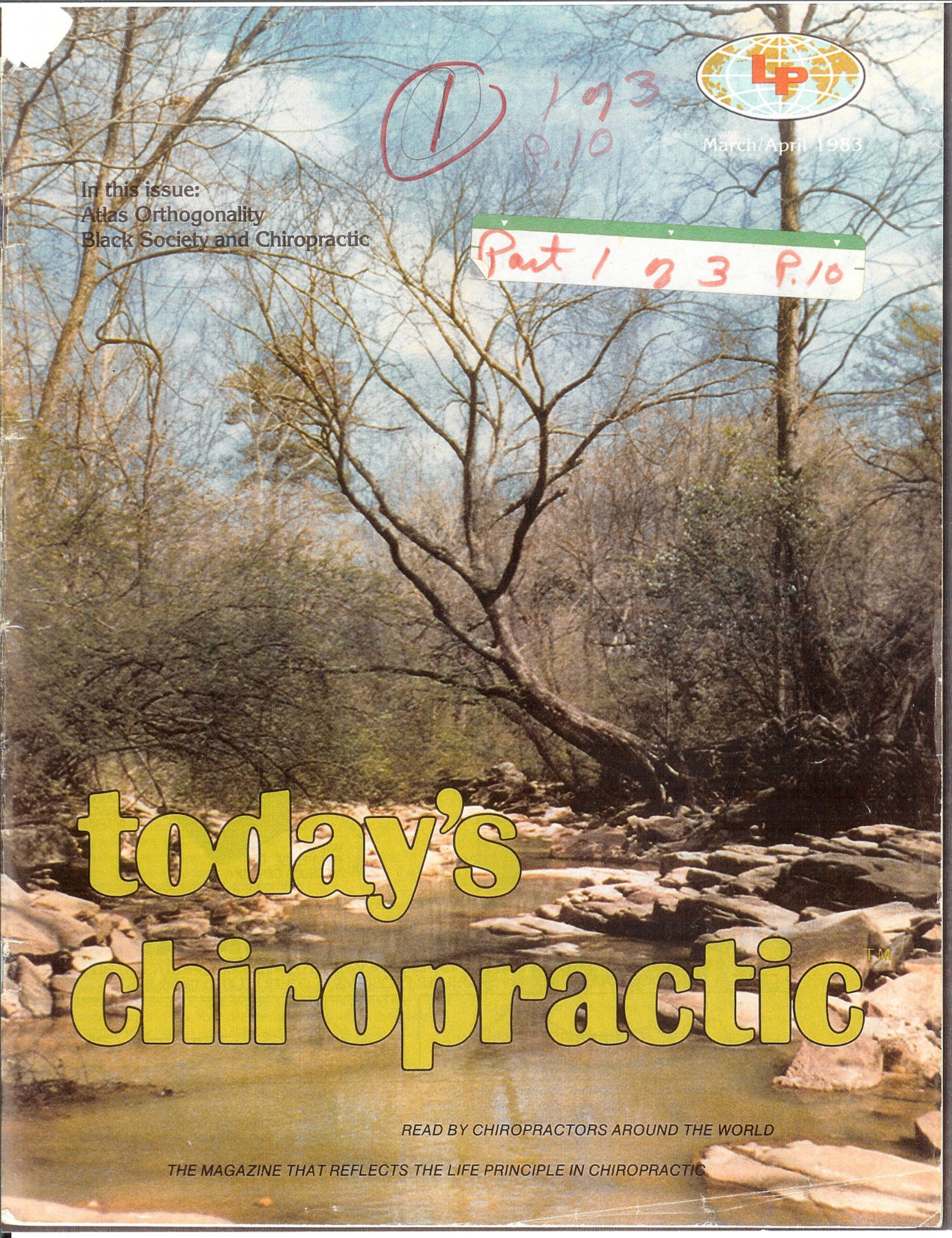
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Atlas Orthogonality

Part One of Three

by Roy W. Sweat, D.C.

About the Author: Dr. Roy W. Sweat's practice is in Atlanta, Georgia. He graduated from Palmer College of Chiropractic in Davenport, Iowa, in 1950. In 1952, he began a course of study specializing in the upper cervical occipital-atlanto-axial complex under Dr. John F. Grostic in Ann Arbor, Michigan. In 1962, Dr. Grostic chose him to become an instructor at his seminars. Dr. Grostic died in 1964, at which time Dr. Sweat and four other doctors organized the Grostic Presentation Seminars and continued the specialized training programs in Atlanta, Georgia. He wrote the Vertical Resultant Angles Book in 1970. In 1977, Dr. Sweat organized the Society of Chiropractors Orthospinology. He designed the cervical analysis instrument. In 1981 he created the program of Chiropractic Atlas Orthogonality and wrote a series of five books. Dr. Sweat has designed a chiropractic adjusting instrument and has developed a series of five different models. He has also designed a series of x-ray analysis instruments, which are in use today, and attachments for the x-ray machine and the orthogonal adjusting tables. He has completed a three-year program in chiropractic orthopedics from the National College of Chiropractic. Dr. Sweat is past president of the Georgia Chiropractic Association, and is an associate professor at Life Chiropractic College in Marietta, Georgia. The atlas orthogonality program was chosen by Dr. C.H. Suh, Ph.D of the University of Colarado and presented at the 13th annual Biomechanics Conference of the Spine. Dr. Sweat has been a member of the International Chiropractic Association (I.C.A.) since graduating from college and is a member of the National Research Committee of the I.C.A.

I submit to the scientific community the neutral relationship of the cranium-atlas-axis-cervical spine (Fig. 1).

OR-THOG-O-NAL-I-TY (N) - the quality or state of being orthogonal. OR-THOG-O-NAL (ADJ) - having to do with or involving right angles, intersecting at right angles, mutually perpendicular. OR-THOG-O-NIST (N) - certified doctor of chiropractic orthogonality.

The Human Body Is A Vertical Structure

The human body is a biped and maintains a center of gravity in the middle of its two pedal supports. When the body leaves its vertical center there is always an adaption and a compensatory shifting of the lower structures to maintain a position as near vertical as possible. As the head leaves vertical and moves horizontally, there is a compensatory shifting of the vertical spine to maintain a center of gravity that is continued all the way through the entire spine. When a person has a scoliosis, curvature, low shoulder, high hip, or any body imbalance, innate intelligence keeps the body as vertical as possible by shifting the entire structure to a center of gravity. In abnormal or cogenital conditions where one occipital condyle is higher than the other, innate always tries to adapt by having one lateral mass wider than the other, or one side of the axis body higher than the other side to keep the body balanced as vertical as possible. In our orthogonal adjusting procedure we are always trying to make the head vertical, the atlas horizontal, and the cervical spine vertical (Fig. 2).

Arthrology

The articulations of the spine include the three major types of joints: synarthroses, diarthroses and amphiarthroses. The Occipital-Atlanto-Axial Complex is a diarthrodial - synovial joint, or a "freely moveable joint." (Fig. 3).

The growth centers for the occipital condyles are each from a single center. The basilar portion is ossified from one center. The atlanto-occipital joints involve a superior articular facet of the lateral mass of the atlas and a condyle of the occipital bone. It is ellipsoid in type. The articular surfaces are reciprocally curved. Each atlantal facet is concave and tilted somewhat medially. The shape of the facet varies but it is usually constricted about its middle; the articular surface is thus partially, sometimes completely divided. The bones are united by the articular capsules and the anterior and posterior atlanto-occipital membranes. Ellipsoid

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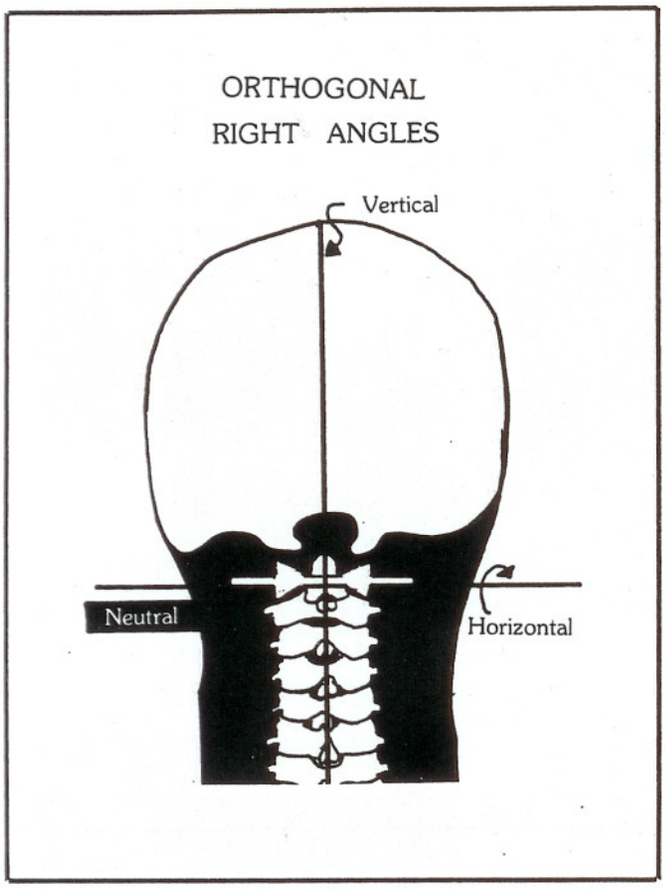

Fig. 1

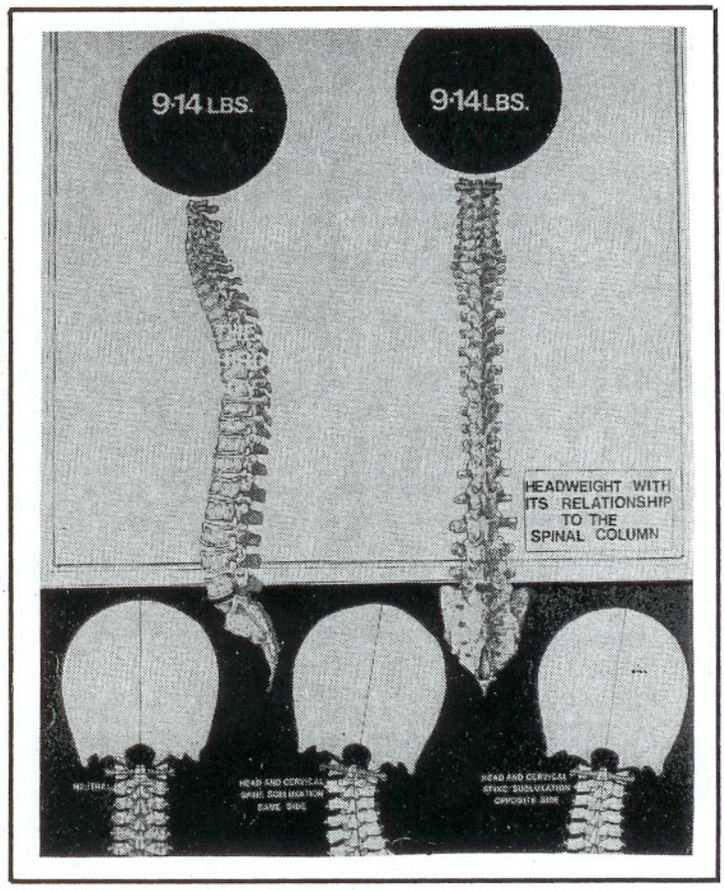

Fig. 2

joints are bi-axial and formed by the reception of an oval, convex, male surface into an elliptical female concavity. Primary movements are possible about two axes at right angles such as flexion and extension, and abduction and adduction. These movements may be combined as a movement of circumduction. There is little appreciable rotation around the third axis, as this is prevented by the overall shape of the articular surfaces.

Growth centers for the atlas are usually ossified from three centers. One appears in each lateral mass and the anterior arch.

The growth centers of the axis are ossified from five primary and two secondary centers. The atlanto-axial joints are the articulation of atlas and axis and comprise three synovial joints, one on each side between the inferior facet of the lateral mass of the axis, the other median, between the dens and the anterior arch and transverse ligament of the atlas. The lateral atlanto-axial joints are classified as plane joints but may be convex in their long axes.

Dr. John F. Grostic stated in his seminars in Ann Arbor, Michigan, "The atlas area has the most wedges, circles, incline planes, fulcrums, and levers than any other area of the spine." Dr. Ruth Jackson in her book on the cervical syndrome states, "The cervical spine is more subject to injury than any other area of the spine." Gray's Anatomy states, "The cervical spine has more range of motion than any other area of the spine." Dr. Gillet of Belgium states, "It is fast becoming recognized that the most important region in the spine, the region in which subluxations are the most pathogenic, is the cervical region." Dr. B.J. Palmer's famous "hole-in-one" atlas procedure states, "There are no interosseous locks in the atlas articulations and everything is from above down and inside out."

The one feature that makes us superior to animals is the human brain. The foramen magnum, the great opening, for this brain to function is the cranio-vertebral region (Fig. 4)

White and Panjabi state, "With the possible exception of the terminal cocygeal joint, the occipital-atlantal joint has received less attention than any of the articulations in the axial skeleton. This generalization seems to hold for anatomic as well as biomechanical and clinical studies. Both the basic and clinical literature concerning this area are highly controversial, and sometimes confusing. The extensive amount (47 degrees) 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. With axial rotation of the head in one direction on the side away from the direction in which the head turns, the atlas moves forward in relation to the lateral portion of the axis. The portion of the artery between these two sections is stretched and narrowed. Selecki showed that the contralateral artery was first affected at 30 degrees of rotation and that it became markedly kinked at 45 degrees. Moreover, he observed that with more than 45 degrees of rotation, the contralateral vertebral artery was altered by either kinking or stretching. If the flow in the vertebral artery on the ipsilateral side is compromised, then symptoms may be illicited. This potential problem has been well illustrated by Fielding."

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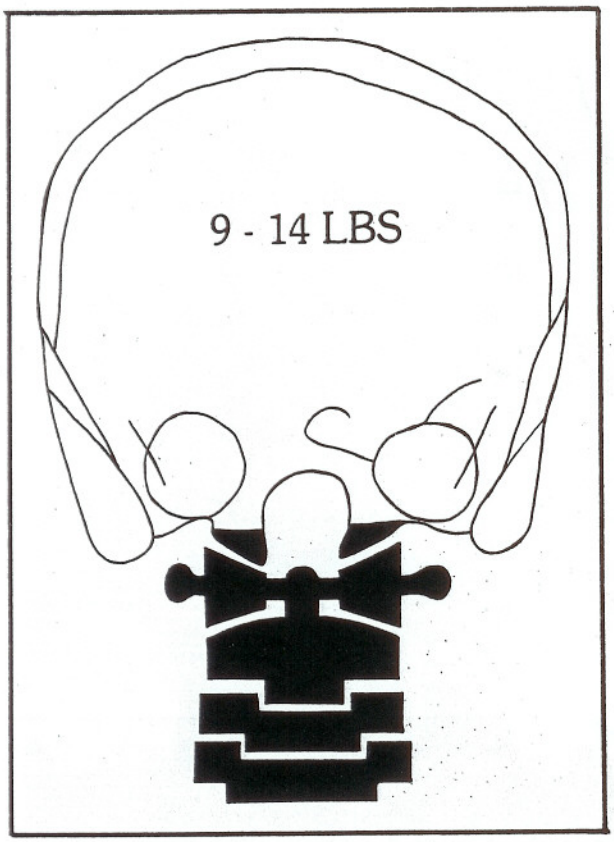

Fig. 3

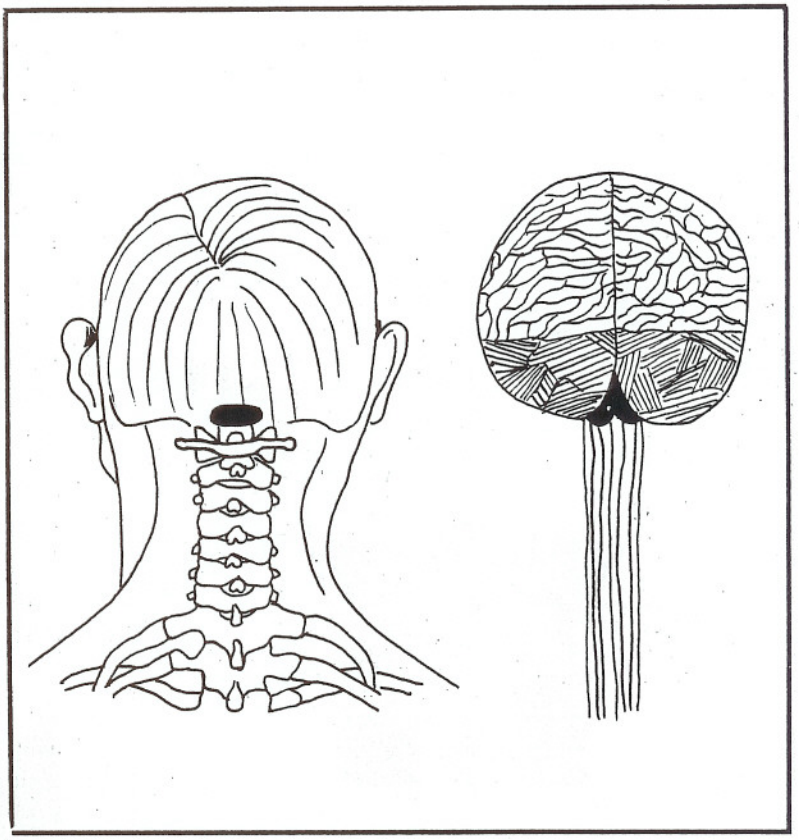

Fig. 4

Rothman and Simeone state that "40 percent of flexion and extension in the cervical spine is at the occipito-cervical joint." In injuries that restrict these ranges of motion we should first suspect lesions to the motor units that are responsible for these major movements.

The anatomy of the ligaments and muscles are such as to collectively provide stability to the spine in its various physiologic motions. There are eight external craniocervical ligaments and five internal craniocervial ligaments. We have the deep muscles of both the anterior cervical spine and the posterior cervical spine. We then have six pairs of small muscles that connect the occipital bone, the atlas, and the axis. There are three pairs of superficial and lateral cervical muscles. According to White and Panjabi, "the spine with its ligaments intact but devoid of muscles is an extremely unstable structure."

Neutral Cervical Lateral

The atlas orthogonal line is constructed by drawing a line along the inferior surface of the posteior arch and extended through the facial features. It will be within a range of one-half the vertical distance of the ocular orbit cephalically down to one-half the vertical distance from the inferior orbit to the hard palate cadually. This represents the neutral atlas on the sagittal plane. There will be a range of 18 to 20 degrees. There may be criticism of the hard palate as a reference point and it may be distorted by abnormal facial features or high arch palate, but it is used and accepted as the reference point for Chamberlain's line and McGregor's line. This represents an "S" 2, 3, or 4 on the Grostic "S" chart. Ninety per cent of the atlases on the sagittal plane will fall in this category. The posterior tubercle does extend superiorly, or inferiorly in many cases, and the anterior arch can be high or low so we find the posterior arch is a more constant anatomical point to establish the atlas orthogonal neutral line.

When the lateral orthogonal line is above the neutral line we usually have a hyperlordosis. When the lateral orthogonal line is below the neutral line we usually have a cervical military spine or a kyphosis. These conditions are abnormal and contribute to cervical spinal instability (Fig. 5).

Neutral Cervical Nasium

The cervical analysis instrument relates the right and left side of the cranium to a center skull line. The most symmetrical area of the skull, with less irregularities of outward and inward deviations in relationship to its opposite side, is from the squamous sutures upward to the area where the crown of the skull begins to curve upward dramatically. At this area one side of the skull may turn much more acutely in its relationship with the other side. The area below the squamous suture down to the mastoid suture is very irregular and should not be used. The useable area along the edge of the skull will average from 2½ to 3½ inches vertically. This is the area used to place the cervical analysis instrument for the center skull line. The instrument is placed over the skull with the appropriate cephalic line that will superimpose or have the closest proximity to the skull line.

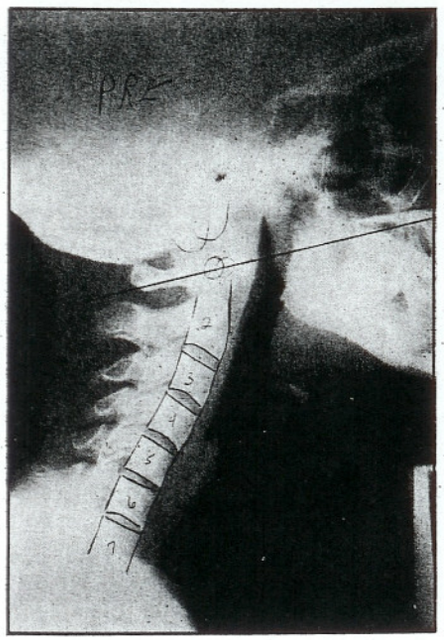

Fig. 5a

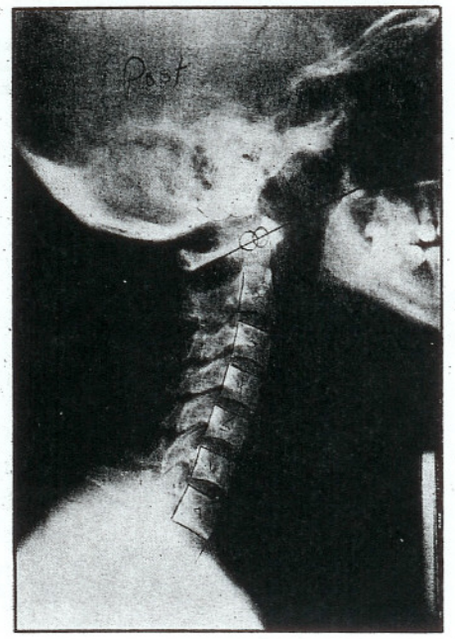

Fig. 5b

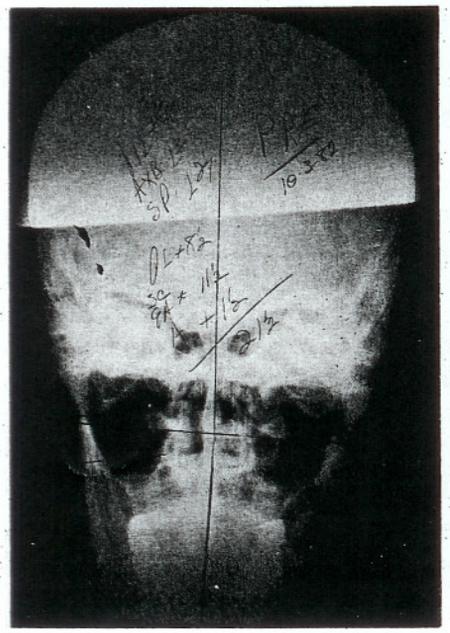

Fig. 6a

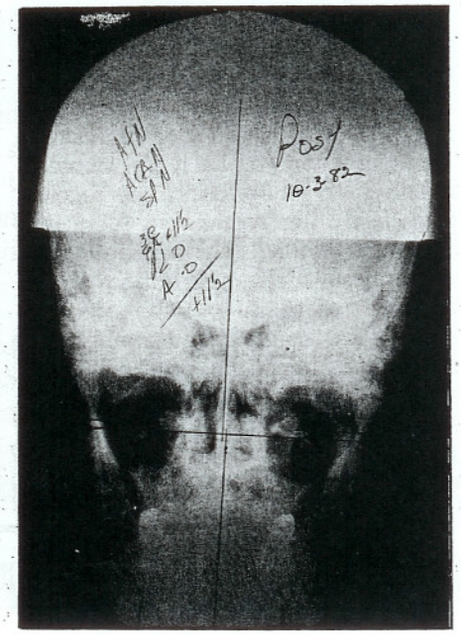

Fig. 6b

There is a groove in the center of the instrument for the line which should be at a right angle to the atlas orthogonal line.

The instrument has a series of atlas brackets that are placed over the atlas to see if the lateral masses are equal on each side and to relate the center of the axis body and the center of the spinous to the atlas. It has a series of circles in which the condylar circles and the axial circles are measured to see if they are equal in relationship to each other and what their circumferences are. The superior tip of the axis spinous represents the posterior aspects of the superior cervical spinal column. The axis laminae join together at the posterior to form the neural canal, the superior tips of the spinous is formed there. The bification of the spinous extends down and out and may vary dramatically. The center of the axis body represents the anterior aspect of the superior cervical spinal canal. The odontoid may be off center from the axis body and should not be used.

The cervical spine orthogonal line is constructed by drawing a line from the center of the body of the seventh cervical cephalically to a point between the center of the axis body and the superior tip of the axis spinous. These two landmarks represent the superior and inferior cervical spine. The spinous of the seventh cervical is elongated and irregular and is not used as a landmark. The cervical spine orthogonal line and the orthogonal center skull line should be at right angles to the atlas orthogonal line. If not, this is abnormal and contributes to cervical spine instability.

On the nasium view, a line through the inferior posterior arches where they attach at the lateral edges of the lateral masses is used at the atlas orthogonal line. The posterior arch attachment should appear horizontally across the lateral masses and will always be in the center or toward the top of the lateral masses. They are rarely below the center of the lateral masses. The lateral x-ray is used to determine the angle of the central x-ray. The posterior arches must be symmetrical and in equal porportions from superior to inferior on the right and left lateral masses to be used as a landmark (Fig. 6A & B, & 7A & B).

Neutral Cervical Vertex

The vertex center line is constructed by placing the vertex analysis instrument over the cranium. It has a series of small, medial and large vertex cephalic circumferences and relates if the vertex view of the skull is symmetrical and finds the center of the skull from the vertex angle. The analysis instrument has an opening in the center and the line is drawn through it. We construct a second center skull line by finding the center of the axis body and moving it back to center according to the nasium x-ray. We use this to represent the center of the foramen magnum. This represents our posterior landmark. On the base of the internal cranium, there is an anterior frontal groove that consists of the nasal bones and the ethmoid and sphenoid sinuses. In the vertex placement, these structures are close to the film and more accurate than other structures. We mark the center of this to represent our anterior landmark. We construct a line through these anterior and posterior points to represent the center skull line. The two center lines should superimpose or be parallel to each other. We outline the right and left lateral masses and measure the posterior surfaces to see if

they are at a right angle to the central skull line. The posterior lateral masses are dense, compact bone and are radiopaque. They usually rise, cephalically, a quarter-inch or more above the posterior arch and are good x-ray landmarks. We also pick the center of the foramen transversarii and measure them to the center skull line. They should be at a right angle to the center skull line. The foramen transversarii are made up from the anterior roots and the posterior roots joining to make the transverse processes. They are radiolucent and are outlined by the white cortex of the lateral masses, the anterior roots, posterior roots and the medial side of the transverse processes. They are good x-ray landmarks. The lines of the lateral masses and the foramen transversarii should be parallel to each other. The center of the foramen transversarii should be in the longitudinal middle of the lateral masses. In the vertex view, the atlas orthogonal position occurs when the lines drawn through the atlas are at right angles to the central skull lines. If not, these conditions are abnormal and contribute to cervical spinal instability. The vertex is the most difficult view to find and establish true landmarks.

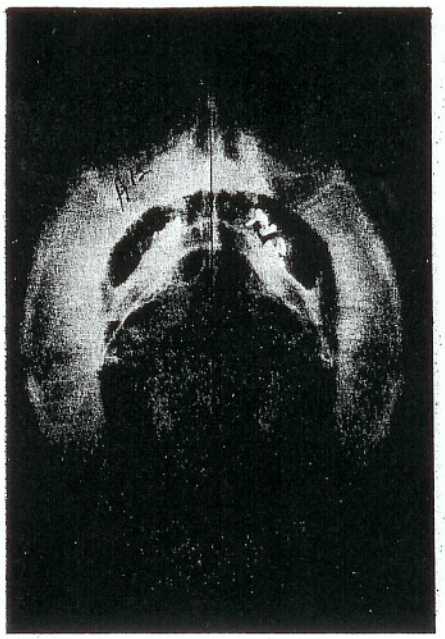

Fig. 7a

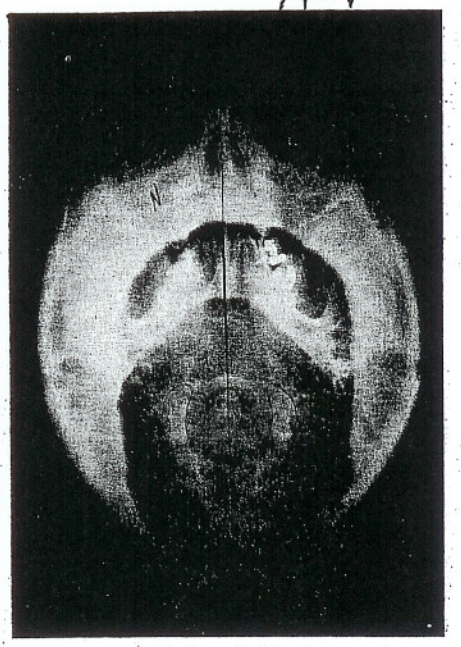

Fig. 7b

Conclusion

When the cranio-vertebral structures in the lateral, nasium and vertex dimensions are not orthogonal, there will be subluxations, gravitational imbalances, muscular and ligamentous stress, cervical spinal instability and compensatory distortions throughout the entire spine and body framework.

The chiropractic orthogonal adjustment is always programmed to return the anatomical structures back toward vertical or neutral. It is not a manipulative program or a program just to move joint facets. This is a chiropractic service that the public cannot receive from any other profession. All of the therapies can be received from other professionals. The main stream of chiropractic services, must be scientific spinal adjustments based on anatomical and architectural programs that are not duplicated in other professions. The public will be served by the profession that can perform the best service. Our motto is service first and our goal is excellence in performance.■

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