

Effect of whiplash injury on accommodation

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Shayne Brown

FROM ABSTRACT

Background: Accommodative disturbance has been cited as one of the causes of visual disturbance following whiplash injury but to date, with one exception, none of the studies have incorporated a group of control subjects; none of the results have been statistically analyzed.

The aim of the present study was to examine the amplitude of accommodation in a group of whiplash subjects, the majority of whom had specifically complained of visual/ocular symptoms.

Methods: The whiplash group consisted of 19 subjects and the control group consisted of 43 subjects.

The amplitude of accommodation of the right and left eyes of the whiplash and control group subjects was measured and the results of the two groups compared.

Results: There was reduced amplitude of accommodation of the right and left eyes in the whiplash group subjects compared to the control group subjects.

Conclusion: These results indicate that whiplash was associated with defective accommodation in the present select group of whiplash subjects.

THIS AUTHOR ALSO NOTES:

"Visual and ocular disturbances resulting specifically from a so-called whiplash injury have been widely reported in the English-speaking literature."

"The most commonly reported ocular signs and symptoms following whiplash injury are blurred vision, visual disturbances, and defective accommodation."

The anatomical relationship between the structures of the neck and the pathway of the sympathetic system supplying the eye is well documented.

"Because of this close anatomical relationship, damage to the cervical region has been postulated as the most likely cause of ocular signs and symptoms."

"The hypothesis proposed is that damage in the cervical region results in either an interruption to the sympathetic pathway, which may cause Horner's syndrome, or in stimulation of the sympathetic pathway, which may cause changes in accommodation and pupillary dysfunction."

Visual disturbance symptoms such as 'spots before the eyes', or 'vision coming and going', have been attributed to:

- 1) Vascular disturbances of the vertebral, basilar or internal carotid artery
- 2) Stimulation of the cervical sympathetic pathway
- 3) Impaction of the midbrain resulting in edema and hemorrhage in the area of the third cranial nerve nucleus.

"Because the parasympathetic system is acknowledged to be the primary innervational system of accommodation, possible damage to that system has been postulated as the cause of defective accommodation following whiplash."

If accommodative control is the result of a fine balance between the parasympathetic and sympathetic innervation, disturbance of either system would cause accommodative disturbances.

In this study, no subjects had pending litigation. **[IMPORTANT]**

No subjects had an associated head injury.

All subjects had sustained a whiplash injury as a result of motor vehicle accidents.

Subjects with both an acute and a chronic whiplash injury were included.

Seventeen of the 19 whiplash subjects complained of ocular or visual symptoms.

All the subjects complained of neck pain and 15 subjects complained of headaches.

Forty-three naive control subjects were recruited to participate as the control group. None of the subjects had a history of a neck or whiplash injury.

The ages of the whiplash group subjects ranged from 23 years to 55 years. The mean age was 38 years. There were 13 female and six male subjects. The age range of the control group subjects was from 19 years to 57 years of age. The mean age was 36 years.

The whiplash and control subjects were given a standard assessment of measurement of accommodation.

RESULTS

The results show that the decline in the amplitude of accommodation with age was evident in both the whiplash and control groups.

"The mean amplitude of accommodation of the whiplash subjects is less than that of the control subjects and is also at the lower end of the range in all decades."

DISCUSSION

"The results of the present study indicate that there was a significant reduction in the amplitude of accommodation compared with those of the control group subjects."

"These results are indicative of possible dysfunction of the ocular portion of the autonomic nervous system in these subjects."

"There was a higher incidence of female subjects who suffered a whiplash injury, which is consistent with other studies."

"As mentioned earlier, defective accommodation has been attributed to vascular disturbances of the vertebral, basilar or internal carotid artery; stimulation of the 'cervical sympathetic pathway'; or impaction of the midbrain resulting in oedema and haemorrhage in the area of the third nerve nucleus."

"Anatomically it is easier to accept that damage to the neck by an insult such as whiplash injury could result in damage to the ocular sympathetic pathway rather than to the parasympathetic pathway."

Recent studies conclude that the sympathetic system makes a small contribution to accommodation.

"While parasympathetic innervation predominates, there is evidence that some individuals utilize supplementary inhibitory sympathetic innervation."

"The functional significance of these findings is that the parasympathetic system is possibly responsible for rapid changes in focus (e.g. changing focus from a near to a distant object) and the sympathetic nervous system is responsible for sustained viewing (e.g. using a visual display unit (VDU) monitor)."

"Based on the findings of the present study, it has been shown that whiplash may effect accommodation."

"A possible explanation is that the whiplash may cause damage to the walls of the vessels carrying the sympathetic innervation to the eye."

"An interruption to the sympathetic innervation may disturb the fine balance between the parasympathetic and sympathetic control of accommodation."

CONCLUSIONS

"There was a reduction in the amplitude of accommodation in these subjects with visual/ocular symptoms who sustained a whiplash injury."

"It is postulated that in this group of whiplash subjects a whiplash injury may have caused interruption to the sympathetic innervation to the eye, thus upsetting the fine balance between the parasympathetic and sympathetic control of accommodation."

KEY POINTS FROM DAN MURPHY

- 1) Whiplash trauma can cause altered visual acuity from defective accommodation.
- 2) The most common ocular symptoms following whiplash injury are blurred vision, visual disturbances, and defective accommodation.
- 3) The sympathetic nervous system makes a small contribution to accommodation [by innervating the ciliary muscle].
- 4) The sympathetic innervation to the eye ascends in the walls of the blood vessels.
- 5) Cervical whiplash injury can injure the cervical sympathetic innervation to the pupillary accommodation and mechanism.
[There is evidence that the cervical sympathetic nerves innervate the ciliary muscle, helping to control accommodative balance].
- 6) Visual accommodative control is the result of a fine balance between the parasympathetic and sympathetic innervation.

COMMENT FROM DAN MURPHY

Visual disturbances following whiplash injury are common. One article documents its occurrence at 42% of those so injured (Lord S, Barnsley L, Wallis B, Bogduk N. Chronic Zygapophysial Joint Pain After Whiplash, A Placebo-Controlled Prevalence Study. *Spine*, August, 1996;21:1737-1744). This article suggests that the etiology for these visual disturbances is altered sympathetic nerve traffic to the ciliary muscle for accommodation. Consequently, improvement of these visual disturbances following chiropractic spinal adjustments would add to the evidence that spinal adjustments influence the sympathetic nervous system.

This article has 43 references.