"Good morning Mrs. Smith its nice to see you". "Thank you Dr. Jones, I'm very interested to know what you found on my examination yesterday". "Mr. Williams told me how you helped him, but I have never been to a chiropractor and I'm not quite sure how you're going to help me". "Well Mrs. Smith, chiropractic care differs from your past medical care in that we get to the cause of your problem rather than treating the symptoms". "As chiropractors we correct your problem at the source, spinal subluxations". "Spinal subluxations cause the nervous system to malfunction, and since the nervous system controls every function in your body we are able to get to the cause". "How, Dr. Jones, are you able to tell if I have a subluxation?". "Well, if the problem is serious enough we can detect nervous system malfunction through tendon reflexes, muscle strength, and/or altered sensations". "But Dr. Jones, you mentioned yesterday that all those things were OK, does that mean I have no subluxations?". "Oh no Mrs. Smith, we have other ways of knowing if you have subluxations such as your unequal leg length, fixated vertebrae, and posture problems". "But what do any of those things have to do with nervous system malfunction, Dr. Jones?". "These things we found are indicators of subluxation, Mrs. Smith". "But isn't there a test that can show me exactly how my nervous system is functioning?". "Uh well, uh Mrs. Smith, I .....". "When my doctor discovered my heart malfunction he showed me an EKG". "When he suspected diabetes he showed me a laboratory blood test". "What can you show me that tells me exactly how my nervous system is working?". "Well Mrs. Smith, I uh ..... uh ........".
Does the above scenario sound possible, or is it familiar? How many patients are thinking these very thoughts during our explanations on subluxation? How many fail to understand care because nothing tangible ever demonstrated to them the neurological damage produced by their subluxations?

How do we know if patients enter our offices with neuropathophysiology? Do they leave with improved neural function after the adjustment, or is it worse? How do we know which adjustment is most efficacious? These are the questions each field practitioner faces daily.

How are we to answer these questions? Should we do so with vague tests such as leg length, postural analysis, motion or static palpation? We as a profession stand on the core principle that our forefathers developed, that both health (homeostasis) and disease are nervous system dependent. The foundation of our profession relies upon our ability to effect the health of our patients via restoration of neural function. As chiropractors we tell our patients that we improve nervous system function. Don't you think that we should be able to prove it? Isn't it about time that we as a profession focused on objectively monitoring the neurophysiology of our patients on a pre and post adjustment basis?

Neurophysiology and the Subluxation Complex -

There is no longer any doubt in the health sciences about the importance of the nervous system. Gray's Anatomy states that, "Homeostatic responses are innate in all living organisms, but with increasing size and complexity of structure, the range and flexibility of responses has steadily increased in parallel with the evolution of the nervous system". It further states that, "its structure and activities are inseparable from every aspect of life; physical, cultural, and intellectual". Cutting edge research into the
exact level of control the nervous system exerts has uncovered processes that stagger the imagination. The discovery of brain cell hibernation stunned the research community with the knowledge that nerve cells could actually remain dormant for decades awaiting awakening by a slight increase in blood supply. Recent studies have also found a direct two-way communication system between the brain and every cell in the body. The amount of research supporting chiropractic’s core principle is enormous. All of these technological advances in neurobiochemical and neurophysiological research have established with certainty the nervous system's dominance in controlling and coordinating all bodily functions. It seems that science has finally caught up with our 100 years of clinical observations.

What then are we doing to objectify neuropathophysiology in our patients? What are we doing to measure what science has determined to be the most detrimental of all system malfunctions? Surely we as a majority in this profession can agree that our first and foremost role as chiropractors is the restoration of proper nervous system function through correction of the subluxation. However, with time we have established a more modern and complex definition of the subluxation; the vertebral subluxation complex (VSC) with its five basic components (neuropathophysiology, kinesiopathology, histopathology, myopathology, and biochemical changes). Some schools of thought hold that all of the components must be present for the subluxation to exist. If the patient presents with one component missing are they without subluxation? Aren't neuropathophysiology and aberrant arthrokinematics (a subcategory of kinesiopathology) the two that must be present at all times for a subluxation to exist? Can't all of the other components be completely absent with subluxation still present?, yes! Yet field practitioners are currently using a plethora of instruments in an endeavor to monitor as many of the components of the VSC as possible, why? Apart from neuropathophysiology and aberrant arthrokinematics the rest of the components are
effects. Aren't we as chiropractors supposed to get to the cause? Why are we measuring the effects of the subluxation and not its core element? These other instruments are luxuries at best and merely yield adjunctive measurements of the subluxation. It seems that with this evolution of the VSC we as a profession are losing sight of who we are and what we do. As chiropractors we should focus on the direct measurement of the prime component, neuropathophysiology. Once this is corrected all the other components will follow; or do we "treat" something else?

There are an overwhelming number of instruments available to the chiropractor today. Instruments such as needle EMG/NCV, surface EMG, somatosensory evoked potentials, computerized muscle strength, current perception threshold, computerized inclinometers and many others are currently used in patient examination. However, one must be careful of manufacturers claiming that their instruments measure neurological function. Many of these instruments do not. Some of these instruments do test for neurological function, but fail to do so on a broad scale. Measurement of a segmental neural pathway is not enough to make a determination of global neuropathophysiology. Most of these devices are also not sensitive enough to detect minute neurological changes. Moreover, the time involved in the actual performance of many of these tests is usually prolonged. However, the greatest problem encountered with the majority of these instruments is patient compliance. If any analytical system must incorporate much more than the physical presence of the patient, errors will ensue. If the accurate use of the instrument necessitates that the patient move, sit extremely still, or register a verbal confirmation, the validity of the test comes into question. Many of these tests carry up to a 40% error rate. How objective can an examination truly be when the subjectivity of patient compliance is involved? We as a profession cannot afford errors such as these when the patient's health lies in the balance.
An Instrument for the Chiropractic Profession -

What we need is a truly objective analysis of nervous system function; an analysis that will be able to remove human biases and tell the doctor with certainty when neuropathophysiology exists and when the proper adjustment has corrected it. We need an instrument which can validate the science, aid in the art, and support the philosophy of the chiropractic profession. In order to suit our needs the device must meet certain criteria. First and foremost it must be able to fulfill the founding principle of our profession, the detection of subluxation via measurement of global and segmental neurological function. Since we as chiropractors also claim to affect visceral function, we will need an instrument that analyzes the autonomic nervous system. The device must also be sensitive enough to detect the first signs of neuropathophysiology; a minimum requirement for preventative care. It must be easy to use and fast enough to perform daily pre and post adjustment tests. And finally, the device must have ample research behind it to support its accuracy, repeatability, stability, sensitivity, specificity, and validity in the area of neuropathophysiological analysis. Research which has also determined a standard for normal neurological function, thus providing a normative database to which the patient can be compared.

What instrument fulfills this criteria? Is there a system designed specifically for the needs of the chiropractic profession? The only instrument available at this time which meets every one of these criteria is computerized paraspinal infrared thermography. This does not mean the expensive camera systems popular in the eighties. Current technology makes computerized paraspinal thermography very affordable and within the reach of every chiropractor. We say we are able to improve the function of the nervous system, now we can prove it! With the event of modern computerized paraspinal thermography, the field chiropractor now has the means of monitoring nervous system function on a pre and post adjustment basis; thus fulfilling
the needs of modern outcome based care. Both the doctor and the patient can now see when neuropathophysiology is present and when the adjustment has corrected it. For the first time, the patient and the doctor are both able to determine objectively how much neurophysiological improvement has been made and when more care is indicated.

The only device manufactured at this time, which meets the stringent instrument standards required by the international thermographic community, is the Tytron C-3000 Computerized Paraspinal Infrared Thermographic Imaging System. With the recent invention of the Tytron C-3000 not only is all the above criteria met, but every inherent problem encountered with other outdated instruments of this type is avoided. Although these instruments represented major early efforts to monitor nervous system function, the outdated technology used in their production presents many significant limitations. The most crucial problems encountered involves the thermodynamics of thermocouple devices and the low resolution of improperly designed and unstable infrared sensor systems.

When any contact device is used, such as a thermocouple instrument, it immediately succumbs to the Zeroth Law of Thermodynamics. This law states that when two thermally dissimilar objects are brought into contact they attempt to reach an equilibrium by the exchange of energy down a hot to cold thermal gradient. Consequently, a cold thermocouple probe will change the true temperature of the skin by cooling it. Some doctors attempt to overcome this problem by "seasoning" or acclimating the probes to the patient. Unfortunately, this does not change the immutable laws of thermodynamics. When improperly designed infrared instruments are used problems also arise. If the device cannot trace exactly over the path of a previous scan, collect enough thermal readings along the spine (poor thermal
resolution), and/or the sensors are unstable, factual data will not be gathered. Using either of these types of instruments ultimately results in false thermal readings. Consequently, these devices will not meet chiropractic's needs due to their inability to meet the strict standards required for proper thermal interpretation.

Today, the Tytron C-3000 has taken paraspinal thermography to its highest level, while addressing all of the limitations associated with the devices of the past. The Tytron C-3000 incorporates extremely sensitive (up to 1/100th of a degree F) and stable infrared sensors, high resolution thermal data collection, fiber optic communication, beam collimating lenses, travel distance encoders, and computer processing. This new paraspinal scanner houses its sensors in a solid block of aluminum, which allows them to maintain their peak efficiency throughout each scan. Additionally, the Tytron C-3000 has the unique ability not only to record thermal differentials (right to left thermal asymmetries) on the horizontal scale, but to also record direct temperatures on the vertical scale (independent right and left absolute temperatures), both at a very high resolution (Fig. 1). This is a critical feature for proper "pattern" analysis (it is possible to have an identical differential and the patient not be in "pattern"). Computer processing also allows the doctor to quantify the exact temperatures of all the thermal shifts, or "breaks", within the pattern (Fig. 2). Pre and post adjustment scans dramatically demonstrate to the patient their nervous system's improvement with care (Fig. 3 pre and 4 post adjustment full spine scans). When the correct access point to the nervous system is used, normalization of neuropathophysiology will occur (Fig. 4). The scans may also be displayed as color bar graph images with green representing normal and yellow, orange, and red as 1-3 standard deviations from the norm (Fig. 5 pre full spine abnormal and 6 post adjustment "green"). Past office visit scans may also be displayed as a multiple comparison image for tracking patient improvement and the need for future care (Fig. 7). Moreover, the Tytron C-3000 has the ability to display pre and post
adjustment scans as an overlay graph (Fig. 8) or side-by-side bar graphs. This new paraspinal scanner is also designed to read accurately into the hairline and up to the occiput without thermal distortion. Another plus is that the instrument is extremely easy to use and can be mastered in a clinical setting in less than a week. The incorporation of all of the above cutting-edge technology insures that the practicing field doctor can produce accurate, repeatable, and valid paraspinal thermographic scans. Consequently, these images allow the doctor to objectively demonstrate to the patient a clear picture of their improvement and any need for future care.

With the increasing costs of running a practice concerning many clinicians today, incorporating computerized paraspinal thermography into patient care becomes an important issue. With the use of many other types of instruments, the time needed to perform the test can be quite prolonged. This can cause office problems such as the need for extra personnel, increased use of space, and reduced patient flow. With the combined use of computer processing and fast-stable infrared sensors, the Tytron C-3000 can produce full spine scans in less than 15 seconds. Current technological advances have also brought manufacturing costs down to a point that paraspinal thermography is now within the reach of every field doctor.

Research and Computerized Paraspinal Thermography -

We as a profession have a responsibility to both the patient and ourselves to monitor the nervous system’s function due to its unique role in the maintenance of global bodily function. Over 30 years of research and 6,000 peer reviewed and indexed journal papers have confirmed thermography as a valid analysis of neurophysiology. Both the chiropractic and medical professions have issued policy statements confirming thermography’s validity as a neurodiagnostic imaging tool. The medico-legal system has allowed thermography to be introduced as evidence in court for over two decades.
Thermographic imaging is used across the United States and overseas in almost every major medical center. It is also accepted by federal agencies and departments as being valid and useful. The weight of the evidence lends overwhelming support to thermography as a valid procedure for the analysis of neuropathophysiology.

The guiding principle of our profession rests upon our ability to effect the health of our patients via correction of abnormal neural function. Since there is no longer any dispute over nervous system dominance, what are we doing to measure the most deleterious of all system malfunctions? Why we are using instruments and tests which analyze the component effects of the subluxation! How are we to use devices which cannot under any circumstances directly establish an objective analysis of neuropathophysiology? There is nothing wrong with testing for other VSC components so long as it is understood that the findings are adjunctive to the cause. With the use of quality paraspinal thermography, the field doctor is finally be able to tell when neuropathophysiology (subluxation) is present and when the correct adjustment has been rendered.

The International Upper Cervical Chiropractic Association (IUCCA), through its Applied Upper Cervical Biomechanics Certification Program, is making an effort to bring this level of care to the profession. Extensive research into computerized paraspinal thermography has determined normal paraspinal thermal values; thus normal neurophysiology. The IUCCA was the first to incorporate this normative database as a guideline for neuropathophysiology and a standard for the correction of the subluxation. If results oriented (outcome based) care is to become a reality, the need for objectifying our professions core premise becomes a necessity.
A Challenge -

Do patients really enter our offices with neuropathophysiology on a regular basis? Do we know for a fact that we correct their subluxations and they leave our offices with normalized neural function? Are we absolutely sure they are not made worse with our care? How do we know which adjustment is most efficacious? Can we as field practitioners truly answer these questions without objective instrumentation?

Over 6000 peer-reviewed papers in the past 30 years have established computerized infrared thermography as the new standard in sub-threshold neurophysiological analysis. If the chiropractic profession is going to continue to stand on its core principle that the subluxation, and its adjustment, does affect the neurophysiology of the body, it becomes absolutely necessary as responsible doctors to monitor its function using the best technology the world has to offer. Regardless as to whether or not you "believe" in any particular technique, we as profession must insist on the highest standards possible in objective neurophysiological outcome measurements. Only then will we truly discover what works and what doesn't. Do we as a profession need to be challenged, or is it a challenge to do what we profess as a principle?

About the authors: Louis H. Tiscareño, Jr., D.C., and William C. Amalu, D.C., are the president and vice president, respectively, of the International Upper Cervical Chiropractic Association. They are both certified chiropractic upper cervical specialists, having completed over 300 hours of postgraduate course work. We would like to thank Tytronics Corp. for granting us the use of the Tytron C-3000 scanner for our research projects. For information about the Tytron C-3000 Computerized Paraspinal Infrared Imaging System, please contact Tytronics R&D Corp. at 800-705-2307. Any questions regarding the IUCCA, the Applied Upper Cervical Biomechanics Certification Program, or the above article, should be directed to Dr. Tiscareño at (510) 757-9200 or Dr. Amalu at (415) 361-8908.

References


46. Goldberg G. Thermography and magnetic resonance imaging correlated in 35 cases. Thermology 1986;1:207-211.


113. Uematsu S. Symmetry of skin temperature comparing one side of the body to the other. Thermology 1985;1:4-7.


142. Position Paper on Thermography - Congress of Neurological Surgeons.


149. Vlasuk, S: Standards for Thermography in Chiropractic Practice.


202. Uematsu, S., Jankel, W.: Skin Temperature Response of the Foot to Create Stress of
the Hand: A Test to Evaluate Somatosympathetic Response.
204. Kobross, T, Steiman, I.: Reflex Sympathetic Dystrophy of the Upper Extremity:
    A New Diagnostic Approach Using Flexi-Therm Liquid Crystal Contact
205. Lewis, R., Racz, G., Tabian, G.: Therapeutic Approaches to Reflex Sympathetic
    Dystrophy of the Upper Extremity. Clinical Issues in Regional Anesthesia, No. 2.
208. Thermography used to diagnose the facet syndrome-case report. J Neurol