The fundamentals of the chiropractic profession are based on vertebral and osseous involvements producing neurological insult and disease. Now we have a circulatory fundamental with vertebral and osseous involvement producing vertebral artery insult resulting in ischemia, causing neurological deficit and disease. A variety of diseases, maladies and symptomatic conditions, in which the chiropractic profession has achieved outstanding success and miraculous results, can now be documented by the medical profession as related to vertebral artery insult.

Central peripheral nervous system dysfunctions due to vertebral artery compromise have been described by researchers to occur from degenerative, traumatic, and kinematic effects, and from subluxations of the cervical spine. These findings broaden the spectrum of chiropractic treatment to provide for the removal of vascular compromise as well as neurological insult. This current evidence is an important explanation of the effectiveness of chiropractic care for the treatment of cranial nerve, brain stem, cerebellum, and posterior cerebral functional disorders.

The vertebral artery is the major source of blood supply to the cervical spinal cord and brain stem which includes the medulla oblongata, pons, and mid-brain. It also supplies the visual cortex of the cerebrum and the cerebellum via the basilar artery. Compression of the vertebral artery has been noted by numerous authorities and is reported to produce a bizarre variety of symptoms resulting from ischemia. Minor compromise of the arterial blood flow is characterized by Barre-Lieou syndrome. Severe kinking of the vertebral artery may result in the formation of a thrombosis that may extend superiorly and occlude the posterior inferior cerebellar artery producing Wallenberg's syndrome.

**Review of Literature**

Hadley states, "The vertebral artery is an important link in the collateral cerebral blood supply. The symptoms constitute a most bizarre and confusing clinical picture, which has been described as the Barre-Lieou syndrome. They include: headache, vertigo, nausea, vomiting, nystagmus and suboccipital tenderness."

In their book titled, The Cervical Spine, published by the Cervical Spine Research Society of the medical profession, Ian MacNab states, "Minor degrees of vertebral artery compromise may be responsible for the so-called vertebral artery syndrome consisting of dizziness, tinnitus, intermittent blurring of vision and occasional episodes of retro-ocular pain. Occasionally, a neurocentral osteophyte may produce severe kinking of the artery, resulting eventually in a vertebral artery thrombosis that may extend superiorly and involve the posteroinferior cerebellar artery. Occlusion of this artery leads to the development of the Wallenberg's syndrome, which is associated with the following symptom complex:

1. **Dysphagia**, ipsilateral palatal weakness, and vocal cord paralysis from involvement of the nucleus ambiguus of the vagus.

2. Impairment of sensation to pain and temperature on the same side of the face from involvement of the descending root and nucleus of the fifth nerve.

3. **Homer's syndrome** in the homolateral eye from the involvement of
the descending sympathetic fibers.

4. Nystagmus due to the involvement of the vestibular nuclei.

5. Cerebellar dysfunction in the ipsilateral arm and leg from interference of the function of the midbrain and cerebellum.

6. Impairment of sensation to pain and temperature on the side of the body opposite from the involvement of the spinothalamic tract.

Epstein states, "Spondylotic deformities may impinge on the foramina transversaria and cause compression of the vertebral artery, thereby producing a clinical syndrome of vascular insufficiency with headache, vertigo, visual and speech defects and gait impairment."

Von Torklus states, "Vascular disturbances (irritation of the vertebral arteries and the posterior cervical sympathetic plexus, commonly referred to as vertebral syndrome) can cause occlusion of the venous or cerebrospinal fluid circulation."

Kabat states, "Decreased blood flow in the basilar artery and the resulting ischemia of the brain stem, cerebellum and visual cortex produces a form of basilar artery syndrome. More common complaints from compression of the vertebral artery are vertigo, syncope and nausea. Infrequent symptoms from such compression of the vertebral artery include impairment of vision, diminished sensation in the face; intention tremor or ataxia, and dysphagia. These different complaints usually occur singly but may appear together. Vertigo from compression of the vertebral artery is the result of ischemia of the brain stem affecting vestibular function. Diminished sensation in the face, usually unilateral and localized to the lips or around the orbit, is another manifestation of compression of the vertebral artery produced by ischemia of the sensory nucleus of the fifth cranial nerve in the pons. Light-headedness or feeling faint may be caused by compression of the vertebral artery. Compression of the vertebral artery produces ischemia of the brain stem affecting the function of the vomiting center."

Rotham and Simeone state, "Children with occipitocervical anomalies may be more susceptible to vertebral artery injury and brain stem ischemia, particularly those who undergo skull traction for correction of scoliosis. Even moderate amounts of traction (less than 15 pounds) that normally would be well tolerated may compromise these abnormal vessels. Although this condition is congenital, many patients do not develop symptoms until the second or third decade of life."

Similarly, arteriosclerotic changes in the vertebral arteries may make these vessels more susceptible to minor or temporary constrictions that would go unnoticed and may later cause ischemia or infarction. The symptoms frequently occur in older patients in whom congenital anomaly would not ordinarily be considered. Patients with this malformation have been mistakenly diagnosed as having multiple sclerosis, posterior fossa tumors, amyotrophic lateral sclerosis or traumatic injury. Blurring of vision, intermittent blurring of vision of short duration, tinnitus, buzzing in the ears or a "plopping" sensation and dizziness, early severe vertigo may be caused by a temporary shutoff of the vertebral arteries. The vertebral arteries may be compressed in chronic cervical disc disease by three mechanisms that are obvious when one considers the anatomic confines of the foramen transversarium in vertebrae C2 through C6 through which the vertebral artery passes. These are (1) osteophytes from the lateral portion of the disc margin; (2) osteophytes extending anteriorly from the zygapophyseal joint and (3) compression by the inferior articular facet from posterior subluxation with
scissoring action by the adjacent superior articulating facet.”

White and Panjabi state, “There is extensive axial rotation between C1 and C2. Studies have shown that 50 per cent of axial rotation in the neck occurs at C1-C2 and that the remainder occurs at the joints of the lower cervical spine. The extensive amount (47°) of axial (y-axis) rotation at C1-C2 can sometimes cause clinical problems with the vertebral artery. Symptoms of vertigo, nausea, tinnitus and visual disturbances may occur from occlusion of the vertebral artery associated with axial rotation of the atlas.”

Anatomy of the Vertebral Arteries

The vertebral arteries arise from the subclavian arteries and run posterior and cephalad between the longus colli and scalenus anterior muscles entering the transverse foramen of C6 and follow an almost vertical ascent through the aligned cervical transverse foramen until they reach the transverse process of C2, which projects posterolaterally and 25 degrees to 45 degrees caudally compared to the anterolateral and horizontal projection of the lower cervical vertebra. From the transverse of the second cervical vertebra to the occiput, the vertebral artery makes four right angle turns in the area of 20 millimeters to 30 millimeters.

Hadley reports the first right angle turn to occur posterior and lateral within the transverse of C2. The second turn occurs as the artery exits from the transverse foramen of C2 bending cephalad to the transverse of C1, forming a loop. As the artery passes through the C1 transverse process, it abruptly turns posterior and continues along the upper surface of the posterior arch of the atlas vertebra, completing the third right angle turn. The final turn occurs as the artery curves sharply around the posterior aspect of the lateral mass of the atlas and ascends anteriorly to enter the foramen magnum. Vertebral arteries are more subject to insult when they bifidate or make a sharp angle turn. It should be noted that “CIBA” depicts the vertebral artery running vertically from C6 to the C1 transverse without the two lower loops.

Vertebral arteriogram (a.p. projection)