

## **Acute cervical hyperextension-hyperflexion injury may precipitate and/or exacerbate symptomatic multiple sclerosis**

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FROM ABSTRACT

We report here 39 cases in which definite multiple sclerosis (MS) was precipitated or exacerbated by specific hyperextension-hyperflexion cervical cord trauma.

The worsening or onset of the symptomatic disease bore a striking temporal relationship to the focal injury.

Our data suggests that central nervous system (CNS)-specific acute physical trauma such as cervical cord hyperextension-hyperflexion injury may aggravate latent clinical symptoms in MS.

The deterioration of MS bore no direct relationship with the severity of neck injury.

Possible pathogenic mechanisms of focal CNS-specific trauma aggravating the course of asymptomatic or benign MS are discussed.

This may have implications in improving our understanding of the factors that may modify the clinical course of MS.

THESE AUTHORS ALSO NOTE:

The cause of multiple sclerosis (MS) is unknown.

Axonal pathology from focal trauma with an increase in nitric oxide in the brain, leads to demyelinating injury.

Certain factors modify the clinical course for MS by precipitating or aggravating the clinical symptoms, including:

- (1) infections
- (2) pregnancy
- (3) electrical injuries
- (4) penetrating and surgical wounds of the brain
- (5) acute emotional psychological stress
- (6) certain vaccinations

"Breakdown in the blood-brain barrier (BBB) is an early and obligatory event in the development of acute MS lesions."

Focal hyperextension-hyperflexion injuries to the cervical spinal cord have been shown to cause a severe disruption of the BBB both locally and generally.

These authors have documented 39 patients who developed symptomatic MS or in whom a stable disease with minimal disability was converted to a rapidly progressive form within some days to weeks after an acute hyperextension-hyperflexion injury to the cervical spinal cord.

All patients presented within 3 months from the date of their acute cervical cord injury from automobile, industrial or environmental accidents.

Of the 39 cases, 24 were of new onset. These cases had no previous history of neurological symptoms and were previously in excellent health. The onset of symptoms occurred within 12 hours to 12 weeks post-trauma with a peak between 2 and 3 weeks.

In another 15 cases with pre-injury mild MS, their condition rapidly accelerated to a progressive form following their injury. The worsening of their MS occurred between 1 and 12 weeks post-trauma with a peak at 1-2 weeks.

In both groups, there was no correlation between the severity of injury and the subsequent deterioration of MS symptoms. There were no cervical vertebral fractures, dislocations or spinal cord compressions.

## DISCUSSION

"The role of physical trauma on MS has been debated for a number of years."

"In this case series, all the patients had developed new symptoms of MS within 3 months following the cervical spine hyperextension-hyperflexion injury."

"The 24 patients with the new onset of MS had been in perfect physical health with no evidence of any disturbances within the CNS."

"Fifteen cases were considered to have previous MS symptoms but few had any major disability prior to their acute cervical cord trauma."

"It is important to stress that the trauma was of a uniform type in all cases, i.e. an acute hyperextension-hyperflexion focal injury to the cervical spinal cord."

The majority of cases occurred in motor car accidents.

"The severity of the soft tissue injury was mild to moderate in the vast majority of the cases."

The authors cite 9 studies (1946, 1950, 1957, 1964, 1966, 1975, 1975, 1988, 1991, 1992) that support that specific CNS trauma may precipitate or aggravate MS. The proposed mechanism in these studies includes:

- (1) specific focal trauma
- (2) co-existence of cervical spondylitic myelopathy
- (3) mechanical stresses communicated to the cord via the denticulate ligaments during flexion of the spine
- (4) repetitive stresses that cause breakdown of the BBB
- (5) electrical injuries that cause breakdown of the BBB

The critical role of changes in the BBB influencing the clinical course of MS has been evident since 1950.

"Research has clearly established that an abnormal BBB plays a critical role in the initiation and progression of demyelination."

"Our hypothesis is that acute hyperextension-hyperflexion injuries of the neck will at the very least produce a local breakdown of the BBB."

Massive breakdown of the BBB of the cord and of the brain follows experimental induction of whiplash injuries in monkeys.

There are many studies showing pathologically verified new MS plaques surrounding the specific areas where the BBB had broken down.

Therefore, any external factor that can influence the integrity of the BBB of an individual will increase chances to develop MS and have the potential to trigger the disease symptoms.

"The cervical region is the commonest site of spinal cord involvement in MS and spinal cord atrophy provides the best correlate of the degree of disability. Thus, it would only seem logical that rapid progression of disability was a direct consequence of the cervical cord disease in our cases."

## CONCLUSIONS

CNS-specific focal trauma has a role in "precipitating the symptoms of undeclared MS and adversely affecting the course of benign MS."

Cervical cord hyperextension-hyperflexion injury is likely to unmask or worsen the natural course of MS in a subgroup of affected patients.

"This may be important because the prevalence of asymptomatic ('silent') MS has been estimated to be about 25% of that diagnosed *in vivo*." **[WOW!]**

"Physiologically, CNS-specific trauma produces focal breaches in the BBB and induces metabolic changes by activating the stress response."

Focal trauma enhances the expression of nitric oxide synthase in the CNS microvasculature.

"In susceptible individuals, these effects might unleash critical changes in the levels of pro-inflammatory cytokines and nitric oxide, thus triggering MS symptoms *ab initio* or aggravating symptoms of pre-existing latent disease."

Possible mechanisms as to how specific focal trauma can aggravate multiple sclerosis:

- (1) Increased permeability of BBB
- (2) Increased production of pro-inflammatory cytokines
- (3) Increased production of nitric oxide synthetase
- (4) Synergistic effect of psychological stress
- (5) Direct axonal injury

#### KEY POINTS FROM DAN MURPHY

- (1) Whiplash and other spinal trauma can initiate MS signs and symptoms in asymptomatic, perfectly healthy individuals.
- (2) Of those with MS, 25% have asymptomatic "silent" MS.
- (3) Whiplash and other trauma can adversely affect the course of benign MS.
- (4) The initiation of MS symptoms following trauma may manifest with hours, peaks within days to weeks, and is rare after 3 months.
- (5) Breakdown in the blood-brain barrier (BBB) is an essential event in the development of MS.
- (6) Breaching of the BBB results in a pro-inflammatory cytokines immune system response. Consequently, I suggest that a logical aspect of management is chiropractic nerve function improvement (segmental, systemic, and postural chiropractic subluxation management), and the anti-inflammatory diet (more omega-3s with antioxidants and fewer excitotoxins, trans fatty acids, omega-6s, and saturated fats).
- (7) The whiplash trauma involved may be minor.