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CLINICALNOTE

A history of temporal sphenoidal (TS) diagnosis and its clinical application

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Abstract: Rees studied the TS points extensively and attempted to determine how these reflex points might relate to the body and be used for diagnosis and guiding treatment. His initial theory suggested that the TS points on the skull helped to monitor messages sent from a vital organ as sensory feedback to the brain. He believed that these messages could be measured by an EEG (Rees used an oscilloscope) as micro-voltages of an alpha wavelength. Therefore when an organ was stressed, the matching TS point had an imbalance of alpha wave production compared to the other points, thus setting up a local hyper-excitability or reduced inhibition effect on the active TS point.

From this came a method Rees termed the '*Alpha Wave Enhancement*' technique to address this imbalance and facilitate both afferent and efferent supra-spinal visceral communication.'

A brief 'conference' version of this paper, with slide show, was previously published as a Clinical Note. This paper gives full detail.

Indexing terms: Chiropractic; Alpha-wave enhancement; Temporal sphenoid; diagnosis

Note

A brief 'conference' version of this paper, with slide show, was published in the previous issue as a Clinical Note: Davis KY, Davis LV. A history of temporal sphenoidal (TS) diagnosis and its clinical application. Asia-Pac Chiropr J. 2022;3.2 URL apcj.net/papers-issue-3-2/#DavisTemporalSphenoidClinicalNote

This paper gives full detail.

Introduction

When treating patients it is often essential to find some way of generalising their presentation so we can assess how to treat a patient and follow their progress. Commonly in chiropractic, orthopedic and neurological tests are used to gain a generalisation into the patient's presentation, determine what care might best be rendered and whether the patient has a positive response to this care.

Temporal sphenoidal (TS) diagnosis is an assessment tool discovered by Major Bertrand DeJarnette (1) and developed by ML Rees (2, 3, 4) in the 1960s. TS diagnosis is based upon palpatory exploration of the circumference of the greater wing of the sphenoid and temporal bones assessing regions of swelling and/or sensitivity to the patient. Rees considered this TS ring to be a kind of master control panel 'circuit breaker box' for all vital functions in the

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human body. He believed that a stressed viscus anywhere in the body flashes its distress (viscerosomatic reflex) signal to the brain through this control panel. He purported that when these reflexes are received at the TS region, the brain interpreted this signal, and sought to regulate or improve the function of the distressed viscus.

In the early 1960's, DeJarnette handed the TS research project to Rees. In 1963 Rees reported he had observed an interesting change that occurred before and after a chiropractic adjustment in the area of the patient's *external auditory meatus*. This occurred at the *Aladdin Hotel* in Kansas City, Missouri, at the annual *Sacro Occipital Technique Clinic*. Preliminary physical examination purportedly determined that a tortuous external auditory canal was found. After a sacro occipital adjustment, it appeared that the ear canal had normalised, even though direct treatment was not rendered to the ear canal. This clinical response confirmed to Rees the need to follow up on the work of DeJarnette since he believed the patient's response suggested that the temporal bone was connected in some way to body function.

The TS Points and EEG

Subsequently Rees studied the TS points extensively and attempted to determine how these reflex points might relate to the body and be used for diagnosis and guiding treatment. His initial theory suggested that the TS points on the skull helped to monitor messages sent from a vital organ as sensory feedback to the brain. He believed that these messages could be measured by an EEG (Rees used an oscilloscope) as micro-voltages of an alpha wavelength. Therefore when an organ was stressed, the matching TS point had an imbalance of alpha wave production compared to the other points, thus setting up a local hyper-excitability or reduced inhibition effect on the active TS point.

To deal with this effect and attempt to balance this reflex activity Rees developed a method he termed the '*Alpha Wave Enhancement*' technique to address this imbalance and facilitate both afferent and efferent supraspinal visceral communication. Just as direct visceral manipulation procedures are to restore motion, flow, or reflex activity of the central nervous system (CNS), autonomic nervous system (ANS), lymphatics, and viscera, the *Alpha Wave Enhancement* technique was believed to support the visceral manipulations by restoring or balancing the bioelectric or electro-magnetic fields of the body. Ultimately the goal of the *Alpha Wave Enhancement* technique is to restore the communication pathways between the CNS/ANS and by locally enhancing alpha wave production in the region of the TS point.

TS Points and *Alpha Wave Enhancement* technique

The purpose of this article is to give the reader a window into how Dr. Rees utilised these reflex diagnostic points and *Alpha Wave Enhancement* as a means to improve clinical outcomes. TS diagnosis is based upon what Rees called the sixteen vital functions of the human body, which will be discussed.

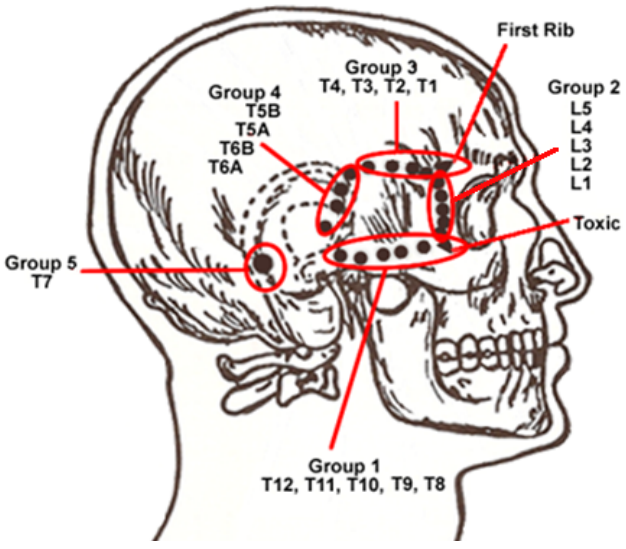


Figure 1: The 5 general screening groups.

Methodology

The General Screening

General screening is a technique for testing multiple TS points as a group in search of 'active' or sensitive points indicating an active reflex. This screening technique allows the doctor to isolate the most sensitive TS point by palpating the reflex points utilising five pounds (2.2kg) of finger pressure. While palpation for pain is the most reliable method of assessment, Rees also incorporated what DeJarnette called '*Mind Language Testing*' (5) or Goodheart called '*Therapy Localisation*'. (6) DeJarnette and Goodheart's assessment methods utilise pre and post testing; most commonly evaluating patient's straight right arm strength when contacting the various TS points.

Goodheart hypothesised that the activity of TL correlates with a spinal gating mechanism reminiscent of the gate control theory of pain perception. (7) Specifically, therapy localisation stimulates mechanoreceptors, thereby influencing pain perception and muscle function. The essence of therapy localisation or mind language is that input from low-threshold mechanoreceptors in the skin can modulate ongoing activity in muscles. This is consistent with Hilton's Law which states '*a nerve trunk which supplies the muscles of any given joint also supplies the muscles which move the joint and the skin over the insertions of such muscles*.' (9, 10) Based upon this law and supporting EMG studies, we can assume that dermatomes are neurologically integrated with myotomes and sclerotomes producing associated sensory and motor dysfunction. Should there be an organic or biomechanical encroachment or compression affecting the ventral nerve root, for instance, we can anticipate autonomic impairment in the associated viscerotomes and dermatomes. (11)

As a means of isolating the most active TS point(s) Rees developed five screening groups as depicted in Figure 1 and outlined below:

- TS Group 1: consists of six TS points: T12, T11, T10, T9, T8 plus the '*toxic*' point.
- TS Group 2: consists of five TS points: L1, L2, L3, L4, and L5.
- TS Group 3: consists of five TS points: First Rib, T1, T2, T3, and T4.
- TS Group 4: consists of four TS points: T5B, T5A, T6B, and T6A.
- TS Group 5: consists of a single TS point: in front of the asterion landmark for T7.

Localising primary TS active point(s)

After '*active*' TS points are identified by General Screening within one of the TS screening groups, the next step is to further assess which is the most active point. The testing is the same as with group screening either using up to five pounds (2.2kg) of palpation or *Mind Language Testing* of the specific TS points to find the most sensitive or reactive TS point.

The temporal sphenoidal reflex points on the skull have an associative point, sometimes two points, mapped to each spinal level. Rees also found two additional points, (1) the first rib which he found relates to body balance, and (2) the '*toxic*' point which he found related to imbalanced dural tensions affecting the foramen magnum and the atlas.

The following table gives Rees' assessment method of how to palpate the TS points as well as what he believed to be their related vertebral and visceral relationship.

TS Point	Organ Involvement	How to Locate
Group 1		
T12	Kidney (Except Pelvis)	Start on the TS ring, on the zygomatic process in front of the right ear canal.
T11	Duodenum, Left Kidney (Pelvis)	Start on the TS ring, one finger width anterior to the T12 landmark on the zygomatic process of the temporal bone.
T10	Jejunum, Ileum	Start on the TS ring, two finger widths anterior to the T12 landmark.
T9	Adrenal, Medulla and Cortex	Start on the TS ring, three finger widths anterior to the T12 landmark.
T8	Liver, Portal Circulation	Start on the TS ring, four finger widths anterior to the T12 landmark.
TOXIC	Foramen Magnum	Start on the TS ring, on the zygomatic prominence "V" indentation (just lateral to the lateral canthus).
Group 2		
L1	Ileocecal Valve	The L1 indicator is superior of T8 on the zygomatic process in front of the inferior aspect of the orbit of the right eye.
L2	Proximal 1/3 Colon	Start on the right TS ring, one finger width superior to L1 (at level of the middle of right orbit).
L3	Ovary/Testicles	Start on the right TS ring, two finger widths superior to L1 (middle of right orbit).
L4	Distal 2/3 Colon, Hemorrhoidal Plexus	Start on the right TS ring, three finger widths superior to L1 (middle of right orbit).
L5	Uterus/Prostate	Start on the right TS ring, four finger widths superior to L1 (middle of right orbit) or one finger width inferior to the right frontal "V" indentation where the FIRST RIB point is located.
Group 3		
First Rib	Body Balance	Start on the right TS ring, on the frontal eminence "V" at the spheno-frontal junction lateral and superior to the right eye.
T1	Left: Coronary Right: Glandular Overfunction	Find the frontal eminence "V" at the spheno-frontal junction lateral and superior to the right eye. From the tip of the "V", go posterior one quarter inch, and you are over the T1 indicator on the TS line.
T2	Left: Myocardial, Valvular Right: Glandular Underfunction	Start on the TS ring, two finger widths behind the frontal eminence "V" at the lateral edge of the eyebrow.
T3	Lung Fields	Start on the TS ring, three finger widths behind the frontal eminence "V" at the lateral edge of the eyebrow.
T4	Bile Duct	The T4 indicator is located at the pterion.
Group 4		
T5B	Stomach Mobility	Start on the TS ring, one index finger width posterior of the pterion.
T5A	Stomach Secretions	Start on the TS ring, one index finger width posterior and inferior of T5B, following the auricularis anterior muscle to root of the ear.
T6B	Pancreatic Digestion	Start on the TS ring, exactly half way between T5A and T6A. When T6B reflex is active, it becomes quite painful to 5 lbs. pressure when palpated.
T6A	Pancreatic Insulin	Start on the TS ring, at the auricularis anterior muscle, where it attaches to the ear. The muscle is easily palpated under the skin as a slight "ropey" feeling, which goes from the ear in the direction of the pterion.
Group 5		
T7	Lymphatics/Spleen	Start on the TS ring, posterior to the ear, just anterior to the asterion landmark.

Alpha Wave Enhancement technique

Once the most active TS point is located along with visceral manipulation and nutritional support, the *Alpha Wave Enhancement* technique was developed by Rees to help balance electromagnetic pathways between the CNS/ANS, viscera and spine. Alpha waves (one of the brain wave frequencies found between waking and sleep) are characterised by a calm, relaxed, yet conscious state. In the alpha state, the body recharges and rebuilds and appears closely related to increased parasympathetic nervous system activity. Dr. Rees found that patients could self-induce an alpha state by closing their eyes and rolling their eyes upward within closed lids. Other methods to increase alpha wave production described in the literature relate to having a subject perform relaxation or meditation exercises. (12, 13)

Ideally Rees believed that *Alpha Wave Enhancement* technique facilitates a patient's clinical response by incorporating a relaxation effect, stimulating parasympathetic activity, and inducing an alpha state in the patient with the goals of balancing bioelectric fields at the TS points, spinal level and related viscera. (14)

Protocol

Once the most active TS point has been determined, the related spinal segment balanced, and any needed visceral manipulation or chiropractic manipulative reflex technique (CMRT) procedure performed, then the *Alpha Wave Enhancement* technique can be utilised to complete the treatment as follows:

Step	Description
1	Contact the TS major indicator point with doctor's left index finger.
2	Have the patient close his/her eyes and then look upward inside the eyelids to initiate an alpha state.
3	With the right hand, contact the specific "entrance point" associated with the spinal major active TS point.
4	Once the patient goes into an alpha state, within 20 seconds remove your hands from the contact points and leave the patient alone for approximately 2 minutes. The increased alpha wave activity will facilitate improved visceral or viscerosomatic reflex function.
5	Instruct the patient that, prior to sleep, to put him/herself into an alpha state and then concentrate on or place his/her right hand on the "entrance point."

TS Entrance and Reflex Points

TS Entrance Points

According to Rees, each TS indicator can be a way of facilitating alpha wave production to affect '*organ entrance points at specific locations in the soft tissue of the body*.' The entrance points are the contact points leading directly to the involved organ or viscera. The doctor uses his/her right hand on the entrance points to create a connection between the increased local alpha wave production to the involved organ.

TS Reflex Points

Rees taught that the TS reflex points are a representation of the primary musculoskeletal symptoms for each spinal major syndrome as well as those that have a viscerosomatic or somatovisceral reflex relationship. Reflex areas become sensitive when a viscus has dysfunction

sufficient enough to create afferent nociceptive stimuli. Ideally the TS points can be used as pre and post assessment tools as the palpatory tenderness should resolve following treatment.

Discussion

Rees' methods were very novel and innovative for the 1960-1990s when he was teaching his various assessment and treatment modalities. Initially the TS points were a significant clinical breakthrough for him and those who studied with him. Regretfully while he performed extensive clinical studies to develop his methods of care he did not publish these in peer review journals. His methods were not studied for reliability or validity; however, the doctors who studied with him found that the patient's response to care was significant.

While Rees found that the TS points and '*alpha wave* technique' were helpful in patient treatment, it is important to determine if there is a biological plausibility to this assessment process. It is clear that more research will be needed to uncover this reflex relationship. If a theory for the TS points were to be considered, some questions to be answered include the following: Why are there '*active*' points located along the temporosphenoidal sutures? Why is there sensitivity at a specific point? What causes this sensitivity? And why does the pain reflex change with a therapeutic application?

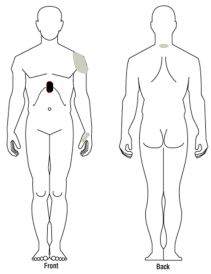
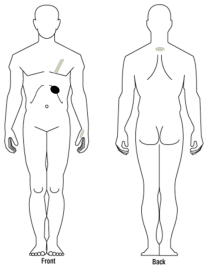
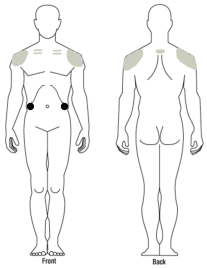
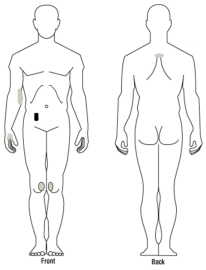
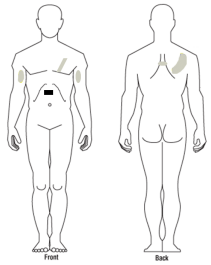
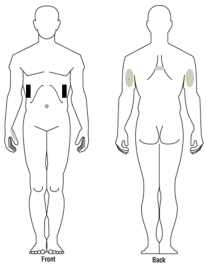
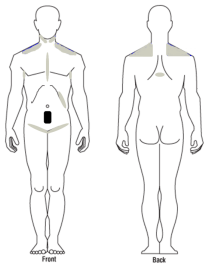
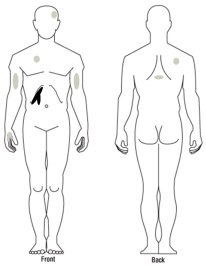
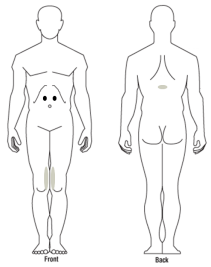
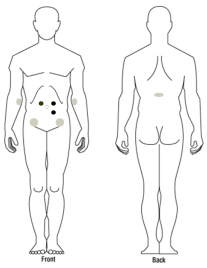
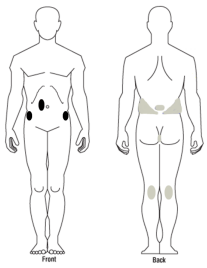
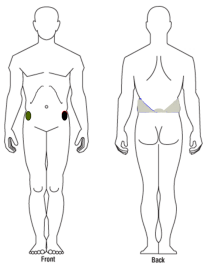
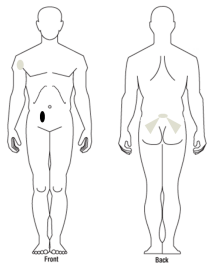
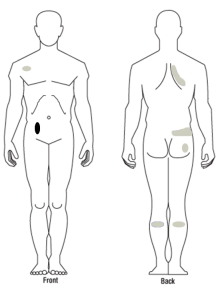
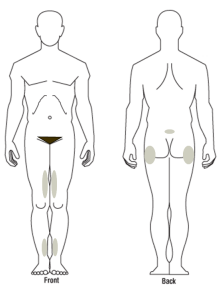
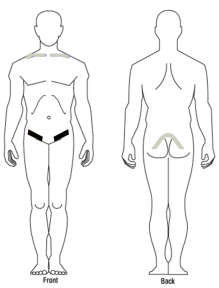
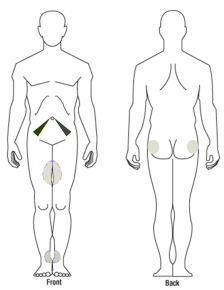
Nerve fibres within the cranial sutures

Anatomical animal studies have found nerve fibres within cranial sutures and this has been generally extrapolated to humans. A study using squirrel monkeys was performed by Retzlaff et al and found that both myelinated and non-myelinated nerve fibres were present within the loose matrix of intrasutural connective tissue. Some of the fibres terminated as '*branched free-endings along the inner periosteal covering of the free ends of the bones. These types of endings (Ruffini) are considered to be sensitive to pressure change and may produce pain sensations'* to increased pressure. (15) In another animal study Retzlaff et al showed the presence of nerve and vascular tissue large enough to supply intrasutural connective tissue. Nerve endings were traced from the sagittal suture to the neck. (16)

Entrance Point and Reflex Point Reference Diagrams

Key:

Black indicators = Entrance Point
Grey shading = Reflex Point

			Thoracic 1: Left: Coronary - Right: Glandular Overfunction
			
Thoracic 2: Left: Myocardial-Valvular - Right: Glandular Underfunction	Thoracic 3: Respiratory Tract	Thoracic 4: Bile Duct	Thoracic 5: Stomach
			
Thoracic 6: Pancreas	Thoracic 7: Lymphatic System	Thoracic 8: Liver	Thoracic 9: Adrenal
			
Thoracic 10: Small Intestines	Thoracic 11: Duodenum, Kidney (Pelvis)	Thoracic 12: Kidney	Lumbar 1: Ileocecal Valve/ Jejunum
			
Lumbar 2: Cecum	Lumbar 3: Ovary/Testicles	Lumbar 4: Colon Dysfunction	Lumbar 5: Uterus/Prostate
			

Since there have been studies that noted that the inner periosteal dura penetrates the cranial suture connecting to the outer cranial bone periosteum, (17) it is not unreasonable to assume that, with the nerve fibres passing through the suture, a relationship may exist between the inner and outer fascial or meningeal structures. Various studies have found that the cranial dura mater is heavily innervated and likely sensitive to manipulation. (18) A rat study investigating extra-cranial innervation of meningeal afferents revealed mechanoreceptive fields both in the dura mater and the parietal periosteum. '*Collaterals of meningeal nerve fibres project through the skull, forming functional connections between extra- and intracranial tissues*'. (19, 20)

There are nerve endings and nerves within the intrasutural regions that project to extra- and intra-cranial tissues and are likely sensitive to pressure. Since this relationship may be present it would be interesting if there was also an autonomic nervous system relationship. In another study by Retzlaff et al they determined that the '*arterioles of the dura and cranial sutures are innervated by non-myelinated autonomic nerve fibres which may be neurosecretory in function and effect vascular function. Free sensory endings are found in relation to the venous vessels as well as in the walls of the venous sinuses*.' (21)

Investigating temporalis muscle contraction Retzlaff et al noted that '*the parieto-temporal suture is classified as a squamous type which permits the two surfaces to slide upon each other. Accordingly the nerve fibre and blood vessels will be compressed when the temporalis contracts. It is known that an area which is ischemic will become painful due to the local effect on the sympathetic (autonomic) perivascular plexus. Also the Golgi type IV sensory endings in the suture will be compressed, which will contribute to localised and more distant referred pain*'. (22) Localised contraction of the temporalis muscle, such as what is purportedly taking place at a TS Point, may create a sustained point of sensitivity. Interestingly a study by Strassman et al on cats found that '*medullary trigeminal neurons that receive convergent inputs from dura and facial skin may provide a physiological substrate for the cutaneous referral of dural sensation*'. (23)

Another factor contributing to suboccipital or temporalis muscle chronic localised tension (TS Point) could be associated with our visual and vestibular righting mechanism. '*Visual and vestibular input, as well as joint and soft tissue mechanoreceptors, are major players in the regulation of static upright posture. Each of these input sources detects and responds to specific types of postural stimulus and perturbations, and each region has specific pathways by which it communicates with other postural reflexes, as well as higher central nervous system structures*'. (24) Chronic viscerosomatic or somatosomatic reflex or referred pain patterns may create segmental changes in the regions of spine or within theoretical metameres related with that specific postural reflex activity. This persistent reflex could lead to spinal postural positions which could lead to posture induced myofascial accommodations in the suboccipital and temporalis muscle regions as a means to maintain balance visual and vestibular righting.

Milani and Roccia proposed '*Through the formulation of the dermatoneuromeric theory, an explanatory model for the understanding of the reflexotherapeutic results in the visceral pathology treatment.*' (25) They suggested that there may be many different '*points for the functional balance of the internal organs and consequent diseases, that these points are located in many cases on the same dermatomes and that these are connected with the starting neuromeres of autonomic fibres (Ortho and Parasympathetic) to the organ*' (25) and consider that this relationship may have a spinal metameric reflexotherapeutic relationship with scanty modulation of the supra-axial centres.

DeJarnette believed that pressure over the carotid sinus reflex could affect vagal function and that simultaneous contact over specific visceral reflex areas would stimulate local neural activity similar to '*Hiltons Law*' which considers the cutaneous tissue to be associated with underlying joint and connective tissue. (26) Likewise Rees attempted to find regions of the body that would

stimulate parasympathetic activity. He also used the TS points as a way to stimulate alpha wave production.

The challenge is determining if a viscerosomatic reflex is able to affect a spinal segment and have a supraspinal relationship. Cervico found that 'the number of nociceptive afferent fibres in viscera is very small but these few nociceptive afferents can excite many second order neurons in the spinal cord which in turn generate extensive divergence within the CNS, sometimes involving supraspinal loops.' (27) He found that this divergent input can trigger several systems; sensory, motor and autonomic, creating '*reactions that are characteristic of visceral nociception: a diffuse and referred pain, and prolonged autonomic and motor activity*.' (27)

It is postulated by Rees that a discrete form of visceral referred pain coordinated in a group of specific regions on the body as well as at the TS points. Procacci and Maresca suggested that specific regions of referred pain may be '*generally comprised in the same metameres*'. (28) They found that different pathogenic mechanisms may be involved in the onset of referred pain such as '*convergence of impulses in the central nervous system and reflexes inducing muscle contraction, sympathetic activation, and antidromic activation of afferent fibres, which induces so-called 'neurogenic inflammation*.' (28) Benarroch also found that '*Spinal and visceral afferents provide converging information to spinothalamic neurons in the dorsal horn and to neurons of the nucleus tractus solitarius and parabrachial nuclei.*' (29)

Other studies found descending central nervous system relationships between cerebral representations of somatic and visceral pain. (30) Bennarroch in another study considered how the nociceptive and autonomic systems functioned within an interrelated manner interacting '*at the level of the periphery, spinal cord, brainstem, and forebrain'*. (31)

The relationship Rees found between a TS Point sensitivity and alpha wave production may be related to the intrasutural autonomics and parasympathetic activity. There are studies that have investigated the relationship between alpha wave production and autonomic nervous system (parasympathetic). (12) Additionally, EEG activity during meditation or relaxation, a parasympathetic dominant period, is associated with increase alpha wave production. Not surprisingly Lagopoulos et al found '*a significant increase in alpha power in the meditation condition compared to the rest condition, when averaged across all brain regions … '* (13) It is unclear if the '*Alpha Wave technique*' and TS Points create a meditative state that increases parasympathetic function, or a combination of other factors not yet discovered.

A relationship appears to exist within the central and autonomic systems affected by somatic and visceral afferent reflex pain which may have spinal and supraspinal effects. There may be relationships between cranial sutures, temporalis muscle, trigeminal reflex activity, postural righting reflexes and other factors leading to a possible explanation for the TS Points. At this stage in the study of this novel assessment and treatment modality, we are left with much more work to do before anything conclusive can be stated.

At this time the goal of those utilising Rees methods is to begin the arduous task of developing an evidence base of literature. Presenting it in an historical manner is a beginning. However, critically evaluating Rees' assessment and treatment protocols is necessary to determine if there is a biological plausibility to his methods. Since reflexes and related treatments are difficult to study, it is important to report clinical outcomes comparing patient groups to controls or other types of interventions.

Conclusion

The TS point assessment, as described by Rees, offers the doctor a rapid assessment of the health of the body using the network of relationships between the TS points, spine, viscera, and soft tissue. Through decades of clinical study Rees mapped out these reflex relationships and

incorporated them into clinical care leading to positive clinical outcomes. He found that in addition to improving spinal segmental and related organ (viscerosomatic reflex) balance and function, that the *Alpha Wave Enhancement* technique was an integral process in aiding a patient's recovery.

With this novel and complex manner of assessment and treatment, further study into its biological plausibility as well as determining its reliability and validity will be needed.

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References

1. DeJarnette MB. Temporal-sphenoidal research project 1965. Privately Published. Nebraska City, NB. 1965.
2. Rees ML. Temporal sphenoidal research. Dispatcher. Privately Published. Waterloo, Quebec, Canada. Mar 1968;3(9).
3. Rees ML. Temporal sphenoidal research. Dispatcher. Privately Published. Waterloo, Quebec, Canada. Mar 1968;3(10):9-10.
4. Rees ML. Temporal sphenoidal teaching lecture. Privately Published. Sedan, Kansas. 1974.
5. DeJarnette MB. Sacro Occipital Technic. Privately Published: Nebraska City, NB. 1984: 1,13,24-30,149,265-272.
6. Goodheart GJ. Applied Kinesiology Research Manual. International College of Applied Kinesiology-USA, Shawnee Mission, KS. 1974: 1-38.
7. Goodheart GJ. Applied Kinesiology Research Manuals. Privately published yearly. Detroit, MI. 1964-1998.
8. Melzack JR, Wall PD.The Puzzle of Pain. Basic Books, New York, NY. 1973.
9. Chaitow L, Delany J. Clinical Application of Neuromuscular Techniques: The Upper Body. second edition. Elsevier, Edinburgh. 2008:3.
10. Hilton J. On the influence of mechanical and physiological rest in the treatment of accidents and surgical diseases and the diagnostic value of pain. Bell and Daldy, London, England. 1863.
11. Rosner AL, Cuthbert SC. Applied kinesiology: distinctions in its definition and interpretation. J Bodyw Mov Ther. 2012 Oct;16(4):464-87.
12. Maes J, Verbraecken J, Willemen M, et l. Sleep misperception, EEG characteristics and Autonomic Nervous System activity in primary insomnia: A retrospective study on polysomnographic data. Int J Psychophysiol. 2014 Mar;91(3):163-71.

13. Lagopoulos J, Xu J, Rasmussen I, et al. Increased theta and alpha EEG activity during nondirective meditation. J Altern Complement Med. 2009 Nov;15(11):1187-92.

14. Rees ML. The Art and Practice of Chiropractic. Privately Published. Sedan, Kansas. Second Printing: 1992.

15. Retzlaff EW, Mitchell FL Jr, Upledger J, Biggert T. Nerve fibers and endings in cranial sutures. J Am Osteopath Assoc. 1978;77:100-101

16. Retzlaff EW, Jones L, Mitchell FL Jr, Upledger JE, Walsh J. Possible autonomic innervation of cranial sutures of primates and other animals. Anat Rec. 1982:202:156A.

17. Retzlaff EW, Michael DK, Roppel RM, Mitchell F, The structure of cranial bone sutures J Am Osteopath Assoc 1976;75:106-7.

18. Kemp WJ 3rd, Tubbs RS, Cohen-Gadol AA. The innervation of the cranial dura mater: neurosurgical case correlates and a review of the literature. World Neurosurg. 2012 Nov;78(5):505-10.

19. Schueler M, Messlinger K, Dux M,et al. Extracranial projections of meningeal afferents and their impact on meningeal nociception and headache. Pain. 2013 Sep;154(9):1622-31.

20. Retzlaff EW, Upledger JE, Vredevoogd JD. Cranial suture morphology. Second World ongress on Pain. Montreal, Canada. Int Assoc Study Pain. Aug-Sep 1978;1:68.

21. Retzlaff E. Mitchell FL Jr, Upledger J, Vredevoogd J, Walsh J. Neurovascular mechanisms in cranial sutures - research report. J Am Osteopath Assoc. 1980;80(3):218-9.

22. Retzlaff EW, Mitchell FL Jr, Upledger JE, Biggert T, Verdevoogd J. Temporalis muscle action in parietotemporal suture compression. Am Osteopah Assoc Res Conf. Chicago, IL. Mar 1978.

23. Strassman A, Mason P, Moskowitz M, et al. Response of brainstem trigeminal neurons to electrical stimulation of the dura. Brain Res. 1986 Aug 6;379(2):242-50.

24. Morningstar MW, Pettibon BR, Schlappi H,et al. Reflex control of the spine and posture: a review of the literature from a chiropractic perspective. Chiropr Osteopat. 2005 Aug 9;13:16.

25. Milani L, Roccia L. The importance of the metamere in the interpretation of the therapeutic results obtained with acupuncture. [Elaboration of the dermatoneuromeric theory and critical comment]. Minerva Med. 1980 Dec 22;71(51):3735-41.

26. Hébert-Blouin MN, Shane Tubbs R, Carmichael SW, et al. Hilton's law revisited. Clin Anat. 2013 Nov 22.

27. Cervero F. Mechanisms of acute visceral pain. Br Med Bull. 1991 Jul;47(3):549-60.

28. Procacci P, Maresca M, Referred Pain from Somatic and Visceral Structures Current Pain and Headache Reports 1999, 3:96-99.

29. Benarroch EE. Pain-autonomic interactions: a selective review. Clin Auton Res. 2001 Dec;11(6):343-9.

30. Ladabaum U, Minoshima S, Owyang C. Pathobiology of visceral pain: molecular mechanisms and therapeutic implications V. Central nervous system processing of somatic and visceral sensory signals. Am J Physiol Gastrointest Liver Physiol. 2000 Jul;279(1):G1-6.

31. Benarroch EE. Pain-autonomic interactions: a selective review. Clin Auton Res. 2001 Dec;11(6):343-9.