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Mechanics of the Approach Phase

By Lloyd C. Pond, D.C.

PURPOSE: To enhance the adjustor's understanding of weight control and to emphasize the importance of the neck-lock reflex and the plantar reflex as well as their importance in maintaining ease of motion and body control during establishment of the base of support in the approach phase as well as all following phases of the adjustment.

Gregory stated that, "When the adjustor is observed struggling to maintain balance, and to obtain ease of motion and body control throughout the phases of the adjustment, it is clear that the neck-lock reflex or the foot-lock plantar reflex, or both, have not been properly activated and maintained." (Gregory, 1974). "Equilibrium may be either passive, active, or dynamic. A body holding a pose is static, but the equilibrium being maintained may be completely passive or relaxed or occurs when the individual is wholly supported in some manner. On the other hand if the pose is being held against gravity, muscular force is needed to hold the body segments in place. Under these circumstances the equilibrium is now active as muscular tension is creating force movements to balance those generated by gravity as the pose or stance was assumed. Dynamic equilibrium, on the other hand, is that maintained while the individual is actively performing some form of motion or locomotion such that he keeps his center of gravity over a constantly changing base of support." (Gowitzke and Milner, 1980). The adjustor during the eight phases of the adjustment is constantly changing equilibrium. A properly maintained neck-lock and plantar reflex establish a kinetic chain which aids greatly in controlling equilibrium.

STEP 1: The adjustor's base of support is produced by advancing the inside foot forward first. The adjustor's trunk is angled forward at the same moment in the same action. These simultaneous actions reduce the angle between the adjustor's inside leg and trunk bringing his or her center of gravity more forward which facilitates weight control and balance. The leg is advanced from a center of motion (fixed axis) in the acetabulum on the side of the inside foot; this is angular rotation. The pelvic lever must not rotate forward when advancing the inside leg because this error will shorten the adjustor's side and bend his or her spinal column. To remedy the error, contract the psoas muscle which will lock the pelvis on the side of the inside foot so that it remains parallel to the horizontal resultant and thus prevent forward or rotatory movement.

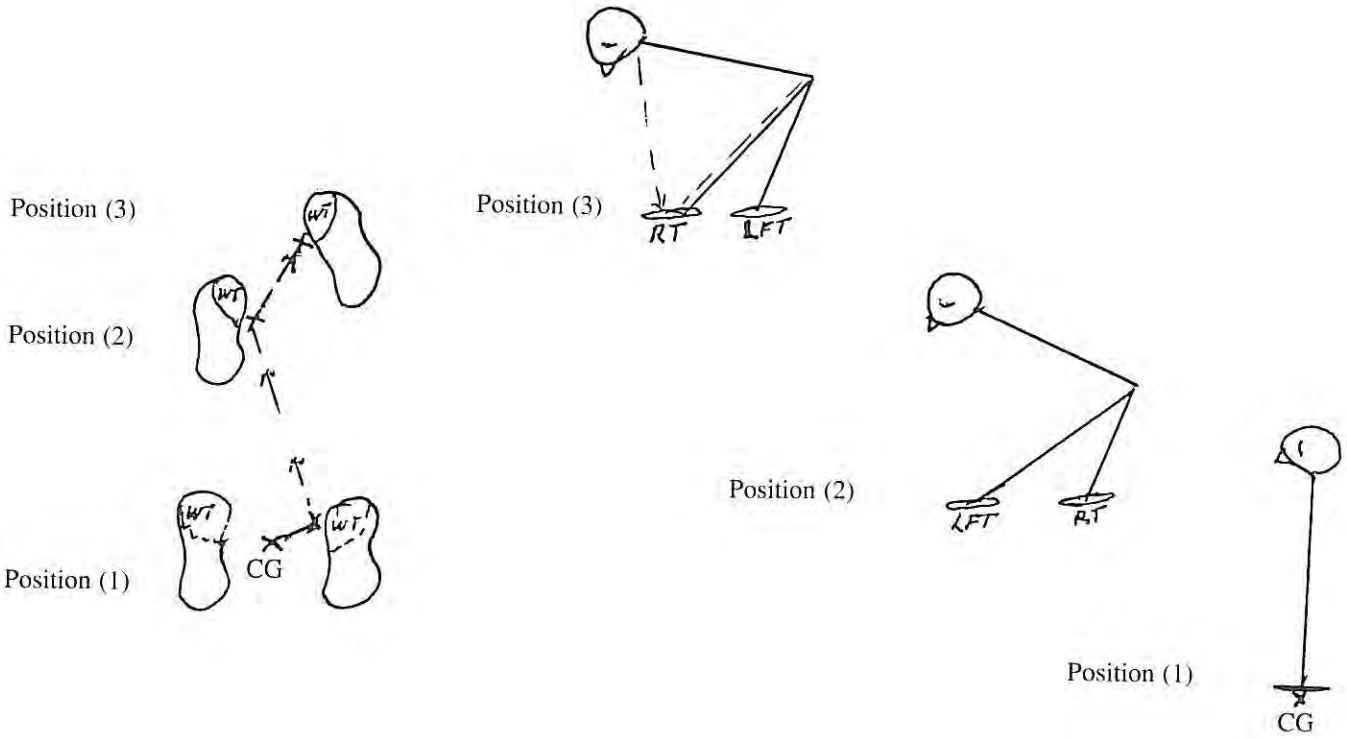
STEP 2: The inside foot is pivoted from the heel to an exact 90 degree angle to the horizontal resultant after being advanced forward. In this action, the sole of the foot should remain in contact with the floor or platform to initiate part of the plantar reflex. After achieving a correct 90 degree angle to the horizontal resultant a conscious effort must be made to press down firmly with an eversionary or pronation type of movement with the metatarsophalangeal joint (big toe). This action will more completely activate the plantar reflex and initiate a controlled body center of gravity which will more readily shift to the outside foot when it is placed in step three. Roberts states that, "The support of the body in the standing position requires that each of the limbs should act as a fairly rigid pillar. The co-operation of the muscles which hold the limb rigid is elicited by a specific complex stimulus situation. When the foot is placed on the ground the distribution of forces in the interphalangeal joints of the digits alters in a characteristic way and the small interosseus muscles between the digits are stretched by the splaying out of the foot. Certain combinations of these stimuli appear to be "recognized" by the spinal cord as signaling that the foot is in contact with a suitable support, and the appropriate stretch reflexes are facilitated so that the limb is converted to a stiff pillar ready to support whatever load is put upon it. The phenomenon is called "positive supporting reaction." (Roberts, 1978). "Muscle spindles are responsible, at least in part, for the POSITIVE SUPPORTING REACTION. The weight of the body pressing upon the feet spreads the interphalangeal joints, stretching the interosseus muscles. Their spindles transmit signals which reach the extensor muscles of the limbs and induce a tonic contraction response, probably by means of gamma facilitation of the extensor spindles. Evidence for the existence of this reflex is found in a situation that occurs when it is absent. The person will become unbalanced and fall." (Gowitzke and Milner, 1980). The adjustor's trunk at this point should be advanced appreciably to assist in center of gravity change or weight control.

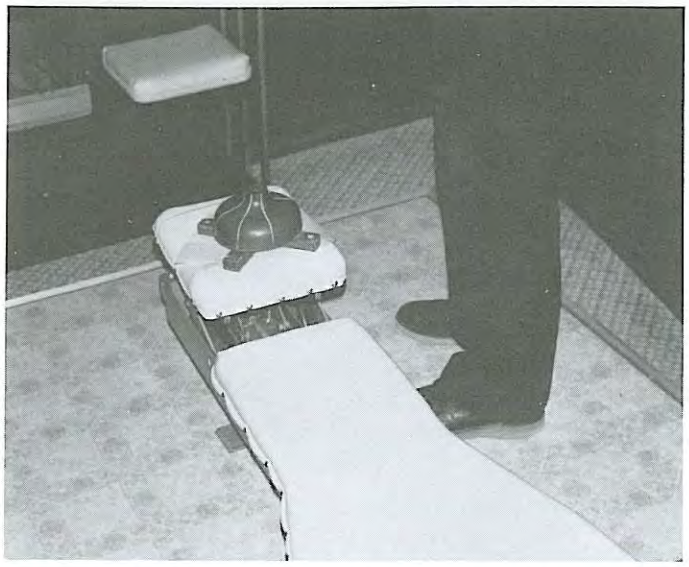
STEP 3: Prior to advancing the outside foot, check to see if the plantar reflex is completely active on the inside foot which should be pressing down with the metatarsophalangeal joint with an eversionary action and being certain that the angle is decreased between the trunk and inside leg sufficiently so that the trunk is angled forward to a sufficient degree to establish a positive weight control. "The adjustor's outside foot is advanced toward the Horizontal Resultant. The pelvic lever is again prevented from rotating forward on that side but drops slightly because the outside leg is shortened by its advancement. The fixed axis or center of motion is in the acetabulum on the side of the outside leg. The longer the Horizontal Resultant, the greater the distance that the outside leg must be advanced so that the Pelvic Lever assumes greater angulation to accommodate the larger vectors. The outside foot should be advanced sufficiently forward so that the Horizontal Resultant passes through the arch of the adjustor's outside foot. The lateral spread of the adjustor's feet (base of support) should approximate the width of the adjustor's Pelvic Lever." (Gregory, 1988).

STEP 4: The outside foot is now pivoted from the heel medialward to approximately 45 degrees to the Horizontal Resultant activating the plantar reflex fully by pressing down firmly with the metatarsophalangeal joint with an eversionary or pronation type of movement. This will establish complete control of the center of gravity toward the anterior medial portion of the foot, thus bridging the base of support now established. The adjustor's greater percentage of body weight should now be controlled on the anterior medial portion of

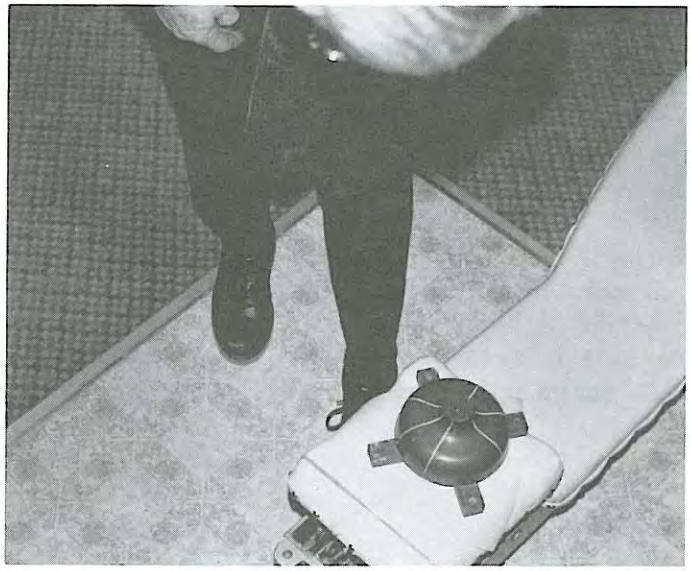
the outside foot. A conscious effort must be made to maintain this element of control firmly as all preceding phases are executed. Just prior to initiating the triceps pull the adjustor must confirm that his plantar reflex and his neck-lock are fully activated to maintain control and balance of his center of gravity. See diagram for progression of transitional weight control and center of gravity on page 5.

The diagram shown illustrates an approach phase for a right listing. The arrow indicates transitional change of the center of gravity (CG). The angle between the trunk and pelvis is decreased rapidly to assist in bringing the (CG) and weight forward which briefly is sustained at the metatarsophalangeal area of the inside foot before skipping to the outside foot as it is placed. The adjustor might visualize a triangular effect from the neck lock to the pelvis then to a focal point of balance at the base of support to the left of center near the metatarsophalangeal area of the outside foot. If the approach phase is properly executed, approximately forty to fifty percent of the settle-back phase is already attained.





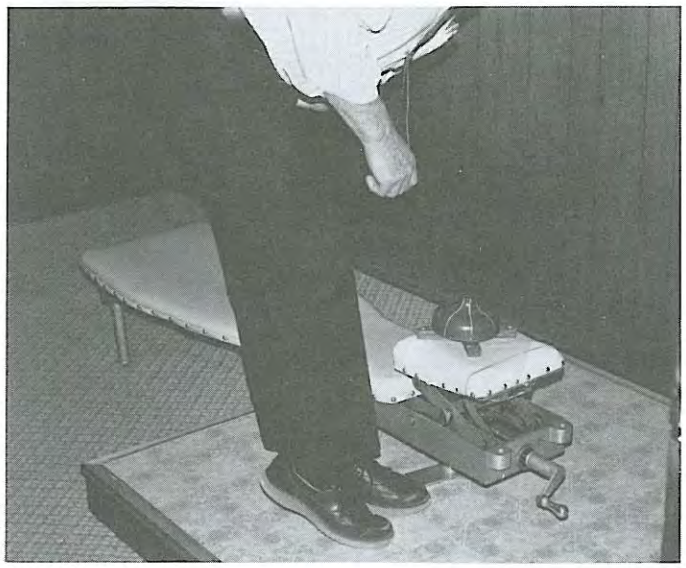
1. Standing erect preparing to advance the inside leg.



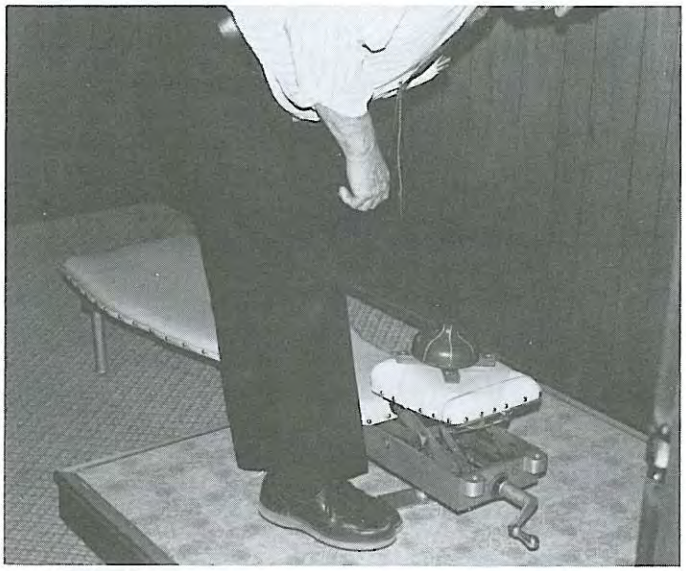
2. Inside foot advanced. Angle decreased between trunk and pelvis. Weight forward before advancing the outside foot.



3. Inside foot advanced. Psoas locked - contracted.



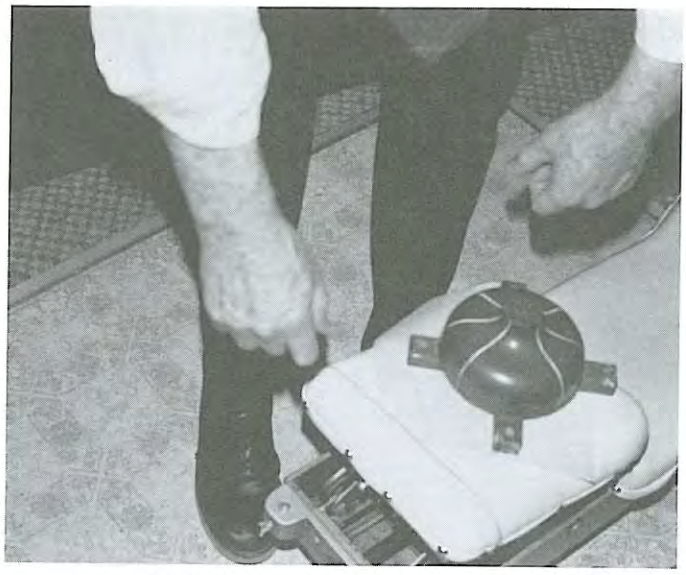
4. Inside leg advanced; hip locked. Angle decreased; trunk and pelvis starting to advance the outside leg.



5. Outside foot in air advancing.



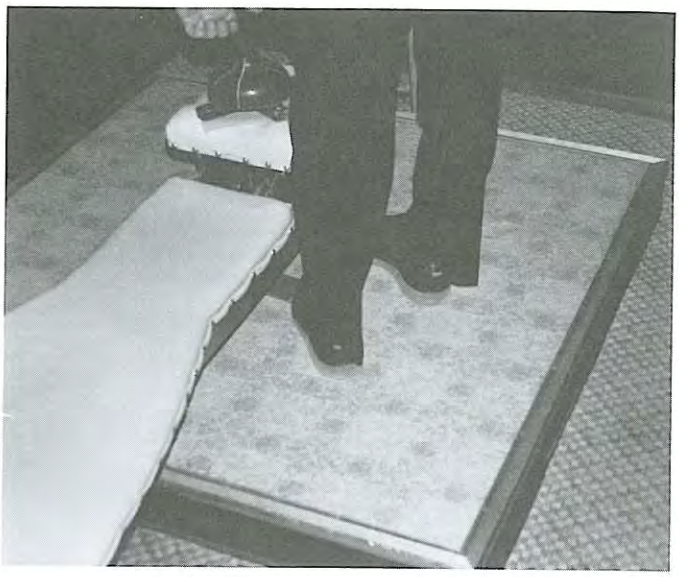
6. Outside leg advanced; weight stabilized.



7. Weight controlled outside foot.



8. Outside foot placed; center of gravity controlled.



9. Feet placed; weight controlled.

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Gowitzke and Milner: Understanding The Sufficient Basis of Human Movement. 2nd Edition. Williams & Wilkins Co., 1980, pg. 75.

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Gregory: The NUCCA Course: Adjusting the Atlas Subluxation Complex. The National Upper Cervical Chiropractic Association, Inc., 1988, pg. 2.

Roberts, T. D. M.: Neurophysiology Of Postural Mechanisms. 2nd Edition. Butterworth & Co., 1978, pg. 148.

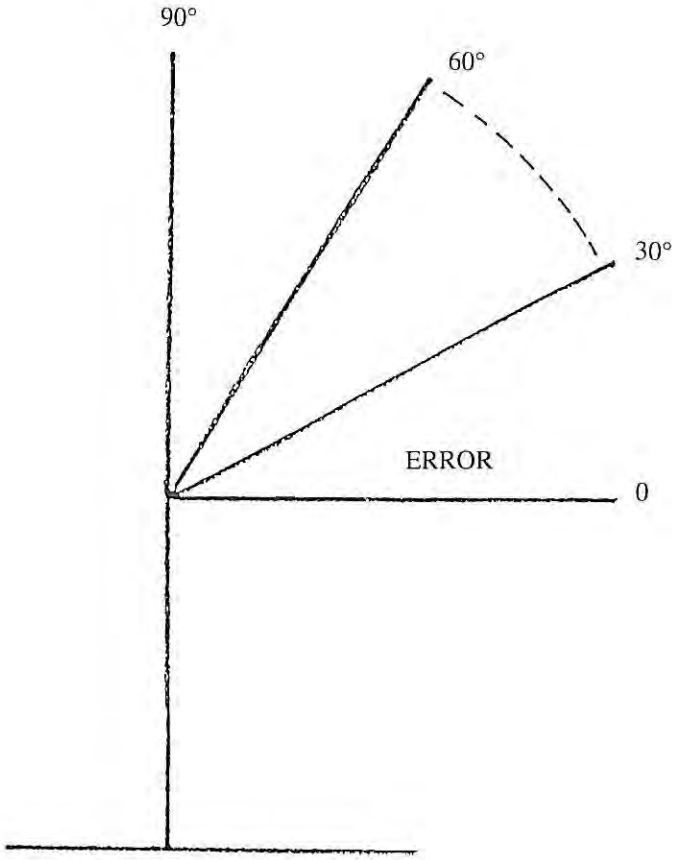
Thermocouple Heat Differential Instrument Examination And Findings In Correlation With The Supine Leg Check And X-ray Findings

By Albert A. Berti, D.C.

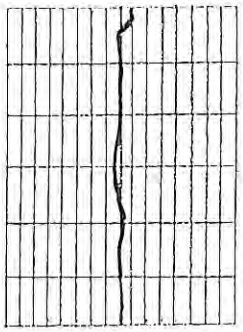
Many NUCCA practitioners are incorporating some type of instrumentation into their regular case management. One of the instruments recommended by NUCCA is a dual-probe pick-up and graph recording instrument. The instrument used in this study of four hundred patients is the Analagraph.

In the study of three heat differential measuring instruments it was found that all instruments demonstrated an over-sensitivity in attempting to establish some correlation with other findings (leg check and x-rays). It was necessary to reduce the sensitivity of the pick-up dual probes with twelve coats of clear nail polish before correlation with the contracted leg became apparent.

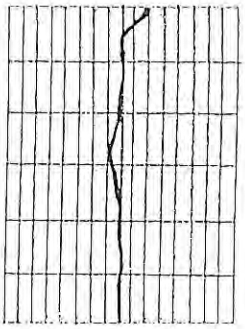
The following bilateral heat differential graphs will demonstrate a correlation with the supine leg check and x-ray findings.



The heat reading is interpreted as a heat break. The heat reading break is related to a contracted leg and the evidence of an atlas subluxation when the reading breaks from a vertical line at an angle between thirty and sixty degrees. Between sixty and ninety degrees is considered a heat reading not indicating the presence of an atlas subluxation. A break reading between zero and thirty degrees is considered an error reading made by the technician.

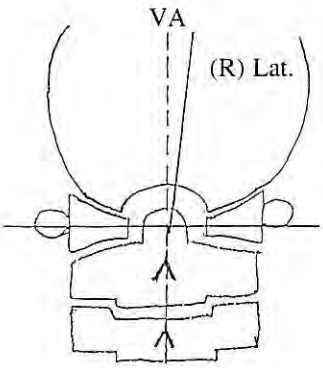


A

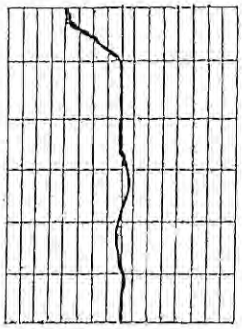


B

A heat reading break of one increment deviating from the vertical between thirty and sixty degrees would indicate a contracted leg of one-eighth of an inch. Graph "A" A heat reading break of two increments at a deviation between thirty and sixty degres from a vertical line indicates a contracted leg of one-quarter of an inch. Graph "B" "For every heat reading break of one increment deviating from a vertical line between thirty and sixty degrees, one leg will be contracted one-eighth of an inch."



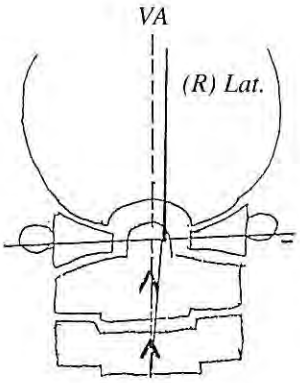
Head turned in toward laterality and away from the vertical axis.



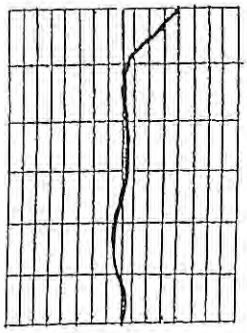
Left heat reading break of four increments. Right leg contracted one-half inch.

If the heat break reading deviates to the opposite side as the contracted leg, the x-ray findings will reveal the head turned in to the subluxation or tilted as in a type four subluxation, a typical "in pattern" type two subluxation and a typical type three subluxation . . . never evident in a type one subluxation.

In the example above, the heat break reading is deviated left from the vertical line four increments at an approximate forty-five degree angle, the right leg is contracted one-half inch. The x-ray findings should reveal the skull turned in or tilted.



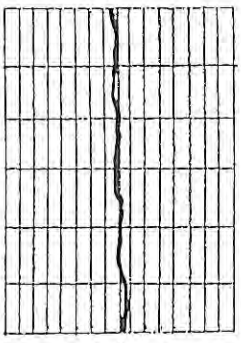
The head is parallel to the vertical axis or away from the laterality.



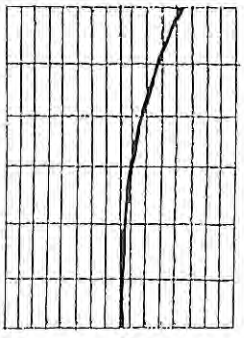
Right heat reading break of four increments. Right leg contracted one-half inch.

If the heat break reading deviates to the same side as the contracted leg, the x-rays will reveal the head is parallel to the vertical axis or turned away from the vertical axis. A type one subluxation is a typical example. This also will be evident in an "out of pattern" type two subluxation where the head is on the vertical axis and in an "out of pattern" type three subluxation where the skull is on the vertical axis.

In the example above, the heat break reading is deviated right from the vertical line four increments at an approximate forty-five degree angle, the leg check reveals the right leg contracted one-half inch. The x-ray findings should reveal the skull on the vertical axis or turned away from the vertical axis.

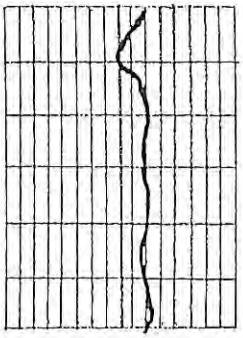


A



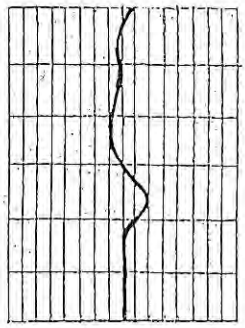
B

With patients on medication or having taken medication within the previous three days a graph similar to examples "A" and "B" will be present. The patient may or may not exhibit a contracted leg. If the doctor finds a graph or heat reading of this nature and a contracted leg, the patient should be questioned as to taking medication or having consumed a large quantity of alcohol.



Cross-over graph refers to a graph that breaks or deviates left and then right or right and then left . . . the breaks deviating between thirty and sixty degrees. The most superior break would indicate the amount of contracted leg. In the example above one leg would be contracted one quarter of an inch.

With cross-over graphs, one cannot determine if the head is parallel to the vertical axis or turned in.



A heat reading break between thirty and sixty degrees in the vertebrae zones of C3, 4, 5, indicate the spine is moving into a subluxated state and within a few days the heat reading break will be evident at the atlas-occiput area. The heat reading may or may not be a crossover graph.

All heat readings are interpreted at the inferior atlas zone up into the occipital area or zone (superior one inch from base of occiput). Heat readings are started at C5 zone.

FINDINGS:

A. The amount of the contracted leg.

B. Skull on the vertical axis or turning in of the skull.

C. When the skull has changed its relationship to the vertical axis. Example: If a type four has been corrected, the next time the subluxation is evident, the reading will tell you whether the skull has turned in again or is now on the vertical axis or parallel to the vertical axis. Comparing and relating the graphs to the leg check will tell the doctor whether or not to re-x-ray.

D. If a patient has not been seen for a period of time and the subluxation was a type one (skull on the vertical axis) and the present graph and leg check are opposite, re-x-rays are indicated.

E. "Out of pattern" type two's and three's (skull on the vertical axis) can be evaluated as to "in pattern" subluxations (skull turning in) when the subluxation returns.

F. Type four's (skull tilted) with the graph reading break and contracted leg on the same side are type one subluxations but abnormalities throughout the skull create a type four subluxation. This finding requires more validity at this time.

NUCCRA Data Base

By James F. Palmer, M. S.

The NUCCA Board of Directors has submitted a written response to the Conference for the Establishment of Guidelines for Chiropractic Quality Assurance and Standards of Practice that was held at the Mercy Center in San Francisco, California from January 25-30, 1992.

The NUCCA Mercy document provides a general perspective of NUCCA/NUCCRA by presenting a representative sampling of its literature with examples of data in support of the NUCCA technique while avoiding the more sophisticated elements of its paradigm that necessitate a fuller, if not more complex, analysis and discussion.

Section nine of this document, "Clinical Effectiveness: Examples of Supporting Data," is reprinted in its entirety. Most of the data has appeared in the MONOGRAPH. Tables 11, 12, and 13 contain data that has never before been published.

IX. CLINICAL EFFECTIVENESS: EXAMPLES OF SUPPORTING DATA

The following tables provide several examples of data supporting NUCCA clinical effectiveness.

TABLE 1A indicates that for a sufficient sample size ($N \geq 100$) the pre-adjustment means and standard deviations for the measurement of atlas laterality are almost identical; statistically the result is obvious: they are of the same population. The weighted mean of the two smallest samples is 2.72°; this is remarkably consistent with the larger samples ($N > 100$).

The studies in TABLE 1A were arranged in chronological order so that the reader can more quickly ascertain that the efficacy of the adjustment as manifested in the post-adjustment means and standard deviations is improving with time.

Table 1A. Atlas Laterality. Pre- and Post-Adjustment Means and Standard Deviations.[1,2,3,8,9,10]

Adjustor	# Cases	Pre-Adjustment		Post-Adjustment	
		Mean	Std.Dev.	Mean	Std.Dev.
Grostic[a]	523	2.63°	1.49°	1.40°	1.60°
Gregory[b]	50	3.01°	1.81°	0.87°	1.25°
Gregory[c]	108	2.64°	1.37°	0.23°	0.51°
Gregory[d]	100	2.63°	1.39°	0.13°	0.35°
G, D, P[e]	36	2.31°	1.51°	0.23°	0.34°
Gregory[f]	52	2.69°	1.45°		

[a]Grostic (1948-1950, 1963)
[b]Gregory (1958)
[c]Gregory (1982)
[d]Gregory (1989)
[e]Gregory, Denton, Palmer (1989)
[f]Gregory (1950-1983)

Table 1B indicates that the absolute difference between pre-adjustment and post-adjustment atlas laterality means progressively increased (improved) with time. Also it indicates that the relative change between pre-adjustment and post-adjustment atlas laterality means progressively increased (improved). It is important to note that both the absolute difference and the relative change nearly doubled.

Table 1B. Atlas Laterality. Difference of Pre-Adjustment and Post-Adjustment Means ($\Delta \bar{x}$); Relative Change of Pre-Adjustment and Post-Adjustment Means $\frac{\Delta \bar{x}}{\bar{x}\ \text{PRE}}$ [1,2]

ADJUSTOR	$\Delta \bar{x}$	$\frac{\Delta \bar{x}}{\bar{x}\ \text{PRE}}$
Grostic[a]	1.23°	.47 (47%)
Gregory[b]	2.14°	.71 (71%)
Gregory[c]	2.41°	.92 (92%)
Gregory[d]	2.50°	.95 (95%)
G, D, P[e]	2.08°	.90 (90%)

[a]Grostic (1948-1950, 1963)
[b]Gregory (1958)
[c]Gregory (1982)
[d]Gregory (1989)
[e]Gregory, Denton, Palmer (1989)

The 1.23° difference (TABLE 1B) in pre-adjustment and post-adjustment means of atlas laterality in the Grostic and DeBoer study of Grostic was used by Keating and Boline as their precision criterion.[1,4] Based on this number, the data in the Sigler and Howe article and the two studies by Jackson et al, Keating and Boline concluded that "despite high reliability findings (linear coefficients) in all three studies, the precision of measuring atlas laterality changes is still in doubt."[5,6,7] The Gregory (NUCCA: post-Grostic) data nearly doubles this difference. A paired T-Test on Gregory (1982) (N=108) indicates that the means of the pre- and post-adjustment laterality measurements to be ultra highly significant ($p<0.0001$) (N=108), Mean=2.412, STD DEV=1.139, SE MEAN=0.110, T=22.01, PValue=0.0000). This is an order of magnitude more significant than in the Grostic and DeBoer study.

Consequently, the statistical analysis of the NUCCA data in Tables 1A and 1B leaves almost no reasonable possibility that "the precision of measuring atlas laterality changes is still in doubt."

Table 2A. Rotation. Pre- and Post-Adjustment Means and Standard Deviations[1,10]

Adjustor	# Cases	Pre-Adjustment		Post-Adjustment	
		Mean	Std.Dev.	Mean	Std.Dev.
Grostic[a]	523	2.75°	1.512°	1.43°	1.601°
Gregory[b]	100	2.56°	1.57°	0.42°	0.69°

[a]Grostic (1948-1950, 1962)
[b]Gregory (1989)

Table 2B. Rotation. Difference of Pre-Adjustment and Post-Adjustment Means ($\Delta \bar{x}$); Relative Change of Pre-Adjustment and Post-Adjustment Means $\frac{\Delta \bar{x}}{\bar{x} \text{ PRE}}$ [1,10]

ADJUSTOR	$\Delta \bar{x}$	$\frac{\Delta \bar{x}}{\bar{x} \text{ PRE}}$
Grostic	1.32°	0.48 (48%)
Gregory	2.14°	0.84 (84%)

TABLE 2A indicates good agreement in pre-adjustment means and standard deviation. Table 2B supports the argument that precision is not in doubt for measuring rotation.

Tables 1A, 1B, 2A, and 2B indicate the importance of understanding the biomechanics of the atlas subluxation complex since there have been significant increases in the percent reduction of the misalignment factors with time.

Using data provided from the NUCCRA files (collated in 1982 by D. Seemann) the following statistics on inter-observer reliability for 10 sets of randomly chosen nasiums were calculated and comprise TABLES 3 through 6.

Table 3. Inter-Observer Reliability (1982 data). Atlas Laterality

OBSERVER	MEAN	STD.DEV.
Gregory	2.700°	1.855°
Denton	2.675°	1.795°

Linear correlation coefficient = .987
Standard error of estimate = .305°
Absolute value of deviations averaged = .275°

Table 4. Inter-Observer Reliability (1982 data). Odontoid

OBSERVER	MEAN	STD.DEV.
Gregory	2.900°	1.810°
Denton	2.875°	1.758°

Linear correlation coefficient = .988
Standard error of estimate = .306°
Absolute value of deviations averaged = .275°

Table 5. Inter-Observer Reliability (1982 data). Lower Angle

OBSERVER	MEAN	STD.DEV.
Gregory	3.650°	2.944°
Denton	3.550°	2.983°

Linear correlation coefficient = .987
Standard error of estimate = .503°
Absolute value of deviations averaged = .350°

Table 6. Inter-Observer Reliability (1982 data). Height Vector

OBSERVER	MEAN	STD.DEV.
Gregory	4.025	2.043
Denton	4.075	2.135

Linear correlation coefficient = .995
Standard error of estimate = .228°
Absolute value of deviations averaged = .150°

Although atlas laterality, odontoid, and lower angle are measured quantities, the height vector is a calculated quantity. Because the height vector is calculated from signed elements it tends to dampen or smooth out the effects of variation in the measured quantities that are elements in its calculus. Thus its linear correlation coefficient would be expected to be higher than in the measured quantities that are elements in its calculus. This is desirable because the height vector is directly used in determining the line of drive of the adjustic process. In a sense, small errors in measured quantities are somewhat forgiving in the final analysis.

Several arguments can be made after considering TABLES 3-6. Linear correlation coefficients are very high; that is they explain more than 95% of the variance. Standard error of estimates is also very high — as good as if not better than any other available data in any study published indexed journals. These examples illustrate that many aspects of the analysis system can be measured reliably. NUCCRA members are of the opinion that the very best NUCCA doctors are practicing at today's highest standards of upper cervical care. (See NUCCA Board Certification process - VI.)

Using data provided from the NUCCRA files (collated in 1982 by D. Seemann) the following statistics on intra-observer reliability for 10 sets of randomly chosen nasiums were calculated (TABLE 7). At least one month elapsed between remarkings. This set of 10 is the same set referred to in TABLES 3-6.

Table 7. Intra-Observer Reliability (1982 data). Height Vector

OBSERVER: Denton	MEAN	STD. DEVIATION
Trial #1	4.075	2.135
Trial #2	4.125	2.145

Linear correlation coefficient = .991
Standard error of estimate = .301°
Absolute value of deviation averaged = .200°

Participating doctors in the (N=36) study were Gregory, Denton, and Palmer. Approximately 90 percent of the patient cases were by Gregory or Denton, the two doctors whose inter-correlation data has just been presented. The other 10 percent of the patient cases were by Palmer. Drs. Palmer and Denton have been associates of Dr. Gregory for about ten years. All three doctors are Board Certified NUCCA doctors. All x-rays were taken by Drs. Denton and Palmer.

TABLE 8 illustrates the clinical basis for NUCCRA's neurophysiology/spastic contracture arguments in that all cases had to have had at least 3/4° of atlas laterality in concert with other misalignment factors for the leg check and the anatometer measurements to yield a non-zero observable reading.

Table 8. Laterality: Pre-Adjustment Cumulative Distribution. Absolute Value of Range Limits (1989; N = 36)

ABSOLUTE VALUE OF RANGE LIMITS	# CASES	PERCENT
0.00°	0	0
0.25°	0	0
0.50°	0	0
0.75°	3	8
1.00°	10	28
2.00°	22	61
2.50°	25	69
3.00°	28	78
4.00°	32	89
5.00°	33	92
8.00°	36	100

TABLES 9 and 10 which are based on two additional NUCCRA studies support the criterion of 3/4° of atlas laterality. All data in Tables 9 and 10 are by Gregory.

Table 9. Laterality: Pre-Adjustment Cumulative Distribution. Absolute Value of Range Limits (1989; N = 100)

ABSOLUTE VALUE OF RANGE LIMITS	# CASES	PERCENT
0.00	0	0
0.25	0	0
0.50	0	0
0.75	4	4
1.00	16	16
2.00	50	50
2.50	55	55
3.00	72	72
4.00	88	88
5.00	98	98
8.00	99	99
8.50	100	100

Table 10. Laterality: Pre-Adjustment Cumulative Distribution. Absolute Value of Range Limits (1982; N=108)

ABSOLUTE VALUE OF RANGE LIMITS	# CASES	PERCENT
0.00	0	0
0.50	0	0
1.00	16	15
2.00	51	47
2.50	64	59
3.00	79	73
4.00	92	85
5.00	104	96
8.00	108	100

Data in Tables 8-10 are supported by the Grostic and DeBoer study in JMPT (1982).

Table 11. Pre- and Post-Adjustment Means and Standard Deviations for Various NUCCA X-ray Measurements (N=100; 1989) and Calculations Based on Measurements.[10]

Measurement	Pre-Adjustment		Post-Adjustment	
	Mean	Std.Dev.	Mean	Std.Dev.
Atlas Laterality	2.63°	1.39°	0.13°	0.35°
Odontoid	2.63°	1.39°	0.13°	0.35°
Spinous	3.57°	2.50°	0.17°	0.44°
Rotation**	2.56°	1.57°	0.42°	0.69°
Lower Angle	3.75°	2.86°	0.52°	0.93°
S-Line	2.55	1.09		
Condylar Circle	3.35	0.27	3.23	0.29
Axial Circle	6.78	1.73	6.81	1.66
Plane Line	1.03	0.86	0.25	0.45
Nasium Vector*	3.28	1.46	2.06	0.97

*Nasium vector=height vector
**Grostic/DeBoer N=523; Mean=2.75°; Std. Dev.=1.512°

Table 12. Pre-Adjustment Mean and Standard Deviation for Contractured Leg Length. (N=100; 1989)[10]

MEAN	STD.DEV.
0.93 inches	0.21 inches

Table 13. Pre and Post-Adjustment Means and Standard Deviation for Anatometer Measurements. (N=100; 1989)[10]

Measurement	Pre-Adjustment		Post-Adjustment	
	Mean	Std.Dev.	Mean	Std.Dev.
Frontal plane	2.36°	1.00°	0.09°	0.24°
Transverse plane	1.58°	1.45°	0.55°	0.60°
Fixed point	1.41°	1.07°	0.31°	0.60°

TABLES 11, 12 and 13 all indicate statistically significant changes in the misalignment factors and in body distortions as a direct result of adjustment.

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Letter To The Editor

To The Editor:

Ever since chiropractors began adjusting the spine, the upper cervical region has been recognized as a special area, not only because of its unique architecture and relationship to the brainstem, but also because of the structural and symptomatic changes which occur following an upper cervical adjustment. The National Upper Cervical Chiropractors Association has found some clinically demonstrable structural changes which occur in all patients who present with an upper cervical subluxation and have termed these changes the Atlas Subluxation Complex. These structural changes include unilateral extensor hypertonia, contractured leg, pelvic distortion, and displacement of the body's center of gravity. Many different theories have been proposed to explain the neurological mechanisms involved with the production of these structural changes. In the most recent MONOGRAPH, Dr. Grostic has suggested that the dentate ligament tractionization mechanism is one way to explain the various structural and symptomatic changes seen in patients following reduction of upper cervical misalignments. I would like to make a few comments on this theory as well as to propose an alternate view which can account for these phenomena.

Dr. Grostic states that the physical and symptomatic changes seen in individuals presenting with an upper cervical subluxation are due to direct mechanical compromise of the tracts of the brainstem by abnormal tensile stresses caused by the dentate ligaments. Due to the proximity of the spinocerebellar and spinothalamic tracts to the attachment point of the dentate ligaments, it is proposed that mechanical deformation of these nervous structures can alter their function. Extensor imbalance and pelvic distortion are proposed to be the end result of altered electrical impulses within these compromised nerves. Dr. Grostic cites as examples — warmth in the lower extremity or the reduction of sciatic pain immediately following an upper cervical adjustment. The source of the nerve impingement is proposed to be located in the brainstem as opposed to being located in the lower lumbar area where the sciatic nerve exits the spinal column. Most cases of sciatica which I have encountered show direct evidence of nerve root impingement at the lower lumbar area. The pain distribution usually follows a discreet dermatomal pattern along the area which is innervated by a specific nerve at a specific lumbar level. Also straight leg raising is usually reduced on the affected side due to nerve entrapment in the lower lumbar spine. If the source of the nerve impingement was located in the brainstem level as Dr. Grostic states, the pain would not follow a discreet dermatomal pattern nor would straight leg raising be affected. Reflex and muscle testing of the lower limb can frequently indicate specifically which nerve root is involved. If the nerve impingement were to be located on the brainstem area, all reflexes would appear normal because reflexes are mediated by a monosynaptic reflex loop near the specific spinal level that the nerve enters the cord. Impingement of the nerve higher up the neuraxis would not affect this simple reflex. Plain film, myelography, and C.A.T. scan imaging can also clearly demonstrate narrowing of the I.V.F. which can affect the sciatic nerve. If the problem were located in the brainstem area, no amount of manual therapy, including manipulation of the lumbar spine or surgical removal of a herniated disc, would affect any positive change. We do frequently see, however, that these treatments for sciatic pain can often reduce the severity of pain experienced by these patients.

The minimum amount of displacement between the skull and atlas vertebrae (laterality) which may cause physical manifestation of the atlas subluxation complex has been observed to be three quarters of a degree. This amount of bone-on-bone movement is less than one millimeter. Static x-rays of the upper cervical spine show the relationship of the skull, atlas, and subadjacent cervical vertebrae to the vertical axis and the three cardinal planes. These views are taken when the spine is at rest. The spine, however, is a dynamic structure and is capable of a large degree of motion. If less than one millimeter of laterality is capable of producing all of the signs of an atlas subluxation, what happens to the brain stem structures when the cervical spine is moved to its end range of motion? Punjabi and White have demonstrated that there is a large degree of mobility in the upper cervical spine. The values most pertinent to our discussion include eight degrees of motion between the occiput and atlas during lateral flexion of the head and forty-seven degrees of rotation between atlas and axis during normal neck rotation. In fact fifty percent of neck rotation occurs between C1 and C2. If static misalignment of the occipital-atlantal joint of less than one degree is sufficient to cause tractionization of the brain stem and subsequent postural distortions, what happens when lateral flexion of the head causes an increase in angulation to eight degrees? What happens when the head is rotated? The axis of rotation of C1 on C2 is the odontoid process and when the spine is rotated around this pivot point there is considerable displacement of the neural foramen. What happens in an asymptomatic, subluxation-free individual during normal cervical range of motion? If the brainstem were so firmly anchored within the neural canal at the atlanto-axial area, there would be no normal movement possible between the vertebrae without creating a massive amount of neurological interference. If the brainstem were susceptible to small changes in tension applied to the dentate ligaments what occurs when the person is lying on their side? Would not the laterally transferred weight of the brainstem also cause neurological problems? While it is true that movements of the neck can cause changes in the flexor-extensor tone of the paravertebral musculature, I feel that this is not due to the neck movements causing

tractionization of the nerves leading to these muscles, but rather through an inherent reflex mechanism which coordinates body posture and movement.

I feel that the recognized importance of the upper cervical spine is not because of its proximity to the brainstem or the brainstem's vulnerability to mechanical derangement via the dentate ligaments or osseous encroachment, but simply due to the fact that the upper cervical spine serves as a base of support for the skull. Nature has provided ample free space in the upper cervical area to allow for a large degree of movement without causing any impingement on neurological structures. Examples of this can be seen in cases where there has been a fracture of the odontoid, congenital absence of the odontoid, or rupture of the transverse ligament which causes large displacements of the atlas on axis during flexion and extension. Many of these patients are asymptomatic even though there is direct mechanical compression of the spinal cord by the posterior arch of the atlas during extreme forward flexion or extension. Small misalignments in the upper cervical area do not cause an imbalance in the extensor musculature by physically deforming nerves, but simply by initiating special postural reflexes which are "hard-wired" into our nervous system.

The upper cervical spine serves as a base of support for our skull which not only houses the brain but also contains two of the primary detectors of body position and equilibrium, our eyes and our inner ear (vestibular apparatus). These organs are responsible for informing the central nervous system of the head's position in relation to the horizon and the velocity and direction of head motion. A greater degree of information has been required of these organs ever since man abandoned quadripedal stance and decided to walk upright on two feet. The delicate act of balancing on such a narrow base of support has eventually evolved a complex neural circuitry which deals with upright stance, coordinated head and eye motion, and coordinated body motion.

The primary component of an upper cervical subluxation has long been recognized as a lateral deviation of the skull of the atlas — termed "laterality". Laterality must be present in any individual presenting with signs of an atlas subluxation. As the skull deviates laterally on the atlas, the third receptor responsible for informing the brain about structural positioning becomes an important component to the production of the A.S.C. These organs are the proprioceptive mechanoreceptors which are imbedded within the joint capsules and muscle tissues of the body, namely the articular receptors and muscle spindles. As I have described before (NUCCA MONOGRAPH 1985, "Neurological Mechanisms of the Atlas Subluxation Complex") these receptors are found in extremely high density in the upper cervical spine, provide detailed information about the degree of tension and length of each muscle in which they are imbedded, and respond to even minute changes in muscle length or tension. In fact these are the only receptors that have been shown experimentally to be capable of responding to the minute displacements seen in subluxations of only three quarters of a degree. Changing the rate of discharge of the muscle spindles has also been shown to reflexively affect changes in muscle tension in various associated muscles of the body. As laterality is produced the skull will initially deviate from the vertical axis in the frontal plane. The eyes, inner ear (vestibular apparatus or statokinetic labyrinthe), and the muscle spindles associated with the upper cervical spine will all detect this deviation from the vertical axis. The brain, sensing this deviation, must compensate by attempting to return the skull to the vertical axis. As T.D. Roberts has stated in his book entitled *Neurophysiology of Postural Mechanisms*, "The original head positions are primarily determined by the labyrinthe and optic organs; the somatic (body) 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."

These body orienting reflexes will tend to shift the spine under the skull by changing the tone of the extensor musculature so as to return the skull and its enclosed proprioceptive organs to a more optimal position parallel to the vertical axis. If the top part of the spine shifts then there must be a concomitant shift in the lower spine and pelvis to futher compensate. This deviation of the skull from the vertical axis, recognition of the deviation by the central nervous system, and subsequent reflex alteration of supporting extensor musculature, can easily produce the hallmarks of the A.S.C.: unilateral extensor hypertonia, pelvic distortion, contractured leg, and displacement of the body's center of gravity.

The muscular imbalances and deviation of the spine and pelvis from the vertical axis will change the axis of motion and the distribution of gravitational forces in all supporting structural architecture. Abnormal gravitational stresses may, in time, result in facet irritation, muscular hypertonicities, vertebral fixations, hypermobilities, hypomobilities, sacro-iliac joint strain, and mechanical derangement of the intervertebral discs due to unequal lateral force distribution from the nucleus pulposis to the outer annular fibers. The peripheral nervous system may also become affected due to the fact that the spine houses the spinal cord. Mechanical impingement of the nerve roots may occur by decreasing the diameter of the transverse foramen, resulting from facet joint capsule swelling, by contracture of the musculature which the nerve must pass through, or by herniation of the nucleus pulposis.

Treatment of all spinal conditions must first be comprised of an attempt to restore the spinal column to its optimum structural relationship, namely on the vertical axis with the base of support of the spine (pelvis) and base of support of the skull (atlas) perpendicular to the vertical axis with all musculature and ligamentous structures balanced. Through proper adjusting of the upper cervical spine the skull is returned to the vertical axis, its base of support (atlas) becomes level, and the subadjacent cervical vertebrae are also returned to their proper position along the vertical axis. The optic organs, inner ear, and upper cervical mechanoreceptors now inform the brain that everything is positioned properly; therefore, there is no need for postural compensation of the subadjacent spinal musculature. The extensor muscles balance, the pelvis levels off, and the contractured leg now becomes equal. Gravitational forces become centered, abnormal unilateral stresses are eliminated, and the balanced musculature can function in a coordinated, bilaterally symmetrical manner. This allows the

facet joint to heal, the strained sacro-iliac joint to move properly, and the compressed peripheral nerve to regain function.

As you can see, we do not need elaborate theories of mechanical compression, venous stasis, or brainstem tractionization to adequately explain the symptomatic and structural changes seen with subluxation of the upper cervical spine. The signs and symptoms of the Atlas Subluxation Complex are simply the result of pre-programmed neural reflexes attempting to perform the complex task of maintaining an upright posture against the constant pull of gravity.

Sincerely yours,



R. G. COCKWILL D.C.

RGC:ks

Editorial Comment

The following three articles by Drs. Dickholtz, Sr., Cripe and Yardley discuss the use of surface lead markers as an aid to locating the atlas transverse process. These procedures have not been fully approved by the NUCCRA Board, but deserve further study. Expert opinion in the field of radiology offer no legal or radiological contraindications to the use of markers at this time.

Locating The C-1 Transverse Process Using Surface Lead Markers

By Marshall Dickholtz, Sr., D.C.

Introduction

In the classical (Grostic - NUCCA) sequence of films for precision upper cervical work the lateral or "scout" film is the first film. A major purpose in taking a lateral film is to determine the proper nasal projection (the S-line) for the nasium film; however, it is difficult to see a significant point for the ruler on the posterior aspect of the posterior arch of C-1. To help in this, lead pellets (bird shot) have been used in my office for the past twenty-seven years.

What follows are (1) a description of the processes that have been used, (2) some basic observations resulting from the use of those processes, and (3) some examples of applications with calculations.

Locating The Transverse Contact

Before taking the lateral film, the locations of the very inferior aspect of the right and left palpable mastoids are determined. At each location, a pellet is placed and affixed with a soft piece of skin tape.

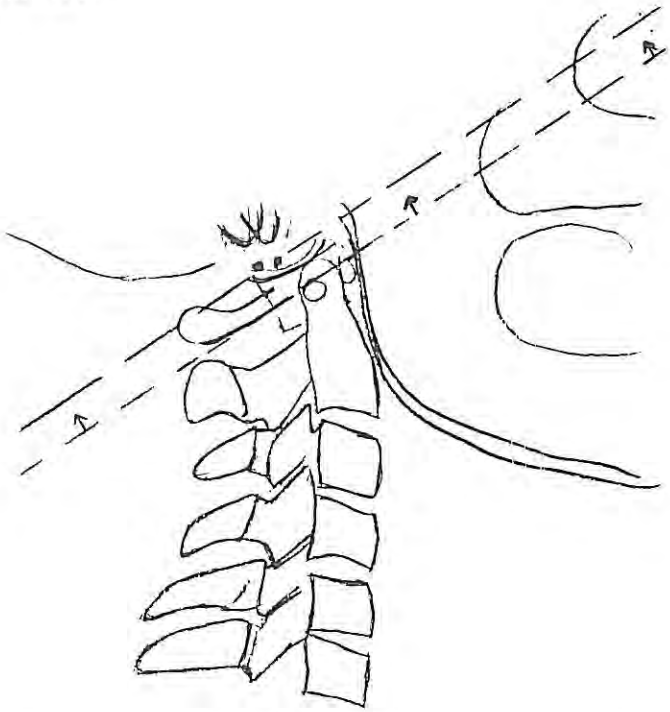
When viewing the lateral film, for the nasal projection, you would hold a straight edge (ruler) under the posterior arch (first one-half inch, as it attaches to the lateral masses, showing a little clearance on the posterior portion of the one-half inch). This is the angle at which you would take the nasal film. If you see both sides of the posterior arch, go in between them.

See Drawing #1

A perfect lateral film view will show the image of two pellets in a horizontal plane, not superimposed, because the tips of the mastoids were not in the exact center of the central ray. The larger image would be the pellet that is farthest from the film. This is one way you can tell the right side from the left.

On the nasium film you will notice that the pellets are about three-eighths to one-half inch below the mastoids. The ligamentous structures, muscles and skin, will prevent you from palpating the exact location of the mastoid. You may notice a white horizontal line at this point. There is a 33% magnification factor in this area because of the ratio of the focal spot to object - object to film distance.

The determination of the atlas transverse contact is necessary because palpation is not reliable. Contacts have been found



Drawing #1

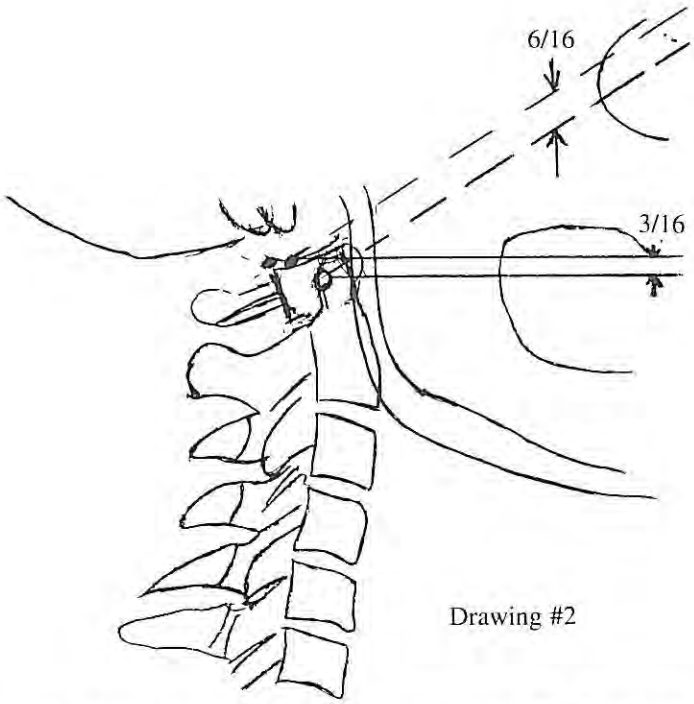
that ranged from three-quarters of an inch above the palpated tip of the mastoid to one inch below the palpated tip of the mastoid. Adjusting into the ligamentous structures that adhere to the mastoid and the transverse structures increases the atlas laterality.

When trying to locate the transverse for your contact, the palpable inferior-anterior tip of the mastoid is a perfect place to start. But how does one relate the atlas transverse contact to the palpable inferior-anterior tip of the mastoid? The transverse, being in front of the mastoid, will project different relationships to each other when x-rayed at different angles.

Observations And Considerations

Hold a ruler on the lateral view from one of the pellets to an S^4 angle and note a marked transverse to this line. Now move the ruler to an S^0 angle, pivoting at the same pellet and again notice the location of the marked transverse to this line. You will notice that the transverse moved cephalicward in relationship to the pellet.

See Drawing #2



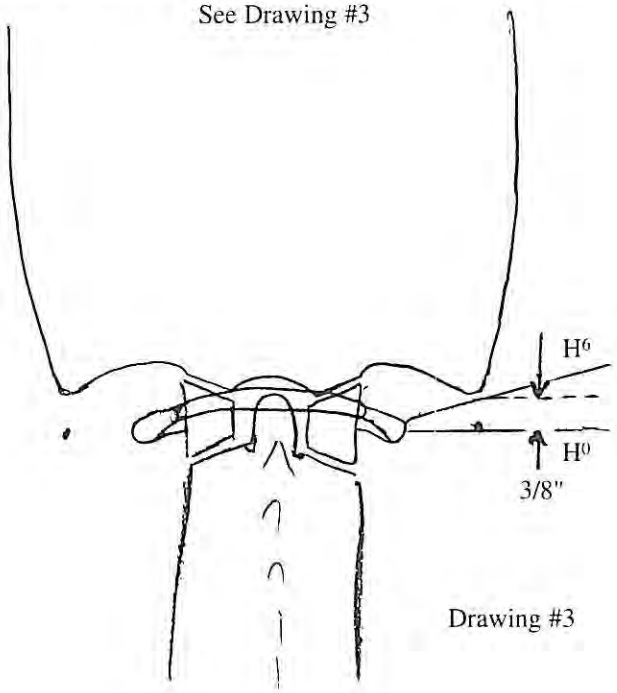
Drawing #2

So when there is an x-ray projection over S^0, there will be an acknowledgement of 1/32 of an inch that the projection moved the transverse cephalicward in relationship to other structures in this area. You are looking for a horizontal distance in regards to the transverse and marker for two reasons.

1. To help in figuring the transverse contact;
2. This corrected measurement will be used to locate the transverse on the lateral film in relationship to the pellet.

Another factor that has to be considered is the adjustment vector, which generally is at an angle to the transverse and the transverse is about one inch below the skin surface, so the contact on the skin surface has to precede the transverse contact. For the difference of an H^0 to H^5, I would raise cephalicward one-quarter of an inch, or a fraction of this distance for a lower adjustment vector.

See Drawing #3



Drawing #3

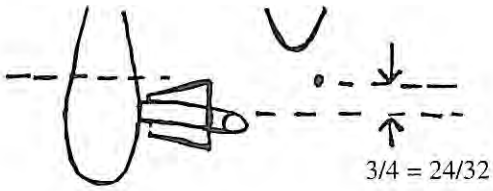
To summarize, there are four considerations that have to be taken into account, after you have figured out the height vector, when taking contact:

1. What part of the transverse are you going to take contact on, H^0 the middle of the transverse, H^1 or above, the superior aspect, L^1 or lower, the inferior aspect.
2. The angle of the nasal film, adding 1/32 of an inch to the height of the transverse for every number the projection was over S^0.
3. Subtracting 33% for magnification after allowing for the nasal film projection.
4. Considering the height vector because of the transverse to the skin distance. The transverse can be very short.

Examples of Applications with Calculations

Start figuring from the part of the atlas transverse (on the side of laterality) that you will be taking contact.

EXAMPLE:



Projection S^3 Type 1

I will be using figures now, but in practice, you will move your pencil on the x-rays lateral to the atlas transverse area, and in only a few seconds, you have the final contact point. The example shows three-quarters (24/32) of an inch between the transverse and marker. The transverse projected below the metal marker in this case. The x-ray was taken at S^3 so subtract the distance 3/32, the figure now is 21/32. Now minus 1/3 for magnification 21/32 - 7/32 = 14/32.

For height vector of H^5, I will move my contact hand another 8/32 cephalicward, 14/32 - 8/32 = 6/32. This shows that the contact should be 3/16 inch below the palpable tip of the mastoid. Also allow for the depth of the transverse when considering the rotation vector.

I just used these small dimensions to illustrate the principles that have to be known, but the application is very simple and fast.

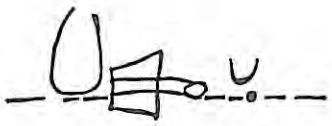
Now let's consider the nasal x-ray film that shows the transverse at the same level as the marker.



Projection is at S^1 Type 1
Start with + 1/32 for the S^1 projection.

No magnification factor. The marker and transverse are almost on the same level. The height vector of H^5 will add 1/4 inch cephalicward for out contact hand.

With the above figure, contact will be taken 1/32 inch + 1/4 inch above the palpable tip of the mastoid. When looking at the lateral film, the superior portion of the transverse will be located in the front of the marker.



ANOTHER EXAMPLE: Projection S^0 Type two. Don't have to allow anything for projection. No magnification factor. Inferior aspect of transverse is on the same level as the marker. The adjusting vector is a low 3, so allowing for skin-transverse distance, the contact will be 1/8 inch below palpable tip of the mastoid.

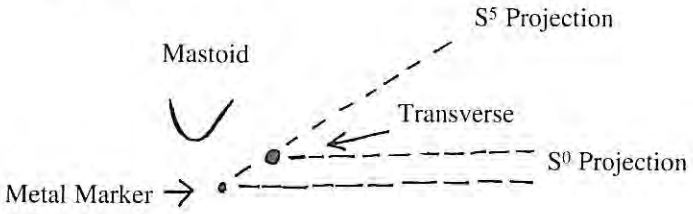


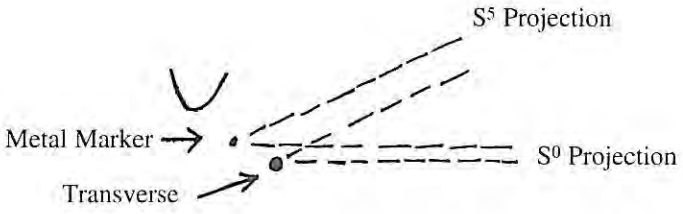
ANOTHER EXAMPLE: Projection S^1 height vector H^3 Type 1. The transverse is 1/4 inch above the palpable tip of the mastoid. Starting at the superior aspect of the transverse and going up 1/32 inch because of the projection, 1/4 inch + 1/32 inch = 9/32 inch above palpable tip of the mastoid.

1/3 inch off for magnification 9/32 inch - 3/32 inch = 6/32 inch. Now add 1/8 inch for height vector 6/32 inch + 4/32 inch = 10/32 inch. Contact will be 1/3 inch cephalicward of the palpable tip of the mastoid.

There is another advantage in using the lead pellets. If two pre-nasal films are taken at the same time (one 2 inches higher than the first and there isn't a low posterior arch on either film), they both can be analyzed and the films can be superimposed by overlaying the pellet spots. If there is a difference in the central skull line or plane line, the x-rays should be re-examined for errors. Use the lower projected film for the measurement of the condyles and axial circles.

I would like to make one more observation at this point. On the nasal film, the x-ray image of the nose in relationship to an imaginary line drawn between the pellets will give you the S-line projections of the nasal film. In an S^0 projection, the bottom of the nasal image will be on this line. The higher the S-line projection, the further the bottom of the nasal image would be below the imaginary line. With this information, now when viewing an x-ray and you see the posterior arch of the atlas is too high or too low, you can now adjust your next nasal x-ray accordingly.





These two illustrations show that no matter where the atlas transverse is in relationship to the marker, that if you look at two projections, one S^0 another S^5, the transverse will appear to move up on the S^0 projection as it relates to the marker.

Locating The C-1 Contact Point

By Glenn E. Cripe, D.C.

Introduction

The precision of the NUCCA x-ray analysis is only as reliable as the doctor's ability to practically apply the information to the patient. Errors in determining the exact point of contact, and pisiform placement of the contact hand, can be detrimental to the reduction of the Atlas Subluxation Complex.

The purpose of this study was (1) to test a simple reliable method of determining the location of the C-1 transverse process, and (2) also test the accuracy of the pisiform placement of the contact hand in relation to the C-1 transverse process.

Observers for this study were Dr. D. Gordon Hasick, Calgary, Alberta, a NUCCA Board Certified practitioner, Dr. Glenn E. Cripe, Newport Beach, California, a NUCCA Board Certified practitioner and Dr. Robert Goodman, Newport Beach, California, with Part II NUCCA Certification qualifications.

Procedure

Ninety participants were involved in the study, and these were divided equally among the observers. Each doctor used NUCCA approved aligned x-ray equipment and standard patient placement procedures.

1. A metal BB was taped to each intertragus notch. (See Figure 1)
2. The standard NUCCA series of pre x-rays were taken.
3. Using the nasium film, on the side of C-1 laterality, the distance between the inferior border of the BB and the C-1 transverse process contact point was measured. Standard nasium magnification factors were considered. (See Figure 2)
4. With the patient on the adjustment table, the following procedures were inducted: Using the intertragus notch as the superior point, the measurements from step 3 were used to determine the contact point. With a felt tip pen, a mark was placed on this point.
5. After each tricep pull the doctor observed the pisiform of his contact hand. The mark from the felt tip pen should transfer to the doctor's hand. This indicates the doctor's pisiform location in relation to the contact point.
6. Prior to post x-ray, a BB was taped to the contact point that had been established in step 4.
7. The post x-ray compared the contact point established by step 4, with the C-1 transverse process.



Figure 1

Conclusion

The post x-ray indicated an extremely high reliability with the placement of the contact point BB and the C-1 transverse process.

All doctors observed an inconsistency with the pisiform placement on the contact point. A common error was the placement of the hypothenar region over the contact point . . . the hypothenar region being distal to the pisiform bone.

Remarks

It is the conclusion of the writer that this method is an extremely reliable procedure for determining the C-1 contact point. By using the intertragus notch (a visual landmark), there is a greater consistency compared to palpation. The author would recommend a comparison study using palpation procedures with a contact point placement of a surface lead marker, to determine C-1 transverse process location.

The majority of transverse processes varied from 1/8" to 1-1/2" inferior to the BB. A small percentage of transverse processes were level with or slightly above the intertragus notch. The uses of felt tip pen marks appear to be a valuable self-help tool for placement of the pisiform bone. The marks also made the author more aware of the transverse process location when establishing the nasium, vertex and horizontal resultant vectors.

By performing these steps, two more variables can be eliminated and a higher degree of accuracy can be attained in the reduction of the C-1 Subluxation Complex.



Figure 2

A Pilot Study To Determine The Reliability And Efficacy Of Using Palpation Of The Mastoids To Locate C-1 Transverse Processes

By Lee Yardley, D.C.

Introduction

The purpose of this pilot study is to determine if the palpable mastoids are reliable landmarks for finding the location of the C-1 transverse processes. Comparisons in location are made between (1) palpable mastoids and radiographic mastoids and (2) between palpable mastoids and radiographic C-1 transverse processes.

Standard NUCCA x-ray series were performed. Fifty patients were x-rayed and one hundred plates were taken which allowed for the measurement of two hundred separate transverse processes of the C-1 vertebrae.

Procedure

The mastoids were palpated to determine the palpable inferior-anterior tip of the mastoids. At this location "on" each mastoid (right and left) a single bird shot (BB) was taped. Standard NUCCA x-ray series were then taken.

Comparison in location of lead pellets to projected radiographic mastoid process was made. Standard nasium film magnification was considered. Lead pellets (BB's) were removed and standard adjusting procedure was followed.

Mastoids were again palpated, lead pellets again affixed with tape and post adjustic x-rays were taken. If necessary, the patient was adjusted again and the process was repeated.

Data

The raw data for all fifty cases is given in the table. Column A is the study number for each patient. Column C is the S-line for each case. Films #1, #2, and #3 (Columns D, E, and F respectively) represent sequential posts where the lead pellets are removed and replaced again for the next film. The four exceptions to this procedure are marked with an asterisk. In these cases measurements were made on two nasium pre-views 1/2 an S-line different. This allowed, in sixty-four instances, for an evaluation of the operator accuracy in placement of the lead pellets (BB's) on the same patient film after film. The numbers in columns D, E, and F represent differences as measured in fractions of an inch between the location of the mastoid as seen on the radiograph and the location of the mastoid as indicated by the BB location. Film #1 was usually the pre or the first post, Films #2 and #3 were usually the second post and third post respectively.

Column G is the range of difference in distance between the mastoid as seen on the radiograph and its location upon palpation as indicated by the BB location. This statistic or this value is one measure of the repeatability/reliability of the process of locating the palpable mastoid and identifying it with a lead pellet.

Column H is the measured distance between where the BB was placed and the radiographic location of the transverse process.

A	C	D Mastoid-Osseous Palpable Δ Film #1		E Mastoid-Osseous Palpable Δ Film #2		F Mastoid-Osseous Palpable Δ Film #3		G Palpation Error on Same Patient		H
#	S line	R	L	R	L	R	L	R	L	Palpable Mastoid Transverse Distance
1	S4½	3/8	5/16	3/8	3/16			0	1/8	0
2	S1	5/16	5/8	3/8	11/16	5/8	7/16	1/4	1/4	0
3	S3	3/8	1/2	3/8	7/16			0	1/16	0
4	S1	1/4	1/2							I 5/8
5	S1	5/8	1/4							0
6	S4	9/16	3/16							0
7	S3½	1/2	3/8							0
8	S3	1/4	1/8							0
9	S3	7/16	1/2	7/8	7/16			1/2	1/16	0
10	S3	7/16	1/2							I 1/4
11	S3½	5/8	9/16	5/8	11/16			0	1/8	0
12	S0	5/8	1/8	5/8	1/4	5/16	1/8	1/4	1/8	0
13	S1½	3/8	1/8							0
14	S2	3/8	3/8	1/2	5/16	7/16	1/8	1/8	1/4	I 5/16
15	S2	5/8	1/2							I 1/8
16	S1	3/8	5/16							0
17	S½	9/16	3/4							0
18	S3½	0	0							I 1/2
19	S0	9/16	9/16	3/8	1/8	1/8	1/4	1/2	3/8	I 1/8
20	S2	5/8	1/4							0
21	S2	1/8	1/4	3/8	1/2			1/4	1/4	0
22	S3	3/8	3/16	5/8	3/8			1/4	1/4	S 1/8
23	S3½	3/8	5/16							I 5/8
24	S2½	5/8	1/2	*9/16	1/2			1/16	0	S 1/2
25	S3	3/8	9/16	5/8	7/16	3/4	1/2	3/8	1/8	0
26	S3	3/8	3/16	5/8	1/4	7/16	1/4	1/4	1/16	0
27	S3½	1/8	1/2	7/16	1/2			5/16	0	S 3/8
28	S2	3/8	3/16	5/16	5/16	5/16	5/16	1/16	1/8	0
29	S3	3/8	1/2	1/4	1/2			1/8	0	0
30	S3	3/8	7/16	1/4	5/16	1/2	3/8	1/4	1/8	I 1/8
31	S0	1/8	1/8	3/8	1/4	1/8	1/4	1/4	1/8	I 1/8
32	S0	5/8	5/8	5/8	5/8	1/2	5/8	1/8	0	S 1/2
33	S2	3/8	3/8	1/4	1/4	1/2	3/8	1/4	1/8	S 1/8
34	S3¼	5/8	3/8	3/4	1/2	7/8	3/8	3/8	1/8	I 1/2
35	S3	5/8	3/8	*11/16	7/16			1/16	1/16	0
36	S3¼	5/8	7/8	*3/4	9/16	9/16	5/8	1/8	5/16	S 1/2
37	S5	7/16	1/8	1/4	1/8			3/16	0	0
38	S4	11/16	11/16							S 1/8
39	S3	3/16	5/16	1/8	3/8			1/16	1/16	0
40	S3	1/2	3/8	1/4	3/16			1/4	3/16	0
41	S2	5/8	1/2	7/16	3/8	13/16	1/2	3/8	1/8	S 1/8
42	S1	1/2	3/8							I 1/4
43	S2	3/8	7/16							I 1/8
44	S3	3/8	1/4							0
45	S3	1/4	1/8	3/8	1/4	7/16	5/16	3/16	3/16	0
46	S2¾	3/8	3/16	*3/8	1/8	5/8	3/8	1/4	3/16	S 1/8
47	S2	9/16	1/2							S 1/8
48	S2¾	5/8	5/8	3/4	5/8			1/8	0	S 5/8
49	S3	7/8	3/4	1	3/4			1/8	0	S 1/4
50	S2¾	3/8	1/2	3/8	1/2	1/2	1/2	1/8	0	0

Summary of Findings

Distance of BB (palpable mastoid) from radiographic mastoid	Average 7/16"	High 7/8"	Low child 0 adult 1/8"
Palpation Error	Average 3/16"	High 1/2"	Low 0

If you take the average distance of the BB from the mastoid as visualized on the radiograph to be 3/8" as suggested by Dr. Dickholtz and if you assumed this was a constant and allowed for this in adjusting patients you would be correct within plus or minus 1/8" 60% of the time (based on the above measurement of 200 transverse processes).

The assumption that the operator will consistently palpate within plus or minus 1/8" of the actual location of the mastoid on the same patient would be correct 58% of the time (based on 64 comparisons).

If you assumed that the palpable mastoid is directly over the transverse process of C-1 within plus or minus 1/8", you would be correct 74% of the time (based on 50 cases). Of the 50 cases, 52% were the same, 24% inferior, 24% superior. The positional average distance of the transverse process of C-1 from the palpable mastoid is superior 0.015 inches which is about 1/64 of an inch. The average of the absolute values of the positional difference is 0.14 inch which is approximately 1/8 of an inch.

Implications and Questions

The average height of a transverse process is 1/2". Contacting the superior, center or inferior aspect of the transverse process can affect at least several elements in the correction of a subluxation. In some cases, (possibly many cases) it may determine if any correction at all is obtained or indeed, if the subluxation is made worse. Taking into account palpation error (42% of the time) and then inconsistency between the palpable mastoid and radiographic mastoid (agreeing only 60% of the time with a given ''constant'' i.e. 3/8" inferior) one would wonder what this tells you about the patient you are about to adjust? Exactly how, on a clinical level, might this information be used? Use of the BB has been of great value in locating the transverse relative to the palpable mastoid and I believe this has improved my corrections. Is there not some other location to place the BB that would bear a constant relationship (in all positions) to the transverse process of C-1 such as in the ear in an earplug thus eliminating the palpation error factor?

Using the Inter Mastoid Line for Central Skull Line Reliability

By Vince Fitzpatrick, D. C.

Introduction

Many upper cervical techniques use the central skull line to determine C-1 laterality. The reliability of the construction of the central skull line with trained practitioners appears good. Studies conducted by Seemann,[1] and Jackson[2] attest to this reliability. The post adjustment x-ray outcome assessment using the central skull line must also be objectively performed by the observer to gain reliable information. The use of the inter mastoid line adds another step to improving the reliability in the construction of the central skull line.

Procedure

On the pre x-ray, find the tip of each mastoid and mark each one with a pencil dot. Next, connect these two points with an imaginary line (mastoid line). Then, measure the angle at which the central skull line and mastoid line intersect. In the example below, they intersect at a right 1½ degree angle.

CROSSCHECKING THE CENTRAL SKULL LINE
ON PRE & POST X-RAY BY USING A LINE
JOINING THE MASTOID TIPS

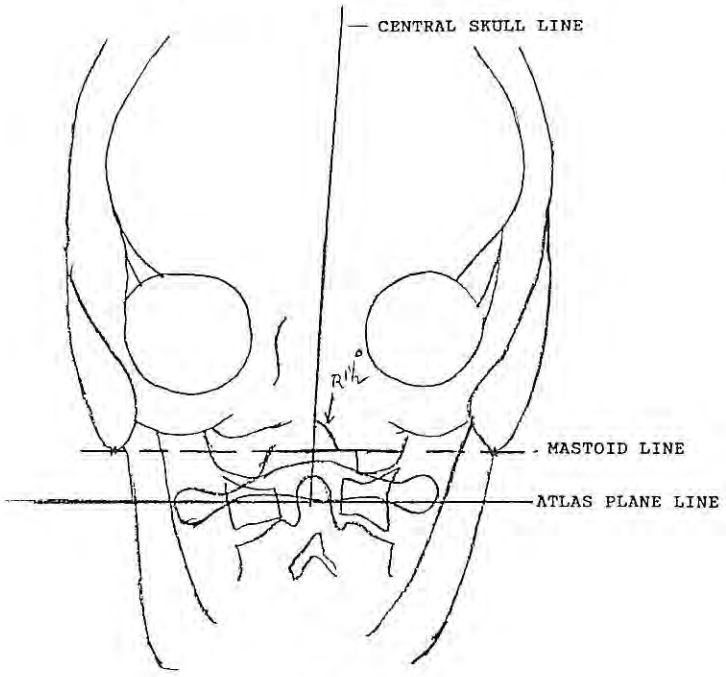


Figure 1.

(The angle formed by the intersection of the mastoid line and the central skull line is Right 1½ degrees in this example)

On the post, repeat this procedure. The central skull line and mastoid line should once again intersect at a right 1½ degree angle if the post central skull line is a duplicate of the pre. If not, the cephalometer has been used on different parts of the skull than on the pre. At this point, find out where the discrepancy is and why. It may lead to a change in the pre central skull line or the post central skull line. In either case, more accuracy is assured in establishing the central skull line.

If the mastoid tips cannot be seen clearly and these same points identified on the pre and post, then do not use them. A similar example would be attempting to construct the atlas plane line without having good clarity of the posterior ring attachments. If there is a problem with this, then other like points bilaterally in the skull may be used. Again, make sure the same points are not distorted and can be easily identified.

Comments

It has been my observation that this crosschecking system has shown the greatest discrepancies in cases where there is a considerable amount of head tilt on the pre and very little on the post. The post central skull line, of course, is the more accurate one because of more equal bilateral magnification. In these cases, re-divide the pre skull until it matches the post. If there is a small laterality on the pre in combination with a lot of head tilt, it would be wise to take another pre with the head tilt removed so that the true side of laterality is found. Current NUCCA research indicates that up to 4 degrees of head tilt will not cause magnification errors. With malformed skulls, it can be difficult to remember the exact point on the skull that was chosen for the central skull line on the pre. This system, of course, will be helpful in reorientation to these points.

The angle at which the mastoid line and central skull line intersect can be recorded on the patient card allowing for crosschecking any additional posts or re-pre's without getting the patient's x-ray file out every time. Again, if there are discrepancies, do what is necessary to track them down.

Obvious changes in laterality can be discovered prior to constructing the central skull line simply by comparing the mastoid line to the atlas plane line. Of course, this does not replace construction of the central skull line on posts. It would be comparable to an obvious lower angle change before the lines are constructed.

Many other observations have been made since instigating this system but more information is necessary to validate the findings. I encourage those who incorporate this method into their practices to contribute any observations or refinements they may have.

References

1. Seemann, D. C., "Observer Reliability and Objectivity Using Rotatory Measurements on X-Rays," 4(1):1, 6-8. Jan. 1986.
2. Jackson et al, "Inter- and Intra-Examiner Reliability of the Upper Cervical X-Ray Marketing System: A Second Look," JMPT, 1987; 157-163.

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

Anatometer II Receives Patent

The NUCCRA Board of Directors and Benesh Manufacturing are pleased to announce that on February 18, 1992, the Anatometer II received a U. S. Patent, number 5,088,504. Inventors Peter Benesh, Monroe, Michigan, Ralph R. Gregory, deceased, Keith E. Denton, legal representative assigned to The National Upper Cervical Research Association.

ABSTRACT

The machine of the present invention measures and records in terms of the orientation planes of motion the presence of, the location of, and the severity of the postural distortion-stress effects of C-1 subluxations on the human body, making possible thereby statistical analyses between C-1 misalignments (determined by X-ray analysis) and such postural distortion-stress effects on the skeletal framework as directly result from the misalignment interferences of C-1 on the nervous system and its normal functioning. This machine can demonstrate the postural distortion-stress effects of C-1 subluxation on the spine by checking the malpositional relationships of upper thoracic vertebral segments and pelvis prior to and subsequent to C-1 correction, indicating thereby the corrections obtainable throughout the spine and thus reducing the need for repeated applications of X-radiation to the patient. The machine has movable elements which provide indications of corrections or displacement and has a pair of weight sensitive platforms with horizontally adjustable pads (foot guides). The platforms are coupled to force transducers which indicate a means for measuring the portion of total body weight that is supported by each of the patient's feet. The pads are individually or simultaneously adjustable toward and away from each other to properly space the feet relative to the ilii.

Current NUCCRA Research with the Anatometer II includes the development of a new display which will give the observer the average weight differential of 30 readings on each side within 6 seconds. The second display will give the average total weight and the average percent relative weight differential. The NUCCRA Board hopes that this information will provide more useful data than the current. Dr. Daniel Seemann, Executive Director, has submitted for publication, "Bilateral Weight Differential And Functional Short Leg: An Analysis Of Pre And Post Data After Reduction of An Atlas Subluxation."



MacDonald Receives NUCCA Certification

The NUCCA Board of Directors take pride in announcing that Dr. Steven N. MacDonald, of Pacific Grove, California, completed all requirements for certification. Dr. MacDonald, a long standing member of NUCCA, responded to the organization's need for certified doctors. We welcome Dr. MacDonald's commitment and look forward to his involvement in the NUCCA educational programs. Dr. MacDonald has been in practice for 14 years and is located at 718 Lighthouse, Pacific Grove, California 93950. He and his wife, Debbie, have 3 children.

Hasick Scholarship Fund Established

Dr. D. Gordon Hasick, a 1980 graduate of Palmer College of Chiropractic, has established a scholarship for students who intend to practice outside the United States and who specialize in the National Upper Cervical Chiropractic Association (NUCCA) technique. The award will be $500 per trimester.

In making the award Dr. Hasick stated, "Palmer gave me an incredible education. This college has a quality of education and philosophy that is unique. I want to support it and help it to grow through this small gesture which hopefully will grow in the future. Perhaps others will follow."

Dr. Hasick, a distinguished alumnus of the College, was named a Fellow in the Palmer Academy of Chiropractic at this year's Homecoming celebration.



Dr. Robert T. Brooks

Elected Alumni President and 1992 Outstanding Alumnus at PCC

Dr. Robert Brooks, a long time NUCCA Member and Director, has been selected as the Outstanding Alumnus for 1992. He has shown outstanding leadership and dedication since his graduation in 1970 through his involvements with the PCC International Alumni Association and in his service to Palmer College.

His work with the Alumni Association began in 1976 as Oklahoma state president. Since then he has served as South Central regional director and first and second vice presidents.

Dr. Brooks' devotion to the College is evident by his student recruitment efforts. As of 1991, his practice, Brooks Spinal Care, has trained eleven associates and referred eighteen students who have completed or are completing their chiropractic education at Palmer. He has also served as chair of the Student Recruitment Committee and national coordinator of the Alumni Recruitment Contact Program.

Because of his involvements, Dr. Brooks is frequently on the Palmer campus. During his visits, he always takes the time to meet with students, to answer their questions and share his vision and experience on chiropractic. He has participated in Philosophy Forums since 1985, has been a Visiting Clinical Professor since 1987 and has served as an Adopt-a-class sponsor.

His dedication to the chiropractic profession overall is shown by his involvement with Delta Sigma Chi, the Chiropractic Association of Oklahoma, the International Chiropractors Association, the National Upper Cervical Chiropractic Association, the Oklahoma Chiropractic Research Foundation, the Congress of Chiropractic State Associations, the Association for the History of Chiropractic and the Foundation for Chiropractic Education and Research.

He is a past president, among other offices, of the Chiropractic Association of Oklahoma and received Distinguished Service Awards from 1985 through 1987. He also received Distinguished Service Awards from Sherman College of Straight Chiropractic in 1977, Palmer College in 1986 and Life College of Chiropractic in 1987.

A well-respected and progressive thinker, Dr. Brooks is a leader in the profession today. He is certain to continue making great strides for the future of Palmer College and the chiropractic profession.



Dr. D. Gordon Hasick Receives Fellowship In The Palmer Academy of Chiropractic

Dr. Gordon Hasick has provided outstanding service and dedication to the chiropractic profession and Palmer College.

Dr. Hasick graduated Magna Cum Laude from Palmer College in 1980. Upon graduation, he opened a private practice in Calgary, Alberta, Canada. With his strong interest and knowledge of sports chiropractic, he formed the Alberta Chiro-Sports Management Company and was responsible for getting chiropractic officially involved in the 1988 Winter Olympics. Dr. Hasick is also the team chiropractor for the Canadian men's national volleyball team.

In addition to his tremendous work in sports chiropractic, Dr. Hasick has been very active in the Alberta Chiropractic Association, serving as a member of the Board of Examiners, Chairman of the Olympic Committee, member of the Executive Council, Chairman of Public Relations and Chairman of Continuing Education.

He is a member of the Palmer College Continuing Education faculty as a board certified NUCCA instructor and is also on the University of Calgary Personal Development faculty, teaching courses on health and wellness. In addition, Dr. Hasick is involved in the ICA, the CCA and the PCC International Alumni Association, serving as Western Canada Regional Director.

Through and through, Dr. Hasick is a chiropractor who has a high level of expertise, enthusiasm and concern for his patients, students and practitioners around the world. Because of his devotion to Palmer and the chiropractic profession, he is honored as a Fellow in the Palmer Academy.

THE CITATION

Dr. Gordon Hasick . . .

. . . For his deep devotion to the chiropractic profession . . .

. . . For exceptional support of his alma mater . . .

. . . For his obvious commitment to the betterment of mankind . . .

Now on behalf of the faculty and Trustees of Palmer College of Chiropractic, and by virtue of the authority vested in me by the laws of the state of Iowa, I do hereby confer on Dr. Gordon Hasick the award of Fellow in the Palmer Academy of Chiropractic, honorus causa, admitting him to all rights and privileges thereto; in testimony thereof, I present this medallion and diploma symbolic of the award.

Palmer College of Chiropractic NUCCA Club

What an opportunity to be entering the profession of Chiropractic at a time such as this. Many students are wavering in their decisions as to whether they want to be subluxation based or symptom based. Thankfully NUCCA stands proud in their philosophy of subluxation oriented practice. When a patient comes under NUCCA care we have a clear goal in mind and an accurate means to measure our progress with that patient over subsequent visits, which other techniques lack. Many other chiropractic externs wonder what to do next on follow up visits and find themselves chasing symptoms as they have no reliable measure to assess their patients' progress.

We are thankful for Dr. Ralph Gregory for being a pioneer and holding steadfast in his principles of true chiropractic. Secondly to all the board members and certified NUCCA doctors for their selfless energies devoted to the students of PCC. As a result of this dedication and commitment to the students, NUCCA continues to grow at the college. At present there are more externs practicing NUCCA in the Palmer clinic than ever before.

The NUCCA club would like to extend its immense thanks to Dr. Al Berti for his gracious donation of a NUCCA table to the Palmer Clinics, which now brings the total to four NUCCA tables. Dr. Berti also kindly donated a battery powered adjusting tecnique training device to the club. The club members are now looking forward to the NUCCA basic course at Palmer College in November and December. Thank you all again for your continued support to the Palmer College NUCCA Club.

The Ralph R. Gregory, Ruth O. Gregory Research Funds

The Board of Directors of NUCCRA acknowledges those who have contributed to NUCCRA and the Ralph R. Gregory and the Ruth O. Gregory Memorial Research Funds. The perpetual funds shall be used to further research projects as deemed appropriate at the discretion of the Board of Directors of The National Upper Cervical Chiropractic Research Association. All donations are tax deductible.

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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.

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8:00 - 9:00 **Registration**	8:00 - 9:00 **Video Tape**	8:00 - 9:00 **Video Tape**
9:00 - 9:30 **Opening Remarks**	9:00 - 10:30 **X-rays Analysis Errors**	9:00 - 10:30 **Adjusting Errors**
9:30 **Basic Course Begins**	10:30 - 12:00 **Doctor's Choice**	10:30 - 12:00 **Doctor's Choice**
9:30 - 11:00 **Advance Adjusting**	12:00 - 1:30 **Lunch**	12:00 - 1:30 **Lunch**
11:00 - 12:00 **Head Piece Placement**	1:30 - 3:00 **Research Update**	1:30 - 3:00 **Technique Update**
12:00 - 1:30 **Lunch**	3:00 - 4:30 **Doctor's Choice**	3:00 - 5:00 **Seminar Wrap-up**
1:30 - 3:00 **Biomechanics of the Cervical Spine**	4:30 **NUCCA Business Meeting**	
3:00 - 4:30 **Doctor's Choice**	7:30 **NUCCA Board Meetings**	**Summary of Hours**
4:30 - 5:00 **Session Feedback**		Lecture 11.5 Practical 6.0 Research 1.5 Basic Course 21 Total Advanced 21
7:00 **NUCCA Banquet**		

Application Form for Spring 1993 NUCCA Convention

☐ Advanced Course ☐ Basic Course

Name _____ Phone _____

Address _____ Zip _____ Number Attending Banquet ____
(Please Print)

Please make your own reservations 1-415-589-0770.

Registration: Professionals, $450.00. Doctors (2 years or less in practice), $250.00. Students (enrolled in college), $150.00.
Make checks payable to N.U.C.C.A. Full fee must accompany this form.
Professional Members deduct $50.00.

Mail to: NUCCA, 217 W. Second Street, Monroe, MI 48161
1-313-241-5755 Contact Edna L. Denton
Executive Secretary

Registration Deadline is March 15, 1993.

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 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 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, BIO-MECHANICS AND ADJUSTING
   - A. Knowledge of osseous structures, bio-mechanics 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 1 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 abnormal 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

Doctors who have successfully completed Parts II and III of the NUCCA Certification Program as of November 1, 1992:

Part II

Dr. Richard DeCamillis
Dr. Marshall Dickholtz, Jr.
Dr. Sherry Dickholtz-Gaber
Dr. James Downes
Dr. John Dunn
Dr. Daniel Fedeli
Dr. Patrick Foran
Dr. Otto Portmann
Dr. Robert Wiedemann
Dr. Michael Zabelin

Part III-Certified Doctors

Dr. Albert Berti
Dr. Glenn Cripe
Dr. Keith E. Denton
Dr. Marshall Dickholtz, Sr.
Dr. Gordon Hasick
Dr. Teresa Palmer
Dr. Lloyd Pond
Dr. Lonnie Pond
Dr. Edward Stein
Dr. Larry Schrock
Dr. Steven MacDonald

NUCCA's non-profit status requires that remittance be received prior to shipping of orders. Make orders payable to: NUCCA.

SUPPLY PRICE LIST

INSTRUMENTS - SET

(Vertex Square, Cephalometer, Relatoscope)
Students - $30.00
Doctors - $60.00

NUCCA PLAQUE - $125.00

PAMPHLETS - $30.00 per 100

MONOGRAPHS - SET

Students - $48.00
Doctors - $96.00

POSTER

A.S.C. Poster - $25.00

BLACK BOOKLETS - SET

$45.00

STANDARDS OF PRACTICE MANUAL

$75.00

NUCCA PINS

Silver - $25.00
Gold - $500.00 Donation

INSTRUMENTS - INDIVIDUAL

Vertex Square - $15.00
Cephalometer - $25.00
Relatoscope - $20.00
X-Ray Alignment Mask - $75.00
Chin Centering Device - $25.00
Film Marking Pencils - $10.00 per dozen
'92 Protractors - $10.00 Each
Old Protractors - $5.00 Each
Cutting Knife, Mirror & White
Lead Paint (with instructions) - $15.00

MONOGRAPHS - INDIVIDUAL

Vol. 1-3 - $1.00 each
Vol. 4-5 - $3.00 each

POSTER

Post/Adjustment Healing Cycle - $5.00

BLACK BOOKLETS - INDIVIDUAL

X-Ray Analysis - $15.00
Biomechanics - $15.00
Adjusting - $15.00

VIDEO TAPES

Osseous Structure - $90.00
X-Ray Analysis - $100.00
Adjusting The ASC - $300.00
Errors In Adjusting The ASC - $200.00
Leg Check/Headpiece Placement - $90.00
X-Ray Alignment & Pt. Placement - $90.00
Biomechanics - 4 Basic Types - $100.00
Questions and Answers - $100.00

WHOLE SET OF TAPES - $800.00