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CASE REPORT

Decompressive Craniectomy for Intracerebral Hemorrhage Complicating Herpetic Meningoencephalitis: A Case Report

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ABSTRACT

Herpetic encephalitis is the most common viral encephalitis in adults and is the most severe form of herpes simplex virus infection. The diagnosis is based on polymerase chain reaction in cerebrospinal fluid, as well as brain magnetic resonance imaging. Although intra cerebral petechial hemorrhage has been described during herpetic encephalitis, intraparenchymal cerebral hematoma is an extremely rare form.

The absence of response to treatment or the worsening of clinical symptoms should suspect the diagnosis. The medical treatment is based on acyclovir which should be initiated as soon as the diagnosis is suspected. Surgical treatment is based on decompressive craniotomy. Herein, we report the case of a 62-year-old man in whom the diagnosis of herpetic encephalitis was confirmed, and the patient was put on acyclovir-based medical treatment. The follow-up was marked by the appearance of an intra-parenchymal hematoma for which the patient had a decompressive craniotomy. The evolution was marked by neurological worsening leading to the death of the patient.

Keywords: Herpetic meningoencephalitis, Intracerebral hemorrhage, Craniectomy, Intensive care.

Introduction

Herpetic encephalitis is one of the most severe manifestations of herpes simplex infection. Its pathophysiology is still poorly understood.[1] It is commonly caused by type 1 herpes simplex virus (HSV1) in 90% of cases. Its incidence is around one to three documented cases per million inhabitants per year.[2] We report a case of herpetic meningoencephalitis complicated by intracranial bleeding which was managed by decompressive craniotomy.

Case report

A 62-year-old man, with a medical history of type 2 diabetes poorly controlled by oral antidiabetic drugs, chronic smoking, and previous vaccination against COVID-19; was admitted to the medical intensive care unit for a febrile impaired consciousness dating back to three days prior to admission.

Upon admission, the patient was intubated, ventilated, and sedated. He was hemodynamically stable with a mean arterial pressure of 100 mmhg, and heart rate of 84 bpm. The patient was ventilated under volume control mode with a FIO2 of 50%. The patient was febrile at 39.5°C. The rest of the somatic examination was without particularities.

A cerebral computed tomography (CT) scan was performed and showed lepto-meningeal contrast enhancement, suggesting meningitis. Lumbar puncture was therefore performed and showed a protein count of 0.42 g/L, glycorrhachia of 2.62 g/L, with a normal glycorrhachia/blood sugar ratio of 0.7 as well as a normal cell count of <3 elements/mm3.

The cell blood count revealed a hyperleukocytosis of 15,800/mm3 with a predominance of neutrophils at 13,400/mm3, platelets were at 220,000/mm3, with a hemoglobin of 13.6 g/dl. The C-reactive protein (CRP) was at 84 mg/L. Immediate intravenous treatment was started on the first day of admission, combining acyclovir 10 mg/kg/8h and ceftriaxone 100 mg/kg/day.

A cerebral magnetic resonance imaging (MRI) was performed, showing a meningoencephalitis aspect with herpetic patterns. On the same day, a second lumbar puncture was performed showing hyperproteinorachia at 1.70 g/L, glycorrhachia at 0.53 g/L, with a glycorrhachia/blood glucose ratio of 0.5. Cell elements accounted for 110 elements/mm3, of which 90% were lymphocytes. The multiplex Polymerase Chain Reaction (PCR) was positive for HSV1. Other PCR tests were negative (tuberculosis, Listeria monocytogenes, cytomegalovirus, HSV2, varicella-zoster virus, Epstein-Barr virus, enterovirus). Serologies were also performed and came back negative (syphilis, Human immunodeficiency virus), so were the blood cultures.

The diagnosis of herpetic meningoencephalitis was therefore confirmed. Ceftriaxone was discontinued and intravenous acyclovir was carried on.

The follow-up was marked by neurological worsening with a Glasgow coma scale of 6/15 once the sedation was discontinued. A second cerebral CT scan was performed and showed a left fronto-insulo-temporal intra-parenchymal hematoma measuring approximately 80 x 50 x 45mm.

The patient was therefore urgently taken to the operating theatre where a decompressive craniotomy was performed and the intraparenchymal hematoma partially drained. The evolution was then marked by neurological worsening leading to the death of the patient.

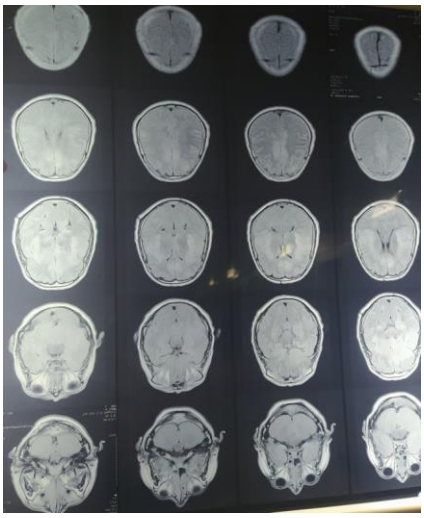

Figure 1: Brain MRI displaying features of herpetic meningoencephalitis.

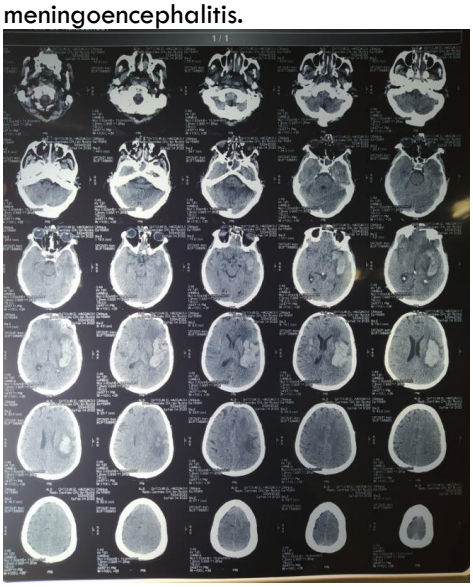

Figure 2: Brain CT scan revealing left fronto-insular-temporal intraparenchymal hematoma measuring 80x50x40 mm.

Discussion

Herpetic encephalitis usually presents with fever, confusion, temporo-spatial disorientation, headache, aphasia, and seizures.[3,4]

Brain MRI is the neuroimaging modality of choice and is more sensitive than brain CT scan. It typically finds bilateral and asymmetric necrotic lesions, predominantly in the inner part of the temporal and frontal lobes.[5]

The diagnosis of herpetic meningoencephalitis is based on the identification of HSV1 deoxyribonucleic acid (DNA) in the cerebrospinal fluid (CSF) using polymerase chain reaction (PCR).[6]

A normal CSF, including PCR test, in the early stages of the disease does not rule out the diagnosis of herpetic meningoencephalitis. In this case, a second CSF-PCR examination should be performed at least four days after the onset of neurological symptoms while maintaining treatment with acyclovir. In our case, the first lumbar puncture was normal and after four days, the CSF came back disturbed with a positive HSV1-PCR.

The treatment of choice for HSV1 or HSV2 meningoencephalitis is intravenous acyclovir at a dose of 10 to 15 mg/kg every 8 h, infused over two to three hours, over 14 to 21 days. Treatment should be initiated as soon as the diagnosis is suspected as delay in initiation is associated with poor outcomes.[7] Although intracerebral petechial hemorrhage has been described during herpetic encephalitis, individualized cerebral hematoma is an extremely rare form, especially in cases receiving surgical decompression.

The underlying mechanism of hemorrhage is not well-understood. However, some hypotheses have been postulated such as vascular rupture secondary to necrotizing vasculitis and transient rise of intracranial pressure during herpes encephalitis.[8]

The pathogenic mechanisms involved in the development of cerebral hemorrhage probably include a destructive process of cerebral blood vessels secondary to the inflammatory response generated in the subarachnoid space. This process may eventually lead to the development of an aneurysm with a potential subsequent fatal rupture resulting in cerebral hematoma and/or subarachnoid hemorrhage.[9]

Other pathophysiological abnormalities which may lead to the development of hemorrhage include focal hyperperfusion secondary to loss of cerebral autoregulation due to cerebral ischemia, localized extracellular space acidosis, or release of vasodilatory mediators during the inflammatory process. In addition, coagulation disorders triggered by the septic process may also contribute to bleeding.[10,11] Antivirals may also have a role to play since there are cases of thrombocytopenia induced by acyclovir.[12,13]

Pathological examination in herpetic encephalitis often shows cytotoxicity, vasogenic oedema, as well as necrosis with petechial hemorrhages. Therefore, limited hemorrhage is an integral part of the disease process, but in a subset of patients, a well-defined intraparenchymal hematoma develops. This complication is likely to result from the weakening of the neurovascular unit caused by the necrotic process as well as increased permeability due to the release of cytokines, chemokines, and proteases.[14,15]

During our literature search, we found a greater number of ischemic strokes than intraparenchymal hemorrhage. A study using administrative data found diagnoses of ischemic stroke in 5.6% and hemorrhagic stroke in 2.7% among 4871 cases of HSV encephalitis, between 2002 and 2014 in the United States.[16]

Cerebral hematoma should be suspected in case of non-improvement or worsening of brain imaging.[17] Its time of onset is variable and may occur during or after the end of treatment.[8] Antiviral treatment does not prevent this life-threatening complication.[8,17]

Medical treatment to control intracranial hypertension due to cerebral oedema or intraparenchymal hematoma includes hyperventilation, corticosteroids, and osmotherapy. The use of corticosteroid therapy in herpetic encephalitis is controversial because of its potential to fuel viral replication.[18]

Surgical treatment should be considered if intracranial hypertension is refractory to medical treatment or if imaging findings suggest brainstem compression due to temporal lobe mass effect. However, some reviews have not demonstrated significant differences in long-term outcomes between medical and surgical treatments in patients with intraparenchymal hemorrhage.[19,20]

The spontaneous course of the disease is disastrous, with high morbidity and mortality. Time to initiation of acyclovir therapy is a significant prognosis factor and should be less than 48 hours. Mortality of herpetic meningoencephalitis is very high with 28% of deaths at 18 months. it rises with the delay in initiation of acyclovir therapy.[8] Furthermore, the most frequent neurological sequelae after HSV1 meningoencephalitis are aphasia, memory disorders, cognitive disorders, temporospatial disorientation, focal neurological signs, and a dysexecutive syndrome.[3]

Conclusion

Herpetic meningoencephalitis is a serious condition that should be diagnosed as early as possible.

Looking for HSV by PCR in the CSF is the technique of choice to confirm the diagnosis, but the negativity of this test at the onset of clinical symptoms does not rule out the diagnosis, hence the interest of a second PCR while maintaining treatment with acyclovir.

The absence of clinical improvement or worsening of neurological symptoms should indicate an urgent brain imaging to detect a potential complication. Intra-parenchymal hemorrhage is a rare but plausible complication of herpes simplex encephalitis which should be looked for in patients with no clinical improvement or worsening of neurological symptoms within weeks of treatment onset.

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