OCCIPITAL FIBER SYSTEM:

A NEUROLOGICAL INTERPRETATION

A Literature Review

Written by: Mary C. Unger-Boyd

Advisor: Suzanne A. Seekins, D.C.

LOGAN COLLEGE OF CHIROPRACTIC

TABLE OF CONTENTS

INTRODUCTION

The Occipital Fiber System, developed by Major Bertrand De Jarnette, D.C., D.O., is a result of many years of research. The following is an excerpt from The Research of Major B. De Jarnette, D.C.: 1924-1984[i]: "Around 1930 a situation occurred that opened an even wider field of research. A patient complained of severe pain in the left hip and leg. While conducting the vasomotor test, the area over the third sacral foramen reacted and, in doing so, all pain from the hip and leg disappeared changing its locale to left occipital bone.

"Upon palpation of the occiput, De Jarnette felt a fiber that had somehow been produced by some reaction of the sacrum. Unaware of what the fiber was or what to do about it he decided to press on it as hard as he could. This led him to eventually conclude that some manner of reflex system existed between the sacrum and occiput, as all pain from the patient's hip and leg had disappeared.

"Along about this time De Jarnette came across a copy of Regional Diagnosis by Robert Bing, a neurologist emeritus at Basle University, London. Bing had done original research on the nerve tracts within the spinal cord. This, along with the occipital fiber discovery, inspired De Jarnette to see what could be proven between the relationship of the sacrum and occiput. This was the beginning of a career that spanned sixty years of dedication to research and development of the method he would soon call Sacro Occipital Technic.

"De Jarnette's original techniques often raised more questions than provided answers. Needing facts for these developments, his research began to take him outside his normal training of chiropractic. Enlisting the help of medical researchers in the fields of neurology, anatomy, physiology and pathology. De Jarnette began to support his new methods with anatomical and physiological facts.

"Residents and medical researchers received grants set up by De Jarnette through a "milk fund", a specific endowment by which the researchers were unaware of where or from whom they received the grants. These future scientists and doctors were asked to research De Jarnett's theories through various methods, one of which was the use of over 20,000 spinal taps for neurological studies of spinal innervation. These findings laid the physiological basis of Sacro Occipital Technic."

Unfortunately, the original research is no longer available. Therefore, this paper brings to light the little information that is still in publications.

Is the production of the Occipital Fiber System a result of structural or neurological input? Or both? Or the result of cerebral spinal fluid (CSF) congestion? Or, all the above? What is the mechanism?

This literature review consists of a search for information concerning the neurological descriptions of the Occipital Fiber System as described by Major Bertrand De Jarnette, D.C. in his writings in the Sacro Occipital Technic 1984[iiii] This will include a description as described by Dr. De Jarnette and a review of current literature with reference to the findings of Dr. De Jarnette. No current information directly related to the Occipital Fiber System was found through the MedLine search at Logan College of Chiropractic. This paper, therefore, attempts to clarify the concepts note in Dr. De Jarnette's publications.

ABSTRACT

Objectives: The objective of this paper is to review the current medical literature and the past writings of Major Bertrand De Jarnette, D.C. associated with the anatomy, physiology and neurology of the Occipital Fiber System.

Data Sources: The data presented in this paper was selected from a literature search on the Med-Line system at Logan College of Chiropractic in Chesterfield, Missouri, the private publications of Major Bertrand De Jarnette, D.C., and neurological and anatomy textbooks.

Conclusions: The primary function of the Occipital Fiber System is defensive in nature and a result of altered physiology in the spinal column from various stressors: mechanical, visceral and pathological. The clinical use of this system over the past several decades has proven very beneficial to the diagnosis and treatment of patient's complaints, yet current medical literature has no direct correlations with Dr. De Jarnette's mechanism for the Occipital Fiber System..

Key Words: Occipital Fiber System, Golgi Tendon Organs (GTO), vasomotor

DISCUSSION

"The Occipital Fiber is one of the most accurate means at the disposal of the Doctor of Chiropractic for the analysis of disease processes and a means of offering a prognosis as to the recovery of the patient." [iii] It has been noted by Dr. De Jarnette and Dr. Pottenger [iv] that the best place to detect visceral problems is at the vertebral level. Through a system of intercommunicating spinal areas with the occipital fibers, a system was developed to analyze and monitor the status of a patient.

Anatomically, the occipital fibers are located at the occipital superior nuchal line at the insertion sites of the sternocleidomastoid and the trapezius muscles (Diagram A). The periosteum of the outer table of the occiput corresponds to the dura mater periosteum of the inner cranial tables. The inner periosteum is pierced by nerves and blood vessels, the outer periosteum by the aponeurotic sheaths of the origins and insertions of the muscles of the cervical triangle and the cervical spine. These muscles of the cervical spine are intimately associated with the total musculoskeletal system and the underlying cavities and its contents.

The Golgi Tendon Organs (GTO) are located in the musculotendon junction of these muscles. The function of the GTO is twofold: one is a dynamic response from sudden increases in tension and the other is a static response of information of an instantaneous nature from the central nervous system from varying degrees of tension on small segments of the muscle fibers.[v] Best and Taylor describes this as a slow conduction process that includes not only information from peripheral sources but also central. The fast conduction, as described by Best and Taylor is responsible for the responses of the GTO in skeletal muscle reflexes and also for control of equilibrium.[vi] (Diagram B).

Golgi Tendon Organs are encapsulated mechanoreceptors present at the myo-tendinous and myo-aponeurotic junctions of muscles. Within the tendon organ capsule are the terminal branches of large diameter afferent fiber, called Ib fiber and are intertwined with collagen bundles. The other end is continuous with a fascicle of 5-25 muscle fibers, contributed by several motor units. The contraction of these fibers exerts strain on the collagen's bundles thus causing deformation of the sensory terminals. This is adequate stimulus of the tendon organ since it has a very low threshold. A single fiber twitch can

elicit a discharge from the receptor. The exact information to the central nervous system, though, remains unanswered, according to Jami.[vii]

Swete[viii] * reports that morphological evidence gained from light and electron microscopy shows unmyelinated terminal branches of the Ib afferent fibers innervating the Golgi tendon Organ lie within the spaces between the braids of collagen. It is proposed that force applied to a muscle tendon will straighten these collagen braids and cause compressional deformation of the axon branches trapped between them. The mechanical event, presumed to occur in the GTO appears to explain how it may function as a biological force transducer under static loading conditions. This mechanical principal described for the GTO, he hypothesized, may be the mechanism employed by sensory receptors that function as position (and force) detectors.

This basically describes the function of the Occipital Fiber System. The following is the neurological pathways outline by Dr. Major B. De Jarnette from the 1984 Manual [i] to describe the formation of the occipital fiber:

PATHWAY: Cord: Lower body structures (via the long ascending tracts of Goll/fasciculus gracilis)
Upper body structures (via the short ascending tracts of Burdach/
⇓ fasciculus cuneatus)
Vestibulocerebellar path
⇓
Passes the roof nucleus of cerebellum
⇓
Hook Bundle of Russel
⇓
Deiters Nucleus (lateral vestibular nucleus)[ix]
⇓
Begins occipital fiber tension

Excitation of GTO resulting from the muscle De Jarnette fascial tension from the CSF congestion/block resulting from torque in the dura.

⇓

Disturbances of antigravity muscles: impulses
Spinocerebellar tracts

Through condylar system orient to space Begins the muscle stretch reflex: Occipital Fibers

⇓
Culmen and centralis portion of
the cerebellar cortex
⇓
Globose and Emboliform Nuclei of cerebellum
⇓
Brachium Conjunctive to Red Nucleus
⇓
Controls the postural muscles
of the cervical and dorsal spine[i]

Every sensory input has a motor output. All sensory input synapses through the cervical spine and through the antigravity mechanisms of the cerebellum produces the motor output into the suboccipital muscles. The fulcrum of the balance is maintained for the occipital bone by three muscles: the rectus capitis posterior minor, rectus capitis posterior major and the obliquus capitis superior. "The motor impulses to the cervical muscles that insert onto the occiput respond to the sensory input by controlling any excess osseous motion of the condylar system to protect the brain stem." According the Ned Heese, D.C. in Occipital Fiber Pain Control.[iii]

How is the information from the cord level stimulate? De Jarnette found that "viscus pathology developed when a vertebrae became subluxated and gained motion in excess of function"[x] "This occurs in the following manner:

1. Vertebral motion creates a field of stimuli resulting in excessive musculo-skeletal response.
2. The musculo-skeletal response makes necessary specific muscle splinting
3. This splinting controls motion, but impedes normal circulation to the innervated area.
4. This results in functional and with time pathological changes.
5. These changes through the proprioceptive pathways are referred to the occiput and the viscus
6. functional and pathological changes also make necessary a new arrangement of defense through the reflex fixation of soft tissue." (Dangerfield)

Dangerfield continues that neurological bombardment at the cord level can occur from three main sources: proprioceptors, affarent sympathetics and higher motor centers.

According to Robert, the pial sheath of the anterior spinal artery displays a system of ligaments that course along the ventral surfaces of the anterior spinal artery and its feeder arteries of the spinal cord. These ligamentous straps reinforce the anterior spinal artery to the sheath of the anterior spinal never root to reinforce these structures. Microscopy of ligament sections revealed numerous Golgi-type neurofascicular receptors along the liagament fasciles and associated with well-myelinated nerves. This type of mechanoreceptor has been known only in association with stretch reflex mediation in the musculoskeletal system and this appears likely that the anterior spinal artery ligaments and their

homologous type of receptors may be implicated in sensing distraction and protectively modifying the actions of the involved spinal musculature.[iv]

Innervation of the spinal musculature of the intertransversarii, rotatores and interspinal muscles[xi] is via the internal posterior branch of the dorsal nerve. Spinal dura has been demonstrated to be innervated by vasomotor, sensory and somatosensory fibers, according to Kumar, Berger, Dunsker and Keller.[v]

The above information begins to explain the relationship of the input from the cord to the development of the Occipital Fiber. Yet, Dr. De Jarnette's research uncovered much more information this article is unable to review, such as the development of the lines of the fibers (Line 1, Line 2, and Line3), and utilization of the findings for corrective procedures. These procedures can be found in the History of SOT, Chiropractic Manipulative Reflex Technique (CMRT) and other texts written by Dr. De Jarnette, as well as Occipital Fiber Nutrition by C.C. Buddingh, D.C.

The Occipital Fiber Chart in included in Diagram C[vi] for your information.

The effectiveness of the use of the Occipital Fiber System for patient management is documented anecdotally by many Doctors of Chiropractic. The current literature offers little to substantiate the proposed mechanisms. Thus, again, research has produced more questions than answers.

BIBLIOGRAPHY

[i] Heese, Ned, The Research of Major B. De Jarnette, D.C.: 1924-1984, Chiropractic History, Vol. 2, June 1991, presented at Parker College of Chiropractic, June, 1990.

[i] De Jarnette, Major B., Sacro Occipital Technic of Spinal Therapy, Self-published Nebraska City, NE 1940.

[ii] De Jarnette, Major B., Sacro Occipital Technic 1984, 3rd edition. Nebraska City, NE 1986

[ii] De Jarnette, Major B., Sacro Occipital Technic 1984, 3rd edition. Nebraska City, NE 1986

[iii] De Jarnette, Major B., Philosophy, Art & Science of Sacro Occipital Technic, Self-published Nebraska City, NE, 1981.

[iv] Pottenger, Francis Marion, Symptoms of Visceral Disease, C.V. Mosby Company, pp. 168, 1944.

[v] Buddingh, C. Curtis, Occipital Fiber Nutrition: Chiropractic Manipulative Reflex Technique, Sacro Occipital Research Society International, 1990.

[vi] Best and Taylor's Physiological Basis of Medical Practice, 11th Edition, Williams & Wilkins, 1985.

[vii] Jami, L. Functional Properties of the Golgi Tendon Organ, Arch. Int. Physiol. Biochem. 1988 Sept. 96 (4). P. A363-78.

[viii] Swett, Je.E., Mechanical Transduction in the Golgi Tendon Organ: A Hypothesis, arch. Italian Biol. 1975 Dec. P 374-82.

*

i

[ix] Kandel, E.R., Schwartz, J.H., Jessell, T.M., Principles of Neural Science, 3rd Edition, Elsevier Science Publishing Company, Inc., 1991.

i

[iii] Heese, Ned, Occipital Fiber Pain Control: Technique of Balancing the Spine and Cranium. Presentation to SOTO Europe Conference, March 1996.

[x] Dangerfield, A, C.M.R.T.: Chiropractic Manipulative Reflex Technique, SORSI Dispatcher, July 1971, Reprinted Technical Report, Sacro Occipital Research Society International, April, 1995.

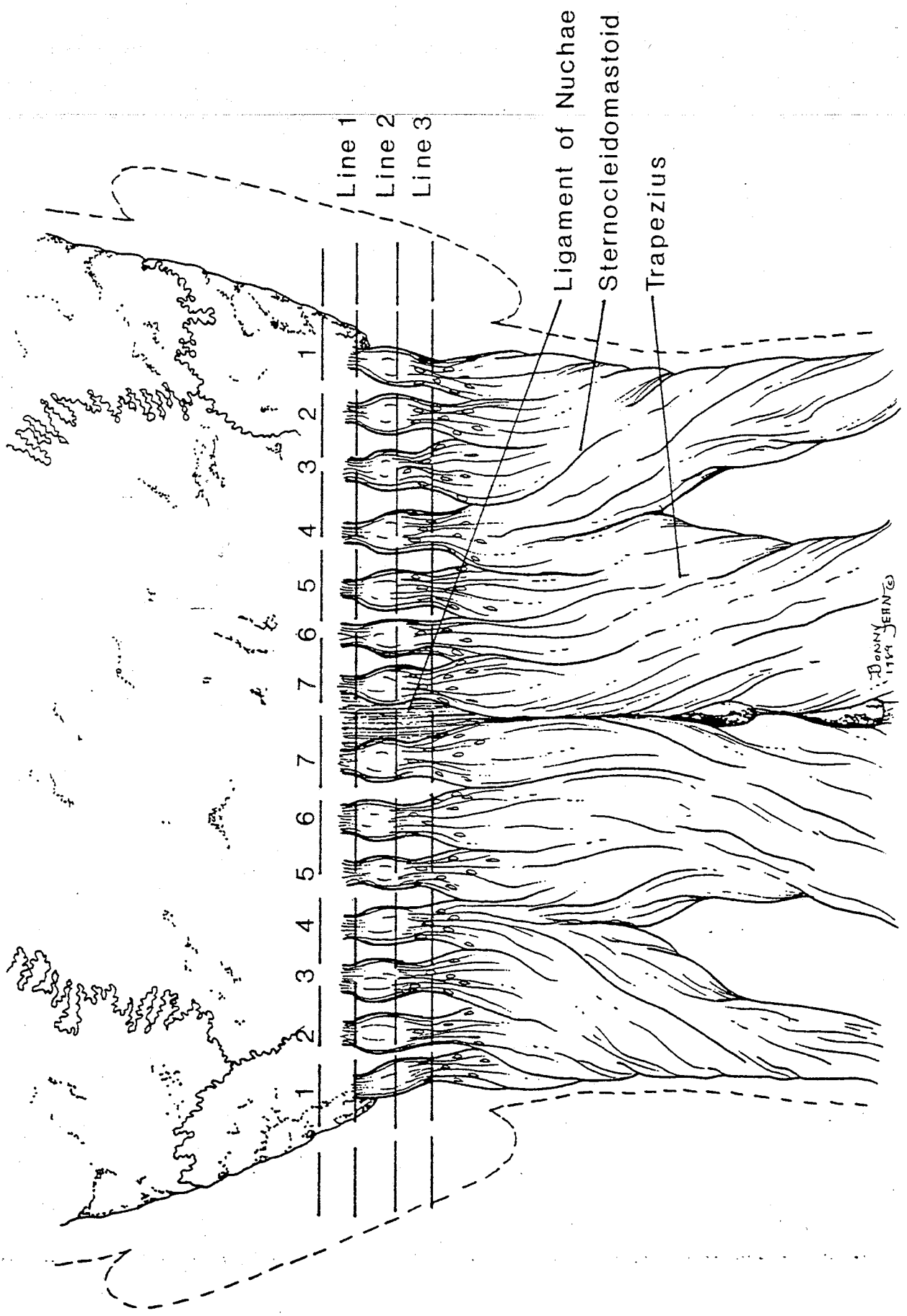
[iv] Robert, E., The Pial Liagaments of the Anterior Spinal Artery and their Stretch Receptors. A Spinal Cord Distraction-Sensing System?, Van Denmark Institute of Anatomical Research, Department of Anatomy, University of South Dakota School of Medicine, Spine, Sept. 1993.

[xi] Gray, H., Grav's Anatomy, 15th Edition, Crown Publishers, Inc. 1977.

[v] Kumar, R., Berger, R.J., Dunsker, S.B., Keller, J.T., Innervation of the Spinal Dura: Myth or Reality?, Spine, Volume 21, 1996.

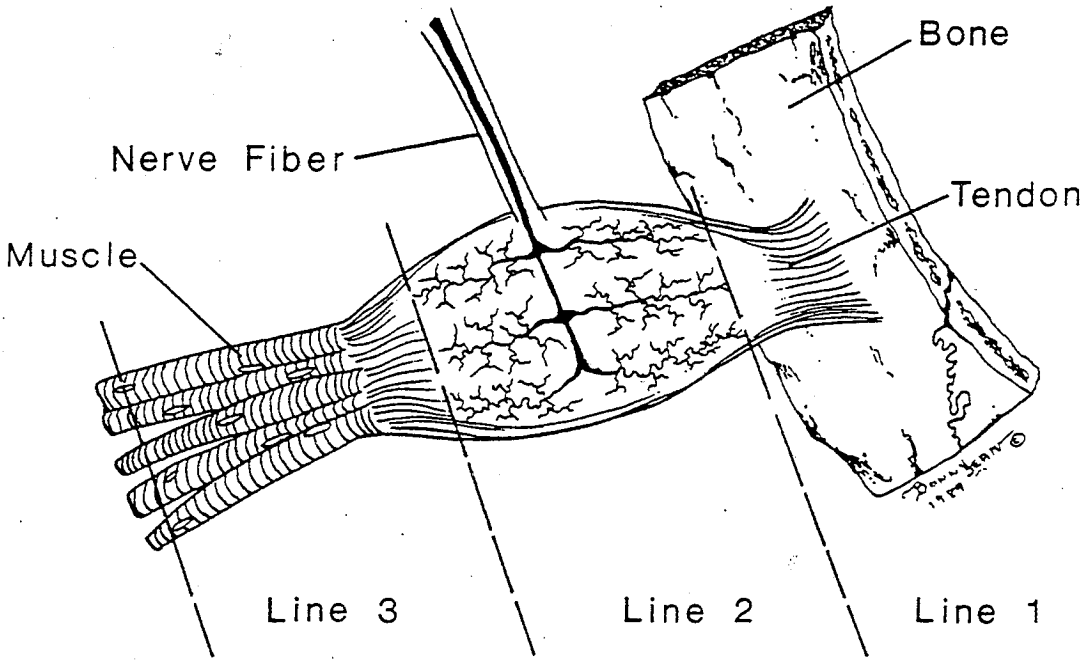
[vi] De Jarnette, M.B., Line Two Occipital Fiber Technique with Advanced C.M.R.T. Methods, Compiled and edited by Ned Heese, D.C., Sacro Occipital Research Society International, 1993.

DIAGRAM A



Anatomy and location of the Occipital Fibers

DIAGRAM B



Golgi Tendon Organ

DIAGRAM C

OCCIPITAL FIBER REFLEXES

LINE ONE - FUNCTIONAL	Vertebral Meningeal Ganglionic Reflexes					(MOTOR)	
OCCIPITAL / TRAPEZIUS AREA	1	2	3	4	5	6	7
CERVICAL REFLEX	1	2	3	4	5	6	7
THORACIC	1,2,10	3,11,12	4-5	6	7	8	9
LUMBAR	-	-	1	2	3	4	5

LINE TWO - VISCERAL	Vertebral Visceral Autonomic Reflexes					(SENSORY)	
OCCIPITAL AREA	1	2	3	4	5	6	7
THORACIC	1,2,10	3,11,12	4-5	6	7	8	9
LUMBAR	-	-	1	2	3	4	5
SACRAL REFLEX	-	-	1	2	-	4	-

LINE THREE - PATHOLOGIC	Vertebral Structural Central Nervous System Reflexes						
OCCIPITAL AREA	1	2	3	4	5	6	7
CERVICAL CONTROL	1	2	3	4	5	6	7
THORACIC	1-12	2-11	3-10	4-9	-	5-8	6-7
LUMBAR → Cervical Reflex	5 STYLOID ATLAS	4-2C	3-3C	2-4C	1-5C	-	-
ATLAS-AXIS-CONTROL	1-2	1-2	1-2	1-2	1-2	1-2	1-2

LINE FOUR - PAIN CONTROL	Pain Control Reflexes				Spinal Intercommunicating Pathways of DeJarnette		
SUB- OCCIPITAL AREA	1	2	3	4	5	6	7
∧ CERVICAL	1	2	3	4	5	6	7
∧ THORACIC	1-2	3	4-5	6	7	8	9
UP DOWN							
THORACIC ∨	10	11-12	-	-	-	-	-
LUMBAR ∨	-	-	1-2	3-4	5	-	-
SACRAL ∨	1	2	3	4	5	-	-
SUB- OCCIPITAL AREA	1-2	3-4	5	6	7	-	-

VERTEBRAL INDICATORS

LINE ONE

LINE TWO

LINE THREE

OCCIPITAL FIBER NEUROLOGY developed by Major B. De Jarnette, D.C.
CHART CORRELATION courtesy of Ned Heese, D.C.