Trigeminal sensory impairment after soft-tissue injury of the cervical spine. A quantitative evaluation of cutaneous thresholds for vibration and temperature

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FROM ABSTRACT:

The cutaneous sensibility for vibration and temperature in the trigeminal skin area was examined with quantitative methods in 30 patients with a previous soft-tissue injury of the cervical spine.

Sixteen patients with chronic and disabling symptoms had significantly increased thresholds for vibration over the ophthalmic and mandibular divisions of the trigeminal nerve compared with 14 without symptoms.

Temperature thresholds were measured in all three divisions of the trigeminal nerve, and were significantly increased in all three compared with controls.

The impairment of vibration and temperature sensibility in the trigeminal skin area in patients with chronic symptoms after soft-tissue injury of the cervical spine indicates damage to the central trigeminal system in upper spinal cord segments and ponto-medullary levels of the brainstem.

THESE AUTHORS ALSO NOTE:

Whiplash injury is usually defined as a soft-tissue lesion of the cervical spine, including:
Rupture of the anterior longitudinal ligament
Muscle injuries
Disc injuries
Spinal cord hemorrhage
Subdural hematoma
Arterial spasm

Chronic whiplash symptoms include:
Neck pain
Headache
Radiating pain
Vertigo
Visual disturbances
Auditory disturbances

These patients are often medically disabled and treatment is difficult because the pathophysiology is unknown.
Ulnar arm pain and numbness can be caused by scalene muscles swelling and may not indicate cervical nerve root lesion.

Experimental findings suggest that the other chronic symptoms may be caused by injury to the cervical spinal cord or to the intracranial contents.

It is possible that trigeminal neural structures in the brainstem and the upper spinal cord is injured from whiplash trauma, causing the chronic symptom complex.

These authors developed methods to precisely measure temperature (hot and cold perception) [small diameter function] and vibration [large diameter function] sensibility in the trigeminal skin area.

The study involved 17 healthy individuals, 14 asymptomatic patients who had been injured in a whiplash trauma, and 16 patients with chronic whiplash symptoms. The physical examination on the 16 chronic whiplash patients was normal. [Very Important]

RESULTS

There was a much higher thresholds for both trigeminal skin vibration and temperature in the patients with chronic whiplash symptoms compared to the other two groups. [More vibration amplitude and a high temperature was required for perception].

“The thresholds for both vibration and temperature were significantly higher for all test points in patients with chronic symptoms compared to asymptomatic patients.”

There was no difference in trigeminal sensory thresholds between the asymptomatic patient group and the normal control group.

In the chronic whiplash patient group:
56% had marked trigeminal sensory impairment.
31% had slight trigeminal sensory impairments.
11% had normal trigeminal sensory examination.

DISCUSSION:

“In the present study we were able to demonstrate substantial sensory deficits in the trigeminal skin area of the face in a large proportion of patients with chronic disabling symptoms after soft-tissue injury of the cervical spine.”

These authors believe that the trigeminal sensory injury they documented is the result of trauma to the brain stem because:

1) The sensory disturbances were bilateral in most cases.
2) Both temperature and vibration sensation were altered.

2A) Temperature is relayed via small diameter fibers that project caudally, through the lower medulla down to C1-C2.

2B) Vibration is relayed by large diameter fibers that project more rostrally, primarily through the pons.

Consequently, the abnormal trigeminal sensory findings are best explained by brainstem injury rather than a peripheral injury.

Damage of the brain and/or brainstem could lie behind many types of chronic symptoms after whiplash.

This study “provides strong additional support to the notion of damage to the central nervous system in some patients after soft-tissue injury of the cervical spine.”

“The pathological findings in the present study more specifically point to the brainstem and upper spinal cord as the probable site of injury.” [Important]

In support of brainstem injury in patients with chronic whiplash symptoms, other studies document oculomotor disturbances in chronic whiplash patients.

These authors propose two mechanisms for the brainstem injuries noted in this study:
1) Acceleration / deceleration concussion.

2) Permanent or temporary spasm of the vertebral arteries causing vascular insufficiency in the territories of the basilar and posterior cerebral arteries. This vascular insufficiency could cause the noted symptoms of nystagmus, tinnitus, deafness, and dizziness.

These authors recommend in whiplash-injured patients that trigeminal sensory testing should be performed to disclose “possible damage to the central brainstem parts of the trigeminal sensory system.”

KEY POINTS FROM DAN MURPHY

1) Chronic whiplash symptoms can include:
   Neck pain       Headache       Radiating pain
   Vertigo         Visual disturbances      Auditory disturbances

2) Ulnar arm pain and numbness can be caused by scalene muscles swelling and may not indicate cervical nerve root lesion.
3) Chronic whiplash-injured patients can have normal physical examination but still have abnormal trigeminal sensory examination indicating they suffered a upper spinal cord or brainstem injury.

4) None of the normal control patients or the asymptomatic whiplash-injured patients showed an abnormal trigeminal sensory examination.

5) In this study, 87% of chronic whiplash patients had an abnormal trigeminal sensory examination.

6) The findings that indicate brainstem injury in chronic whiplash-injured patients are more vibration amplitude and a high temperature requirement for perception.

7) “The thresholds for both vibration and temperature were significantly higher for all test points in patients with chronic symptoms compared to asymptomatic patients.”

8) Damage to the brainstem could lie behind many types of chronic symptoms after whiplash.

9) “The pathological findings in the present study more specifically point to the brainstem and upper spinal cord as the probable site of injury.” [Important]

10) Oculomotor disturbances in chronic whiplash patients also support occurrence of brainstem injury in these patients.

11) Chronic whiplash-injured patients with nystagmus, tinnitus, deafness, and dizziness may have permanent or temporary spasm of the vertebral arteries causing vascular insufficiency in the territories of the basilar and posterior cerebral arteries.

12) Whiplash-injured patients should have trigeminal sensory testing to disclose “possible damage to the central brainstem parts of the trigeminal sensory system.”