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Magnetic Resonance Angiography (MRA) Analysis Offers Explanation of Possible Mechanism of Stroke Relating To Critical Neck Positions

by Edward J. Stein, D.C.

Certain activities of daily living (ADL) that place stress on the cervical spine have been implicated in posterior circulation stroke. M.I. Weintraub, M.D. reported five cases of elderly women, ages 55 to 84, with neurological problems including four strokes in an article titled "Beauty Parlor Stroke Syndrome: Report of five cases," in the April 28th, 1993 issue of JAMA.[1] Previously, Weintraub had reported two cases in an article in Neurology 1992.[2] "These reports suggest that the hanging head – hyperextended position may be an important independent risk factor for transient cerebral ischemia and stroke in elderly women. Public education directed specially at beauty salons should lead to avoidance of hyperextension positioning during shampoo treatment in elderly persons with substitution of a safe, flexed posture."[3]

Neck positioning in surgical procedures where airway insertion requires hyperextension and where the patient's head is kept in rotation or hyperextension rather than being returned to a neutral position during the entire length of the procedure, has been implicated in stroke production.[4] Anesthetized patients cannot complain of symptoms, and they may have their neck hyperextended and rotated for hours.

The following abstract appeared in the Journal Neurology, April 1994:

Critical Neck Positions as an *Independent* Risk Factor for Posterior Circulation Stroke: An MR Angiographic Analysis

Michael I. Weintraub, Briarcliff, NY;
Andre Khourey, White Plains, NY.

Objective. To compare effects of critical neck angulation on vertebral artery (VA) perfusion in symptomatic and control subjects.

Background. The VA is uniquely vulnerable to injury and occlusion at the atlanto-axial-occipital junction. Prior pilot data noted hyperextension (HE) and rotation (R) as independent risk factors for TIA/CVA.

Design. Cross-sectional study of 40 symptomatic adults (mean age 69.9 yrs.) and 30 controls (mean age 66.3 yrs.) using a dynamic MRA technique simulating activities of daily living (ADL). Flow defects were scored at AO-AA and distal VA.

Results. Consistent pattern of contralateral hypoperfusion at AO and distal VA (grade 3/4, $p < .01$); RVA was disproportionately hypoplastic(6/7) and occluded with left rotation (4/7). Prevalence = 13%. Post-positional dizziness in 71% symptomatic vs 13% controls was a significant vascular marker ($p < .005$) with MRI infarction (87.2); reduced angulation/flow defect ratio in symptomatic group was a trend. Coumadin and anti-platelet drugs (67%) did not provide protection.

Conclusions. Mechanical impingement by R and HE can produce profound VA hypoperfusion leading to occlusion and TIA. Public and physician education to minimize extreme neck motions during ADL is needed.

AO Atlanto-occipital
AA Atlanto-axial
TIA Transient Ischemic Attack[5]

The proposed mechanism of injury is as follows: When the head is hyperextended and/or rotated the flow of blood in the vertebral artery slows. Stasis occurs due to compression resulting in decreased blood flow velocity. Platelet activity increases in this environment leading to thrombus formation. Emboli may result when head and neck are returned to the neutral position and the blood flow velocity increases. "The brunt of the mechanical impingement has been hypothesized as secondary to a downward shift of the contralateral atlas while the vertebral artery is fixed."[6] Functional and morphological changes of stretching, occlusion and dissection have been reported.[7] Aside from the direct effect of mechanical occlusion, the role of intimal injury and stasis has been implicated in development of small thrombi and subsequent emboli with or without symptoms.[8] A study conducted on cadavers implicates a degenerative process called cystic mucoid degeneration or medial cystic necrosis which is accepted as a predisposing cause of arterial dissection.[9]

Similarly, intra-arterial embolism has been reported with atherosclerotic disease of vertebral artery origin.[10] Thus, the provocation of neuronal ischemia (dizziness, vertigo, and ataxia) will depend on numerous factors, including the duration and force of movement, collateral circulation, atherosclerosis, hypoplasia, and cervical spondylosis.[11] Possible hazardous effects of sustained neck positions and neck manipulation have been reported in young subjects.[12]

Adjustive/manipulative techniques that involve hyperextension and/or rotation of the cervical spine obviously would carry the foregoing risk factor mechanism and could explain unfavorable clinical outcomes, albeit a statistically rare event. Adjusting/manipulative techniques are commonly used in chiropractic, osteopathic, and less commonly in orthopedic/physical medicine practice specialties. The National Upper Cervical Chiropractic Association (NUCCA) has long been an advocate of mechanically and neurologically sound adjustive procedures. NUCCA has been a leader in the chiropractic profession in the research of mechanics of the atlas subluxation syndrome. Interestingly, current understanding shows that the most biomechanically sound and effective methods to reduce the atlas subluxation complex (misalignment C0, C1, C2) do not involve either hyperextension or rotation. In fact, the patient is in a side-lying neutral position with the side of the atlas laterality up with a solid mastoid support on a non-drop headpiece. The objective has been to develop a sound biomechanical and effective technique for the management of the atlas subluxation complex. As a side benefit, the side-lying adjusting procedure does not carry with it the small, but indeed real risk, of potential vascular injury due to rotation and/or hyperextension of the cervical spine. Estimates regarding occurrence of post manipulative stroke vary:

Gutman, 1983, Dvorak and Orelli, 1985 all place the figure at 0.002%, or 2-3 cases per million.[13] Maigne places the figure as low as 1 in several tens of millions.[14] Scott Haldeman, D.C. M.D. places the figure closer to 1 per million.[15]

Jeff Collins, an Orange County Register staffer, in an article printed Sunday, January 21, 1996 in The Seattle Times reports of a case where a 42-year-old man died after "cracking" his own neck. An autopsy showed that Michael Paul gave himself a stroke. The snap damaged Paul's vertebral artery, one of the main arteries to the brain, said Orange County Deputy Coroner Jackie Berndt. Regardless of how statistically small post manipulative vascular accidents are, if they can be avoided by using procedures which do not place the neck in hyperextension and/or rotation, then this would be the prudent course to follow.

Besides NUCCA, there are other techniques which do not place the neck in compromised positions. These include, but are not limited to: Atlas Orthogonal, Orthospinology, HIO, and Activator. In light of the magnetic resonance angiography evidence of compression, decreased blood flow velocity with resulting increase in chance of a vascular event, all cervical adjustive/manipulative procedures should be scrutinized for this modifiable risk factor.

Young people have the added risk factor of vertebral artery hypoplasia, while additional risk factors for all ages include high blood pressure, heavy smoking, obesity, birth control pills, diabetes, atherosclerosis and cervical spondylosis.

Interestingly, a disproportionate number of strokes occur during sleep and upon awakening. This could possibly be explained by altered vertebral artery flow due to awkward neck positions, especially stomach sleeping, with flow velocity increasing when the head is returned to a neutral position. Some researchers have also implicated sleeping on the abdomen with increased risk of SIDS in infants.[16]

Anyone, regardless of age, who experiences dizziness or loss of balance when the neck is turned or hyperextended should avoid activities that require extreme neck positions. Painting ceilings should be avoided. At the beauty salon the hair should be shampooed with the head bending forward over the basin or with a towel or rubber pad supporting the skull on the basin rim. Dental patients should have the chair as near prone as possible during prolonged dental work. Anesthesiologists should be trained to return the neck to the neutral position as much as possible after intubation and for the duration of procedures. Finally, chiropractors, osteopaths and others interested in spinal adjustive/manipulative procedures should employ procedures where the head and neck are not hyperextended and/or rotated.

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The Physical Sciences and Chiropractic

(Part 2 - printed by permission of the Ralph R. Gregory Trust, continued from Vol. 5, No. 5, May 1995)

Two schools of thought regarding the pathoneurology of the C1 subluxation exist. One is the dentate ligament theory which suggests that the abnormal movement of vertebral structures – displacements – puts stress and/or strain on the dentate ligaments. These ligaments are a ribbon-like band of fibers in the spinal pia mater which function to hold the spinal cord in position. Its medial border is attached continuously to each side of the cord; its lateral border attaches to the dura mater between the exits of the spinal cord. It is a narrow, fibrous sheet situated on each side of the spinal cord between the ventral and dorsal nerve roots. Its lateral border presents a series of triangular tooth-like processes, the points of which are fixed at intervals to the dura mater. These processes are twenty-one in number, one on each side. The first process is attached to the dura mater immediately above the foramen magnum. They extend to about the first lumbar. Changes in the form and the position of the denticulate ligament during spinal movements have been demonstrated by cineradiographic techniques (Gray's Anatomy, 35th British Edition, 1973).

The effect of the dentate ligaments can be observed in leg checking when turning the patient's head to either side. One side or the other will cause the contractured leg to shorten more, depending on the C-1 subluxation of the patient being checked, and the predominant factor of the subluxation.

The Reticular Formation

The second theory, or school of thought, re the pathoneurology of the C-1 subluxation complex and the theory that NUCCA subscribes to, is the effect of C-1 and C-2 displacements on the reticular formation and on the patient.

Magoun and Rhines during the 1940s found that muscular spasticity resulted from an imbalance between the inhibitory and the facilitatory neural mechanisms or neurological pathways in the brain stem. These pathways are termed the reticular formation, a name applied to a network of gray and white matter located in the medulla, the tegmental areas of the pons and the mesencephalon. These rather large cells scattered throughout the formation account for numerous reflex connections within the brain stem and also give rise to the reticulospinal fibers which descend into the spinal cord where they synapse upon anterior gray column cells to complete cranio-spinal reflex arcs.

Magoun states (Encyclopedia Britannica, Volume 4, 1968) that the central reticular formation of the brain stem exerts ascending influences upon the cerebral cortex and gives rise to the descending connections to the motor outflow from the spinal cord. He further states that the more cephalic of these connections facilitate spinal motor discharge, while the more caudal region exerts an inhibitory action and that imbalance in these extrapyramidal motor connections is thought to be responsible for spasticity, in which condition inhibitory influences are no longer active, while the facilitatory connections, being unopposed, exert an augmented effect.

NUCCA's findings are that the C-1 subluxation complex produces an imbalance in these extrapyramidal tracts or motor connections, which cause spastic contracture of the muscular extensors, resulting in excursions of the pelvic girdle into the frontal and transverse planes, distortion of the spine from normal or the vertical axis, and a shortened or contractured leg. Whenever a C-1 subluxation exists, spastic contracture presents itself and is alleviated when C-1 is adjusted; therefore, NUCCA favors this hypothesis over the dentate ligament theory. Spastic contracture and the resultant distortion can also be correlated to the misalignment factors of the A.S.C.

The reticular formation – bodily distortion theory is observable, describable, and measurable (discussed later). How spastic contracture relates to the C-1 subluxation's displacement factors is called the predominate factor theory.

First, however, we should discuss more comprehensively the reticular formation which, until fairly recently, has been somewhat of a neurological mystery. Today, it is receiving far greater attention, and its importance is beginning to be realized.

The brain stem's inhibitory and facilitatory areas receive impulses mostly from the higher motor centers in the cerebral cortex, cerebellum, and the basal ganglia. Normally, the ratio of facilitatory and inhibitory impulses converging on the lower motor neurons is such as to maintain normal muscle tone. Normally, the facilitatory impulses slightly exceed inhibitory impulses, but if the latter become predominant, excess muscle tone (rigidity or spasticity) develops.

A C-1 subluxation causes an increase in the facilitatory impulses by lessening the inhibitory influence. This is supported by evidence that whenever a C-1 subluxation is observed to exist, excess muscle tone or spasticity occurs instantly in every case. A non-subluxated case free of excessive muscle tone can be maladjusted and instantly become distorted.

It is therefore observable, describable, and measurable that a subluxation in the occipital-atlanto-axial spine causes an over-innervation of nerve flow – not a reduction. It does not impede nerve flow, it increases nerve flow. Neurologists today agree that imbalance in the extrapyramidal tracts over-innervate the spinal cord and causes spastic contracture. NUCCA finds in every case that spastic contracture is the reason why the pelvis is distorted and the spine deviates from the vertical axis and leg disparity exists.

The mechanism by which the C-1 subluxation causes an imbalance between the facilitatory and the inhibitory extrapyramidal tracts is tractionization of nervous tissue as the vertebral displacements pull on the nerve fibers. This is not a matter of nerve pressure, a fact essential to the description.

Evidence supporting the tractionization concept is seen when a patient has been reduced to normal position on the vertical axis, is not seen for years, is re-x-rayed, and found to have a lesser degree of vertebral displacement but exhibits the same degree of nerve imbalance. Further evidence is noted when the degree of vertebral displacement is observed to be reduced on the X ray, then the degree of spastic contracture reduces.

Tractionization reduces the sizes of the nerve tracts, and when the time element is satisfied that is required for the nerve fibers to regain their normal sizes, far less displacement is essential to produce as much neurological insult. Obviously, the size of the nerve fiber influences the amount of the nerve impulse flow that passes over it.

Mountcastle in his Medical Physiology (13th Edition, 1974), after defining the reticular formation and locating it in the central part of the brain stem, states: "Physiologic studies indicate that it (RF) exerts powerful facilitatory and inhibitory influences on all types of motor activities at all levels of the nervous system."

Grinder's Neurology (6th Edition, 1966) states: "The reticular formation received afferent (sensory) innervation from many sources: From the cerebral cortex, from the periphery via the spinal cord, from the cerebellum, the vestibular nuclei, the nuclei of the cranial nerves. In fact, it appears likely that the reticular formation received impulses from all parts of the central and peripheral nervous systems. Likewise, it sends impulses downward into the spinal cord, upward into the thalamus, the ganglia, and the cerebral cortex. The neurons of the reticular formation are so extensive in their dendritic and axonal connections that a single neuron of this system may be related functionally with thousands of other cells."

One neurologist, J.D. French, sums up the functions of the reticular formation in these words: "It awakens the brain to consciousness and keeps it alert: it directs the traffic of messages in the nervous system; it monitors the myriads of stimuli that beat upon our senses, accepting what we need to perceive and rejecting what is irrelevant; it tempers and refines our muscular activity and bodily movements. We can go further (French continues) and say that it contributes in an important way to the highest mental processes – the focusing of attention, introspection, and, doubtless, all forms of reasoning."

To receive a clearer picture of this phenomenon, and fill out the C-1 description, let's go deeper into the neurology.

Facilitatory tracts are so-called because they conduct impulses that facilitate, i.e., decrease the resting potential of lower motor neurons. Because inhibitory fibers conduct impulses that inhibit, i.e., increase the lower motor neuron's membrane potential above its resting lever, they are termed inhibitory. Inhibition is the opposite of stimulation. Facilitation is the promotion or hastening of a natural process. It is the effect produced in nerve tissue by the passage of an impulse. The resistance of the application of the stimulus evokes the reaction more easily.

Physiologic studies show that impulses over facilitatory reticulospinal fibers facilitate or hasten the lower motor neurons that supply extensor muscles, and at the same time, inhibit, restrain, or arrest the lower motor neurons that supply flexor muscles. Therefore, facilitatory reticulospinal impulses tend to increase the tone of extensors and decrease the tone of flexors. These inhibitory impulses reach the lower motor neurons mainly via inhibitory reticulospinal fibers that originate from cell bodies located in the bulbar inhibitory area of the medulla.

This data is part of the description of the C-1 subluxation complex. For the measurement part, we have discussed the vertebral displacements of the subluxation on the body: The distortion effects of the contractured extensors produced by excessive facilitation.

To digress for a moment, two methods of testing hypotheses or theories exist. One method is to examine the conclusions that can be drawn from the hypothesis. If they agree, fine, the hypothesis is supported to that extent at least. If the conclusions, or any one of them, conflict, the hypothesis needs restating, modifying, or discarding; it may well be invalid.

Another and better method is to draw a conclusion from the hypothesis and check it rigorously against the actual phenomena. This is the method that is more acceptable and more universally used. Incidentally, it is the NUCCA method.

This is mentioned at this time just before we discuss measurement of the effects of over-innervation on the patient's body and the NUCCA hypothesis that a C-1 subluxation produces the contractured leg, pelvic distortion, spinal imbalance, through the imbalance between the facilitatory and inhibitory mechanisms causing over-innervation to the extensors, produced by C-1 subluxation complex.

Two major theories re the cause of leg disparity exist. The first theory places the cause in the lower spine and the pelvis, and in these areas the attempted correction is made.

The second theory, the NUCCA theory, is that leg disparity results from pelvic girdle distortion and spinal imbalance from a C-1 subluxation causing spastic contracture of the extensor muscles which produce the distortion. Incidentally, distortion exists in every subluxated case.

Leg disparity is rarely caused by anomaly. Our investigation discloses that less than two percent of the cases are so affected. In the anomalistic case, however, who is subluxated, the difference between the degree of disparity caused by anomaly and that caused by the C-1 subluxation must be established. This is done simply by adjusting the case, and if the correction is 95% or better, the leg deficiency is again measured. The final measurement can then be accepted as due to anomaly, and a shoe-lift may be suggested.

Leg checking is, at best, very subjective. To reduce some of the subjectiveness, NUCCA employs three exercises: Resistance, rotating the patient's head, and the leg check differential. Resistance is applied to each leg in equal amounts while the patient is in the supine position.The leg on the side of the spastic contracture will show far less resistance than its mate. This is indication of a short leg. Rotating the head from one side to the other employs the torquing of the dura mater in the cervical spine. When the dura is torqued, the shorter leg will either lengthen or will shorten more. If the predominant misalignment of C-1 is increased by torquing the dura, the shorter leg will shorten more; if the predominant factor is reduced, the shorter leg will lengthen. This is evidence of the effect of C-1 subluxation on the leg deficiency.

The third exercise in leg checking – the leg check differential – is performed by placing the patient exactly in accordance with the orientation planes of motion. The center of the head and the pelvis align exactly to the vertical axis and the legs measured for leg deficiency.

While NUCCA is not satisfied with the leg checking process and is now designing a machine that will remove the subjectiveness, these three exercises do help us obtain more accuracy and do support the hypothesis that a subluxated C-1 causes the leg deficiency via producing spastic contracture. In cases wherein the legs check evenly, because no C-1 subluxation exists (as in post checking after the adjustment) and neither rotating the head nor any less resistance is obtained in the leg that was short, adds another bit of evidence that C-1 is the cause of leg deficiency.

It may be of interest to know that the correlation between leg deficiency and the C-1 subluxation was noted years ago when some patients who showed a short leg opposite to the usually deficient leg were checked but not adjusted; they were x-rayed instead. In all cases, the X rays disclosed that one displacement factor of their C-1 subluxation appeared prior to another as compared with their original X rays. When the originally short leg appeared, the patient adjusted. This seemed to average about three days between the leg change. Changes in the spine – in the subluxation – took place and the area was in the upper cervical spine, another bit of evidence.

To closely measure the effects of the C-1 subluxation on the patient's body and test the NUCCA hypothesis more extensively, an instrument referred to as the anatometer was designed. (Slide) The anatometer checks and measures the patient's spine while in the standing position after the leg check is completed. Two motors in the instrument's base can be utilized to balance the subluxated patient and check for anomalies of osseous structures. The pelvis can be measured in relation to its excursions into the frontal and into the transverse planes. The relation of the spine to the vertical axis of the body can also be measured. The pelvis usually drops low in the frontal plane on the side of the shorter leg.

Checks after the adjustment, when an adjustment is required, usually show that all planes are zeroed out if the A.S.C. is corrected. I say usually, because some cases show such extreme excursions into the frontal plane that they may need a few days for the pelvis to balance. These cases are not common, however. If the patient is not in need of an adjustment, the anatometer will so indicate by registering zero in all the planes. This post checking on the anatometer is still another bit of evidence supporting the hypothesis.

To test the hypothesis still further, correlations or mutual relationships are made between the C-1 subluxation's displacement factors and the spinal and pelvic girdle distortions.While this process is still under study, in fact being computerized at present by Dr. D. C. Seemann for the second time with additional data being added, the results clearly show that a mutual relationship does exist between the displacements of the subluxation and the contractured extensor musculature.

The results of these experiments have advanced the predominant factor theory, a theory that has been under examination for twenty-five years. This theory states that the side of spastic contracture is caused by the displacement factor in the C-1 subluxation that exerts the greatest effect on the reticular formation. In some cases, this factor may be rotation; in other cases, laterality; and in still other cases, it can be C-2 rotation into the transverse plane. The theory also includes the proposition that the analyzer of a set of X-ray films can predict from his analysis which factor is predominant and which leg is deficient, or on which side of the patient the greater spastic contracture exists.

For example, then C-1 laterality is the predominant factor of the C-1 subluxation, the contractured leg is contralateral; if C-1 rotates anterior five or more degrees on the side of C-1 laterality, the deficient leg will be ipsilateral. If C-1 rotates posterior three or more degrees on the side of laterality, the deficiency will be in the leg on the side of laterality. Such factors as the turning of the head toward the side of laterality, as seen in some basic types, or away from the vertical axis caused the leg to be ipsilaterally short if it increased the effect of C-1 laterality and if the rotation of C-2 is toward the side of C-1 laterality. While this study is still under way, all indications are that it will prove conclusively that bodily distortion, spastic contracture, leg deficiency, pelvic distortion, and so on are the direct result of a C-1 subluxation over-innervating the spinal cord.

As we learn more about the effects of the C-1 subluxation on the body, hopefully, we can obtain a lead into making corrections between the subluxation and the disease processes. We already know when analyzing the X ray that certain things indicate asthmatic symptoms, radiculitis, why the sciatica is in the right or left leg, and a few other conditions. At the present time, however, the only condition that we can acceptably express evidence about is bodily distortion and its causes: Over-innervation, C-1 subluxation.

Some evidences not mentioned so far that provide acceptable proof of the accuracy of the system, as well as the need for correction of the vertebral displacements, are that symptomatic alleviation does not often occur until the last little bit – perhaps, the last five percent – of the subluxation's misalignment factors are removed. If the system was wrong insofar as line-drawing, analysis in general, establishing a vertical axis, erecting vectors for the adjustment, and any of the remaining procedures, it would not make any difference whether or not the C-1 subluxation zeroed out. If the analysis were wrongly done, what difference would it make re the symptomatology? On the other hand, when the vertebral listing of the displacements change, so do the vectors, and the corrective effect of the adjustment is not apparent. This change in vectors may be very slight, but it is enough to prevent any symptomatic improvement.

For example, a person returns after several months, or even years, following previous service. He/she is adjusted on the original listing with no results – no change in symptoms. An X ray is taken, and it discloses some slight changes in the listings of the displaced vertebrae which change the vector resultant or direction of the adjustic force. The adjustment is slightly changed to agree with the new X rays and results follow and the case checks out on posts. This is proof of the system because it graphically illustrates that an accurate system of analysis is needed to correct the subluxation and to alleviate the symptoms.

Those who criticize the NUCCA system should examine some of these facts. They should also use people in their studies against

NUCCA, or upper cervical, that are qualified to analyze and adjust.

In any event, enough measurable evidence exists in support of the NUCCA hypothesis that spinal and pelvic distortions from the normal or the vertical axis are caused by the displacements of the C-1 subluxation affecting the reticular formation, causing imbalance between the facilitatory and the inhibitory tracts in the brain stem and producing over-innervation throughout the spinal cord, resulting in spastic contracture of the extensors.

A Look at Force and Motion

The term force derives from the Latin word for strength. It is sometimes loosely referred to as a push or pull. Its technical definition comes from Newton's Laws of Motion and means "That which can impose a change of velocity on a material body." Force is that quality that has both size and direction and which initiates changes or arrests motion. Force and vectors go together.

Force is a vector quantity for the simple reason that it has direction. Having direction, it is going somewhere and needs control. Therefore, it must be controlled as to its direction. An adjustment is a mechanical force, as is a manipulation. The former is a controlled force, specifically directed. If it is not exactly directed, it is not an adjustment, because the word "adjust" means "to replace," "to reposition." A force coming from any direction can move a vertebra, but the force must be along a specific pathway to restore a vertebra to its normal position. Vectors are derived from the X-ray analysis, and their purpose is to define the pathway along which the force must travel if it is to correct the vertebral displacements.

If we know the strength of the force, the direction in which it is acting, and the exact portion of the object on which it is exerting its push or pull, we have the essential information regarding force.

Nerves have force in that they have the capacity to conduct stimuli, and chiropractors are concerned with energy called vital force, which characterizes all living organisms.

Force is power made operative against resistance. All subluxations have resistances, varying from five to twenty pounds, which must be overcome by the adjustic force if a correction is to result.

An analysis of the X rays cannot predetermine the amount of force required in any subluxation to correct it and maintain the prediction level of 95%. Too small a force will not reduce the vertebral displacements sufficiently, and too great a force will cause increases in the displacements or changes in the basic types. Thus uncontrolled force will cause damage to the patient.

To resolve this problem and insure control of the adjustic force, NUCCA developed the adjustment in which the required amount of force for a given subluxation was generated in the adjustor's body by pulling away from C-1 with the contact arm and holding down with the roll-in arm, until the adjustor's shoulders compressed to the point where the exact amount of adjustic force was generated. At that point, the displaced vertebrae moved. Depth and force were, therefore, controlled and adequate to the subluxation's resistances, protecting the patient as the vertebrae moved in the direction prescribed by the vector resultant.

Because sufficient force in the adjustment is essential to overcome the subluxation's resistances, the terms "no force" adjustment and "light" adjustment have no meaning.

An example of subluxation resistance is gravitational stress from the skull displacement from the vertical. Other examples include the fixations of displaced vertebrae that interact with other vertebrae. Subluxations are not always due to trauma. An adjustic force directed into the neck disturbs contiguous structures from their normal positions.

When an object, or part of an object, shifts its position, the center of gravity of the shifted part moved with it. When the axis, or center of motion, of the skull and/or spinal vertebrae move from the vertical axis, their centers of gravity move with them. The skull, for example, that has moved from the vertical axis presents a new gravital line – another internal force of the subluxation. This gravital line, or internal force, detrimentally affects the vertebrae below it, locking them, or fixing them, out of their normal positions. This is the meaning of the term "fixation" and of equilibrium, another internal force that can cause problems.

A displaced (subluxated) vertebral segment undergoes rotatory motion, also called angular or axial motion. It is the movement of a segment about an axis at right angles to a plane of motion. Rotatory motion is that motion in which the path of every point in the moving object is a circle or circular arc centered to a specific axis.

The abnormal motion of C-1, that which we call laterality, is really rotatory as C-1 moves about an arc formed by the occipital condyles.

To restore a normal range of motion to a displaced vertebral segment, the axis of the segment must be centered on normal or on the vertical axis. Only then, can it function normally. If the segment's axis is displaced from the vertical axis (normal), its motion becomes eccentric or abnormal motion.

To do work (technically), one must overcome a resisting force. Work is done whenever a force moved something through a distance. Force multiplied by distance equals work ($W = F \times D$). Only the force in the direction of motion counts as work.

Energy is the stored-up ability to do work or to make changes in matter. Energy is the property that the adjustor builds up in his body prior to making the adjustment. This action is a pulling away from the point of contact and a holding action until the energy is built up to the point where it overcomes the vertebral resistances. Work is then done.

There are several types of energy, for example: chemical, electrical, heat, nuclear, and mechanical. The energy used in making an adjustment of vertebrae is mechanical – the only type of energy that will restore a vertebral displacement.

A person performs a motor skill, which the adjustment is, or a voluntary motion to achieve a purpose or objective. If he/she achieves the objective, the motor skill is successfully performed. If not, the skill was a failure. The bowler who makes a strike or

picks up all the spares; the golfer who hits a hole-in-one has achieved the objective – a motor skill has been successfully performed. The adjustment is no different: Adjusting or correcting the vertebral displacements to normal position is the objective.

Objects move in a variety of ways: straight paths; curved paths; they slide, roll, bounce, fall, and rotate about centers of motion. Despite these many kinds of motion, there are only two major classifications of movement patterns. Either an object turns about a center of motion, or it moves in its entirety from one place to another. If the object turns about a center of motion, it is referred to as angular or rotatory motion. Vertebrae perform rotatory motion, either in normal or in abnormal motion. In performing abnormal motion, the vertebra's center of motion does not lie on the body's vertical axis.

C-1 moves about an axis of motion which is influenced in its position by the skull's center of gravity – one of the major factors in determining C-1 rotation into the transverse plane. Subjacent vertebrae move about their axes of motion which lie in their intervertebral discs. When the vertebrae are displaced from the vertical axis, their centers of motion are also displaced to the extent of the vertebral misalignments.

The second classification of motion is called translatory because the object is translated from one location to another. Translatory motion is further classified into rectilinear and curvilinear motion. Rectilinear motion is simply linear motion – the linear progression of an object as a whole with all its parts moving the same distance in the same direction at a uniform rate of speed.

Curvilinear motion, the second subclassification of translatory motion, is motion around a circle or the arc of a circle. This is the motion of C-1 as it moves about the occipital condyles which form the arc of a circle. Laterality, the term we use to describe C-1 motion in this plane, is not a descriptive term.

Measurement of the subluxation's behavior requires understanding of its direction of displacement into all the motions involved. It also requires understanding of the internal forces and the resistances of the subluxation; also the exact amount of distance that the vertebra has abnormally displaced into one or more planes of motion and the vectors required to reverse the abnormal process. Errors in the line-drawing process can only result in lowering the prediction level which, as stated, must be 95% to be scientifically acceptable. A lower percentage of reduction also results from the errors of analysis, and adjustive errors will also lower the prediction standard. If either the analysis or the adjustment are incorrectly performed, or both, the 95% standard will reflect the errors. The proof of the scientific accuracy of the system stands or falls – line drawing and all – on the prediction of the outcome of the analysis and the adjustment.

Direction is important in mechanical problems, including the subluxation. The subluxation is composed of displacements, and as such are vectors, requiring an exact vector computation to control the adjustic force's direction that will restore the displacements to their normal position. Any direction is not conducive to correction. Force produces motion; correctly applied force produces accurate motion. Force has the property of direction.

Leverage

A lever is a pivoted rigid body to which force can be applied. A small force applied at one point causes a larger force to be exerted at another point.

C-1 serves as a lever by which to restore displaced subjacent vertebrae to the vertical axis or normal, thus the lever magnifies the applied adjustic force to a point sufficient to overcome the resistances offered by the subjacent vertebrae. This is known as the ratio of load to effort and is called the mechanical advantage.

Nearly every bone in the skeleton acts as a lever. The bone is the rigid bar, the joint to which it is attached is the fulcrum, and the contracting muscle provides the force.

C-1 levers in the subluxation are mainly of two kinds. The effort arm of the lever is the distance from effort (T.P.) to pivot; the load arm is the distance from load to pivot. Levers are classified as first class, where the pivot or axis is between the effort and load; second class, where the load lies between the other two; and in the third class, the effort or force lies in the middle.

We've discussed some of the essentials of scientific procedure: Observation, description, measurement, and prediction. We've attempted to apply these essentials to chiropractic practice in a simple way; to attempt to obtain proper and acceptable definition of chiropractic terminology. We observe and we describe all the facets of the C-1 subluxation, then we measure the phenomena of the subluxation before attempting the adjustment. We predict the outcome. If we obtain a 95% correction, we have reached the scientific level in all aspects of the chiropractic procedure; film analysis, checking the patient for neurological imbalance; establishing the vectors and delivering the adjustment. We have shown the system to be valid, factual, accurate, logically tested, and irrefutable.

Flaws in Hypotheses

In suggesting that a testing procedure can be applied by the chiropractor in his office in daily practice which can help him to make up his mind as to what system he wishes to practice, some guidance re hypotheses and theories can be set forth.

One way of disclosing errors in a theory or hypothesis is deducing two or more conflicting conclusions from it that contradict each other. More than one conflicting conclusion from any theory, or any two that do conflict, indicates that the theory cannot be substantiated. It must be reexamined and restated.

A far better method of testing a theory is to deduce from it a necessary conclusion and then check the conclusion against actual phenomena in a rigorous manner. This is the method used by NUCCRA. It is also the method used among physicists today. Science exists and develops based on empirical knowledge.

We find, for example, articles in indexed magazines (and others) in which the author(s) have not examined or tested the system they are writing about in an empirical and rigorous manner. In fact, in some instances they don't know what they are writing about, because they are not qualified to perform the system they are criticizing.

NUCCA-NUCCRA has had much of this criticism. I suggest that you read the J. F. Palmer article in Volume 4, No. 7 Monograph, Debate and Protocol Vs Measurement and Openness, a Chiropractic Issue.

In line with this, the static X-ray concept advanced by some that X rays change positionally and that patients x-rayed cannot show reliable films for this reason lacks any supportive evidence. Patients x-rayed even years after having taken service, in the majority of cases, show a very similar pattern to their original films, barring severe trauma. What changes take place, if any, are in the vectors, not in the basic types or listings.

The X-ray distortion idea which is so rampant and which is supposed to destroy the accuracy of X-ray analysis, also fails empirically, because if it were true, 95% corrections could never occur.

Angular Measurement of the Upper Cervical Spine in the Neutral and Laterally Flexed Positions

by R. G. Cockwill, D.C.

Introduction

This project was designed to determine if normal motion exists between the skull, atlas, and axis in a plane perpendicular to the atlas vertebrae during normal, active lateral flexion of the skull. This study was conducted using three test subjects, two project coordinators, and three experienced upper cervical practitioners who performed an independent analysis of all x-rays. The first x-ray performed on each test subject was a normal A.P. nasium projection which was taken in a comfortable, upright, seated position as per NUCCA guidelines.[1] The second x-ray was taken in a state of active lateral flexion of the skull on the upper cervical spine. Due to the limited sample size this study does not attempt to correlate the findings to gender, age, degree of physical impairment, presence or absence of a subluxation, or other associated variables. This study is simply an attempt to detect any angular change which may occur while the upper-cervical spine is in a state of motion.

X-Ray Procedure

This study was conducted using three test subjects each of whom had two x-ray projections taken of their cervical spine. The x-rays were taken with equipment which had recently produced an acceptable set of alignment films. The x-rays were taken by two chiropractors who are experienced in upper-cervical x-ray procedures. The x-rays were taken following NUCCA guidelines using a centering rod, headclamps, and a forty-two inch focal film distance. There was one exception to the procedure used in the nasium projection; the headclamps were placed slightly higher on the parietal area of the skull instead of over the atlanto-occipital joint, to allow free, unhindered motion in the sub-occipital area. Placing the clamps over or near the atlas may affect its normal range of motion. The first x-ray was a routine nasium projection with the skull and spine properly centered and the x-ray beam properly directed along the s-line. For the second view, the chair was moved to one side and the subject was instructed to lean towards the mid-line of the bucky. The subject was then instructed to laterally flex the skull, centering the motion to the sub-occipital area, so that the skull remained vertical and centered to the bucky. When the subject perceived that he was at his end range of motion the bucky was lowered and the skull again placed in the headclamps. The subject was once again checked for proper centering and alignment before the second x-ray was taken. At no point during this procedure did the subject feel that the headclamps were forcing the skull. The headclamps were able to be removed without movement of the skull.

It is important that the subject laterally flexes the body while keeping the skull vertical because typical NUCCA equipment is very accurately aligned along one plane of motion. If the skull is tilted, unequal magnification and distortion will occur which will probably decrease the reliability of accurately locating the central skull line. Requiring the test subject to actively laterally flex the skull until the end range of motion is perceived is important in accurately determining if normal motion is present in this area. Simply shifting the test subject laterally while keeping the bucky and headclamps stationary will not demonstrate the full range of motion as most of the lateral movement will occur in the lower cervicals.

Film Analysis

The method of analysis followed established NUCCA guidelines and was done in consensus fashion.[1] The x-rays were examined by three chiropractors experienced in upper cervical x-ray marking procedures. They were asked to comment on the quality of the x-rays and to perform independent analysis of each x-ray. The two project coordinators were responsible for preparing each x-ray for analysis and collecting and compiling all data. Each x-ray was viewed and analyzed in different stages in order to achieve objectivity in the assessment. All portions of the x-ray film which were not pertinent to the area being studied were obscured from view by the project coordinators so that the examiners were unaware if the x-rays were taken in a static or dynamic state. This was accomplished by masking all areas other than those being studied by using black cardboard.

The chiropractors who functioned as x-ray technicians attempted to produce x-rays which met established criteria. Each x-ray possessed a film marker and was felt to be adequately exposed with good visualization of all pertinent landmarks. Special care was taken to ensure duplication of s-factor and skull centering. The amount of skull rotation which is allowable before errors in locating the central skull line occur, has not yet been determined. For the purpose of this study, any average discrepancy in lateral measurement of symmetrically located skull

landmarks of more than three millimetres will deem the x-ray unacceptable for analysis. The second x-ray taken in this series must also differ from the first by less than three millimetres. These landmarks may include, but are not limited to, the mastoids, zygomatic arches, nasal septum, or sphenoparietal ridges. Each set of two x-rays which was scrutinized and accepted as adequate was then subjected to analysis.

Plane Line and Spinous

The first task in the analysis of all six films was the identification of the atlas plane line and the spinous process of C2. In order to obtain an accurate, unbiased determination of the location of these structures, each film was prepared with the skull, lower cervical spine, and lateral border of the film obscured from view. One x-ray from each of the three sets was randomly chosen and prepared so that the examiners were unaware if the x-ray was taken in a neutral or laterally flexed position. Each examiner was requested to study the first film and locate three points using a pencil. The first two points located were the inferior attachment points of the posterior arch of the atlas where it joins to the lateral masses. The third point was the laminar junction or spinous process of C2. They were then requested to join the two posterior arch attachment points with a line (atlas plane line). The examiner was then requested to leave the room. The project coordinators then measured and recorded, in degrees, the angle that the atlas plane line made as it intersected the lateral border of the film. In order to assess C2 spinous rotation, the project coordinators bisected the atlas and drew a line perpendicular to the atlas plane line. Deviation of the spinous process from this line was measured and recorded in millimetres. Once the atlas plane line and C2 spinous values had been recorded for the first examiner, the lines were then erased and the process repeated until all three examiners had studied the film.

Upon completion of the first stage of analysis, an independent consensus was reached if the difference in all three measurements was less than 1/2 degree. If a discrepancy in landmark identification was greater than 1/2 degree, all three examiners were again requested to review the film until a consensus was finally reached. Once this was obtained, the plane line and spinous locations were left marked on the first film in each set. For the second stage of analysis both films on each subject were placed side-by-side on the view box. All areas of the films other than the atlas and axis were again obscured from view and both films were rotated so that both atlases appeared level. Using the first marked x-ray for comparison, all three examiners were again requested to locate the atlas plane line and C2 spinous on the second x-ray on each subject. The coordinators once again measured, recorded, and assessed each measurement according to the procedure used with the first x-rays.

Central Skull line

To begin the construction and analysis of the central skull line, the project coordinators placed both x-rays of each set side-by-side on the view box and obscured all areas inferior to the squamosal sutures from view. They then delineated identical areas on both x-rays which were to be analyzed using the cephalometer. Each examiner was requested to construct a central skull line using the double pivot method. The project coordinators measured and recorded the angle that the central skull line made when intersecting the superior portion of the film. Each x-ray was analyzed until a consensus among all three examiners was reached regarding the location of the central skull line.

At the conclusion of the study the project coordinators had a relatively accurate and unbiased determination of the angular relationship between the skull, atlas, and spinous process of C2 in both the neutral and laterally flexed position for all three test subjects.

Results

Analysis of the data indicated an average change of two and one half degrees in the angular relationship between the skull and atlas in the frontal plane during lateral flexion. The largest change seen in one test subject was four and one quarter degrees; the smallest change was one and one half degrees. The average change in location of the spinous process was contralateral to the side of lateral flexion by seven millimetres. The largest change seen was fourteen millimetres. This equates to an angular rotation on a three inch condylar circle of twenty-one degrees. (Table 1)

Discussion

One objective of this study was to establish criteria for the accurate and objective assessment of any two comparative nasium projections. Utilizing this criteria, three sets of neutral and laterally flexed projections were subjected to analysis.

The results of this study strongly suggest that motion occurs in the upper cervical spine during lateral flexion of the head. This would tend to agree with the conclusions drawn by various authors who have also conducted studies on the normal range of motion for this area.[2-17] Figures 1-5 quantify the various ranges of motion that these authors have found for the upper cervical spine. These studies illustrate the dynamic nature of the upper cervical spine.

Chiropractic upper-cervical radiographs are taken when the patient is in a static, upright position. These radiographs have been shown to be reliably measured and quantified.[18,19,20] A misalignment is thought to be present when the angular measurement between the skull and atlas vertebrae exceeds three quarters of a degree in the frontal plane. This amount of osseous movement is thought to be responsible for various observable physical changes. These physical changes have been termed the atlas subluxation complex (A.S.C.).[21] They include: distortion of the spine and pelvis, extensor imbalance, shifting of the body's center of gravity, and leg length asymmetry. These physical changes can be reliably documented and measured using various methods and instruments.[22,23] It has also been shown that when an upper cervical misalignment is reduced, the physical manifestations of the A.S.C. also reduce.[23,24]

The dentate ligament tractionization theory was formulated to explain how an upper cervical misalignment can be responsible for the physical and postural distortions which characterize the A.S.C.[25,26] This theory is also felt to explain many of the various symptomatic complaints experienced by subluxated individuals. An upper cervical misalignment is thought to cause abnormal brainstem tractionization via the dentate ligaments

which connect the brainstem and spinal cord to the foramen magnum, atlas, and axis. These abnormal tensile stresses are thought to cause dysfunction of neural elements within the tracts of the brainstem resulting in an imbalance of the supporting musculature and resultant physical and postural distortions. Reduction of the misalignment is thought to remove these abnormal tensile stresses and return the supporting musculature to a balanced state. For this theory to be accepted, it must satisfactorily explain how the brainstem can tolerate as much as five degrees of normal lateral motion of the skull on atlas and forty-five degrees of rotation of atlas on axis without noticeable neurological insult. Figure 6 depicts the relative position of the atlas and axis during normal neck rotation. It is clearly seen that there is considerable deformation of the neural canal. In order to validate the dentate ligament tractionization theory, we must be able to explain how this large amount of movement is possible without producing neurological impairment. The spine is a dynamic structure. It was designed to move. Most individuals can rotate and laterally flex the head and neck without producing extensor imbalance, pelvic tilting, or a contractured leg. While it may be possible that long-standing asymmetrical traction of the brainstem may be responsible for some of the neurological symptoms seen in some patients, it seems unlikely that this mechanism is directly responsible for the immediate physical manifestations of the A.S.C.

Acknowledgements

I would like to thank all of the individuals who volunteered their time and bodies for the advancement of our understanding of the upper cervical spine.

AUTHOR'S COMMENTS

Upon completion of this study, several imperfections were found which should be noted. Subject number one had a low posterior arch on the lateral flexion film. Subject number three had some left head rotation in the first neutral film. Due to the fact that the bucky could not be completely lowered in the lateral flexion films, the atlas was not centered to the film in some cases. This last finding should not, however, give rise to any errors in analysis because the central ray was still centered to the atlas. The lower cervicals were not the subject of this investigation.

The purpose of this study, as mentioned in the introduction, was to determine if normal motion exists in the upper cervical spine during lateral flexion. Perfect films were not obtained in all cases. The neutral projections were relatively easy to perform. The lateral films were a bit more difficult because the test subjects were forced to remain in a very uncomfortable position while they were being centered, clamped, unclamped, rotated, clamped etc . . . Five x-rays were taken on subject number one and number three. Four x-rays were taken on subject number two. One additional subject, who was not included in this study, had received eleven x-rays in a short period of time (as well as fourteen dental x-rays). Due to health concerns, x-rays were discontinued once fairly acceptable projections were acquired. Although it was felt that most films were adequate for the designated purpose of this experiment, the ultimate goal of perfect films for all cases was not obtained.

When this study was completed and forwarded to the *MONOGRAPH* the x-ray films were requested. The three sets of films included in this study as well as one additional set were sent. The films were then sent to another experienced upper cervical practitioner who analyzed them using a digitizing screen and computer with software designed for the upper-cervical practitioner. Each film was analyzed five times. This practitioner concluded that the assessment of each film showed good reliability because the standard deviation from the median on each film was felt to be within an acceptable range.

The low arch seen on the second film on subject number 1 was felt to be a problem. Table #2 shows the results that were obtained. An average change of 2.05 degrees was found between the neutral and laterally flexed positions. Previous reliability studies using the digitizer showed an intra examiner reliability of .45 degrees. The practitioner's conclusion was that the average lateral flexion values would be between 1.15 and 2.95 degrees with scientific confidence.

Regardless of the flaws which were seen, all x-rays showed skull movement on atlas towards the side of lateral flexion. All x-rays showed a magnitude of movement greater than three quarters of a degree. All of these findings strongly support the conclusion that it is highly probable that normal movement occurs between the skull, atlas, and axis during lateral flexion of the head.

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Table 1

Consensus values for 3 test subjects in the neutral and laterally flexed positions.

Values of central skull line, spinous, and laterality either right or left.

Values of plane line either positive or negative measured on left side of film.

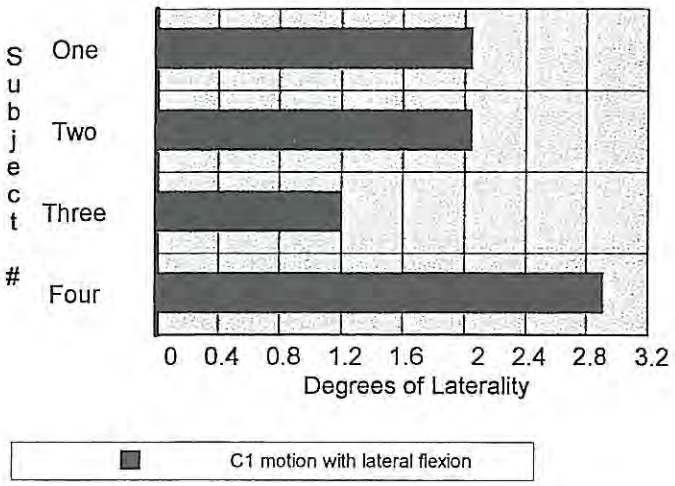
Values for spinous measured in millimetres.

	SUBJECT 1		SUBJECT 2		SUBJECT 3	
C-Skull	0	R 1/4	L 3/4	L 1	L 1.25	L 1
Plane Line	+2.25	+1	+5 3/4	+1 1/4	-2.5	-4.25
Laterality	L 2.25	L 3/4	L 6.5	L 2.25	R 1.25	R 3.25
Spinous	R 3mm	L 2.25mm	R 3mm	L 10.75mm	L 7.5	L 7

Change in laterality	- 1.5 to the right	4.25 to the right	2 to the right
Change in spinous	- 5.25mm - left	13.75mm to the left	5mm to the right

Table 2

Comparison of Motion at C0/C1 Between Four Subjects With Full Lateral Flexion



C0-C1 Lateral Flexion Motion ± Rotation

	Lateral Flexion	Rotation
Kapandji, 1974	3.0°	3.8°
Werne, 1957	8.0°	Combined
Braakman and Penning, 1971	5.0°	
Baake, 1931	5.0°	
Lewit, 1985	5.5°	C0-C-2 Combined
Dvorak, 1984	4°	

Figure 1

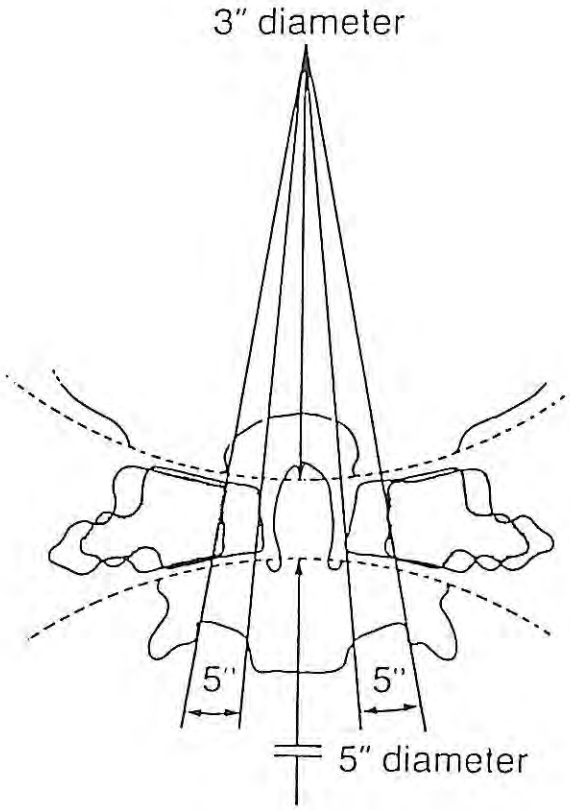


Figure 2

Five degrees of lateral flexion take place between C0 and C1 using the arc of the condyles to form a center of motion. C0 condyles form an angle of 132° radius, approximately 3 inches.

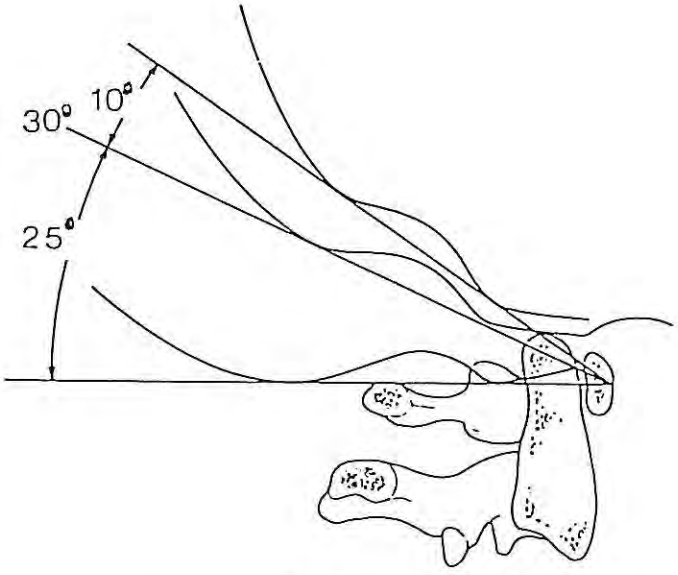


Figure 3

Flexion-extension range of motion between occiput (C0) and atlas (C1).

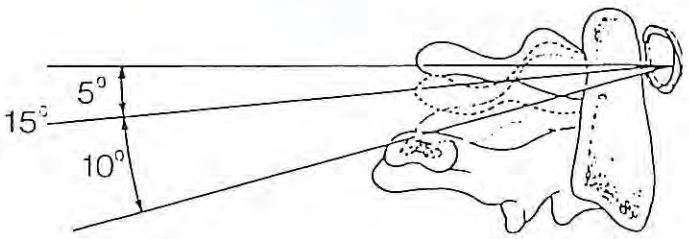


Figure 4

Flexion-extension range of motion between atlas (C1) and axis (C2).

Rotation of C1-C2 Segment

	Rotation	Lateral Flexion
Hohl, 1967	45°	Combined facets offset
Fielding, 1957	45°	
Selecki, 1969	45°	
Dvorak, 1984	40-50°	
Braakman and Penning, 1971	30°	

Figure 5

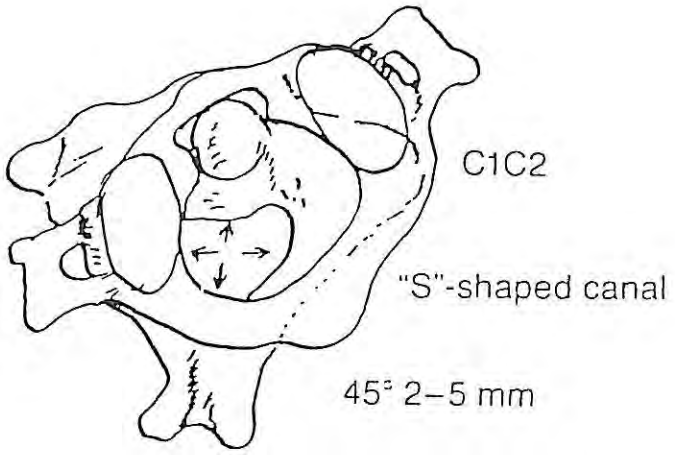


Figure 6

C1 C2 rotation. Spinal canal is "S" shaped at 45°; there is 2-5 mm of occlusion.

Locating and Measuring the Spinous Process of C2 from the Vertex Film

Albert A. Berti, D.C.

In locating and measuring the bifurcation of spinous of C2 in the vertex film, patient positioning in this posture is critical. A review of the "NUCCA Basic Course: X-ray Analysis Manual" by Dr. R. Gregory is recommended.[1]

It has been customary in the past to take the vertex x-ray on an eight by ten film. I would recommend a ten by twelve film be used in order to be able to see C6 or C7 on the film. As we continue this article one will readily observe the reason why.

In studying a gross number of vertex x-rays and attempting to relate the spinous bifurcation measurement on the vertex to the spinous bifurcation on the nasium x-ray, we found in a number of x-rays the relationship of the spinous bifurcation on the vertex and on the nasium did not agree. The error occurred in the positioning of the patient for the vertex view and the accuracy in positioning C7 or C6 directly under the odontoid center (Fig. 1). In determining the accuracy of the x-ray for measuring the bifurcation of C2, the doctor should draw a line from the body center of C6 or C7, perpendicular to the base of the film. If the odontoid center is more than one-quarter of an inch right or left of the line, the rotation measurement of the bifurcation of spinous of C2 will be in error. Refer to (Fig. 1) for an accurate illustration.

Figure 1

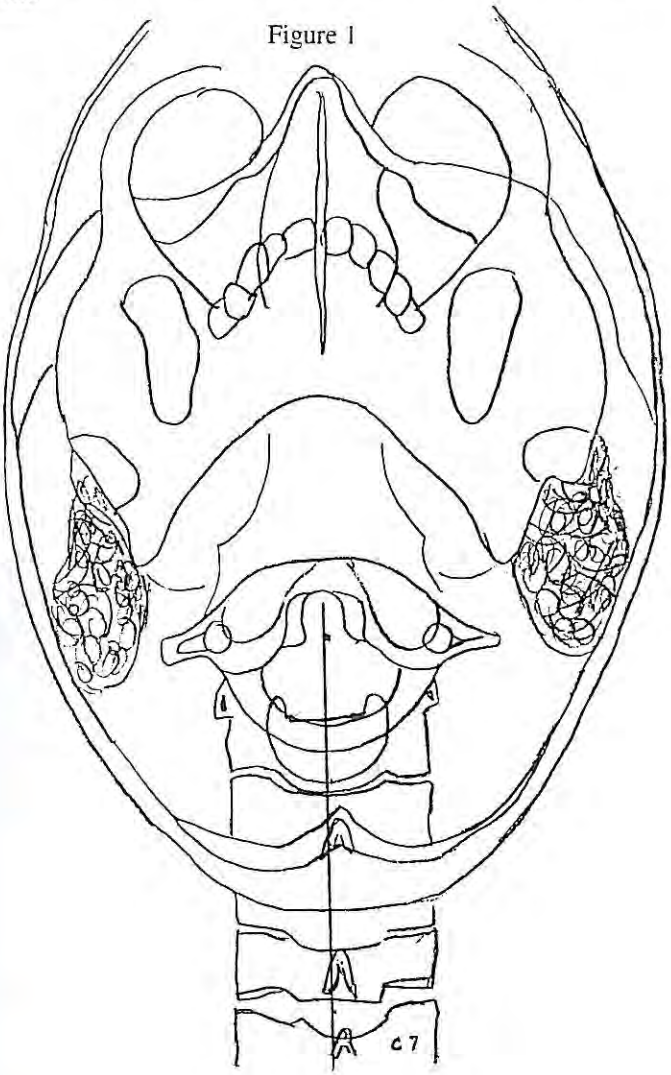
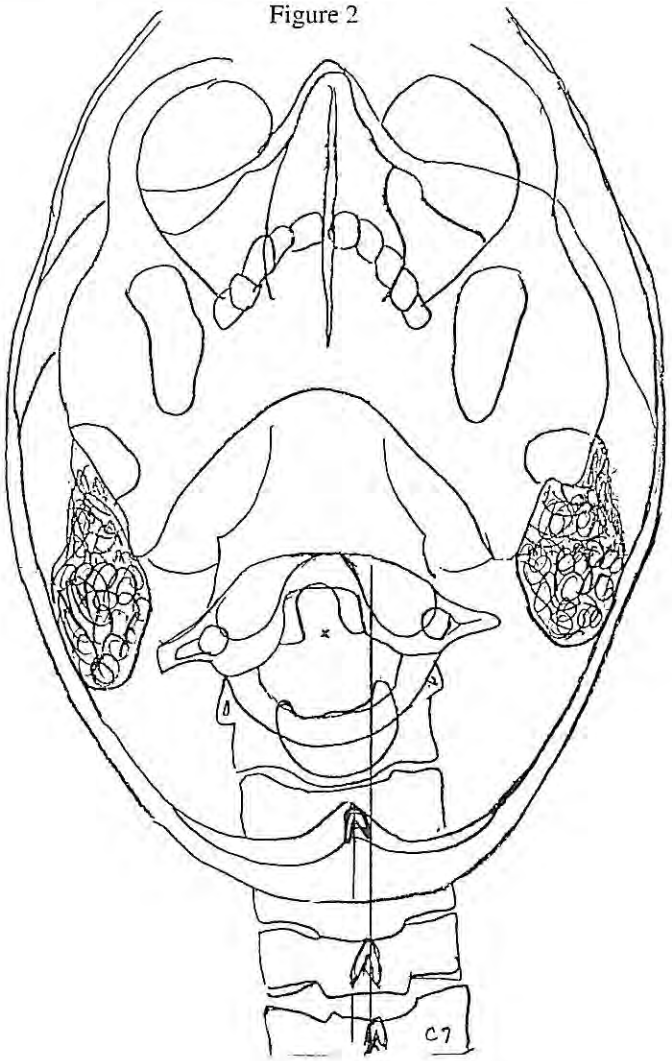


Fig. 2 is an x-ray drawing of the same patient as Fig. 1 illustrating the odontoid center approximately one-half inch left of a line drawn from the body center of C7, perpendicular to the base of the film. The measurement of the bifurcation of C2 will not be accurate in this case even though the x-ray has no head rotation or head tilt and the occipital protuberance is relatively close to being over the center of C7.

Figure 2



In locating the spinous bifurcation or more specifically, the posterior center of the axial canal, the doctor must locate the inferior border of junction of laminae to the body of C2. (Fig. 3. points A and A1). Follow the arrows and the circle formed illustrates the axial canal. Center the base of the vertex square grid over points A and A1. The apex of the triangle illustrates the position of the bifurcation of spinous of C2 or the posterior center of the axial canal (Fig. 3. point B). Draw a line from the center of the odontoid, perpendicular to the top of the film, down to the posterior point of the axial canal. Measure this point of the canal to this line. The measurement scale used is determined by the condylar circle measurement from the nasium film. In this drawing (Fig. 3) the measurement of the spinous bifurcation is directly under the odontoid center and therefore will be directly under the odontoid center on the nasium.

Figure 3

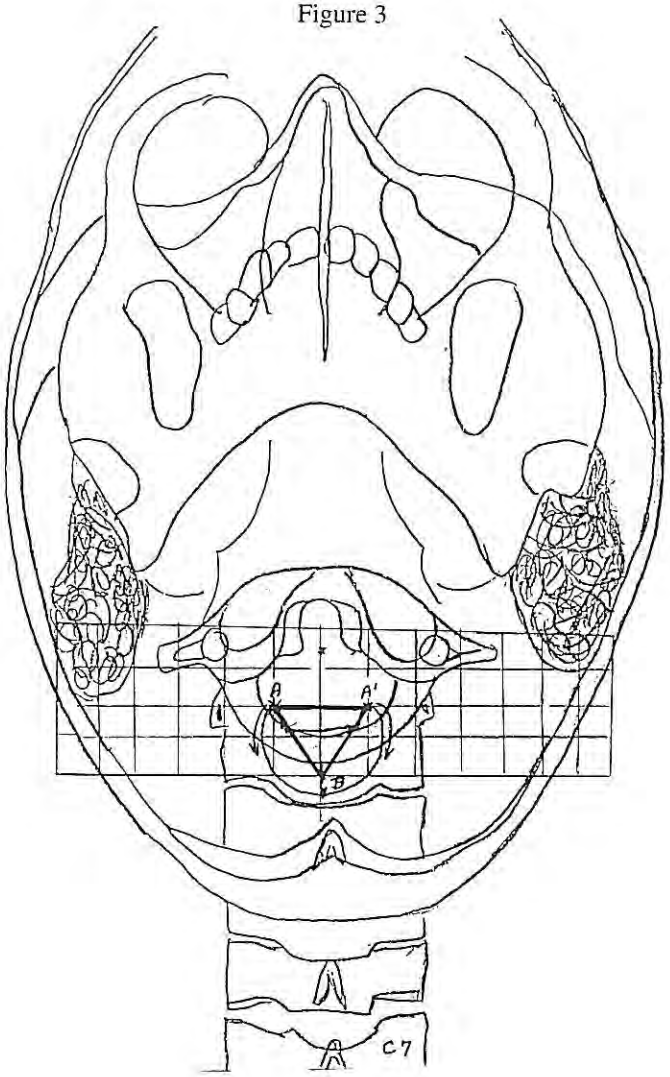
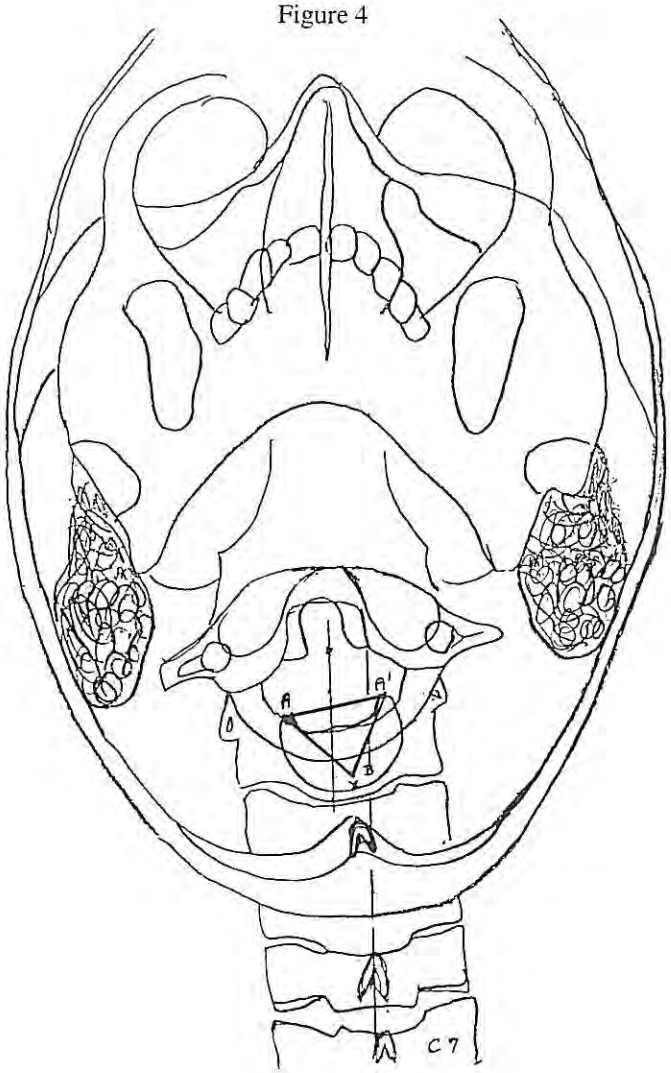


Fig. 4 is the same as Fig. 2 illustrating the odontoid center approximately one-half inch left of a line drawn from the body center of C7, perpendicular to the base of the film. Again, by centering the triangle of the vertex square in relation to the inferior border of the junction of laminae to the body of C2, (points A and A1) one can see the bifurcation of the spinous process of C2, (point B) approximately one quarter of an inch to the right of a line representing the odontoid center. The measurement of the bifurcation of C2 spinous in this drawing would not agree with C2 spinous bifurcation position in the nasium view.

Figure 4



Positioning the patient for the vertex film becomes more critical when one considers the relationship of the spinous bifurcation to the nasium film in cases with a large degree of angular rotation (such as greater than six degrees). In cases with large angular rotation, the doctor should attempt to position the posterior center of the skull as close as possible over the center of C7. Again, accurate positioning of the patient and directing the central ray at right angles through an imaginary line that extends from the superior of the patient's orbit to the tip of the transverse process will give an accurate measurement of C2 spinous rotation and a much clearer view of the transversaria foramina.

Reference

[1] Gregory, R.R., The NUCCA Basic Course: X-ray Analysis pg. 29, 30.

Angle of The Mastoid

A Study

Presented to the Twelfth Annual Upper Cervical Conference
by Hugh L. Crowe, D.C.
assisted by Marta Maria Trujillo, D.C.

The essential element of the most effective atlas adjustment is a properly supported skull using the mastoid process of the temporal bone as the point that is to be supported. It is the surface point that is nearest to the atlas so that it provides the best leverage or shearing action for movement of the atlas on the condyles.

My presentation to the sixth annual upper cervical conference covered the design, construction and consistency of the headpiece.[1] All previous research had shown the need for the table to have a tiltable headpiece so that it could be set to conform to the contour of the skull. As we did more research we found that specifically the headpiece should be set to conform to the contour or angle of the mastoid. Our post X-rays would tell us when the mastoid was not properly supported. We were instructed to circle the "m" on the listing sheet to indicate a round head or steep mastoid angle which required extra attention in placing the mastoid.

In order to get a better perspective of the mastoid angle, we decided to do a study using precise measurements.

Since the mastoid (#1) usually curves sharply at the tip and has major muscle attachments, we chose to measure 1/4 inch from the tip and construct a straight line over the next 1/2 inch. We then measured the angle of that line as it relates to the edge of the film. (See Plate I)

Dr. Marta Maria Trujillo selected 103 cases at random from our files. Using the above criteria she measured both right and left mastoid to the nearest 1/2 degree. Oddly, very few measured the same on both sides. The smallest angle was 17 degrees and the largest was 27.5 degrees with an average of 22.5 degrees. (See Plate II)

This was somewhat startling to me. I had rarely considered more than 22 degrees of tilt in the headpiece. With this study, we have become more conscious of the angle of the mastoid in placing the patient, especially if it is a problem case.

Discussion

In the Grostic work, we were taught to place the mastoid on the headpiece 1/4 inch from the edge to get away from the roll of the edge. For round heads, we should be able to touch the top of the ear without depressing the upholstery. For a flat head, we should depress the upholstery to touch the top of the ear. The elevation of the headpiece was related to the direction of C-2 spinous.

In the NUCCA work, the C1 subluxation is classified into four basic types and the mastoid is placed according to the basic type being adjusted; Type I being supported higher up on the mastoid, Types II and III on the tip of the mastoid and type IV between the other two. (See Plates III and IV)[2]

[1] Hugh L. Crowe, D.C., The Mastoid Support, (6th Annual Upper Cervical Conference, November 1989).

[2] Ralph R. Gregory, D.C., The NUCCA Advanced Course: Biomechanics (The National Upper Cervical Chiropractic Association, Inc., 1987) 18-35.

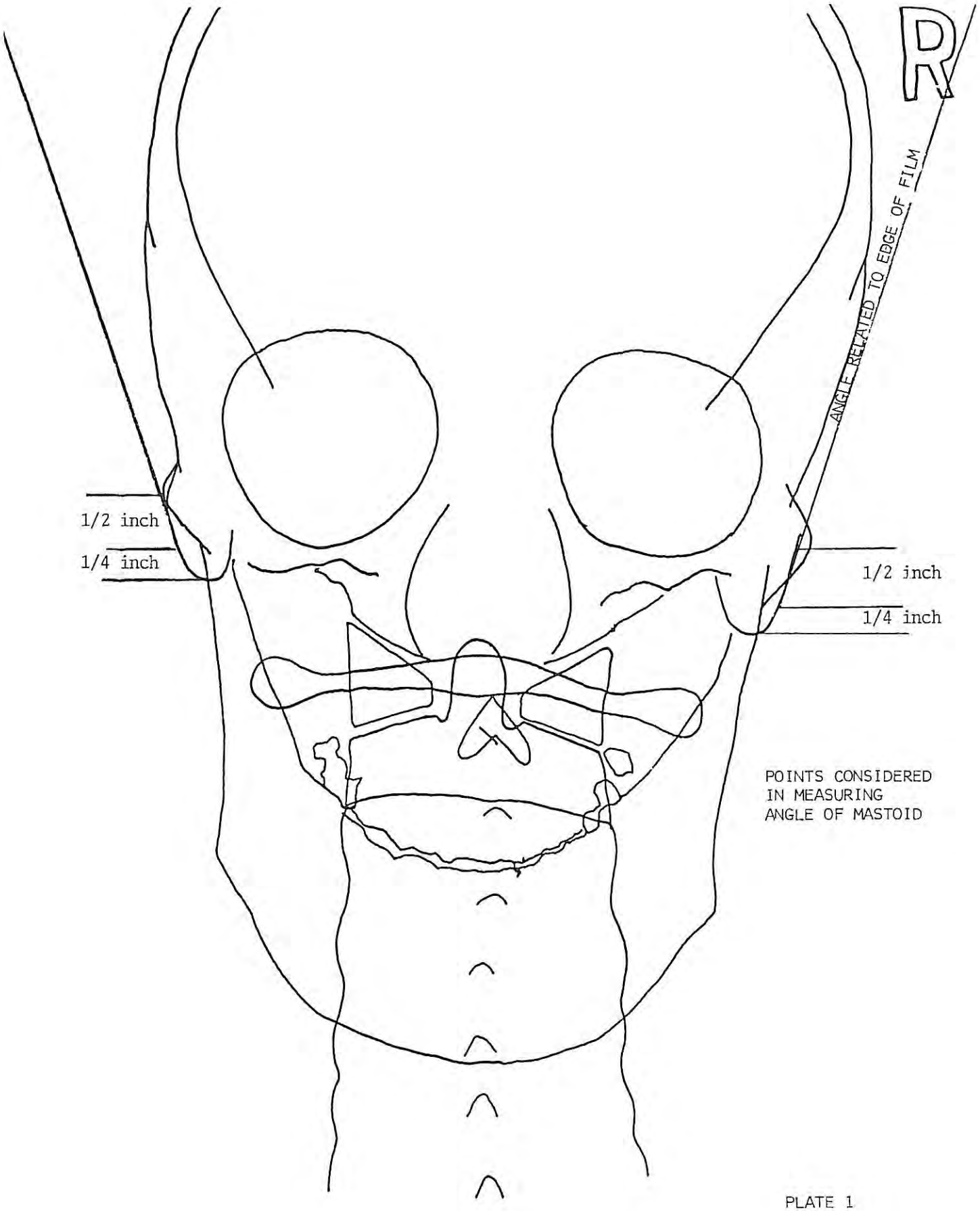

R
ANGLE RELATED TO EDGE OF FILM
1/2 inch
1/4 inch
1/2 inch
1/4 inch
POINTS CONSIDERED
IN MEASURING
ANGLE OF MASTOID

PLATE 1

CASE NUMBER	RIGHT MASTOID IN DEGREES	LEFT MASTOID IN DEGREES
6894	18.5	21.5
7139	22.0	21.5
7145	18.5	26.5
5070	22.0	21.0
7614	22.0	23.0
7371	24.0	26.0
7355	23.0	25.0
7797	23.0	26.0
7752	24.0	26.0
7599	21.0	22.5
7547	25.0	24.0
6831	25.5	23.0
281	26.0	23.0
7886	22.5	26.0
7881	20.0	25.0
7625	21.0	24.0
7490	20.0	25.0
2544	18.0	26.5
1541	24.0	23.0
1438	20.0	20.0
7413	19.0	19.0
6671	21.0	22.0
4802	19.0	22.0
7414	21.5	24.0
2104	21.0	21.0
7231	23.0	27.0
7639	17.0	23.0
1272	23.5	22.5
7887	24.0	23.0
1446	23.0	26.0
4467	23.0	26.0
7627	26.0	23.0
2074	18.0	21.0
7711	19.0	27.5
4670	26.0	23.0
7431	24.0	24.0
3368	19.0	22.0
6784	23.0	26.0
7305	22.5	26.0
7259	23.0	22.0
7857	26.0	24.0
7638	29.0	21.0
4181	27.0	22.0
4542	21.0	26.0
3151	20.0	24.0
5959	26.0	23.0
7545	23.0	22.0
7486	23.0	26.0
6872	26.0	25.0
7710	20.0	21.0
4342	24.5	23.5

CASE NUMBER	RIGHT MASTOID IN DEGREES	LEFT MASTOID IN DEGREES
7861	20.0	27.0
2203	25.0	20.0
7408	24.0	23.0
7899	20.0	23.0
7858	26.0	22.5
7141	20.0	22.0
7710	21.0	20.0
7217	22.0	25.0
6617	18.5	23.0
7649	27.0	24.0
7247	22.0	26.0
6470	26.0	23.0
6537	24.0	18.5
3159	21.5	23.5
7656	23.0	22.5
7384	20.0	24.0
6215	26.0	24.0
5565	25.0	22.5
7668	22.5	22.0
6339	21.0	22.0
7280	22.0	21.0
2064	19.0	20.0
6029	23.0	22.0
7657	22.5	19.0
7715	25.0	22.0
4126	19.0	26.0
6385	22.5	26.0
7406	22.0	24.0
7122	26.0	26.0
7229	26.0	23.0
7654	27.0	24.0
7202	25.0	24.0
4764	25.0	25.0
7657	27.0	18.5
7766	23.0	25.0
4987	23.5	23.0
7378	22.0	25.0
7355	23.0	24.0
7708	20.0	18.0
7445	18.0	25.5
7283	27.0	24.0
7582	22.0	23.5
7782	18.0	22.0
7366	20.5	26.0
2607	26.0	24.5
7583	21.0	20.0
7267	21.0	19.0
7220	24.0	18.0
7482	25.5	19.0
7772	20.0	16.0
3570	22.0	25.0
6052	25.0	24.0

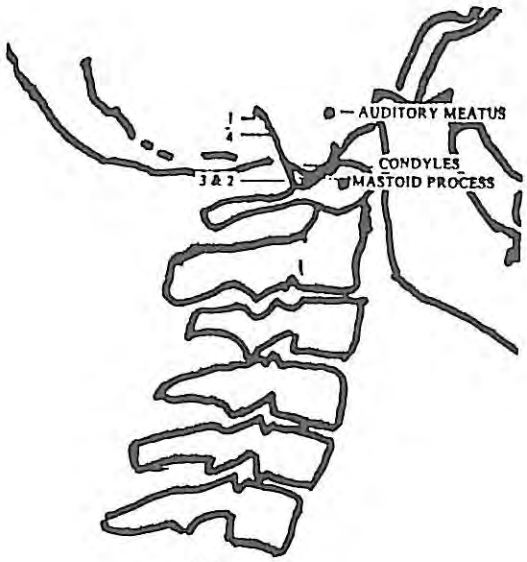


Figure 15
Headpiece Placement Scale

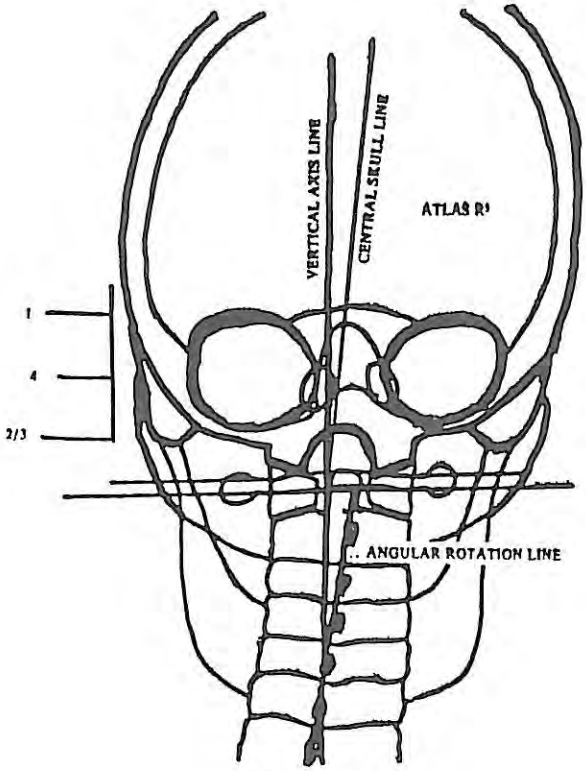


Figure 16
Fourth Basic Type

Taken from The NUCCA Advanced Course: Biomechanics, 1987

Plate III

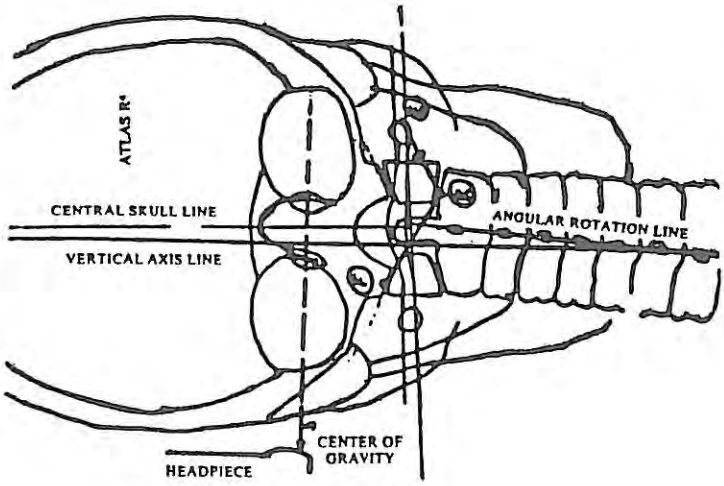


Figure 19
First Basic Type
Positioned on Headpiece

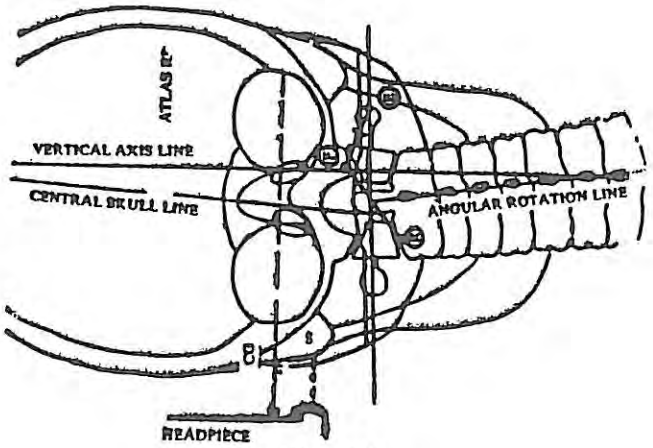


Figure 21
Second Basic Type
Positioned on Headpiece

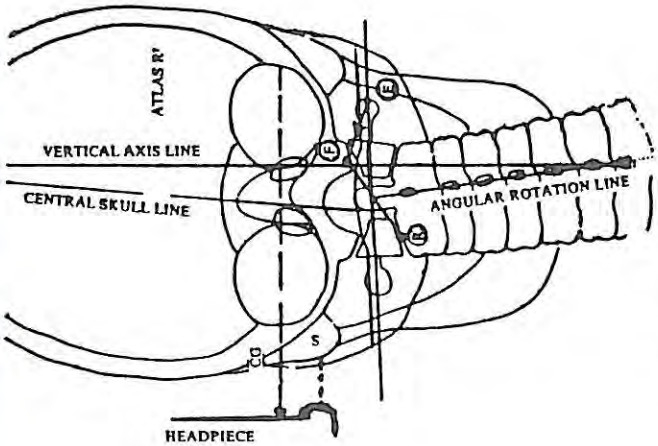


Figure 23
Third Basic Type
Positioned on Headpiece

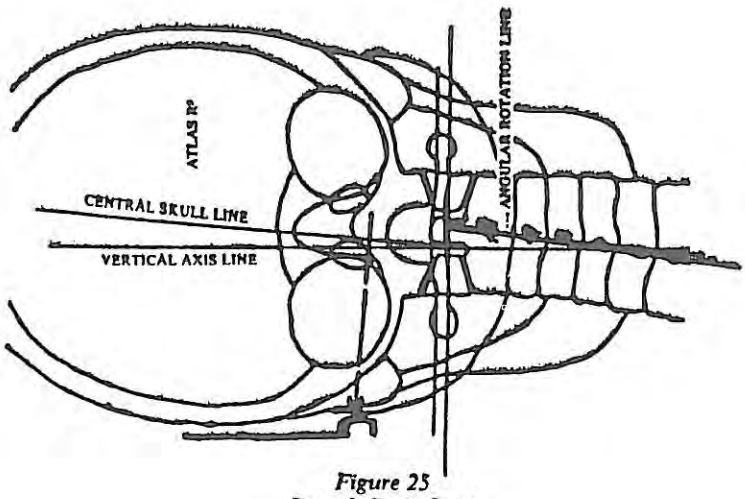


Figure 25
Fourth Basic Type
Positioned on Headpiece

Taken from The NUCCA Advanced Course: Biomechanics, 1987

Plate IV

Standards: Patient Safety and Terms of Acceptance

NUCCA Chiropractic Practice Classification:

The NUCCA chiropractic practice is a limited, primary health care profession.

NUCCA chiropractors may receive patients directly, without referral from another provider.

The NUCCA chiropractic practitioner's responsibility and authority are limited to the anatomy of the spine; The condition of the vertebral subluxation, and a scope of practice which encompasses addressing the vertebral subluxation as well as educating patients and advising them about the subluxation.

As members of a limited, primary profession, NUCCA chiropractic practitioners have the responsibility to determine the safety and propriety of applying their methods of analysis and adjustment to their patients; to recognize and appropriately deal with emergency conditions as described by the International Red Cross; and to report to the patient any non-chiropractic findings the chiropractor considers unusual discovered during the course of locating and characterizing the vertebral subluxation. The limited nature of the profession dictates a responsibility and authority requiring the NUCCA chiropractor, in the interest of safety, to refrain from offering advice, diagnosis, prognosis, or treatment of non-chiropractic findings, while continuing to address the chiropractic needs of the patient.

NUCCA Chiropractic Practice Objective: The professional practice objective of a NUCCA chiropractor is to correct the vertebral subluxation in a safe and effective manner. The correction of the subluxation is not considered to be a specific cure for any particular symptom or disease. It is applicable to any patient that exhibits a vertebral subluxation regardless of the presence or absence of symptoms or disease.

Managing the patient to a biomechanical conclusion far exceeds patient management based on symptomatic relief. Monitoring the patient's progress with x-ray analysis and instrumentation objectively identifies the success or failure of the NUCCA practitioner to restore normal form and function. It objectively identifies maximum improvement and residual impairment.

Recommendations:

A. **Case History**

The NUCCA chiropractor shall compile a Case History to elicit information to assist in the administration of safe and effective care.

B. **Chiropractic Analysis**

The NUCCA chiropractor shall perform a Chiropractic Analysis for the determination of the presence and character of the vertebral subluxation.

C. **Chiropractic Findings**

The chiropractor shall inform the patient of chiropractic findings.

D. **Unusual Findings**

Findings considered unusual by the NUCCA chiropractor, both related and unrelated to the vertebral subluxation, which present in the course of chiropractic analysis should be recognized and recorded.

E. **Report of Findings**

The patient must be informed of unusual findings related and unrelated to the vertebral subluxation. This includes information about which the NUCCA chiropractor does not offer advice, assessment of significance, diagnosis, prognosis or treatment for such findings, while continuing to address the chiropractic needs of the patient. The patient's acknowledgment of such findings must be recorded.

F. **Plan of Care**

The patient must be provided with a description of a plan of care for addressing the chiropractic findings.

G. **Referral**

a. **Intraprofessional Referral:**

1) The NUCCA chiropractor should refrain from further care when the atlas subluxation is not being reduced and either consult with or refer the patient to another NUCCA chiropractor who, by virtue of ability or experience, may more effectively address the patient's atlas subluxation.

b. **Interprofessional Referral:** In the delivery of NUCCA chiropractic care, a practitioner may encounter findings which are outside the professional areas of scope, responsibility, or authority to address. The NUCCA chiropractor has a responsibility to report such findings to his/her patient, and record their existence. Additionally, the patient should be advised that it is outside the responsibility and scope of the NUCCA chiropractic practitioner to offer advice, assessment of significance, diagnosis, prognosis, or treatment for said findings and that, if the patient chooses, he/she may consult with another provider, while continuing to have his/her chiropractic needs addressed.

H. **Terms of acceptance**

The NUCCA chiropractor should establish the Terms of Acceptance, constituting an informed consent of a general nature which benefits both the patient and the NUCCA chiropractor. This agreement provides the patient information upon which to base his/her decision to accept care. Included in the agreement are the NUCCA chiropractor's areas of responsibility and authority; professional objective; main area of interest; limitations and other areas. These topics adequately convey the reasonable benefits available to the patient and engender a proper patient expectation. The patient acknowledges an understanding of these concepts prior to the initiation of care. It is highly recommended the Terms of Acceptance should be recorded.

My Life With Chiropractic

Addendum to Vol. 5, No. 6

By Dr. Mary E. Madden

I first met Dr. Grostic over 40 years ago in Ann Arbor, Michigan. My husband and I had traveled from Texas to Ann Arbor to attend a Grostic seminar and to obtain chiropractic care from Dr. Grostic. This encounter was a dream come true, one I had looked forward to from the first time I had ever heard about Dr. Grostic and his fabulous adjustment and technique! At last I was to be adjusted by him. I remember being very excited just getting to meet him.

First, I want to give you a little history about my experiences before I heard of Dr. Grostic. At the age of eleven, I developed TB and was on a "rest" cure, which meant that I stayed in bed most of the time. I had to live in a high, dry climate, and if lucky enough, I would get well and have a normal life, within bounds. During my high school years, I went to class for half of the day and stayed in bed most of the remainder of the day. At age fifteen, I caught the mumps. I also relapsed with them. The medical doctor told my mother that the mumps had settled in my female organs, and I would be sterile. Because of the cramping and pain, he had me take two aspirins every two hours. Two days later, I was still taking the aspirins waiting for the pain to stop. Additionally, the heating pad across my stomach had caused large blisters.

The rest of my family had been under chiropractic care for various complaints, so Mom asked the chiropractor if he had any suggestions for me. He told her to try chiropractic for my troubles. Well, he came to our house and checked me with an NCM instrument. Then he had me taken by ambulance to his clinic where I was x-rayed. He read the pictures and adjusted my neck, and within about five minutes, the pain was gone! The next week, I returned to high school half days. My chiropractor was Dr. L. Grupe of San Angelo, Texas. He was a close friend of B. J. Palmer. This was the beginning of my life with chiropractic and of my eventual meeting with Dr. Grostic.

When I was eighteen years old, my stepbrother, whom I was extremely close to, decided to go to Palmer School of Chiropractic and become a chiropractor. About a year before that, I had asked Dr. Grupe if there were many women in chiropractic. He told me that there were a few. So when my brother decided to go, I decided to go, also. We graduated from PSC in 1940, and with Dr. Grupe's influence, we were accepted into the B. J. Palmer Research Clinic. We interned at the clinic for six months and gained some of the most important experience of our lives. We then returned to Texas. My brother set up practice in Corpus Christi, and shortly thereafter, I joined him in his practice. By 1943, I had met and married a young marine who planned on becoming an M.D. after the war. Instead, he became a chiropractor!

While he was studying at PSC, we heard of this new technique that had been developed by young Dr. Grostic in Ann Arbor, Michigan. Many tales were told of the miracles that he performed. I wanted to know about it. It was an Atlas Adjustment, just like HIO, but it didn't hurt. I liked that idea. I promised myself that if I ever got the opportunity, I would go see this doctor and see if he could help me and possibly teach us what he did so that we could help others. Neither my brother, my husband, nor myself, had ever had an adjustment other than HIO.

Several years and two babies later, my husband and I got the opportunity to meet Dr. Grostic. Finally I was in his office looking at this tall, very serious young man, probably in his late 30's or early 40's. He had beautiful hands. I remember them as being thin, with long fingers, and well shaped. He went right to work, checking my spine with an NCM or neucalometer. He then did the leg check and x-rays. As I remember, he had me come in the next day for my first adjustment. When he began to adjust me, I thought something was wrong. He had me on the opposite side from the usual way, and I asked him about this. I had always had an ASLA listing, but he explained that my atlas had gone to the right and posterior! I didn't understand how this could occur until many years later when I recalled a certain event and realized that that would be a logical reason for my listing to change. Anyway, when Dr. Grostic adjusted me the first thing I noticed was that it really didn't hurt. The adjustment was as light as a feather, which was very different from HIO. I was so relaxed from the adjustment that I dozed off while still on the adjusting table. This was the beginning of a new way for me to care for people because this was great. I continued to be checked, although I don't remember if I was adjusted again. I know that I was post x-rayed, which as far as I could remember had never been done with HIO. Until we left to return to Texas, we continued to be checked and to learn more of this technique. After we returned, we began to practice the Grostic technique in our office. Many young chiropractors throughout Texas also began to learn Grostic, and eventually we, the Grostic practitioners, began holding monthly meetings all over the state. During these meetings, we would practice the Grostic techniques, as well as learning about Grostic so as to practice it better. All of this occurred during the 50's and 60's.

My husband died in 1965, and during that same year, I began using the NUCCA technique. Between Dr. John Clark and the NUCCA seminars, I learned this technique and have been practicing NUCCA ever since. I am still in practice in Corpus Christi, Texas. One of my sons, David Madden, also became a chiropractor. He learned the NUCCA technique, but now teaches at Life College in Marietta, Georgia. There, among others, the Grostic technique is still taught.

NUCCA NEWS
Published by THE NATIONAL UPPER CERVICAL CHIROPRACTIC ASSOCIATION, INC.

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Dr. Vince Fitzpatrick Receives NUCCA Certification

The NUCCA Board of Directors take pride in announcing that Dr. Fitzpatrick has completed all requirements for certification. Dr. Fitzpatrick is a long standing member of NUCCA.



Dr. Vince Fitzpatrick

I graduated from Palmer College of Chiropractic June 14, 1975 and entered into an associateship with my older brother, Dr. James Fitzpatrick, in Issaquah, Washington on June 15 of 1975. We were both using the Pettibon system at that time. Shortly after entering practice with my brother, Dr. Ed Stein introduced us both to the NUCCA technique via Dr. Al Berti's excellent results on him and other Washington chiropractors. We were both very impressed and took the basic work in the fall of 1975. In June of 1976, I started my own practice in Greenacres, Washington, a suburb of Spokane. I discontinued taking the NUCCA seminars around 1980 and then returned in 1990 hoping to find answers for my 5 year old daughter's problem neck. I was excited to see the advances in the work since my last seminar which included classification of the subluxation into the 4 basic types, center of gravity studies of the skull, a new headpiece, and biomechanical advances. With all this new information and very little experience working with it at that time, I chose to refer Mandy to Dr. Berti. Dr. Berti has done a wonderful job of reducing Mandy's subluxation and in the process talked me into going through certification.

I am very grateful for certification because it put me in a position where I had to advance. Because of those advancements, not only my family members are receiving better adjustments but also all the patients in my practice. It has made a huge difference!

Thank you, Dr. Berti, all the NUCCA instructors and the NUCCA organization in general.

NATIONAL UPPER CERVICAL CHIROPRACTIC ASSOCIATION, INC.

A NON-PROFIT CHIROPRACTIC ORGANIZATION
APPLICATION FOR MEMBERSHIP

I hereby apply for membership in the NATIONAL UPPER CERVICAL CHIROPRACTIC ASSOCIATION, INC. (NUCCA):

- ☐ **ACTIVE MEMBERS: In Practice Over 2 Years:** Dues $100.00 per year.
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Members will receive a 10% discount on all NUCCA supplies.

LIFETIME MEMBERS shall be Active Members who pay lifetime dues to NUCCA and shall have all of the rights and privileges of Active Members.

ACADEMIC MEMBERS shall be members of the faculty, research department, or administration of chartered colleges or universities who are in good standing and have paid annual academic dues. Academic Members are entitled to attend NUCCA membership meetings and to address the assembly, but are not able to make motions, vote, or hold elective office.

STUDENT MEMBERS shall be chiropractic students who have applied to or are actively enrolled in a charter college or university of chiropractic who have paid annual student dues. They are entitled to attend NUCCA membership meetings and to address the assembly but are not eligible to make motions, vote, or hold elective office.

SUPPORTIVE MEMBERS shall be NUCCA friends, family, and patients who desire to contribute dues and/or other gifts for the advancement and support of NUCCA. They are entitled to attend NUCCA membership meetings and to address the assembly but are not eligible to make motions, vote, or hold elective office.

RETIRED MEMBERS shall be former Active, Academic, or Supportive Members who have achieved retirement and who wish to retain membership in their previous category. Retired members are excluded from holding office.

HONORARY MEMBERS are persons other than student or graduate chiropractors who have demonstrated outstanding devotion and service to NUCCA. Honorary Members shall be recommended by a member of NUCCA and elected by a majority vote of the Board of Directors. They shall not pay dues, be entitled to vote, or hold elective office.

1996-97
NUCCA Directory

The NUCCA directory will be published following the May Convention. The directory contains the names, addresses and phone numbers of Doctors who have paid their annual dues. With the exception of Certified Doctors, this directory makes no attempt to qualify individual expertise or right to practice Chiropractic in any jurisdiction. Contact the NUCCA Executive Secretary regarding any corrections, omissions, or deletions. Directory information is due by April, 1996. This directory will be published every May.

NUCCA Certification

A certification program has been initiated by the National Upper Cervical Chiropractic Association, Inc. (NUCCA). The purpose of the program is to NUCCA-qualify doctors in the NUCCA work and establish a set of standards for all NUCCA doctors to maintain. Doctors who successfully complete the program will be eligible to qualify as instructors in the NUCCA procedures. Examinations will be given at NUCCA seminars and conventions. Doctors who desire to take the examinations must make application to the certification committee one month prior to the seminar or convention date.

Doctors who wish to be NUCCA-certified must meet the following prior conditions: (1) be in practice for a period of at least three years; (2) have possession of, or access to, equipment and instrumentation recommended by NUCCA; and (3) permit NUCCA inspection of their office facilities. The entire examination must be completed within a three year period. Certificates will be issued to successful candidates.

Doctors who have not engaged in practice for three years but who have attended NUCCA seminars are eligible to take the examination or examinations which cover a three year period. A fee is charged for each examination. There are three examinations which must be passed in order to become certified. In the event of failure of the examination, or any part thereof, the candidate is re-examined on the part of the examination that is failed without paying an additional fee, provided re-examination takes place within a one year period.

Certification will be evaluated every three years and certified doctors will be requested to either take an oral examination and update data or provide evidence that they have attended a NUCCA seminar at least once each year.

The examination is in three segments, as follows:

1. X-RAY AND INSTRUMENTATION
   - A. Understanding of X-ray alignment procedures
   - B. Theory about distortion, magnification, collimation
   - C. Produce five sets of consecutive pre-cervical X-rays suitable for analysis
   - D. Submit a set of X-ray alignment films as designated by NUCCA X-ray outline
   - E. Examination on X-ray procedures
   - F. Examination on instrumentation

   Parts A and B are a written examination composed of one hundred questions with a passing grade of 85. The practical portion, Parts C, D, E, and F cannot be taken until the written part is successfully completed.

   The fee for Segment 1 is fifty dollars and must be included with the application.

2. FILM ANALYSIS, BIOMECHANICS AND ADJUSTING
   - A. Knowledge of osseous structures, biomechanics and adjusting. Written examination of 100 questions. Passing grade of 85.
   - B. Submit five consecutive pre-sets of analyzed cervical spinal X-rays. The analysis must be the analysis outlined by NUCCA. The X-ray analysis must pass an inter-observer reliability of .90.
   - C. Examination of film analysis.

   Parts B and C can not be submitted or taken until Part A is passed. X-ray sets from Segment I cannot be submitted for Segment 2.

   The fee for Segment 2 is one hundred dollars and must be included with the application.

3. ADJUSTING
   - A. Submit ten sets of consecutive pre and post cervical X-rays. The post X-rays presented to the examining board should be those taken after the initial adjustment. Reduction in the misalignment factors must be 85% or better. Reduction in cases of gross or normal misalignment factors to be evaluated at the discretion of the examining board.
   - B. Submit an outlined work-up for each of the above set of X-rays. The work-up outline is to be requested from the examining board.
   - C. Oral examination in which the candidate is given various listings for which he is to explain reduction procedures.

   The ten sets of X-rays submitted cannot be X-ray sets from Segments 1 and 2.

   The fee for Segment 3 is one hundred dollars and must be included with the application.

Each Segment must be successfully completed before application can be made for the following Segment examination.

Application for certification examinations must be submitted one month prior to seminar or convention date to:

Dr. Albert Berti
200 - 3825 Sunset Street
Burnaby, B.C., Canada
V5G 1T4

NUCCA CERTIFICATION EXAMINATION

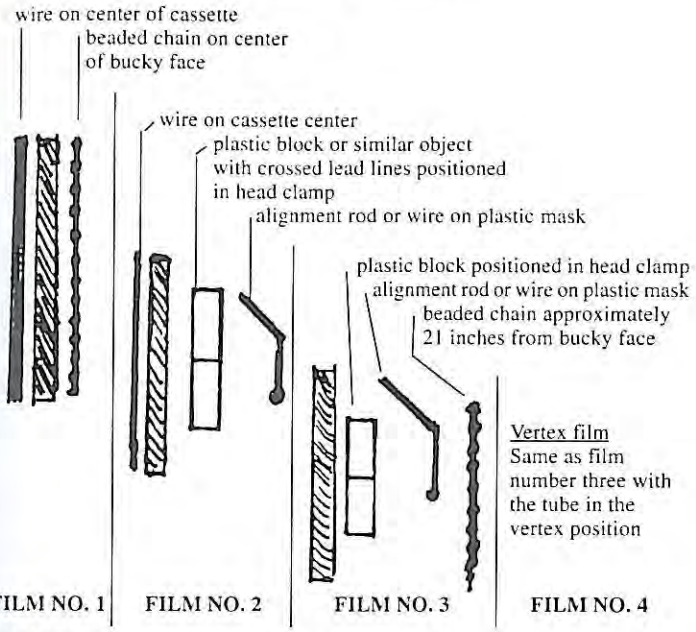
SEGMENT I

PART A: A written examination composed of one hundred questions with a passing grade of eighty-five. The examination will address understanding of X-ray alignment procedures, theory about distortion, magnification, collimation, X-ray analysis and basic biomechanics.

PART B: (cannot be submitted until Part A is successfully completed).

Submit five sets of consecutive pre-cervical X-rays suitable for analysis.

Submit a set of four alignment films (three nasium views and one vertex view). Refer to drawings below.



SEGMENT II

PART A: A written examination composed of one hundred questions with a passing grade of eighty-five. The examination will address: advanced biomechanics, X-ray analysis, adjusting mechanics and osseous structures.

PART B: (cannot be submitted until Part A is successfully completed).

Submit five sets of consecutive pre X-rays. The X-rays are to be analyzed and marked as illustrated on the drawings on page 37.

SEGMENT III

Ten sets of consecutive pre and post X-rays are to be submitted to the certification committee. The post X-rays are to be the X-rays taken following the initial adjustment. All X-rays should have the date imprinted on the films. Hand printed dates on the films are not acceptable. All X-rays are to be marked as illustrated on the drawings on page 5.

Within the ten sets of submitted X-rays, the workup listed below must be completed for one Type One subluxation, one Type Two subluxation, one Type Three subluxation and one Type Four subluxation.

1: List the Basic Type of subluxation and give its characteristics.

2: How is laterality produced and why that factor is significant.

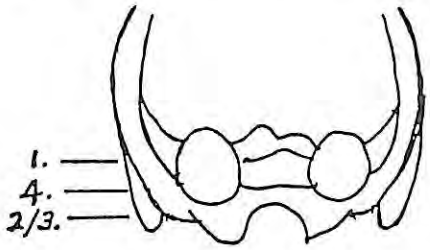
3: List the resistances encountered and how to overcome them.

4: Explain the lower cervical angular rotation pattern and the frontal plane the rotation is in.

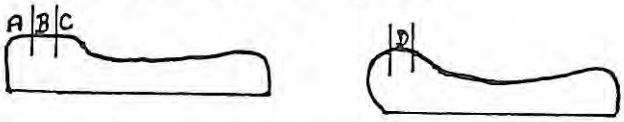
5: Explain the type of mastoid support to be used and why.

Round  or Square 

6: What portion of the mastoid or skull will be placed on the mastoid support: (1), (2), (3), or (4), (refer to drawing).



7: What portion of the mastoid or skull (1), (2), (3), or (4) (see drawing question #6) is placed on the mastoid support areas (A), (B), (C), or (D). Explain why.



8: Which headpiece angle will be used in each case.

(A)  or (B) 

9: Did you change the adjusting vector and if so, why.

10: What do you think the predominant factor is and why.

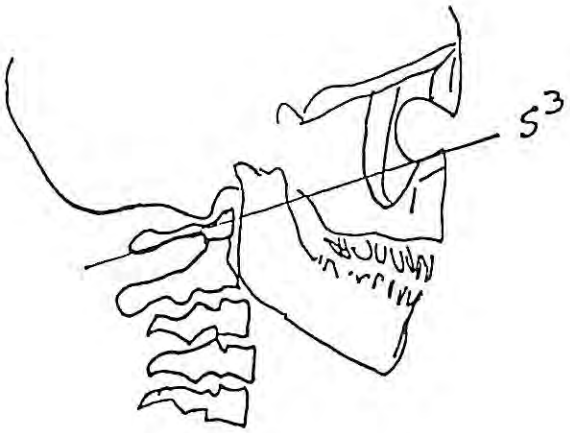
11: Based on your pre and post findings would you expect the pattern to remain stable or change. Explain briefly.

12: Based on your pre and post X-ray findings would you change the headpiece placement or the adjusting vector in order to achieve a higher degree of correction.

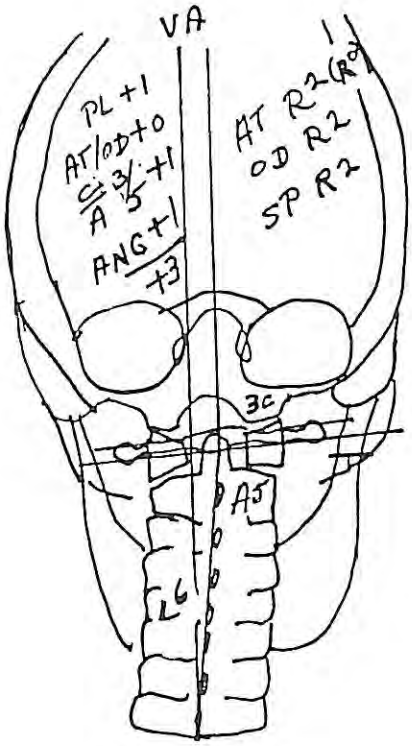
13: In comparing your pre and post X-rays, do you feel the patient X-ray placement was accurate. If not, explain.

14: Based on the pre and post X-ray analysis and the objective findings, when do you think a repre X-ray is necessary.

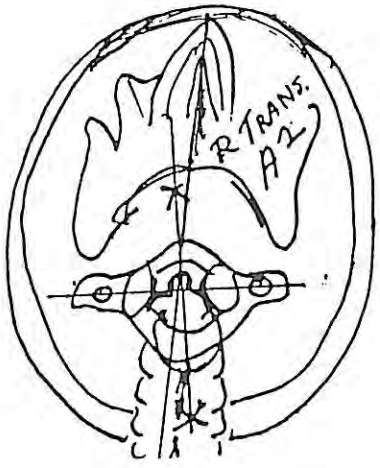
Drawings illustrating X-ray markings.



The S or I factor is to be marked on the lateral film.



The misalignment of C1, odontoid of C2 and spinous of C2 are to be marked as illustrated, i.e. in the frontal plane in which the excursion has occurred. The plane line, At/Od, C/A and angle factors are to be marked and added on the opposite frontal plane. If the head is tilted or turned away from the vertical axis it should be marked on the film.



The excursion of C1 in the transverse plane is to be marked as illustrated.

A.U.C.C.O. Centennial Event

By Dr. Michael Thomas

October 20-23, 1995, saw the inaugural gathering of The National Upper Cervical Chiropractic Association, The Society of Chiropractic Orthospinology, and The International Atlas Orthogonality Society under the auspices of The Academy of Upper Cervical Chiropractic Organizations. These three organizations all met at the Sheraton Gateway Hotel for their respective Fall Conferences. In addition, on Saturday, all three groups met together for presentations by representatives from each organization.

First to speak was Dr. Albert Berti. Dr. Berti has been a Board Member of NUCCA since 1967 and has been President of The National Upper Cervical Chiropractic Association since the death of Dr. Gregory in 1990. Dr. Berti graduated from Palmer in 1956 and maintains a practice in Burnaby, British Columbia.

Next to speak was Dr. Craig York. Dr. York is Vice President of the Society of Chiropractic Orthospinology. He is also Editor of the Orthospinology Newsletter, "Atlas". Dr. York is a 1989 graduate of Life and maintains a practice in Little Rock, Arkansas.

Last to speak was Dr. Fred Vogel. Dr. Vogel is the founding President of the Roy W. Sweat Foundation and President of the International Atlas Orthogonality Society. Dr. Vogel is a 1973 graduate of Palmer. Dr. Vogel maintains a practice in Eastpointe, Michigan.

Saturday evening, the Academy hosted a banquet for all participants. Dr. Jill Bradshaw spoke movingly of her deceased husband and mentor to so many, Dr. John Grostic. Dr. Hal Crowe, President of the Academy of Upper Cervical Chiropractic Organizations also addressed the gathered participants and urged each doctor to become a member of the Academy and help create a voice for this work in the chiropractic profession and in the world at large.

Sunday morning brought two featured speakers. Dr. Ed Owens, Research Department, Life College, spoke about the results of the first joint study sponsored by the Academy which involved a blinded x-ray analysis reliability study. Dr. Thomas Kleinmann, a diplomate of the American Board of Chiropractic Neurology, in private practice in Gainesville, Florida, spoke on "Challenges for the AUCCO". Dr. Kleinmann encouraged individual practitioners and the groups represented to facilitate the education of twenty chiropractic neurologists over the next five years. He noted that a group of twenty chiropractic neurologists who practice in the Grostic tradition could not only develop a balanced awareness of the pertinent published research but also create a powerful voice within the profession.

This first exercise in reconnecting the three organizations who practice in the Grostic tradition was very successful. Each organization will maintain its own autonomy. The success lies in having 220 doctors together all of whom recognize the deleterious effects of the atlas subluxation complex syndrome; who recognize the power of the corrective adjustment; who together create a voice with the potential to be heard.

1996 NUCCA Fall Seminar

The Fall Educational Seminar will be held Friday, October 18, Saturday, October 19, and Sunday, October 20, 1996, at the Hyatt Regency Woodfield, Shaumburg, Illinois.

Basic and Advanced classes will be taught, with special emphasis on adjusting, biomechanics, and x-ray analysis.

Palmer College will co-sponsor the event, with license-renewal CEU's applied for in most states.

In Memoriam



Dr. Kazuo Nakano
(August 9, 1920 – December 23, 1995)

The passing of Dr. Kazuo Nakano on December 23, 1995, marked the close of a forty year outstanding career in chiropractic. Dr. Nakano began his practice in 1955, with his son, Dr. Steven Nakano, joining him in 1989.

Kazuo Nakano was born August 9, 1920. He graduated from San Pedro High School in 1939. He attended California State Polytechnic in San Luis Obispo where he majored in electrical engineering. Kaz's studies were interrupted by World War II, when his family self-evacuated. Kaz was sent to Poston Camp II block 226. One year later he relocated to Chicago, Illinois, where he worked in a camera shop.

In 1949 he returned to Palos Verdes to work on his father's farm. As the oldest son, Kaz was to assume the operation of his family farm, but a childhood accident prevented it. The physical requirements of farm labor aggravated an injury he sustained when he was struck by a school bus. As a young man Kaz sought the help of a chiropractor, Dr. Freeland, in Los Angeles. His personal success with chiropractic motivated him to attend Palmer Chiropractic College in Davenport, Iowa. In 1955 he started his practice on Western Avenue in Gardena, California. In 1961 he married Junko Tawa, (June).

Dr. Nakano attended the Grostic Technique Seminars in Ann Arbor, Michigan. He became an early supporter of the NUCCA – NUCCRA organizations. Kaz attended every convention and seminar until his death.

Dr. Haruo Iwo, in his eulogy, wrote that Kaz was a wise and gentle teacher. He was a mentor in the purest sense of the word – not as a friend – not as a father, but as a wonderful example. Dr. Nakano was a quiet leader, by example. He will remain in our memories, as an example to emulate, and a professional dedication to equal. We will miss him greatly. To his wife June and his son Steven, The NUCCA – NUCCRA Organization extend their heartfelt sympathies.