

Reduced reactivity and enhanced negative feedback sensitivity of the hypothalamus–pituitary–adrenal axis in chronic whiplash-associated disorder

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Jens Gaab, Susanne Baumann, Angela Budnoik, Hanspeter Gmünder, Nina Hottinger and Ulrike Ehlert

FROM ABSTRACT:

Dysregulations of the hypothalamus–pituitary–adrenal (HPA) axis have been discussed as a physiological substrate of chronic pain and fatigue.

The aim of the study was to investigate possible dysregulations of the HPA axis in chronic whiplash-associated disorder (WAD).

In 20 patients with chronic WAD and 20 healthy controls, awakening cortisol responses as well as a short circadian free cortisol profile were assessed.

In comparison to the controls, chronic WAD patients had attenuated and suppressed cortisol responses.

Dysregulations of the HPA axis in terms of reduced reactivity and enhanced negative feedback suppression exist in chronic WAD.

The observed endocrine abnormalities could serve as a systemic mechanism of symptoms experienced by chronic WAD patients.

THESE AUTHORS ALSO NOTE:

“Whiplash-associated disorders (WAD) are characterized by a constellation of somatic and psychological symptoms, including pain in the shoulders, arms or neck; headache; jaw ache; dizziness; tinnitus; and memory and concentration difficulties.”

Chronic, persistent whiplash symptoms “occur in a considerable proportion of patients” but has no established objective or specific biomedical cause.

Chronic whiplash symptoms may be the result of a “general [systemic] illness with widespread symptom presentation” caused by dysfunction of systems beyond the neck injury. **[Very important]**

The hormones of the hypothalamic–pituitary–adrenal (HPA) axis is of prime interest, as hormones of the HPA axis are related to chronic pain and fatigue.

The function of the hypothalamic–pituitary–adrenal (HPA) axis is altered by “traumatic stressors.” **[Important]**

Reduced activity of the HPA axis has been noted in chronic pain syndromes such as fibromyalgia and chronic fatigue syndrome, chronic pelvic pain, and low back pain.

The possibility of neuroendocrine alterations has not been addressed in chronic whiplash patients. [This Is Not True]

Testing for HPA axis dysregulations can be done by measuring salivary cortisol levels.

This study used 20 patients with chronic whiplash-associated disorder (WAD) and 20 healthy age and gender-matched control subjects. The patients had persisting neck pain and musculoskeletal signs (decreased range of motion and point tenderness) for more than 6 months (Quebec WAD Grade II).

Patients were excluded from participation if they had head-contact trauma, coma, traumatic amnesia, or preexisting pain in the head, neck or shoulders.

In this study, all patients reported an onset of their symptoms after a rear-end motor vehicle accident.

None of the patients were involved in litigation. **[Important]**

The mean duration of whiplash symptoms was 29.9 months, with a range from 6 to 104 months.

Control subjects had no head, neck or shoulder pain and no history of a whiplash injury or motor vehicle accident in the past.

Cortisol assessment in this study was performed by measuring salivary free cortisol levels. Salivary cortisol samples were obtained immediately after awakening and 15, 30, 45 and 60 minutes thereafter. Subjects were asked to remain lying in bed for the first 30 min and not to have breakfast or brush their teeth during the first hour after awakening in order to avoid false high cortisol values.

“WAD patients had significantly lower overall awakening salivary cortisol levels in comparison to controls.”

DISCUSSION

In this study, chronic whiplash patients had attenuated cortisol responses and persisting suppression of cortisol levels. **[Important]**

The results of this study show that in chronic WAD, the endocrine ability to secrete cortisol is suppressed.

“This is the first study to report dysregulations of the HPA axis in patients with chronic WAD.”

“The observed endocrine pattern in chronic WAD patients resembles that seen in other medically unexplained conditions such as chronic fatigue syndrome and

fibromyalgia, as well as psychiatric disorders with a predominance of somatic symptom presentation, such as atypical depression.”

“In conclusion, the results point towards the existence of dysregulations of the HPA axis in chronic WAD.”

KEY POINTS FROM DAN MURPHY

- 1) Dysregulations of the hypothalamus–pituitary–adrenal axis can cause chronic pain and fatigue.
- 2) This study shows that chronic whiplash patients have dysregulation of the hypothalamus–pituitary–adrenal axis resulting in reduction of the normal production of the anti-inflammatory hormone cortisol from the adrenal cortex.
- 3) These observed endocrine abnormalities could be the mechanism for the systemic symptoms and dysfunctions experienced by chronic whiplash patients.
- 4) Chronic, persistent whiplash symptoms “occur in a considerable proportion of patients.”
- 5) These authors note that the possibility of neuroendocrine alterations has not been addressed in chronic whiplash patients prior to this study.
[This is not true. Whiplash alteration of neuroendocrine function is the primary emphasis of the International Chiropractic Association’s Certified Chiropractic Spinal Trauma program, which has been an ongoing program for 20 years. The 2006 class starts January 21 & 22 at Life Chiropractic College West, (510) 780-4500. The program has graduated about 2000 chiropractors, including many of you who proudly display your CCST credentials.]
- 6) Rear-end collisions are statistically most likely to cause chronic whiplash symptoms.
- 7) One can have chronic whiplash symptoms, even though they are not involved in litigation. In this study, none of the chronic whiplash patients were involved in litigation.
- 8) “This is the first study to report dysregulations of the HPA axis in patients with chronic whiplash associated disorders.”

BACKGROUND INFORMATION

Cortisol is an anti-inflammatory steroid hormone produced by the adrenal cortex.

Cortisol is released from the adrenal cortex in response to adrenocorticotrophic hormone (ACTH) from the pituitary gland.

Cortisol levels are often measured to evaluate pituitary and adrenal function.

Cortisol levels are highest in the morning, about 6 to 8 a.m., and lowest at about midnight. In normal people, cortisol levels are very low at bedtime and at their highest just after waking.

Physical and emotional stress can increase serum cortisol, because a normal response to stress involves increased secretion of ACTH by the pituitary gland.

This study documents that in patients with chronic whiplash symptoms, there is a reduced production of cortisol.

Synthetic cortisol (hydrocortisone) is a drug used to fight allergies and inflammation because cortisol is anti-inflammatory.

Inflammation alters the threshold of the pain afferent system. Therefore inflamed people feel more pain. Individuals with reduced cortisol are more inflamed and experience more pain.

Chronic whiplash patients have more pain and a reduced ability to produce cortisol.

A MODEL FOR CHIROPRACTORS

Whiplash mechanism injures the disc and facet capsules.

The disc and facet capsules are innervated with mechanoreceptors.

Disc and facet mechanoreceptors mechanically build the synaptic array of the cerebellum.

Altered disc and facet mechanoreceptor firing (chiropractic subluxation) alter cerebellum neuroplasticity and function.

The cerebellum primarily fires to the contralateral thalamus.

The thalamus is the presynaptic integrated pool of neurons that fire to the cortical brain.

The cortical brain controls the hypothalamus.

[“The hypothalamus receives nerve fibers directly or indirectly from virtually all areas of the brain.” Endocrinology, Charles Brook & Nicholas Marshall, Blackwell Science, 2001, pp. 37-38.]

The hypothalamus controls the production of corticotropin releasing hormone (CRH). [“CRH secretion is determined by blood cortisol acting by negative feedback at the hypothalamic level and by neural inputs from other brain centers.” Endocrinology, Charles Brook & Nicholas Marshall, Blackwell Science, 2001, p. 47.]

Hypothalamic corticotropin releasing hormone (CRH) stimulate the anterior lobe of the pituitary gland to produce adrenocorticotrophic hormone (ACTH).

Adrenocorticotrophic hormone (ACTH) controls the adrenal cortex production of cortisol.

Through this model, post whiplash reduced mechanical afferentation (nerve interference) results in reduced production of cortisol, resulting in systemic inflammation, chronic pain, and other systemic health manifestations.

Chiropractic has proven to be most effective in treating chronic whiplash and other chronic pain patients, with proven improvements in systemic health. [see references]

Dan Murphy, DC

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