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Acute Cervical Spine Trauma Evaluation

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Injuries to the cervical spine that occur as a result of a motor vehicle accident cause pain that may arise from several structures in the cervical spine, including the ligaments that interconnect vertebrae, outer fibers of the annulus fibrosus, the facet joint, paravertebral musculature and fascia, periosteum, blood vessels, and spinal nerve roots.

When a patient presents to your office immediately after an auto accident, what should you do? Proper examination with appropriate screening tests is the answer.

Step one might be to put the patient in a cervical collar. Filling out office intake forms can often take 10-20 minutes with the neck in a flexed posture. This could aggravate the acute condition.

Step two involves the history taking: elicitation of an accurate history includes details of the current accident, traumatic history, personal and family history and the presenting chief complaints. Keep the patient in the cervical collar during the history to provide as little movement as possible in the cervicothoracic spine.

Step three involves a brief physical examination. Keep in mind that hyperexcitability of the afferent (sensory) nerves are the most common patient problem seen in the chiropractic office. Our typical patient does not have loss of nerve function (sensory deficit and/or motor weakness). Every nerve cell in the brain, spinal cord and peripheral nervous system, are classified by number of processes or by function. By process there are unipolar, bipolar, and multipolar. The process is an active extension of the cell body. If the process takes an impulse away from the cell body, it is called an axon. If it brings it in to the cell body, it is a dendrite. When you have nerve damage you’re damaging an axon not a dendrite. During the examination ask yourself if the injury affected the central nervous system vs. peripheral nervous system; the brain vs. spinal cord; nerve root vs. peripheral nerve; musculotendinous vs. ligamentous.

The screening examination includes: A) Vital signs; B) general appearance and posture; C) behavior and mental status including serial reverse exams such as counting backwards from 100 by sevens, noting the alertness of the patient, are they observant, and can they recall objects; D) cranial nerve examination; E) deep tendon reflexes and Babinski's test; F) sensory examination primarily of C5, 6, 7, 8, T1; G) motor (muscle strength) examination including shoulder, elbow, wrist, finger and thumb strength tests.

Step four would be the radiographic examination. Do the lateral cervical taken at 72 inches first. Develop the film and evaluate for instability. The loss of integrity (findings of instability) in the cervical region would be: 1) greater than 3mm or 25 percent anterior vertebral body movement; 2)greater than 25 percent vertebral body compression, being sure to measure the anterior and posterior margins; 3) angular motion at one motion segment that is more than 11 degrees greater than the angular motion at an adjacent motion segment. If any of these findings are present it indicates the soft tissue damage is severe. If the lateral x-ray is within normal limits, it is OK to take the cervical collar off and proceed with additional views, particularly flexion and extension.

Palpation Scale

Palpation should first be done lightly and tenderness graded. The numerical scale for tenderness to digital palpation is based on what the patient states and the patient reaction: +1= annoying/mild tenderness; +2= moderate tenderness; +3+ grater than moderate tenderness and the patient withdraws momentarily in response to the test pressure; +4= severe tenderness, the patient withdraws immediately in response to the test pressure, and is unable to bear sustained pressure.

Sensory Perception Terminology

A sensory neuron is a neuron that conducts information from a receptor through the cell body into the spinal cord or brain. That means that the 12 cranial nerves and the 31 spinal nerves all have a portion of their bulk made up of the axons of sensory neurons which are conducting impulses from receptors through synapses to the brain and spinal cord. The compression of a spinal nerve root between the spinal nerve root between the spinal cord and the cell body located along the root just inside or outside of the intervertebral foramen of the vertebral column results in aberrant neuronal activity which alters the characteristics of reflex mechanisms within the cord.

The sensory examination is performed and the terminology for sensory perception used in chart notes and narrative report writing could include: anesthesia -- complete loss of sensation; hypesthesia -- diminished sensation; hyperesthesia -- increased tactile sensibility; analgesia -- complete loss of pain sensibility; hyperalgesia -- increased sensibility to tenderness; astereognosis -- inability to recognize familiar objects by sense or touch (usually indicates a lesion in the parietal cerebral cortex); hypalgesia -- diminished sensitiveness to pain.

Tonicity Scale

The brain doesn't store nervous impulses. It can't act as a repository of nervous energy. When there are more impulses coming in to the central nervous system than it can deal with at any one particular time, the nervous system simply sends those impulses through the motor neurons to muscle and the muscle stores it. When the muscle tone is changed our musculature has the capacity to store tension. This can lead to: 1) reflex muscle spasm which, if prolonged, can lead to myofascial pain syndromes; 2) accumulated metabolic waste products within the muscle; 3) under strong excitation the sensory gate is wide open and pain is felt due to blocking mechanoreceptive motion going in. The point is that if muscle tone is changed the muscle can become the source of its own pain. Skeletal muscle is primarily the warehouse of nervous energy but smooth muscle is also affected. If smooth muscle becomes hypertonic, it will constrict around the blood vessels and that can cause peripheral resistance to blood flow and blood pressure goes up.

When your muscles are at rest, only a minority of your muscle fibers are firing. No matter how relaxed you are, there are some impulses coming into the muscles, otherwise you would have flaccid, paralyzed muscles. As tension "builds up," more and more impulses are driven into the muscle tissue and more muscle fibers contract than normal. The more muscle contracts, the tighter or more tense we feel. At a certain point, shaking can occur, caused by competition between the extensor and the flexors.

The terminology for muscle tonicity is: O = normal; +1 = sustained muscle contraction with mild resistance to passive motion in any direction; +2 = sustained muscle contractions with moderate resistance to passive motion in any direction with some restriction in motion; +3 = muscle rigidity with complete resistance to passive motion in some direction; +4 = spasm triggered by/with movement to external irritation, e.g., probing on movement or external irritation e.g., muscle contracture observable and often causes antalgic posture or listing.

Reflex Terminology

The majority of nervous system activity is reflexive. The simplest reflex is the kind that we see in a deep tendon reflex, like a knee jerk where a stimulus is created. The impulse comes in the sensory neuron. It comes through the cord and the motor nerve comes out to a certain group of muscle fibers and causes it to contract. It is an indication of neurological continuity between the sensory system, the spinal cord, and the motor system. If there is a break in the continuity, the reflex will not happen. It is appropriate to grade reflexes O-5. O is no response; 1 is a diminished reflex (hyporeflexia); 2 is a normal response; 3 is a hyperrflexia; 4 is hyperreflexia with transient clonus; and 5 is hyperreflexia with sustained clonus. This is the test of a simple stretch reflex, all other reflexes are polysynaptic.

The brain and the spinal cord control the efferent (motor) neuron that fires the impulse to cause the muscles to contract. The motor horn cell will receive as many as 50,000 separate inputs per cell. Many of these come down from the brain and most of those inputs are inhibitory. When you add all the activity and all the neurons of the brain it makes something go or it doesn't. They either facilitate nerve impulse conduction and muscular contraction, or they don't. If they don't they are known as inhibitory neurons; if they do, they are called facilitory neurons. Most of the motor neurons of the brain and spinal cord are inhibitory. If you have brain damage secondary to trauma or a cerebral vascular accident and it involves motor pathways, you will be wiping out a certain portion of inhibitory neurons and the imbalance is one of facilitation. In a brain damage situation the muscle involved will go into spastic paralysis. This is characterized by flexor muscles becoming real tight, and it draws away only with real difficulty and tends to flex back again. If you lose a peripheral nerve or a nerve root on the motor side, the muscle will go flaccid. There will be no reflex.

Orthopedic Examination

The orthopedic examination should attempt to reproduce the patient's symptoms to identify the tissue or structures that are producing the patient's complaints. Cervical nerve stretch tests include: A) shoulder depression test; B) Soto-Hall test; C) vertebral artery test. Cervical compression tests include: A) Jackson's compression test; B) Spurling's test; C) maximum cervical compression; D) Adson's test. Cervical distraction tests include: A) slow continuous vertical traction (distraction test); B) Bakody's test or sign.

The indications for a neurosurgical consultation in trauma cases include: A) cauda equina syndrome; B) anterior spinal cord syndrome; C) intracranial hemorrhage such as subarachnoid bleeding, hematoma); D) upper motor neuron lesion lesions (+ Babinski); E) neurotmesis/axonotmessis/neuropraxia.

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