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Research Update

During the seminar Dr. Seemann reported on two research projects which are in progress. A synopsis of the two projects follows.

EMG Study

A review of biofeedback equipment was given and specific information about the EMG was discussed. Historically the EMG has been used since the early 1950s. The EMG measures motor activity of the muscles in physical units called millivolts. If a muscle is stressed, a higher reading is recorded. A muscle at rest varies but usually record between 1-3 millivolts.

The NUCCA problem is that we know how to reduce the C1 subluxation fairly efficiently but we have not explained the relationship between the biomechanical component and the neurological component. The literature suggests there is a relationship. Magoun (1968) has demonstrated that the central reticular formation of the brain stem exerts influence both on the ascending and descending connections from the cortex and the more cephalic of these connections facilitate motor discharge. Neural imbalance in the extra-pyramindal motor tracts is thought to cause spasticity. Williams (1976) notes that 55% of all pyramindal tracts fibers end in the cervical region which has important implications where there are deviations in the boney structures in that region.

The Anatometer studies have also contributed to our knowledge about the relationship between the neurological and biomechanical. The 1978 study concluded there was a causal relationship between a C1 subluxation, short leg and pelvic distortion.

But a need for closer observation remains and with the sophistication of the EMG equipment and the ability to measure muscle stress it was decided to initiate a study which could directly measure the muscle groups involved in

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Research Update

By Jim Palmer, M.S.

The goal of NUCCRA research is to achieve a thorough knowledge and understanding of the Atlas Subluxation Complex (ASC). The NUCCRA research team realizes that this goal can be achieved only by the rigorous application of scientific principles and methods. Well-tested, leading-edge electrical and electromechanical technology is expected to significantly aid the efforts of the research team.

As stated in the previous Monograph NUCCRA is purchasing a 24″ by 24″ Cal Comp 9000 Series Digitizer. Because the processing unit is being integrated into the digitizer, the expected arrival date has been changed from March to August. In conjunction with the purchase of the digitizer, the RAM memory of the NUCCRA Rainbow Series 100 Computer is being expanded to 320K, with potential for expansion to 832 K. The digitizer/computer system should enable the radiologist and other professionals skilled in anatomy and x-ray analysis to ascertain by a reproducible and analytical method that the NUCCRA chiropractic adjustment results in changes in the relative anatomical positions of selected anatomical features such that the anatomical symmetry is maximized.

Work is progressing on the development of a modified anatometer that would be capable of indicating whether or not a patient's weight is equally distributed on both feet. After the patient's weight is determined to be equally distributed conventional anatometer measurements would be taken. Sensitive scales and foil strain gauges (load cells) are under consideration for use as sensing elements. Foil strain gauges would allow a maximum total force of 400 pounds and would be capable of achieving +0.1 lb accuracy.

A leg-check prototype is being designed that will provide a working definition of the short leg. This analytical instrument will provide meaningful data for correlation with the four basic types and with the anatometer measurements. Also it will provide leg-length difference vs time data for an individual patient. Foil strain gauges capable of +0.01 lb accuracy are being considered to measure the applied forces. A linear variable differential transformer (LVDT) capable of measuring differences in leg length to an accuracy of +0.05 mm with a maximum range of 2 inches (50.8 mm) is being considered. An LVDT is an electromechanical transducer that produces an electrical output proportional to the displacement of a separate movable core.

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Research Update by Dr. Seemann

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the spastic contracture of the extensor muscles. The specific question in the study was: Will the spastic contracture of the extensor muscles reduce after a successful reduction of a C1 subluxation?

Triano (1983) reported that pre and post EMG measurements using a lift, produced changes in the EMG readings. The short leg produced the higher EMG reading. The absence of stress in the low back muscle group after a successful reduction should close the gap between the neurological component and the biological component.

The conclusions from the now completed pilot study indicate that NUCCA should proceed with a more comprehensive study. Preliminary findings show that except for one case all of the patients had a reduced EMG reading after an adjustment. This was true not only in the lumbar area but it was true for the thoracic and cervical regions as well. The new study will also be designed so the researcher who is measuring with the EMG will be blind as to whether the patient has been adjusted or not. The completion of the study is scheduled for sometime in the late fall.

Pelvic Biomechanics

As more information is produced by the Anatometer more questions are also raised. For an example, how is it possible to have a short leg when measured in the supine position and the patient is measured in the standing position on the Anatometer, the patient will have a hip that measures high on the side of the short leg which those who use an Anatometer record as a + rather than a –? One hypothesis is when the frontal plane is high on the side of the short leg then the transverse plane must be anterior thus pulling the frontal plane high to accommodate the anterior excursion into the transverse plane.

NUCCA's computer revealed the following data concerning the above question. There is no trend as to handedness. There are as many patients who have right short legs as left short legs. But the ratio between high plane lines to low plane lines on either side runs 60% low and 40% high. Forty-seven cases were examined where the short leg was in the right frontal plane and anterior. If the hypothesis was to be supported then a high plane line (+) should be found in the majority of these cases. The results did not support the hypothesis. Thirty cases had a high plane and 13 did not. There were 4 cases that had no plane line. On the left side, of 61 cases only 26 cases were plus (+), and 35 were minus (–).

The conclusion from this study are the following.

1. That one plane line does not seem to be dominant. The data does not support hypothesis that the transverse causes the frontal plane shift.
2. There are some physiological relationships we do not understand in the pelvic region.
3. We need to take a closer look at the center of gravity of the pelvis, using the frontal, transverse, and fixed point in combination with each other.

Research Update by Jim Palmer, M.S.

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Preliminary investigations are under way to design a teaching instrument that would be capable of providing force (direction and magnitude) and either distance (depth), velocity or acceleration data on the C1 adjustic process. The major purpose of the instrument would be to enable the chiropractor to get feedback (and therefore perfect) the C1 adjustic process. A secondary purpose of the instrument would be to provide research data on the triceps pull phase of the C1 adjustment. Devices being developed by other groups apparently yield only pressure information and not the direction of the applied resultant force. NUCCA adjustment procedures necessitate controlled forces (direction and magnitude) and a controlled depth.

NUCCA Certification Awards

Certificates were awarded at the NUCCA banquet, May 6, 1985 to Dr. Albert A. Berti, Burnaby, British Columbia, Canada, and to Dr. Glenn Cripe, Newport Beach, California, for successfully completing all sections of the three NUCCA examinations on X-ray and Instrumentation, Film Analysis, and Adjusting Technique. Doctors who qualify within a three-year period are entitled to teach the NUCCA basic work.

Dr. A. Berti (L) and Dr. G. Cripe receive NUCCA Certificates for passing NUCCA exams.

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Neurological Mechanisms of the Atlas Subluxation Complex

By Richard Cockwill

EDITOR'S NOTE: The following article, *Neurological Mechanisms of the Atlas Subluxation Complex*, was submitted by Richard Cockwill while a student at the Canadian Memorial College. Under the NUCCA scholarship grant-in-aid award, the author was awarded $200.00 for submitting an original and acceptable paper.

Introduction

The term Atlas Subluxation Complex (ASC) denotes the mechanical and neurological changes which occur as a result of occipital-atlanto-axial misalignment. This syndrome manifests itself as unilateral extensor hypertonia, contractured leg, pelvic distortion, and displacement of the body's center of gravity.[11] To maintain a biomechanically efficient posture, all of the body's mass must be equally distributed around the center of gravity of the supporting skeletal articulations, and muscular and ligamentous tension must be balanced.[16,17] The neurological aberrations created by the A.S.C. have shown to disrupt the flexor-extensor tone of the axial musculature resulting in unequal distribution of forces and distortion of body alignment. This paper reviews the structures and neurological mechanisms involved in the maintenance of an upright posture and possible ways in which upper cervical distortion may affect this balance. We will initially look at the proprioceptive organs responsible for informing the C.N.S. of the body's position in space. Next we will see how the neural integration and reflexogenic characteristics of the C.M.S. controls the delicate equilibrium necessary for upright posture.

Proprioceptive Organs

All the joints of the body enclosed within a synovial capsule are richly innervated by articular receptors of four basic types.[25] The joints which are richest in articular receptors are the apophyseal joints of the cervical spine. Both the capsule and surrounding ligaments contain receptor nerve endings which may act as either mechanoreceptors or nociceptors. The first three types of articular receptors are mechanoreceptors while the last type is nociceptive in character.

The type I mechanoreceptors are thinly encapsulated globular corpuscles embedded in the outer layers of the capsule. These receptors have a very low firing threshold, are slow adapting, and respond to even small increases in tension. The degree of response of these receptors is proportional to the degree and velocity of stretch so act as static and dynamic articular mechanoreceptors. These receptors respond more readily when a joint is moved from a position of rest as compared with returning to rest.[8] When stationary, the type I fibers have a constant discharge for approximately two to three minutes. The type II mechanoreceptors are thickly encapsulated nerve endings within the capsule and differ from the type I in that they are fast adapting. They are inactive in immobile joints and only fire briefly during joint motion. These behave primarily as dynamic mechanoreceptors. The type III mechanoreceptors are much larger, are located on the surfaces of joint ligaments, have a high threshold, and are slowly adapting. These receptors respond only when large increments of tension are applied to the joint.

The type IV receptors are unmyelinated nocioceptive nerve endings permeating the fibrous joint capsule. These receptors are normally silent but become active when irritated by abnormal chemical or mechanical stimuli.

Most intervertebral joints are supplied primarily by type I, II, and IV receptors. The type I receptors signal the direction, amplitude, and velocity of joint movement as well as its static position when at rest. The type II receptor informs the C.N.S. only that a movement has been initiated. These receptors have a collective, though not specific, influence on postural and locomotor patterns throughout the brainstem, cerebellum, and sensorimotor cortex. It has been said that a change in only two fifths of a degree in the upper cervical vertebrae is sufficient to cause an increase in afferent discharge of the articular receptors.[23]

Another receptor lying within the ligamentous structures is the golgi tendon organ. This receptor is activated by mechanical deformation from excessive tension on the tendon. Its Ib afferent nerve synapses on an inhibitory interneuron in the spinal cord and reflexly causes a decrease in muscle tension of that same muscle. These fibers act as a safety mechanism by reducing muscular tension when the load exceeds normal limits.

Another very important source of information for maintenance of upright posture is the vestibular apparatus or statokinetic labyrinthe. The otolith organs within the inner ear serve to inform the C.N.S. of static position whereas the semicircular canals function as detectors of angular acceleration. The information relayed to the brainstem via the eighth cranial nerve is a major source of input for the facilitory reticular formation. Labyrinthectomy (removal of inner ear) results in nystagmus, ipsilateral decrease in muscular tonus, and rotation and lateral flexion of the head towards the lesioned side. The visual and neck righting reflexes, to be elaborated on later, will remain unhindered but true orientation of the body to the horizon will not be possible. The principle function of the labyrinthe is to keep the head parallel to the ground by affecting the muscles of the neck.[22]

The optic system also has considerable input to the brainstem structures responsible for postural control. The information received from the eyes should coincide with the labyrinthe's information about the relation of the head to the horizon. A discrepancy between visual and labyrinthe afferentation may manifest itself as motion sickness. Integration of information between the proprioceptors of the cervical spine, the labyrinthe, and the optic system allows movement of the head while maintaining gaze on a fixed object. Stimulation of the cervical proprioceptors may elicit optokinetic nystagmus and function to either increase or decrease the equilibrating function of the optokinetic system.[13,15]

The muscle spindle is a sensory organ located within the muscle tissue. It is an encapsulated structure housing the nuclear bag and nuclear chain fibers responsible for transmission of afferent flow. It contains three types of contractile elements, four kinds of muscle end plate endings, and at least two types of receptor endings which can present in a variety of permutations and combinations. The muscle spindle functions to inform the C.N.S. of muscle length, tension, and velocity. As a sensory organ it influences the tension and length of the muscle through higher C.N.S. control. Most of the spindle's function is sub-conscious and reflex in nature. Where spindles are densely populated they are often found in complex conjunctive arrays that involve extensive sharing of intrafusal fibers and capsules. Spindle receptors are not evenly distributed throughout skeletal muscles. The highest densities of muscle spindles are found in the small muscles of the hand and small peri-vertebral muscles of the cervical spine. Both of these areas require finely tuned motor control in order to function precisely.[3] As many as five hundred spindles per gram have been found in the small muscles of the neck; however, the large muscles are less richly innervated. In these small intervertebral muscles, each spindle may have as many as eight to twenty-six nerve fibers supplying it.[3] It is, therefore, easy to realize that one-half to two-thirds of the dorsal and ventral nerve root consists of these small fibers.[19,24]

The muscle spindle is a sensing device in a complex stretch-activated servomechanism. This device can control the large amounts of power in the main muscle bulk by automatically controlling and correcting the performance of its motor function. Stretching the muscle mechanically deforms the nuclear bag and nuclear chain fibers of the spindle and activates the primary and secondary endings of the gamma afferent nerve. Both the primary and secondary (annulospinal and flowersray respectively) endings have a resting rate of discharge which may be modified by higher centers. The primary ending reports on velocity and stretch of a muscle while the secondary ending reports on the static length of the spindle. Both are sensitive to stretch, and fire at increasing frequency in proportion to the degree of stretch. The afferent fibers, once stimulated by stretch, synapse either monosynaptically and polysynaptically with alpha motor neurons. The influence of their discharge is excitatory. The efferent nerve then causes the extrafusal (main muscle) fibers to contract, returning the spindle to its pre-set resting length. This is the basis for the stretch or myotactic reflex. Shortening of the spindle results in a decrease in discharge and reduction of extrafusal muscle tone. The gain of the muscle spindle may be modified by higher centers by this gamma feedback loop. Gamma fibers synapse primarily on motoneurons directly controlling the same muscle or even to the muscles directly adjacent to the spindle itself. This allows for a high degree of precision and specificity of reflex regulation.

The balance between intrafusal and extrafusal muscles by the setting of the gain by higher centers will control the length and tension of any given muscles. Contraction of the intrafusal fibers increases the sensitivity and excitatory influence of the spindle. The higher the frequency of spindle discharge, the greater the reflex contraction of the muscle and the greater its resistance to being stretched. Spindles normally remain in a moderately facilitated state which may serve as a state of readiness. The gamma activity may be turned up or down from this basal level by higher centers. These centers also continuously adjust the gain of the spindle in accordance with the motions and positions which are volitionally and reflexly called for.[17] These stimulatory and inhibitory regions of the brain as well as most of the sensory receptors in the body can alter the motor supply to the spindle. This fact makes the spindle unique in that it is the only receptor organ which has an efferent supply that alters its sensitivity to its adequate stimulus.[6] Through this system, one can see that the muscular contractions, particularly that of involuntarily controlled postural antigravity muscles, can be kept at a constant strength.

Neural Integration

The processing of information from these four main sensory structures is accomplished by different areas of the spinal cord, brainstem, cerebellum, and cerebrum. The motor response in posture and flexor-extensor balance is mediated primarily by the spinal cord and brainstem.[18] As one progresses up the neuraxis, the capacity for sensorimotor integration becomes greater and more complex due to the large amount of afferent and efferent information to be processed. This fact can be demonstrated by the responses elicited from cats with lesions present at various levels of the C.N.S.

To elicit inherent reflexes of the spinal cord, a surgical transsection is made at the junction of the brainstem and spinal cord of a cat. This preparation effectively cuts off all higher influences and only the reflexes inherent to the spinal cord are left. These reflexes may be monosynaptic or utilize interneurons or fiber collaterals to cross over or ascend or descend several segments from their point of entry. The processing of afferent information consists mainly of divergence and convergence which is mediated by facilitory or inhibitory interneurons. Signal inversion, spatial and temporal summation, and recurrent loops and collaterals are all methods in which afferent information is processed. It can be seen, therefore, that considerable modification of the afferent information is achieved even before the signal reaches the brainstem. The spinal cord does not respond to discreet reports from individual receptors of one particular type but rather deals with total patterns collectively from the inputs of many reporting stations.

The reflexes present after surgical transsection of the brainstem and spinal cord are the flexion reflex (reflex of withdrawal from painful stimuli), the crossed extensor reflex, the scratch reflex, the stretch reflex (myotactic reflex), and a positive supporting reflex called spinal standing. The flexion reflex consists of a noxious stimuli applied to a limb and concommitant withdrawal of that limb from the stimuli. This reflex involves facilitation of flexor muscles and inhibition of extensor muscles to that limb. A crossed extensor reflex is the contralateral manifestation of the flexor reflex and serves to support the weight of the body when one limb is flexed away from painful stimuli. This crossed extensor reflex also plays an important part in the rhythmical control of walking. Long spinal reflexes are also present and coordinate forelimbs and hindlimbs in animal locomotion. The stretch or myotactic reflex is a proprioceptive reflex mediated by the muscle spindle.[10] This reflex serves a very important function in the maintenance of a standing posture since it causes the extensor and elevator muscles which are stretched under the force of gravity to contract in a smooth and regulated manner. This reflex, as previously mentioned, is initiated by a Ia afferent discharge which monosynaptically excites the extrafusal fibers of the same muscle. Abrahams et. al., however, have reported the apparent absence of monosynaptic reflexes in the dorsal neck muscles of the cat. These simple monosynaptic reflex loops are present in the extremities but are not present in the neck axial musculature. This suggests a more highly controlled system.[6,9] Further studies also showed that the stretch reflexes of the extensor muscles were more powerful and sustained than the flexor reflexes.[8] The extensor muscles are also more sensitive to stretch and only a slight amount is required to produce a reflex tension suitable to maintain an upright posture.

In the calssis experiment by Sherrington, an animal is rendered decerebrate by a transsection at the intercollicular level of the brainstem. The brainstem consists of the medulla, the pons, the midbrain (mesencephalon), and the thalmus (diencephalon). This area of the brain contains large excitatory energies which are controlled by higher centers. The incision at the intercollicular level abolishes any descending influences further up the neuraxis and the motor energies unleashed manifest themselves as decerebrate rigidity. The animal is in a state of hypertonia of all extensor musculature; the limbs are rigidly extended, the back is stiff and straight, and the head is held up and slightly backward. The control of the rigidity is mediated via the muscle spindle; hence, the term "gamma rigidity". The decerebrate preparation serves to demonstrate the inherent mechanisms of the brainstem in the maintenance of posture through control of flexor-extensor muscle tone. Motor control of the brainstem depends on integration of sensory input and modification of the reflexes initiated by the stimulus from the proprioceptive receptor organs. In addition to regulation of gross muscular tone, the brainstem also adds quality and refines motor actions. Incisions made further up the neuraxis will demonstrate an even further diversity and refinement of motor action.[12]

The primary motor integration area of the brainstem responsible for assortment of afferent and efferent information, modulation of motor activity, and control of autonomic responses is the reticular formation of the brainstem. This is a phylogenetically old part of the brain forming a complex, dense, interweaving matrix consisting of various types of nerve cells and fibers. This formation extends from the caudal part of the medulla to the thalmus. The afferent connections to the veticular formation are from the spinal cord, cerebellum, hypothalmus, pallidum and cortex as well as from the auditory, vestibular, optic, and trigeminal nerves.[14] The primary action of all afferent input is to alter the excitability levels within the brainstem.[14] Efferent fibers from the reticular formation are directed towards all levels of the spinal cord, the cerebellum, the hypothalmus, and the thalmus. Though modulation of motor activity by the reticular formation may influence both alpha and gamma nerves, it is likely that the primary action is on the gamma system. This is due to the fact that the alpha motor system is controlled by the gamma (muscle spindle) loop.

Areas of the reticular formation may be either excitatory or inhibitory on muscle tone. The facilitory zone is larger than the inhibitory zone and lies more cephalad. The input to the facilitory zone is primarily from the vestibulocochlear nerve and from ascending sensory pathways destined to higher areas. The facilitory zone excites extensor muscles while inhibiting flexors. Stimulation of this area results in an increase in the already heightened stretch sensitivity and rigidity of the extensor muscles.[8] This zone is modified by higher centers so when this controlling influence is abolished, as in decerebrate rigidity, the extensor control is also lost. The inhibitory zone which decreases extensor tone is, however, not constantly acting and must be driven into action by higher centers. The variability of motor commands from the reticular formation are dependent upon the diffuse array of interneurons coordinating the responses. These interneurons

> "provide for central distribution of sensory input, give multiple opportunity for alteration of reflex pathways, extend timing for coordination of action, admit action by intermediary cells specialized for inhibition, and permit coordination of simple reflexes into complexes of involved distribution and succession of action."[6]

The smooth coordination of reflexes inherent to the brainstem and spinal cord serve primarily to control body equilibrium and orientation in space. These reflexes are termed the body orienting reflexes and are specific to their afferent supply. This afferent supply arises from the labyrinthe of the inner ear, the visual receptors, and the somatic proprioceptors of the proximal portion of the limbs and axial body parts (particularly that of the neck muscles). Each of these reflexes act in harmony with the other so that optimal integration of afferent input and efferent motor response is achieved. An example of this integration is seen when a cat is tossed upwards in the air. Argular acceleration detectors in the inner ear inform the cat that he is accelerating upwards and also that he is upside down. This fact is quickly confirmed by the visual receptors. At the apex of its flight the angular and visual receptors detect a downward trajectory. The neck and head are initially aligned to the horizon and the rest of the body is quickly rotated to bring it in line with the head. Smooth coordination of all reflexes must be achieved before proper motor reaction can occur. If the afferent supply and its particular information does not reach the brainstem or is altered in any way, motor responses still occur but are not optimal for the condition. A blindfolded, labyrinthectomized cat tossed in the same manner serves as an example of this point. The cat, not detecting acceleration or horizontal orientation, aligns its body with its head. The cat is informed of its orientation in space only when it reaches the ground. Another example already mentioned is the motion sickness experienced when the orientational cues from the labyrinthe and optic organs do not correspond.

The prime reflexes responsible for the final attitude of the body are the somatic orienting, or tonic neck reflexes.[20] These reflexes are mediated by the cervical proprioceptors of the upper three cervical segments and convey their information in the spinoreticular tract of the lateral fascicle and anterior column.[23] The original head position is primarily determined by the labyrinthe and optic organs; the somatic orienting reflexes occur secondarily. These reflexes serve to align the body to the position of the head and to stabilize the trunk with respect to the vertical axis.[22] By these reflexes different head positions may elicit altered motor responses in the flexor and extensor muscles of the trunk and limbs.[1] In the cat, extension of the occiput on atlas stimulates forelimb extensors and hind limb flexors. Rotation of the head causes ipsilateral facilitation of limb and axial extensors.

In the late 1940's, McCough et. al. performed experiments on decerebrate cat preparations in which all major muscles connecting the neck and trunk with the occiput, atlas, and axis were dissected. They found that rotation of the head on atlas would elicit crossed extensor reflexes.[23] Circumcision of the nerve roots supplying the capsule abolished the reflex. It was concluded that

> "... the reflex is ipsilateral and that the receptive field lies in the region of the upper joints of the neck, especially the atlanto-axial and atlanto-occipital joints."[2,4]

This experiment hypothesized that the information which elicits the somatic orienting reflex originated in the joint capsule of the upper cervical vertebrae. It was later shown that there was a relative scarcity of receptors in the synovial capsule compared to those of the small muscles lying close to the vertebral column which were missed in dissection. The present studies now show that the non-articular tissues are not only a possible source but may be a predominate source of receptors from the intervertebral regions.[2] The responses of these perivertebral spindles showed surprisingly large changes in firing rate with even the smallest movement of the vertebral joints.[21]

Conclusion

The biped posture of man mitigates against stability by narrowing the base of support and by elevating the center of gravity so that standing is elaborately protected by a multiplicity of cooperating reflexes.[5] These reflexes must balance the axial loading forces so that the center of gravity falls equally on all articular surfaces of the spine. Proper flexor-extensor balance is essential in maintaining the body's orientation to gravity. This balance is accomplished by integration of information from the labyrinthe, optic organs, articular receptors, and the muscle spindle. Alteration of one or more sources of afferent input will generate reflex changes throughout the musculature of the body. Deviations from the normal angles of the invertebral joints are detected by the articular and spindle receptors of the neck and may affect muscle tone of the eyes and limbs as well as on the axial musculature.[22] The uniqueness of motion and muscular arrangement in this area of the spine creates a considerable potential to provide a detailed picture of head position and movement. Even minute displacement of these vertebrae alter excitability levels within the brainstem and cause changes in flexor-extensor tone. These sensitive reflex responses normally control body position and orientation during both static and dynamic phases. Subluxation at the upper cervical vertebrae will cause the receptor organs to indicate movement from the normal vertical axis and must elicit an adequate motor response to compensate. This response normally tends to bring the center of gravity of the skull back to the vertical axis. Rotation and lateral flexion of the occiput on atlas as well as angular rotation of the lower vertical spine are all methods in which the lower vertebrae adapt to this state of disequilibrium. Leg length and pelvic distortions will also result as the tonic contracture of the lower axial musculature is altered to maintain equilibrium.

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NUCCA Scholarship Awards

The NUCCA Board of Directors has authorized a scholarship grant-in-aid award of $200.00. The award will be paid to chiropractic students currently enrolled in a chartered college of chiropractic who submit to the *Monograph* editor an acceptable article pertaining to the upper cervical spine.

Submitted articles should relate to the Occipital-atlanto-axial spine. They may relate to biomechanics of the cervical spine, analysis of cervical subluxations, corrective techniques for cervical subluxation, detrimental effects of C1 subluxations on the spinal column (distortion), or any other phase of chiropractic in which the upper cervical subluxation is shown to be an etiogenic factor.

Articles must be accurately and properly referenced. All entries will be judged by the NUCCA Board and by Daniel C. Seemann, Ph.D., NUCCA Executive Director. Accepted articles become the property of the National Upper Cervical Chiropractic Association, Inc. (NUCCA). The names of the authors of the accepted manuscripts will be announced at the next NUCCA Convention. Payment of the award will be made upon acceptance of the article.

NUCCA will attempt to return all manuscripts that are accompanied by a self-addressed, stamped envelope. The organization will not be responsible for lost or mislaid submitted material. The judgment of the NUCCA Board of Directors will be final. The writer should retain a carbon copy.

Students are encouraged to submit articles.

Further information is available by writing:

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Monroe, Michigan 48161

Myths and Mis-Truths

The January 1985 Motion Palpation Institute's paper, DYNAMIC CHIROPRACTIC, Volume 3, Number 1, Page 4, carried an interesting article, PARADIGM SHIFTING INTO HIGH GEAR, over the by-line of Dr. L. John Faye. Dr. Faye writes, and I quote: "Everytime I hear a doctor or patient say 'it is back in place', I shudder. If we persist in propagating a mis-truth we don't deserve to be taken seriously". Continuing in the same paragraph, Dr. Faye states: "There can not be one doctor who really believes mis-alignment on x-rays are aligned in patients that get well. Some patients get well and the mis-alignment gets worse".

If the restoration of the misalignments of a C1 subluxation and saying so is propagating a mis-truth then taking post-x-rays also gives false evidence when the amount of correction that was made is measurable. The same can be said of post-adjustic checks of the distortion effects on the body that emanate from a misaligned and subluxated C1, the pre-and-post measurements of the abnormal excursions of the pelvis into the frontal and transverse planes of motion, the deviation of the spinal column from the normal, or vertical axis of the body, the contractured leg and, in short, the entire Atlas Subluxation Complex Syndrome. Measurement, whether on a static x-ray film or on the Anatometer, is proof; and they indicate a reduction of the misalignment factors following the adjustment. The adjuster can validly conclude that the misalignment correction procedure is based on sound evidence, the evidence of measurement.

Static x-ray films are used medically to diagnose joint separations, including the vertebral column; and post x-rays are frequently used after joint reductions or corrections to determine the accuracy of the procedure.

Misalignments of the Occipital-Atlanto-Axial area, occurring in the three planes of motion and subjacent vertebrae, constitute the C1 Subluxation Complex. If there are no measurable distortions of the C1 complex, there will be no excessive neurological flow (facilitation). (The subluxation-facilitation theory was published by NUCCA in 1971).

Spinal column distortion is directly related to the C1 subluxation and to its misalignment factors. Laterality of C1 always produces contralateral bodily distortions which may be modified by a C1 misalignment into the transverse plane of motion (Rotation) and/or rotation of subjacent cervical vertebrae, which may cause an ipsilateral bodily distortion. These changes in bodily distortion from one side to the other are reflected in static x-rays which show that a misalignment of C1 into one plane, or that of subjacent vertebrae, may offset a misalignment in another plane of motion, which becomes more prominent in influencing which side of the body the greater distortion will occur. This evidence strongly suggests the importance of misalignments of the C1 subluxation.

Accidents to patients can cause changes in the misalignment factors and sometimes change the relationship of one plane of abnormal motion in relationship to another. When this occurs the patient will regress symptomatically until the adjustment is modified to accommodate the injury-caused changes, and the adjustment again stabilizes. Thus, more evidence of the importance of the misalignment factors and the need to correct them.

From the evidence obtained from thousands of measurements of patients over many years, doctors know that "misalignment on x-rays are aligned in patients that get well". If vertebral misalignments can be increased, as the article writer suggests, they can be moved by some force. If they can be moved, they can be increased or decreased and even aligned. It is a question of the direction of the moving force.

The writer of the article tells us that "Some patients get well and the misalignment gets worse". Leaving aside the question of malpractice—to increase the subluxation—our research refutes his statement. Patients "get well" i.,e., asymptomatic, for many reasons not associated with the subluxation, regardless of the type technique used. But for how long do they "get well"; for how long do they remain asymptomatic? Increased misalignments can cause greater neurological insult to the sensory nerves sufficient to reduce input to the patient's brain. Consequently, the patient feels better until his/her sensory system again functions normally.

Getting well involves more than getting relief from symptoms. Chiropractically, it involves correction of the bodily distortions and reduction or correction of the misalignment factors of the subluxation. When these two factors are corrected and proven by measurement, the chiropractor should feel confident that he was responsible for helping the patient. The subluxation stabilizes only when the misalignment factors are sufficiently reduced and the vertebral facets are in proper apposition. If misalignments are increased, greater loss of articulatory alignment occurs and greater loss of vertebral function. How, then, can a patient be benefited by an increased misalignment?

Vertebral misalignment is an abnormal state in the spinal column. Normal vertebral function requires the alignment of the vertebrae to the vertical axis of the body. The organization and form of vertebrae is such that alignment is a pre-requisite to normal vertebral function. Vertebrae are structured to be in a normal position.

While it is not our intention to disparage any chiropractic technique, we ask: How does a chiropractor restore normal function and normal motion to a vertebra or vertebrae unless he realigns them to their proper juxtaposition. Over 90% of the subluxated cervical spines move abnormally as a unit into either the right or the left frontal plane of motion when they subluxate. These frontal plane excursions create misalignments throughout the cervical spine and, at times, the dorsals are included. Combined with the rotation of C2, these excursions are the cause of the vertebral rotations below C2. It is not then a matter of manipulating one, two, or three vertebrae in the unit complex but of correcting all of them. A vertebra must be used to lever all the misaligned vertebrae to the normal or vertical axis of the body. C1 is the only vertebra so structured and so located to which leverage can be applied that will re-align the subjacent vertebrae and pelvis.

By taking a position that reduction of vertebral misalignments is not crucial to getting well will only lead to further cracks in the chiropractic suit of armor.

The Ruth O. Gregory Memorial Fund

NUCCRA extends its heartfelt thanks to the generous contributors to the Ruth O. Gregory Memorial Fund. The fund was authorized by the NUCCRA Directive Board in November of 1982 as a tribute to Ruth O. Gregory in appreciation of the time, effort, and money she so selflessly and freely gave to the NUCCRA-NUCCA Organizations in order to further scientific research for the benefit of chiropractic patients, the profession, and chiropractors.

Since her death in June of 1982, donations have been received from doctors, students, and lay persons who knew her. These donations have been used for the sole purpose of engaging in research of the upper cervical spine.

Recent contributors to the Ruth O. Gregory Memorial Fund were:

Dr. & Mrs. Marshall Dickholtz, Sr.	Illinois
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An additional research donation was given in memory of Dr. L. H. McLellan of Arizona who for many years supported the NUCCA-NUCCRA Organizations by Dr. John Houtman.

Notice of Price Increase

Due to increased cost of production and increases in postal charges, the educational pamphlets sold by N.U.C.C.A. will be increased from $20.00 per 100 to $27.00 per 100. If pamphlets are purchased at a seminar, the cost will be $25.00 per 100.

N.U.C.C.A.'s status as a non-profit organization requires that pre payment on all items must be received before shipping can occur.

Self-Help Question Guide Answers

The answers to the Self-Help Question Guide which appeared in Volume 3, Number 9, MONOGRAPH are printed in the same order as they appeared in the last MONOGRAPH. In using the Guide, please attempt to answer each question before referring to the answer. The objective of the Guide is to test the knowledge of the practitioner, an essential element in practicing or performing the C1 adjustment.

APPROACH PHASE:

(1) The reasons for doing this Phase are two in number: to locate and establish the base of support in relation to the settleback point on the Horizontal Resultant, and (2) to activate the plantar reflexes and the neck-lock reflex.

(2) A resultant is the net effect of the forces acting on a body. It is a single force having a definite amount and direction, a single force that replaces all other forces. The height vector and the rotation vector are at right angles to each other, one being in the vertical plane. The resultant, therefore, is the hypotenuse of a right triangle. The Horizontal Resultant in adjusting the C1 vertebra is that horizontal line extending from the point of the application of force (contact point) to the position the adjuster assumes as determined by the length of the Horizontal Resultant which is computed from the two vectors. Thus, the length of the Horizontal Resultant varies according to the sizes of the vectors as analysed from the x-ray films, and the base of support position is established in accordance. The base of support is located one inch from the distal end of the Horizontal Resultant at the settleback point.

(3) The neck-lock is a reflex action initiated by the adjuster when he pulls in his chin. It functions to stabilize the spinal column, elevate the adjuster's chest, retract his shoulders, promote syngeric muscular action, and aid in completing the triceps action. For these reasons it is a very important reflex in the adjustment.

(4) Stepping forward with the inside leg when establishing the base of support positions the adjuster's pelvic lever so that he can obtain an acute angle between the trunk and the thigh on the side of the **inside** leg. This acute angle facilitates the settleback action, permitting the adjuster's pelvis to move more easily about the acetabulum on the side of the inside leg. If this function is not performed properly, the inside leg remains in such a position as to prohibit the settleback action and the easy turning of the pelvic lever to a more vertical plane. Also the inside leg, furthermore, becomes a long pivot in the following steps and phases of the adjustment.

(5) The **inside** foot is place obliquely to the Horizontal Resultant when the adjuster steps forward to establish the base of support so as to set it for the plantar reflex.

(6) The **inside** foot is pivoted from the heel to a 90° angle to the Horizontal Resultant which action initiates the plantar reflex for that foot if the sole of the foot is dragged along the surface of the platform or floor.

(7) When stepping forward with the **outside** leg to establish the A-P dimension of the base of support, the adjuster must initiate the lock-action at the anterior aspect of his pelvis on the side of the outside leg, thus preventing rotation of his pelvic lever in the horizontal plane.

(8) The hip-lock which serves to prevent pelvic rotation in the horizontal plane and the turning of the adjuster's parallel forces or action lines from the Notch-Transverse Resultant.

(9) The length of the Horizontal Resultant; the longer the Resultant, the greater the A-P dimension of the base support.

(10) This relationship, generally speaking, is that the Horizontal Resultant bisects the arch of the adjuster's outside foot.

(11) The outside foot is pivoted at nearly a 45° angle to the Horizontal Resultant to complete the plantar reflex and to serve as a bridge for support.

(12) The width of the base of support is approximately equal to the distance between the adjuster's acetabulae.

(13) On the outside foot.

SETTLEBACK PHASE:

(1) The two reasons for the Settleback Phase are: to convert the adjuster's body to a more vertical plane, and to start the alignment of the adjuster's action lines to the Notch-Transverse Resultant.

(2) The points the adjuster should check before he executes the Settleback Phase are: chin-lock; pelvic-lock; greater weight distribution to outside foot; lateral width of the base of support; A-P dimension of the base of support; settleback point on the Horizontal Resultant; 90° angle of spinal lever to the Horizontal Resultant; plane of the inside foot, and acute angle relationship of trunk and thigh.

(3) At a 90° angle to the Horizontal Resultant.

(4) The inside foot determines the plane of the Settleback.

(5) The planes of both the shoulder and pelvic levers should be the same.

(6) The longer tha A-P dimension of the base of support, the greater the pelvic angulation should be to a more vertical plane.

(7) The maximum settle back principle is that when the adjuster has reached his maximum range of settleback motion, he relaxes his lower back musculature, permits the pelvis to rotate more vertically. This allows him to settle back a greater distance.

(8) This error is corrected by advancing the outside leg a greater distance, being careful to maintain the pelvic lock. This action brings the adjuster's center of gravity forward, taking his greater weight off his heels.

(9) The adjuster must stand up and re-establish his base of support until his tie or plumb-bob falls one inch beyond the settle back point, keeping in mind the maximum settleback range of motion principle.

(10) Recheck the points of question #2; tie or plumb-bob in re to the settleback point, achievement of the maximum range of motion, pelvic and shoulder angles, and body balance.

TURN-IN PHASE:

(1) The reason for the Turn-In Phase is to place the adjuster's episternal notch directly over the contact point or transverse process.

(2) The ankles are the center of motion for the Turn-In Phase.

(3) The rotator muscles of the adjuster's legs are the source of motivation with which the adjuster turns his spinal lever over the contact point.

(4) The tip of the adjuster's sacrum is the point about which the adjuster turns his spinal lever in the Turn-In Phase. This point is controlled by limiting its movement within a distance of two inches.

(5) On extremely long resultants, the adjuster executes the Turn-In Phase as he would for a shorter resultant, but shifts his body as a unit until he is over the contact point. This causes greater angulation of his body as he approaches the contact point.

(6) The adjuster takes his contact when his episternal notch is directly over the contact point. Roll-in is performed only at that point.

(7) After he has completed the Turn-In Phase, the adjuster's weight should not be beyond the center of his base of support.

ARCH PHASE:

(1) The reason for the Arch Phase is to provide a rigid support against the triceps pull. If the contact arch is not solid and breaks down in the adjustment, the completeness of the triceps muscles is lost and the effectiveness of the adjustment fails.

(2) Rigid arches are obtained by extending the hands, palm to palm, with the elbows slightly bent, radial deviation accomplished, with adduction of the thumbs of both hands toward the radial bones and toward the backs of the hands. The hands are then "opened" from the thumb side which causes a slight bending between the metacarpals and fingers. A fairly flat surface should be maintained along the backs of the hands and wrists with no dorsal flexion at the wrists.

(3) Yes, see question #2.

(4) The arch should always be rigid throughout the adjustment, but the arms relaxed.

(5) Yes, see question #2.

(6) Only slightly.

ROLL-IN PHASE:

(1) The two reasons for the Roll-In Phase are: to control the divergent adjustic forces emanating from the triceps muscles, and to prevent scattering of these forces about the transverse process.

(2) The contact arch is aligned to the point of contact at an approximate 45° angle.

(3) The angle of the roll-in hand to the radial bone of contact arm is at a 90° angle when drawn back across the wrist of contact arm at the start of the roll-in act.

(4) The insertion of the pisiform bone of roll-in wrist into the anatomic fossa of contact wrist is at the posterior of the fossa.

(5) The pressure between the pisiform bone of roll-in wrist and the anatomic fossa of contact wrist is maintained by the adjuster pulling back with his contact arm against the roll-in wrist.

(6) The pivot action between the pisiform bone and the anatomic fossa is obtained by turning the humerus ball forward in the glenoid fossa.

(7) The thumb of roll-in hand is forced behind the wrist of contact arm by turning the humerus ball forward in the glenoid fossa.

(8) All pivot action for the roll-in emanates from turning the humerus ball in the glenoid fossa, first forward, secondly reversed.

(9) The pisiform bone is forced more posterior by reversing the forward turning of the humerus ball in the glenoid fossa.

(10) The roll-in wrist lever is turned upward from the radial bone of contact arm at a 90° degree angle.

(11) If the lever of roll-in wrist (from pisiform to anatomic fossa of roll-in wrist) is not turned at a 90° angle, the wrist levers will not align sufficiently to permit the adjustic force to travel in a straight line into the transverse process.

(12) A 90° angle is the correct angle for "breaking" the roll-in lever. This action is confined to the wrist, not assisted in any way by the elbow.

(13) The center of motion for the "breaking" action is in the pisiform bone of roll-in wrist and in the anatomic fossa of contact wrist.

(14) The aiding action in the roll-in breaking motion is to allow the thumb of roll-in hand to slip slightly when performing the act.

(15) The centers of motion for turning the fingers in the Roll-In phase is at the knuckles formed by the phalanges and metacarpals.

(16) The action of dropping the fingers of Roll-In hand about the wrist of contact arm should be quickly done.

(17) The ring finger of Roll-In hand should be past the knuckle on the ulnar side of contact arm.

(18) The radial bone of contact arm should rest against the first phalange of the thumb of Roll-In hand, not in the webbing.

(19) The knuckles of Roll-In hand should parallel the ulnar bone of contact arm after the roll-in action is completed.

(20) Yes, the two levers of both wrists should align so as to transmit the adjustic forces without misdirecting it.

(21) The degree of relaxation required is the same as clenching the fist and then letting it relax normally.

CONVERSION PHASE:

(1) The two reasons for the Conversion Phase are: to align the adjuster's action lines to the same plane as the Notch-

Transverse Resultant, and to return the adjuster's spinal lever to a 90° angle to the settleback point on the Horizontal Resultant.

(2) The center of motion in the Conversion Phase is at the adjuster's episternal notch.

(3) The adjuster moves backward from his outside shoulder to his inside hip.

(4) This plane is necessary because it adapts to the build of the adjuster, and produces more conversion of his body.

(5) The two most common errors of the Conversion Phase are: the adjuster simply turning his body back to the Horizontal Resultant instead of converting his body to the degree necessary to reach the settleback point on the Horizontal Resultant. The second error is noted when the adjuster does not align his spinal lever to an exact 90° angle because of insufficient conversion and to compensate turns his body to an approximate 90° angle. The latter error is due to an incorrectly established base of support so the adjuster must start over.

(6) If the Conversion Phase is executed properly, the adjuster's greater weight will be distributed to his outer foot.

(7) This question is answered in Question #5; the adjuster must re-establish his base of support so that, after the Conversion Phase is completed, his spinal lever naturally aligns at a 90° angle to the Horizontal Resultant.

(8) The adjuster's greater weight should be on the outside foot at the conclusion of the Conversion Phase.

(9) The adjuster's parallel forces or action line should be colinear with the Notch-Transverse Resultant.

(10) The type C1 subluxation in which the execution of the Conversion Phase is essential are those subluxations having a long height vector and those having a large rotation vector.

PELVIC LEVER PHASE:

(1) The reason for the Pelvic Lever Phase is to obtain greater body angulation to the vertical plane so as to better align the adjuster's parallel forces on C1 subluxations that have extremely high height vectors and large rotation vectors.

(2) The Pelvic Lever Phase is used only for extreme C1 subluxations.

(3) The primary center of motion is the inside hip joint.

(4) The most common error is seen when the adjuster does not raise his inside leg from the hip center of motion, but pushes up with the inside foot.

(5) This Phase is essential, when needed, to obtain the necessary angulation of the adjuster's body in order to achieve truer alignment of his action lines with the Notch-Transverse Resultant. It is performed by raising the inside leg.

TRICEPS PULL PHASE:

(1) The reason for the Triceps Pull Phase is to convert potential energy to kinetic energy.

(2) The triceps brachii are pulled from a point approximately ¼ to ½ inch below the center of the glenoid fossae.

(3) The type of lever represented in this phase may be viewed as either a first class lever or a third class depending on the adjuster's view of the mechanical concept involved.

(4) The greatest body lever to be moved first in the Triceps Pull Phase is the adjuster's shoulder lever.

(5) The triceps brachii are pulled upward and medialward which action activates the shoulder lever by compressing it. In turn the episternal notch is expanded by the compression action of the shoulders. At the completon of the triceps pull, a slight reversal of the upward adjustic motion occurs which slightly extends the arms. It is this latter action that enters the patient's neck and moves the Atlas Subluxation Complex, overcoming its resistance at the moment that the triceps pull has adequately compressed the shoulder lever.

(6) the shoulder lever constitutes the resistance to the triceps brachii, not the Atlas Subluxation Complex.

(7) Pulling back with the contact arm against the roll-in wrist pisiform bone aids in maintaining the pisiform-anatomic fossa insertion, reduces the angle of the elbows, and permits greater control of the adjustic action. The larger the angles of the elbows, the greater the error in controlling the forces of the adjustment.

(8) The contact arch must be maintained in its rigid state, but the contact arm must be relaxed to permit equal pull with the roll-in arm.

(9) The adjuster should attempt to stretch the metacarpals of the contact arm arch during the adjustment.

(10) Either an inferior or a superior torque should be set at the moment just prior to the triceps brachii pull.

Donation Received By N.U.C.C.R.A.

A large memorial fund donation was received by N.U.C.C.R.A. in memory of Mrs. Gale Young of Kansas. The fund was initiated by her son, Dr. Michael Young, of Wichita, Kansas.

Mrs. Young was instrumental in the development of Kansas Credit Unions. In 1966 Gale Young began her career as an employee of the Kansas Credit Union League and served as manager of Kansas Corporate Credit Union. In 1979 she accepted the position as manager of Beechcraft Employees Credit Union. In the years following she guided Beechcraft Employees Credit Union from 2 million in assets to over 9 million.

To her credit, Mrs. Young helped in the formation of Bank Limited, a bank holding company and in the purchase of the first credit union owned bank, The State Bank of Lancaster. She was also instrumental in the organization of U.S. Central.

N.U.C.C.R.A. gratefully accepts the donation from Mrs. Young's family. Surviving members include: Mr. Donald L. Young, husband, Michael and Tom, sons, Dianna Friedheim, daughter, and Tom and Josephine Tabing, parents.

NUCCRA Research Report

The National Upper Cervical Chiropractic Research Association, Inc. (NUCCRA) publishes the following research report for those doctors, students, and lay persons whose financial support has made NUCCRA research possible. Monies contributed to NUCCRA via the Ruth O. Gregory Memorial Fund, the McLellan Memorial Fund, and from fees the NUCCA seminars as well as through the generosity of patients and friends have made NUCCRA research a continuous operation.

Research data is released to doctors and students who attend NUCCA seminars and to the profession in the Upper Cervical MONOGRAPH. Thereby the patient, the doctor, and the profession benefit. All research is pertinent to the C1 subluxation, its effects on the nervous systems, the spine and pelvis, and the human body generally.

The NUCCRA Research Staff are: Daniel C. Seemann, Ph.D., James F. Palmer, M.S., both of whom are professors at the University of Toledo; Keith E. Denton, D.C., and Ralph R. Gregory, D.C., practicing chiropractors.

Some of the research projects included in this report are completed in the sense that no research can be considered as finished as new data may change it; many are still in the process of investigation. For doctors and students who are interested in pursuing any project further, the MONOGRAPH contains additional information. Listed below each project is the name of the article briefly discussed and the MONOGRAPH in which it appears.

DOUBLE PIVOT-POINT SYSTEM:

Because of the lack of symmetry of the human skull, film analysers art frequently faced with the difficulty of establishing an accurate central skull line on the nasium (A-P) x-ray film, an integral part in determining laterality of C1. The central skull line concept was discovered by the late Dr. John Francis Grostic of Ann Arbor, Michigan in 1942 when he developed a central line vertically between the parietal bones which he then attached to the atlas plane line which is drawn through C1 at the points where the posterior ring junctures with the lateral masses at their outer margins. The acute angle formed by these two lines constituted the side of C1 laterality. The Grostic instrument, the Cephalo-centroscope used in establishing the central skull line, incorporated the procedure of both rotating the instrument and sliding it laterally. This method often resulted in erroneous measurements and disagreement among analysers because of the sparsity of reference points on the instrument, requiring the analyser to frequently depend on personal judgment.

In 1962, the Grostic procedure was changed by Dr. Ralph R. Gregory of Monroe, Michigan. Gregory developed an entirely new application procedure which he called the Double Pivot-point System designed to lessen individual judgment or eliminate it. Instead of rotating and sliding the Cephalo-centroscope laterally, the double pivot-point system located two midpoints, or pivot points, between the parietal bones as central as possible to the lateral aspects of the parietal bones. A process of proving the central location of these points then began by assuming one of the points to be centrally located, or to be a constant. The other point was assumed to be a variable. The analyser pivoted the instrument about the constant as he checked the contours of the parietal bones every one-eighth inch. The variable pivot point changed as indicated by the instrument's central slot and each change was marked by a dot. The last dot then became the constant, and the analyser read the skull toward the previous constant which now became the variable in the same manner as before. The process was repeated up and down the skull until neither pivot-point could be changed, both had become skull-centered, equidistant to all readable points on the lateral aspects of the parietal bones.

In the mid 1960s a new instrument for establishing the central skull line was designed by Gregory which incorporated the double pivot-point procedure. Grids were added, increasing the number of reference points, and making the device more adaptable to different size skulls. This instrument was named the Cephalometer. MONOGRAPH: Vol. 2, No. 10, page 6: THE DOUBLE PIVOT-POINT SYSTEM

VERTICAL AXIS CONCEPT:

The vertical axis of the human body is that point at which the three orientation planes join. A normally positioned spinal column, one in which the articulations are in proper apposition, is one that is aligned to the body's vertical axis. Vertebrae aligned to the vertical axis function efficiently; therefore execute normal motion. Misaligned and/or subluxated vertebrae execute abnormal motion and cannot function normally. A subluxation, therefore, cannot exist within a normal range of motion, but becomes fixed within an abnormal range of motion. It follows that no single subluxated vertebra can be restored to its normal position unless the abnormal range of motion is also corrected simultaneously. a NUCCRA study of thousands of cervical and skull x-rays confirms that subluxations exist in an abnormal range of motion in which state they become fixed by the normal range of motion.
MONOGRAPH: Vol. 2, No. 5, page 6: **BIOMECHANICS OF THE UPPER CERVICAL SPINE**

CLASSIFICATIONS OF THE ATLAS SUBLUXATION COMPLEX (ASC):

The NUCCRA x-ray film analysis study showed that the Atlas Subluxation Complex broke down into four basic types. This classification was based upon the abnormal movements of the skull and cervical spine from the vertical axis of the body. These abnormal movements, or angular rotations, are excursions of the cervical spine and skull into either the right or left frontal plane, and are the cause of vertebral rotation below C2 into the transverse plane of motion, modified by C2 rotation. The restoration of the cervical spine and skull back to the vertical axis corrects the rotations of subjacent vertebrae.

In three of the four basic types, the cervical spine and skull deviate from the vertical axis. In the third type, the skull moves from the vertical axis but the cervical spine aligns to it. In the third type, therefore, the skull or occipital condyles turn on the superior articulating surface of C1, producing laterality. In type one, C1 moves on the occipital condyles. In the other two types, a combination of these two movements usually occurs. In the third type, no rotation of subjacent vertebrae confirms the NUCCRA hypothesis that such rotation is due to the abnormal excursion of the cervical spine into a frontal plane of motion. Of importance to the adjuster is that he analyse and classfy the ASC as to type because each type requires a different patient placement and vectorial consideration. Adjusting one type as he would another defeats the correction of the ASC.
MONOGRAPH: Vol. 3, No. 8, page 8: **UPDATING THE FOUR BASIC TYPES**

SKULL CENTER OF GRAVITY:

Whenever the cervical spine and/or skull deviate from the vertical axis, the skull center of gravity moves in the same direction, causing gravitational stress or disequilibrium. Disequilibrium, therefore, becomes a fctor to be considered in the adjustment and to be corrected. If disequilibrium is not corrected, the subluxation will again occur, generally within three days.
MONOGRAPH Vol 2, No. 4, page 1: **BIOMECHANICS OF THE UPPER CERVICAL SPINE;** Vol. 2, NO. 9, page 1: **THE CENTER OF GRAVITY OF THE SKULL**

ATLAS ROTATION:

A computer study of the rotatory behavior of C1 and its relation to the four basic types.
MONOGRAPH: Vol. 3, No. 8, page 1: **SOME HYPOTHESES AS TO HOW ROTATIONS ARE PRODUCED WITH CERVICAL SUBLUXATIONS**

LEVERAGE SYSTEMS IN UPPER CERVICAL ADJUSTING:

The classification of the ASC by NUCCRA into the four basic types greatly increased understanding of the biomechanics of the cervical spine. The C1 vertebra is a lever in all types through which the adjustic force is transmitted to the subluxation resistances. This study has been instrumental in obtaining easier and faster corrections.
MONOGRAPH: Vol. 3, No. 2, page 1: **A REEVALUATION OF THE LEVER SYSTEMS IN UPPER CERVICAL ADJUSTING**

VERTEBRAL RESISTANCES TO ADJUSTIC FORCES:

A vertebral subluxation can not be adjusted (corrected) and equilibrium restored unless the resistances inherent therein are overcome by the adjustic force. Studies by NUCCRA of these resistances show that too much force, too little force, or an incorrectly directed force results in changing the type of the subluxation, either increasing it or causing greater subluxation. These resistances include the size of the superior articulating surfaces of C2 (base of support), the degree of the excursion of the skull and cervical spine into the frontal plane, the circular pathway, the plane on which C1 rests, and the amount of rotation of C1 into the transverse plane.
MONOGRAPH: Vol. 3, No. 8, page 8: **UPDATING THE FOUR BASIC TYPES**

THE MULTIPLE SUPPORT HEADPIECE:

Four years upper cervical practitioners used a headpiece having a single mastoid support—a single fulcrum upon which to place the patient's head, regardless of the type or x-ray listing, and from which the reaction to the adjustic force comes. It was found detrimental to the adjustment to have uncontrolled reaction. Some cases have a extremely high line of drive, others an extremely long rotation vector. The tendency for the head to move is great in these cases with the single support headpiece, causing a loss in the reduction of the misalignment factors.

Experiments with various type headpiece supports were conducted and checked against post-x-rays. A headpiece emerged after some months of experimenting that had three adjustable supports capable of accommodating any listing or subluxation. Severely rotated atlases, either anterior or posterior, were easier to correct by using the adjustable occipital support, or, if a posterior, the adaptable zygomatic support. High lines of drive remedied quicker and better by the floating mastoid support which fits the differently shaped mastoids more precisely. In all cases, the patient's head can be held immobile, and the reactive force more resistive to the required resultant in any given case.

ANATOMETER STUDIES:

An Anatometer is a measuring device, designed and invented by NUCCRA. It measures spinal and pelvic distortions before and after C1 adjustments. In thousands of cases, the Anatometer has, without exception, supported the NUCCRA hypothesis that a C1 subluxation distorts the spinal column from the vertical axis of the body. Additonal uses of the Anatometer is the determination of the need for an adjustment or when one is not required. It also indicates when a change has occurred in the listing following a patient-injury. It also signifies patient progress or regression.
MONOGRAPH: Vol. 2, No. 5, page 1: **C1 SUBLUXATIONS, SHORT LEG AND PELVIC DISTORATIONS** Vol. 3, No. 7, page 1: **AN EVALUATION OF THE OBJECTIVITY AND RELIABILITY OF THE ANATOMETER**

NEUROLOGICAL CAUSES OF SPINAL DISTORTION:

NUCCRA postulated that cervical vertebral excurşions from the vertical axis into a frontal plane—angular rotation—tractionize the brain stem, spinal cord tracts, and cervical nerve roots, reducing the diameter of the nerves or subjecting them to enfoldment and compression. Imbalance between the facilitatory and inhibitory neurological mechanisms in the reticular formation of the brain stem as a result of tractionization produce excessive innervation as a result of reduction of the inhibitory control of the spinal musculature attended by spastic contracture, the short leg, and spinal distortion. E.M.G. studies currently being conducted by NUCCRA support the hypothesis.
MONOGRAPH: Vol. 2, No. 8, page 11: **NEUROLOGICAL RATIONALE**

OBSERVER RELIABILITY AND OBJECTIVITY USING ROTATORY MEASUREMENT ON X-RAYS:

The acceptance of spinographic analysis as an accurate measurement has been suspect due to the problems of magnification, distortion, line drawing and observer error. These problems can be solved by properly aligned x-ray, patient placement and competent observers. The results of NUCCRA investigation show that a very high rate of reliability can be demonstrated between and among observers. (Article to be published)

X-RAY ALIGNMENT AND PATIENT ALIGNMENT:

The necessity for precise x-ray machine alignment and for patient alignment is essential to precision x-ray analysis and the performance of corrective adjustments because the adjustment is based upon the analysis of the x-rays. NUCCRA has continued to improve these techniques started in the early 1940s in the J. F. Grostic work.

MONOGRAPH: Vol. 2, No. 8, page 2: **PATIENT ALIGNMENT FOR UPPER CERVICAL X-RAY**

DIGITIZER STUDIES:

NUCCRA has ordered a Cal Camp 9000 Series Digitizer Package, an electronic grid capable of sensing the position of the cursor to within +0.0001 inch (resolution). Delivery date should be about August. Of primary importance to NUCCRA is that the system will prove to independent medical and other skilled observers that the NUCCA system of x-ray analysis and the adjustment results in corrective changes in the subluxated spine.

MONOGRAPH: Vol. 3, No. 9, page 6: **RESEARCH NEWS**

TRICEPS PULL ADJUSTMENT:

An arduous study has been made of the C1 Triceps Pull adjustment, using instrumentation to carefully inspect and to question the production of the adjustic force, measure the force's direction, and depth. Relevant kinesiological principles have been adapted. Some of the potential phases have been revamped. These studies have resulted in perfecting the performance of this motor skill. New concepts have been developed and tested, such as the Notch-Transverse Resultant, the conversion phase, etc. Force has been controlled as to direction and depth, how to produce adjustic force equal to a C1 subluxation's resistances, and how to better reduce or correct C1 subluxations.

MONOGRAPH: Vol. 3, No. 1, page 1: **A KINESIOLOGICAL BASIS FOR THE C1 ADJUSTMENT**

MONOGRAPH: Vol. 3, No. 2, page 1: **A REEVALUATION OF THE LEVER SYSTEM IN UPPER CERVICAL ADJUSTING**

MONOGRAPH: Vol. 3, No. 7, page 1: **ERRORS IN THE PERFORMANCE OF THE C1 MOTOR SKILL**

MONOGRAPH: Vol. 3, No. 8, page 13: **OVERCOMING C1 SUBLUXATION RESISTANCE**

MONOGRAPH: Vol. 3, No. 9, page 1: **MORE ON THE TRICEPS PULL**

SUPINE LEG CHECK:

Because of the lack of agreement and the subjectivity inherent in leg checking, NUCCRA is in the process of designing an instrument that will check leg disparity based on an entirely new principle. It is hoped that the instrument will be completed this year.

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. Doctors who successfully complete the program will be eligible to conduct and teach basic classes. A certification committee will be established from the initial group of doctors first certified. Examinations will be given at NUCCA seminars and conventions.

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 in two years. Certificates will be issued successful candidates.

Doctors who have not engaged in practice for three years but who have attended NUCCA seminars are eligible to take the examination which covers a two-year period. A fee is charged each candidate. In the event of failure of the examination, or any part thereof, the candidate is re-examined in the part of the examination he failed without paying an additional fee, provided re-examination takes place within the two-year period.

Certification will be evaluated every three to five years, and certified doctors will be requested to either take an oral examination on updated 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 ten sets of cervical films suitable for analysis
   - D. Examination on x-ray procedures
   - E. Submit a set of x-ray alignment films
   - F. Examination on instrumentation
2. FILM ANALYSIS
   - A. Knowledge of osseous structures
   - B. Read ten sets of cervical spinal x-rays with an inter-observer reliability of .90
   - C. Examination of film analysis
3. ADJUSTING
   - A. Submit ten sets of consecutive pre and post cervical x-rays. The post x-rays presented to the examining board be those taken after the initial adjustment. Reductions in the height and rotation vectors to be evaluated at the discretion of the examining board.
   - B. Oral examination in which the candidate is given various listings for which he is to explain reduction procedures.
   - C. Written examination on adjusting. 100 questions with a passing grade of 85.

Dr. Larry Schrock, Convention Chairman

The Nineteenth Annual NUCCA Convention

The 1985 Annual NUCCA Convention and Educational Conference was held at the Howard Johnson Motor Lodge in Monroe, Michigan from Saturday, May 4th through Tuesday, May 7th. The convention room was filled to capacity by doctors and students from the United States and Canada, including one doctor from Japan, Dr. Noboru Ikuse.

Dr. Larry Schrock of Indiana, Convention Chairman, gave the Welcoming Address. The Educational Conference was supervised by Daniel C. Seemann, Ph.D., assisted by Drs. T. A. Palmer, K. Denton, Lloyd Pond, A. A. Berti, L. Schrock, Lonnie Pond, M. Dickholtz, Sr., Glenn Cripe, and R. Gregory.

Highlights of the Conference were lectures presented by Daniel C. Seemann, Ph.D., and J. F. Palmer, M.S., on current and future NUCCRA research projects. Michael E. McKelvey, an American Heart Association certified instructor in both Basic Life Support and Advanced Life Support (ACLS) presented a 2-hour, slide/video cassette lecture on basic Cardio-pulmonary Resuscitation (CPR). Mr. McKelvey, a Registered Respiratory Therapist (RRT), is on the staff of the Toledo Hospital. He is completing his thesis for the M.S. in exercise physiology at The University of Toledo.

"Hands on" instruction in Film Analysis, Adjusting technique, Biomechanics and adjusting problems, aided by videotapes, completed the program.

View of X-ray Analysis, 1985 NUCCA Convention.

NOTICE

The NUCCA Board of Directors has decided to make the NUCCA collection of video tapes available to members. The price for tapes has been set at $100.00 per classroom hour. Available titles include:

Osseous Structure Identification (45 min.) . . . . . $ 90.00
This tape depicts the various bony structures involved in the NUCCA x-ray analysis. Included are structures that present analytical problems. X-rays of live and dry specimens are used.

NUCCA X-ray Analysis (60 min.) $100.00
Step by step procedure of the NUCCA analysis using X-rays of live specimen.

Leg Check and *Headpiece Placement* (45 min.) . . . . $ 90.00
Leg Check describes the planes of reference and how to align the examiner's body for accurate checking. Models and patient used. Errors are discussed. *Headpiece Placement* briefly describes the biomechanics of the correction of the four basic types. Center of Gravity of the skull and its placement on the three types of headpieces is shown.

Adjusting the A.S.C. (3½ hrs.) $300.00
Step by step procedures used to align the adjustor's body in addressing the various A.S.C.s. Includes the most common errors in each phase. Outline of video follows early *Monographs*, Vol. 1 No. 3 through Vol. 2 No. 4. Film includes various steps for posterior rotations and low vector listings.

Errors in Adjusting the A.S.C. (2 hrs. $200.00
Compliments *Adjusting the A.S.C.* This tape describes errors in adjusting, what causes them, and how to correct them.

Patient Placement For X-ray (45 min.) $90.00
Precision placement of the patient for the lateral, vertex, and nasium views are discussed.

X-ray Alignment (45 min.) $90.00
Step by step procedure used to align cervical x-ray equipment to N.U.C.C.A. standards. To be used with the N.U.C.C.A. X-ray Alignment booklet.

Biomechanics of The Four Basic Types (1 hr.) $100.00
Detailed discussion of the production and correction of The Four Basic Types of A.S.C.S. Headpiece placement and lever system shown in detail.

Questions And Answers, A Self Evaluation For Adjusting The A.S.C. (1 hr.) $100.00
Follows Monograph Vol. 3, No. 9 and No. 10. A chronological order as a guide for the adjustor when practicing the C-1 or triceps pull adjustment. By self-questioning, based on this tape, the adjustor is alerted to the adjusting steps he/she may have neglected or does not know, and the order in which the steps should be performed.

High quality video tapes have been used for reproduction, which carry a lifetime guarantee. Please specify BETA or VHS. Allow 4-6 weeks for delivery. Prices are subject to change with cost of reproduction.