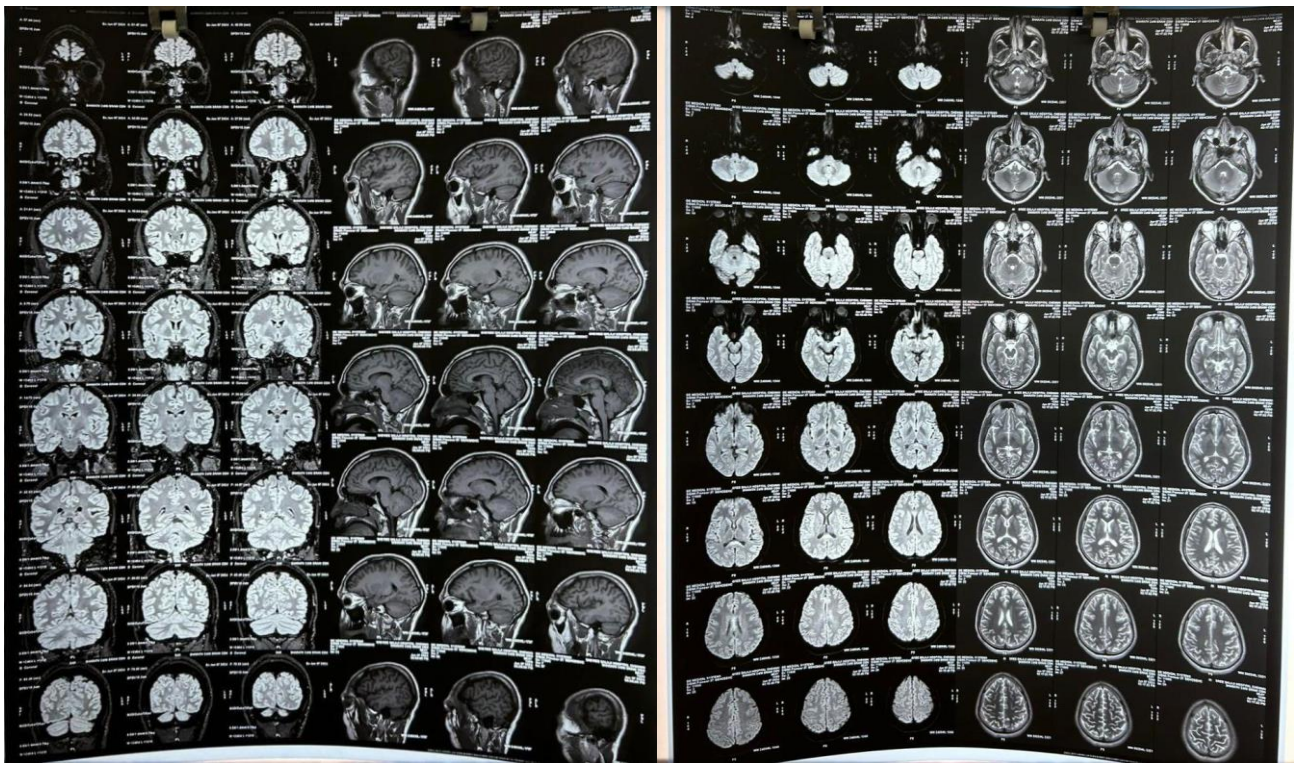

Fig. 2 and Fig. 3: MRI Brain showing an area of diffusion restriction in the corpus callosum's splenium, extending into the region of the body, with subtle T2/FLAIR hyperintensity and edema.

A lumbar puncture was performed to rule out infectious causes, revealing lymphocytic predominance, low CSF glucose, and elevated protein levels, suggestive of a CNS infection. Empirical treatment with intravenous steroids (Methylprednisolone) and antitubercular therapy (ATT) was initiated.

Despite these interventions, the patient's health kept becoming worse, and he developed bradycardia. Due to his worsening GCS, the decision was made to intubate him for airway protection. A follow-up neurological review supported the diagnosis of MBD, and the patient was started on intravenous thiamine, levetiracetam, and benzodiazepines.

3. Discussion

Marchiafava-Bignami disease (MBD) is a rare but severe condition primarily associated with chronic alcohol use, characterized by demyelination and necrosis of the corpus callosum. Although initially identified in chronic alcoholics, it has also been observed in non-alcoholic individuals with nutritional deficiencies, particularly those related to thiamine deficiency. The exact pathophysiology of MBD remains unclear, but alcohol-induced neurotoxicity, combined with poor nutritional status, particularly of B vitamins, plays a critical role in the development of this condition.

Chronic alcohol consumption is known to impair the absorption of thiamine (vitamin B1), an essential cofactor for glucose metabolism in neurons. Thiamine deficiency leads to impaired energy production, particularly in regions of the brain with high metabolic demands, such as the corpus callosum. The corpus callosum connects the two cerebral hemispheres, facilitating interhemispheric communication, and is primarily composed of white matter tracts. In MBD, these tracts undergo progressive demyelination and necrosis, starting in the splenium of the corpus callosum and extending into other regions. This leads to disruptions in the integration of motor, sensory, and cognitive functions between the two hemispheres, which manifests as neurological and psychiatric symptoms.

MRI findings are key in diagnosing MBD. In most cases, MRI displays symmetrical lesions in the corpus callosum, particularly in the splenium, with increased signal intensity on T2-weighted and FLAIR sequences, similar to what was noted in this patient. Diffusion-weighted imaging (DWI) may show restricted diffusion, indicative of cytotoxic edema. These imaging features help distinguish MBD from other alcohol-related brain disorders, such as Wernicke’s encephalopathy, which predominantly affects the mammillary bodies, thalamus,

and periaqueductal gray matter.

The clinical presentation of MBD is highly variable, ranging from mild confusion and disorientation to severe neurological deficits, including seizures, stupor, and coma. In its acute form, as seen in this patient, the disease progresses rapidly with altered mental status, motor impairment, and cognitive dysfunction. Chronic forms of MBD can present with progressive dementia, gait disturbances, and psychiatric symptoms, often mimicking other neurodegenerative disorders.

The patient in this case presented with a 10-day history of gastrointestinal symptoms, including vomiting and constipation, which may have contributed to his dehydration and worsening metabolic state. This was followed by the onset of high-grade fever and abdominal pain, raising concerns for intra-abdominal sepsis, which was ruled out based on imaging and the eventual diagnosis of functional constipation with adynamic ileus. However, the key feature that guided further neurological investigations was the gradual deterioration in his mental status, progressing to drowsiness and bradycardia, necessitating intubation for airway protection.

Given the patient's history of chronic alcohol use and recent binge drinking, combined with the MRI findings of diffusion restriction in the splenium of the corpus callosum, a diagnosis of acute MBD was considered. The presence of subtle T2/FLAIR hyperintensity and edema further supported this diagnosis. Incorporating MBD into the differential diagnosis is essential, when managing patients with alcohol-related encephalopathies, especially when corpus callosum involvement is detected on imaging.

MBD can be difficult to distinguish from other alcohol-related neurological disorders, such as alcoholic cerebellar degeneration, hepatic encephalopathy and wernicke's encephalopathy. Wernicke's encephalopathy, also linked to thiamine deficiency, is characterized by the classic triad of ophthalmoplegia, confusion and ataxia, and primarily affects the thalamus and periventricular regions. Hepatic encephalopathy presents with altered mental status due to the accumulation of ammonia and other toxins in patients with liver dysfunction. In this case, the absence of classic signs of Wernicke's encephalopathy and the characteristic MRI findings involving the corpus callosum pointed more towards MBD.

Other differential diagnoses to consider include cytotoxic lesions of the corpus callosum (CLOCCs), which can occur due to a variety of causes, such as infections, metabolic disturbances, and drug intoxication. CLOCCs typically present with similar imaging findings but are usually reversible with appropriate treatment of the underlying cause. In this case, the possibility of an infectious etiology was considered given the lumbar puncture findings of lymphocytic pleocytosis, low cerebrospinal fluid (CSF) glucose, and elevated protein levels. However, the patient's clinical presentation and imaging were more consistent with MBD, and empirical antitubercular therapy (ATT) was started as a precautionary measure due to the suspicion of a central nervous system infection.The management of MBD focuses on correcting the underlying nutritional deficiencies, particularly with intravenous thiamine supplementation, and addressing any metabolic or infectious complications. In this case, the patient was promptly started on intravenous thiamine, along with corticosteroids (Solu-Medrol) to manage potential inflammation associated with the demyelination process. Additionally, empirical antibiotics and antitubercular therapy were initiated due to the concern for a CNS infection, although no direct evidence of infection was found.

Despite early intervention, the prognosis of MBD remains guarded, particularly in the acute form, where mortality rates can be high. Individuals who make it through the acute period might have severe neurological impairmentsincluding cognitive impairment, motor dysfunction, and psychiatric symptoms. Long-term outcomes depend on the extent of the corpus callosum damage, the timeliness of diagnosis, and the effectiveness of nutritional rehabilitation.

In this case, the patient's Glasgow Coma Scale (GCS) score deteriorated, and he developed bradycardia, necessitating mechanical ventilation. Although the patient was stabilized with supportive care and nutritional therapy, the long-term neurological prognosis remains uncertain, highlighting the need for early recognition and aggressive management in MBD.

4. Conclusion

Marchiafava-Bignami disease (MBD) is a rare but potentially life-threatening condition primarily affecting chronic alcoholics, characterized by necrosis and demyelinationof the corpus callosum. This case emphasizes the need for high clinical suspicion of MBD, especially in patients with a history of chronic alcohol use, malnutrition, and recent binge drinking, presenting with neurological symptoms. The diagnosis of MBD is often

supported by MRI findings, particularly lesions in the corpus callosum, as seen in this patient.

In this case, despite initial diagnostic uncertainty, the patient's clinical history, neurological deterioration, and characteristic MRI findings led to the diagnosis of MBD. Early recognition and prompt treatment, including intravenous thiamine, steroids, and supportive care, are crucial to improving neurological outcomes in affected patients. This case also highlights the importance of addressing chronic alcohol abuse and nutritional deficiencies to prevent such complications. While the prognosis of MBD varies, early intervention may reduce morbidity and mortality.

Further studies and case reports are needed to better understand the pathophysiology and optimal management of this rare condition. It is imperative that clinicians include MBD in the differential diagnosis when managing patients with alcohol-related encephalopathies to ensure timely diagnosis and treatment.

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