Magnesium sulphate as a treatment of acute attack of multiple sclerosis

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Abstract
The blood-brain barrier (BBB) is a complex organization of cerebral endothelial cells. Deregulation of the BBB is among the earliest cerebrovascular abnormalities seen in multiple sclerosis (MS). Magnesium sulfate has been shown to have a protective effect on BBB integrity in multiple experimental models. Magnesium sulphate attenuates BBB permeability. Also, results of light microscopy and electron microscopy verified that magnesium sulfate can attenuate BBB injury. I suggest using of MgSO4 which attenuates BBB permeability during acute relapses of MS. The hypothesis should be assessed in several experimental and clinical trials. If my hypothesis can be verified experimentally and clinically, then using Mg sulphate to treat MS disease could be achieved.

Keywords
Multiple sclerosis, Blood-brain barrier, Magnesium sulphate

Introduction

Multiple sclerosis and blood brain barrier

The blood-brain barrier (BBB) is a complex organization of cerebral endothelial cells (CEC), pericytes and their basal lamina, which are surrounded and supported by astrocytes and perivascular macrophages. Collectively these cells separate and form the compartments of the cerebral vascular space and the cerebral interstitium under normal conditions. Without the BBB, the ‘interior milieu’ of the central nervous system (CNS) would be flooded by humoral neurotransmitters and formed blood elements that upset normal CNS functions and lead to vascular/neural injury (1).

Dysfunction of the BBB (blood-brain barrier) is a major hallmark of MS (multiple sclerosis) (2, 3, 4). Studies have shown that increased BBB permeability is associated with decreased expression of TJ (tight junction) proteins in brain capillary endothelial cells (1). Results have revealed that TJ abnormalities were most common in active lesions, but were also present in inactive lesions and in MS normal-appearing white matter (2).

Immunology researchers at the Kimmel Cancer Center studied various strains of mice; each lacking some genes associated with inflammation and immunity, and looked at what happened to the blood-brain barrier. They discovered that the amount of blood-brain barrier damage and subse-
quent permeability increase correlated to the severity of disease, and surprisingly, in nearly every case, the mouse's genetic make-up didn't matter. The mice developed EAE even without supposedly crucial factors in inflammation and autoimmunity and disease (5).

Magnesium sulphate and BBB

Magnesium sulphate is used to treat eclampsia. Eclampsia is associated with increased blood-brain barrier (BBB) permeability and formation of cerebral edema. Magnesium sulphate attenuates BBB permeability during acute hypertension (6). Also, results of light microscopy and electron microscopy confirmed that magnesium sulfate can attenuate traumatic brain injury and relieve BBB injury. Treatment with MgSO4 in the early stage can attenuate traumatic brain edema and prevent BBB injury (7).

The hypothesis

As dysfunction of the BBB (blood-brain barrier) is a major hallmark of MS (multiple sclerosis) (2, 3, 4). I suggest using of MgSO4 which attenuates BBB permeability during acute relapses of MS.

Evaluation of the hypothesis

My hypothesis could be assessed, by investigating the effect of magnesium sulfate on experimental autoimmune encephalomyelitis (a mouse model for human multiple sclerosis (MS)). Then therapeutic trials could be done to assess its effect compared to steroid pulse in acute relapse.

Conclusion

The aetiology of MS has been debated several times since the disease was first described. Dysfunction of the BBB (blood-brain barrier) is a major hallmark of MS (multiple sclerosis). Magnesium sulphate attenuates BBB permeability. I suggest using of MgSO4 which attenuates BBB permeability during acute relapses of MS. The hypothesis should be assessed in experimental and clinical trials. If my hypothesis can be verified, then using Mg sulphate to treat MS disease could be achieved.

Overview Box

First Question: What do we already know about the subject?
Answer: Dysfunction of the BBB (blood-brain barrier) is a major hallmark of MS (multiple sclerosis). Studies have shown that increased BBB permeability is associated with decreased expression of TJ (tight junction) proteins in brain capillary endothelial cells. Results have revealed that TJ abnormalities were most common in active lesions. Magnesium sulfate has been shown to have a protective effect on BBB integrity in multiple experimental models. Moreover, treatment with MgSO4 in certain disorders as eclampsia and brain trauma can attenuate brain edema and prevent BBB injury.

Second Question: What does your proposed theory add to the current knowledge available, and what benefits does it have?
Answer: As there are limited drugs available for management of multiple sclerosis. I suggest that using of MgSO4 which attenuates BBB permeability could be of value during acute relapses of MS.

Third question: Among numerous available studies, what special further study is proposed for testing the idea?
Answer: My proposal could be evaluated by exploring the effect of magnesium sulfate on experimental autoimmune encephalomyelitis (a mouse model for human multiple sclerosis (MS)). Subsequently, therapeutic trials could be done to assess its result compared to steroid pulse in acute relapse.

References


