Vision Anomalies From Severe Cervical Strain

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INTRODUCTION

Some contemporary optometric postgraduate education has been weighted so strongly in the area of psychology and education that, in the minds of some, our role as a health-care discipline has been largely minimized. While the study of perceptual-motor anomalies is most interesting, it is primarily effective with the child in the area of a learning response. This emphasis on psychology has given a psychosomatic orientation to the field of vision-care which is out of proportion to reality.

Psychology and education are truly noble professions and deal in perceptual and learning problems, but they cannot care for and relate to the physical stress in the neuromuscular mechanism controlling binocular vision. This is a prime task of optometry and we should continue to develop every technique which may expose some new aspect of visual stress. We, as a profession, are repeating the ageless problem of the pendulous emphasis between the psyche and the soma. It shall be the purpose of this paper to emphasize the somatopsychic aspect of visual stress, especially as it is affected by trauma.

There are numerous physical changes that obviously affect the eye and vision. Diabetic retinopathy is an example of a pathology causing revolutionary refractive changes. An intracranial lesion, such as hemorrhage, can produce immediate oculorotary paresis. These are examples of gross pathological changes which are somewhat easy to recognize. Nevertheless, numerous minor physiologic variations are also recognized which can in turn produce an impediment to comfortable single binocular vision. A very common problem today is trauma from a rear-end auto accident producing a severe cervical strain which has been popularized by the term **whiplash**.

Cervical trauma is a broad term which can include any injury to the cervical area, including a controlled trauma such as surgery. Whiplash is a term generally used when applied to rear-end auto accidents. In this type injury there is a violent alternate flexion and extension of the head and neck which sometimes results in visible damage to the vertebrae. In instances of violent whiplash, the head can be thrown backward to a degree that the occiput strikes the spine, then forward to an extent that the mandible does injury to the sternum. In other instances the injury seems to be limited to the soft tissue of the head and neck, i.e., as a tearing or stretching of the tendons and ligaments, thus not visible by means of x-ray.

The very nature of a whiplash injury creates pain and discomfort for the very reason that any pulled tendon or ligament is most painful. Great care is taken with a sprained ankle and the patient receives much sympathy, but the victim of a whiplash injury is immediately suspect of his intentions if not completely well in a few weeks. Some maintain the best cure is the "green poultice" applied by the insurance company. A careful

study of many whiplash patients long after their case is "settled" will show this is not so. Many suffer pain and discomfort the rest of their lives unless the proper therapy is given.

ETIOLOGY

The syndrome of post-whiplash patients has led many to conjecture on the damage done to the body from such a violent acceleration-deceleration mechanism. Weinberg[1] believed that it produced a concomitant concussion of the brain, Nielson,[2] Hackett,[3] and others accentuate spinal ligament and tendon sprain. Billig[4] has listed such things as narrowing of the intervertebral discs, chip fractures, compression fractures of the vertebrae, ligament tearing, and involuntary muscle spasm.

Nielsen[2] reported two cases where there was a complete loss of knowledge (memory) of life experiences without the loss of intellectually-learned facts. This type of affection has been shown to result from lesions of the hippocampal gyri, which lends proof to the probability of intra-cranial trauma. The syndrome of approximately 400 whiplash patients studied in the author's office strongly points to lesions affecting the third, fourth, or sixth nerves.

The nucleus of the sixth nerve is in the floor of the fourth ventricle. The nuclei of the third and fourth are about half an inch forward in the floor of the aqueduct of Sylvius. Thus, the possibility exists that these three oculomotor nuclei may be affected through hydraulic pressure changes through the cerebral spinal fluid which extends from the cervical spine up through the medulla, the fourth ventricle, and into the aqueduct of Sylvius. Certainly the sudden fluid pressure exerted in the violent flexion of the neck might force enough pressure into this area to affect these nuclei.

These nuclei are further connected by the posterior longitudinal fasiculus which extends the whole length of the medulla, pons, and mesencephalon. The medulla is pyramidal in shape and rests on the basilar portion of the occipital bone. It extends to about the first pair of cervical nerves and is thus very vulnerable to cervical trauma. With the location of these motor nuclei which control eye movement possibly being affected by fluid pressure changes, one can easily visualize one method whereby heterophoria might be induced by this form of injury.

CEREBROSPINAL HYDRODYNAMICS

The fluid in the intracraniospinal cavity has a changing pressure value depending upon posture in relation to gravity. The pressure of the intracranial veins is evidently not affected by posture. Nevertheless, these must of necessity maintain a pressure equilibrium under most normal conditions. When there are sudden changes in head or body posture, this pressure can change to a considerable degree. Wolfe[5] has shown that in one subject the flexion of the head caused the vertex intracranial pressure to increase over 200 mm of H_2O as measured by a manometer.

McLaughlin[6] has shown that when a 3500 lb. car traveling at 10 m.p.h. strikes the rear of another car, it can transmit a force of twenty-five tons. The person's body continues forward, but the head snaps backward. Since the neck acts as a fulcrum, the head snaps back with the equivalent of several tons of force. Then when the brakes are applied or the car suddenly stops forward momentum, the head is snapped forward. There may be more than one oscillation of the head and neck, especially in a three-car collision.

Under these conditions, there well may be a surge of pressure beginning in the cervical area and extending through this fluid system. This could in turn produce lesions which would not be revealed by x-ray, but would have to be located by neurological testing and inductive reasoning. It is here that our visual analysis of heterophoric changes can be the key to unlock the door of successful therapy for many sufferers.

POST-WHIPLASH SYNDROME

The symptoms listed by whiplash patients include headache, posterior cervical tension, trapezius tension, lumbar pain, vertigo, blurred vision, hyperesthesia, referred pain to arms, fingers, forehead, nose, eye, temple, and parietal areas of the head; nausea, motor and sensory loss. Some, immediately follow-

ing the accident, report being dazed as though having suffered a partial loss of consciousness.

Those familiar with the symptoms of a binocular stress will see in this list many which overlap. It is not necessary to be aware of blurred vision to have binocular stress, although blurred vision in the absence of refractive error strongly indicates heterophoria. Accomodative loss can also occur from this type injury; accommodative amplitude should be carefully measured.

Routine medical therapy usually includes from one to two weeks in the hospital with emphasis on traction. Muscle relaxants, heat and physiotherapy are all used in conjunction with the traction. In some instances novocaine or zylocaine injections are used in the cervical muscles if the pain is severe. Upon leaving the hospital, many must wear a Thomas collar to keep the neck immobilized. Some have worn these either constantly or intermittantly for many months in conjunction with out-patient physiotherapy.

Depending upon the severity of any cervical damage, most people should be considerably improved by the end of three to four months. If not, or if they are not showing signs of definite improvement, then a latent binocular stress can be suspected.

OPTOMETRIC CARE

Every person seeking professional help following an auto accident and prior to insurance settlement may involve the attending practioner in his lawsuit. Fortunately, many are settled out of court and the medical bills are paid; nevertheless, each case should be handled as though litigation may become necessary.

For this reason a very careful history should be taken by the attending optometrist. Was this a two or three-car accident? Was the car stopped or in motion? What was the exact day it occurred? How much damage to the cars involved? Who is the insurance adjuster and what company?

When did the various symptoms appear following the accident? Was there any indication of these prior to the accident? Was the patient hospitalized? How long? What was done? Were x-rays taken? When? Who is the attending physician? What specialists were consulted (orthopedist, neurologist, neurosurgeon, osteopath, chiropractor)? What treatments or medications are still used? How often?

Any previous visual problems? Any history of diplopia or chronic blurred vision prior to the accident? Neutralize any available previous lens Rx. Take a careful visual history for all of this may become necessary in the event the court should subpoena your records. The most valuable evidence is a daily headache diary showing changes in symptoms from any given therapy.

In the event the case goes to court, the defending insurance company has the right to send this person to a doctor of their choosing for his opinion on your work and your report. This same ophthalmologist or optometrist will be called as their witness in the event there is disagreement of opinions. If this consultant verifies your report, there is an excellent chance of settling out of court. Therefore, great care should be taken in writing reports that the words "in my opinion" preface any conclusion. You are always entitled to an opinion as to the cause and outcome of your findings.

In some cases, the visual problem may manifest itself on your first visual analysis. For example, a man developed "blurred" vision the day following his very mild whiplash and it persisted until seen two weeks later. It was necessary to give him 8^{Δ} vertical prism to regain single binocular vision. His so-called "blurred" vision was a vertical diplopia which appeared one day after he backed his car into a telephone pole with absolutely no damage to either. This later reduced to 6^{Δ}, but has been constant ever since.

However, most of these people will show little or no heterophoria under the normal testing modalities. In fact, some will indicate even the opposite; hence, one visit is generally not enough for the post-traumatic patient. One man, under care at the present time, measured 1^{Δ} esophoria on the entering distance lateral phoria test, but is now wearing 22^{Δ} base-in for a measurable 26^{Δ} exophoria. The change was found after the use of a standardized prolonged occlusion test.[8] With the privilege of having seen almost four

hundred of these head and neck trauma cases, the author can safely conclude that all of these people should go through this standardized test. Anything short of this is being unfair to the patient and cannot give an adequate diagnosis of the visual condition.

Added proof of this can be found in the people who have had a second whiplash injury at a later date. We now have several patient records on file in which a whiplash induced a latent heterophoria; prolonged occlusion was done and the symptoms relieved with proper prism therapy. Later, while still stabilized and comfortable, they had a second whiplash injury only to get a return of the same symptoms. The entering visual analysis showed no change over the previous one, but following prolonged occlusion the change became manifest and with a new lens Rx, the patient was again made comfortable. A unique aspect in about three of these cases was the exact reversal of a previous hyperphoria which resulted in an orthophoric status. The removal of the previous prism brought the relief.

SUMMARY

An attempt has been made to discuss the nature of acute cervical strain, especially the form popularized by the term "whiplash," to list the symptoms resulting from such an accident, and to show that the optometrist plays a key role with many patients who do not respond to conventional therapy within a reasonable period of time.

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going as far down the priority list as it can with the resources available to it. In this aspect of its activities, the Board is ever alert to the intra-and the inter-professional reactions to its efforts. New items are thus added to the list of "tasks-in-process" and the above-mentioned priority sequence is ever being shuffled.

Second, the Board is always informed as to, and mindful of, its available "budget." This is not only the amount of money we have available for spending; it includes also the "time-and-talents" of the members of the OOA — both within and without the "large circle" — who so unselfishly devote hours, days and weeks of highly skilled labor to the assorted causes of OOA. With this information, the Board always includes in its planning decisions as to whether or not a particular project is possible within the limits of the available talents and treasure of the association.

Third, the Board is ever mindful of a fundamental obligation to the membership. The Board must never lag behind the needs and the challenges of any particular moment. It must always be "on top" of the situation, striving to recognize what must be done, what should be done, and what could be done. It must keep the membership fully informed, especially when it appears that the monies and manpower available to the Board are insufficient to make an adequate response to the collective challenges of the moment.

If the Board fulfills the latter obligation, then it is always (as it should be) the **membership**, and not the Board, which decides what limitations will be placed upon the Association's services. Recognizing that OOA services are ones which the individual members cannot supply themselves, the kind and extent of OOA services ultimately is decided by the membership through their allotment,

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