

# Case Study

## Subluxation Based Chiropractic Care in the Management of Cocaine Addiction: A Case Report

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### Abstract

**Objective:** This is a case study of a 63 year old male free base and crack cocaine addict who was court mandated to the Exodus Addiction Treatment Center for residential addiction treatment following a conviction for cocaine possession along with a record of multiple felony arrests over a 40 year period.

**Clinical Features:** The patient was court mandated to the Exodus Addiction Treatment Center after failing to retain recovery or successfully complete eleven previous medical model/disease concept residential addiction treatment programs for free base and crack cocaine addiction. A comprehensive case history, psychosocial, neurological and addiction assessments, along with chiropractic examinations were performed in order to better understand the patient's previous and current state of well-being and establish a treatment plan. Subluxations were detected after chiropractic examination.

**Intervention and Outcomes:** Torque Release Technique (a non-linear tonal model), P300 Wave testing, EMG, thermography and residential addiction treatment were combined for evaluation and application of care. Adjustments were performed with the Integrator adjusting instrument and were limited to Primary Subluxation. P300 Wave testing was performed with the Enigma P300.

**Conclusions:** Although subluxation based chiropractic care is not recognized as the main course of treatment for addiction, it is postulated that improvement of spinal neural integrity and neural dopaminergic pathway efficiency through chiropractic adjustments may contribute to improved homeostasis, Brain Reward Cascade and Reward Deficiency Syndrome thus allowing the body to express a greater state of well-being and human potential as an outcome. Additional outcomes such as increased addiction treatment retention rates and decreases in relapse are also postulated after combining non-linear tonal chiropractic care with standard addiction treatment and behavior modification.

**Key Words:** *Torque Release Technique (TRT), Integrator, Enigma P300, P300 Wave, Chiropractic, Primary Subluxation, Vertebral Subluxation, Brain Reward Cascade (BRC), Addiction Treatment, Cocaine Addiction, EMG, Thermography, Cranio-spinal Meningeal Functional Unit, Reward Deficiency Syndrome (RDS).*

### Introduction

The purpose of chiropractic is to optimize human potential and state of well-being. This objective is primarily realized by the successful adjustment of vertebral subluxation allowing the brain and spinal cord to effectively communicate to the rest of the body creating improved overall nervous system function.<sup>1</sup>

Subluxation and its association with improvements in quality of life has been anecdotally reported by chiropractors since 1895 beginning with DD Palmer, but has remained ignored in

the scientific literature until 2000. Current research is being presented suggesting that chiropractic not only helps with musculoskeletal complaints like neck pain and headaches, but more importantly that subluxation correction allows for greater fulfillment of human potential and state of well-being thereby explaining why it has been shown to improve outcomes in addiction treatment and relapse prevention.<sup>2,3</sup>

Drugs of abuse produce widespread effects on the structure and function of neurons throughout the brain's reward circuitry, and these changes are believed to underlie the long

lasting behavioral changes that characterize addiction.<sup>4</sup> Research by Pert and Dienstfrey (1988) suggest the spinal cord has more limbic system than the brain, where emotion is mediated and the subconscious mind may be.<sup>5</sup> Additionally these emotions are expressed through the Brain Reward Cascade.<sup>6,7</sup> Brain circuitry and addictions directly relate to the dopaminergic system with the A1 allele of the dopamine D2 receptor being implicated in reward mechanisms in particular.

The Brain Reward Cascade includes the release of serotonin (5HT) in the hypothalamus which stimulates methionine enkephalin release which in turn inhibits GABA at the substantia nigra which in turn competes with the amount of dopamine (DA) released at the ventral tegmental region. The net effect of neurotransmitter interaction in the mesolimbic (brain) region induces "reward" when DA is then received at the nucleus accumbens and amygdala in normal concentration.<sup>7</sup> It is well known that when this linear cascade is manifest without neural interference, DA works to maintain our normal state of well-being, drives and pleasure "reward". In fact, DA has come to be known as the "pleasure molecule" and/or the "anti-stress molecule."

When DA is released into the synapse, it stimulates a number of DA receptors (D1-D5) which result in increased feelings of well-being and stress reduction.<sup>7</sup> Early chiropractic literature suggests the cord tension subluxation is the major component of vertebral subluxation and causes greater neurological insult as opposed to the cord pressure subluxation.<sup>8</sup> Excessive cord tension has been described as a source of dysfunction in the Brain Reward Cascade causing a hypo-dopaminergic trait.<sup>9</sup>

The brain of that person requires an increase in dopamine in order to feel good. This trait leads to multiple drug-seeking behaviors such as impulsive and compulsive behavioral disorders including the five addictions: work, food, sex, gambling and drugs and the compulsive and affective disorders such as: ADHD, Tourette's Syndrome, Asperger's Syndrome, autism, dyslexia, chronic violence, post-traumatic stress disorder, schizoid/avoidant cluster, conduct disorder and antisocial personality disorder, to name a few.<sup>7</sup>

The central problem facing any addiction treatment program is multiple relapse. Drug addiction is now being recognized as an act of associative learning causing repeated stimulation from external stimuli.<sup>10,11</sup> Repeated drug interactions are thought to cause a conditioned response leading to brain reward mechanisms that trigger ongoing drug cravings.

Repeated cocaine exposure has been shown to increase dendritic sprouting in the nucleus accumbens, pre-frontal cortex, and caudate-putamen.<sup>10</sup> Dendritic sprouting not only increases synaptic sensitivity, but also increases craving and relapse risk. This ongoing cycle of repeated exposure not only evokes expectations of drug availability from repeated euphoria, but also makes it increasingly difficult for addicts to abstain from their drug of choice.<sup>10</sup>

Torque Release Technique (TRT), developed by Jay Holder, D.C, is a model and technique developed out of human population randomized clinical trial involving subluxation-centered chiropractic in a residential addiction facility.<sup>2,3</sup> TRT utilizes a 9 category non-linear testing priority protocol to

make a differential diagnosis for Primary Subluxation along with 15 diagnostic indicators promulgated from 7 techniques: Palmer Upper Cervical, DNFT (Van Rumpft), SOT, Toftness, Thompson, Logan, and Network to create a non-linear tonal model.

Because the nervous system is suggested to record and memorize everything it perceives, a non-linear adjusting procedure from one visit to the next is needed to ensure listing changes rather than pattern the patient's subluxations.<sup>12</sup>

TRT utilizes the Integrator adjusting instrument which delivers three-dimensional toggle recoil with straight axial, right and left torque directions. The Integrator is the first chiropractic adjusting instrument to receive an FDA 510K Class II medical device designation for the adjustment of vertebral subluxation.<sup>2</sup>

The Integrator delivers toggle recoil thrusts at 1/10,000 of a second, has a pre-cocking pressure sensitive pisiform tip with an automatic release mechanism for the purpose of delivering thrusts with true intraprofessional reproducibility at a constant Hertz frequency.<sup>2,12</sup> Thrusts by the Integrator are expressed at 64 Hz to match the primary subluxation. The basic premise underlying Hz frequency is the notion that intrinsic mechanical behavior of the human spine can be determined by the quantification of the frequency-dependent motion response of various portions of the spine to a known force input.<sup>13</sup>

## Case Study

### History

A 63 year old white male presented at the Exodus Treatment Center with a 50 year history of poly substance abuse. Patient was court ordered to Exodus Treatment Center after a felony conviction for cocaine, violation of probation and eleven failed traditional addiction treatment programs. Cocaine addiction started at age 21 with previous use of alcohol, cannabis, and amphetamines as early as age ten. Psychosocial assessment indicates daily use of cocaine since the age of 21.

Cocaine addiction became uncontrollable resulting in decades of multiple felonies and incarcerations. Secondary health characteristics included low back pain, emphysema, chronic obstructive pulmonary disease (COPD), high blood pressure, coronary artery disease, gastritis, benign prostate hypertrophy, obesity, venous insufficiency and significant cognitive impairment. Patient sought medical care often for heart, lung and gastrointestinal complaints. Medication during current addiction treatment included: Lisinopril, Prevacid, Aspirin, Hydrochlorothiazide, Potassium Chloride, ProAir inhaler, Spiriva, Symbicort, Flomax, Finasteride, and Seroquel.

The patient had a history of severe emotional and behavioral conduct problems. Patient experienced depression and anxiety over his mother's poor medical health and break-up with significant other. Cocaine and sex addiction has also led to financial unmanageability and dangerous liaisons.

Due to patient's long criminal and drug history he was court ordered to 24 hour residential staff monitoring care to cope with recovery related environmental problems. Patient was

provided with a full-schedule of reality and relapse prevention groups, coping skills sessions, psychotherapy and individual lifestyle modification sessions. A wellness recovery plan including Alcoholics Anonymous 12 step fellowship program was implemented to monitor uncomfortable and distressing signs and symptoms related to addiction. Patient was required to attend AA and NA meetings seven days per week.

Continual relapse in spite of eleven addiction treatment programs led to multiple felony convictions and incarcerations for many violations including sales and possession of cocaine and other illicit drugs. Exodus Addiction Treatment Center performed a P300 wave analysis with the Enigma P300 unit after approximately five months of their traditional addiction treatment protocol. The P300 assesses attention, cognitive function, cognitive awareness, cognitive ability and decision making as well as other aspects affecting CNS pathology.<sup>14</sup>

The P300 wave (Auditory Evoked Potential) is the most widely used ERP in psychiatry.<sup>15</sup> The patient was not reaching therapy goals and performing poorly in treatment. Therefore, three P300 wave assessments were performed during the 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> month at Exodus and prior to chiropractic care. Results indicated that traditional addiction treatment at Exodus was failing to improve cognitive function and or increase the P300 wave amplitude. This was reported to the court. The judge then required the patient to remain in Phase One of treatment at Exodus Addiction Treatment Center and complete a neurophysiologic evaluation to develop a more aggressive and comprehensive treatment plan. Therefore, TRT was added to the treatment plan for an additional eight months to improve addiction treatment outcomes, neurological and behavioral function and to make the care more comprehensive.

#### *Examination*

An initial Addiction Severity Index (ASI) was introduced to explain and monitor seven potential problem areas associated with the patient's current cocaine addiction. The ASI is an assessment instrument designed to be administered as a semi-structured interview to patients who present for substance abuse treatment. This instrument gathers information about seven areas of a patient's life: medical, employment/support, drug and alcohol use, legal, family history, family/social relationships, and psychiatric problems.<sup>16</sup>

Using a four point scale from 0 to 4, the interviewer severity ratings indicate the degree of patient problems in each of the seven problem areas based on historical and current information. Composite scores are based entirely on current information and are indicators of the present status of the patient; they are thus useful for treatment outcome studies since successive composite scores can be used to summarize changes in patient status.<sup>16</sup>

Paraspinal surface electromyography was performed by the Insight Subluxation Station during the initial TRT evaluation. Both EMG amplitude and asymmetry were measured on a monthly basis for seven months. Surface EMG is a scanning procedure employing hand-held electrodes which are placed over the skin of muscle tissue. It is used to collect and record electrical potential associated with muscle activity while the patient is in the seated position in a relaxed posture.

The muscular activity of various spinal segments are then analyzed and compared to a normative database. A comparative analysis of the left and right side of the spine, which reveals muscular imbalances from cord tension, is made. Surface EMG, has been shown to be an objective measure of change in the assessment of the patient's progress.<sup>17</sup>

Thermal scan analysis was also performed for initial TRT analysis. Thermography was recorded and compared to normative data throughout the entire eight months of care. The use of thermography has been used since the early days of chiropractic as an assessment for the neurological component of the vertebral subluxation.<sup>14</sup> Thermal scans use infrared technology to measure heat emission given off from the surface of the skin. The use of computer-interfaced infrared devices makes possible more objective digital analysis methods of thermographs using mathematical algorithms.<sup>18</sup>

The differences in peripheral skin temperature have been taken to be a correlate of changes in peripheral vasoconstriction associated with the sympathetic nervous system. Thus, tissues tend to warm and cool as the immediate vascular bed below the skin constricts and dilates. This relationship is based on the physiological ramifications of vasoconstriction and vasodilation of paraspinal tissues.<sup>19,20</sup> Changes seen in thermal scans when properly done not only show high intra examiner reliability, but changes seen are also most likely due to actual physiological changes rather than equipment error.<sup>18</sup>

Palpation by TRT's STIM protocol was performed prior to TRT's functional leg length reflex (FLLR). STIM, an acronym, stands for scanning palpation, tissue palpation, intersegmental palpation, and motion palpation. Tissue palpation revealed increased congestive tissue tone at the anterior neck and kidney regions indicating the subluxation's etiology as chemical, from poor diet, cocaine and other drug use. Motion palpation revealed decreased ROM and hypertonic musculature at the upper cervical and lower lumbar segments of the subject's spine.

Torque Release Technique protocol was utilized with adjustments made by the Integrator. Functional leg length reflex (FLLR) and the pressure test are other standard procedures utilized by TRT in order to detect the primary subluxation and its lines of drive (LOD). Pressure tests (PT) involve digital skin contact applied to the suspected subluxation with a three dimensional direction of correction. The pressure test is applied to temporarily reflex the dynamic dyskinesia or dysponesis of the subluxation's LOD.

Many chiropractic techniques use functional leg length inequality, not FLLR, with the aim to even the leg length after adjusting in aegis with a challenge as opposed to the pressure test.<sup>21</sup> However, only TRT uses the FLLR and only before the adjustment is made. By abrupt foot dorsiflexion the Achilles DTR is utilized while the patient is in the prone position to determine the FLLR. TRT does not aim to balance leg length.

Functional leg length inequality is a controversial phenomenon and is thought to result from physiological adaptations to distorted biomechanics anywhere along the

kinetic chain, such as asymmetric muscle contraction or bony misalignment and is theorized to offer information that may be of help in making the leg length even or balanced including clinical decisions about the nature of the vertebral subluxations detected and the type of corrections that should follow, again with the aim to make the legs even or balanced, and to stop adjusting when the leg length becomes even or balanced.<sup>22,23,24</sup>

### *Interventions & Outcomes*

After eight months at Exodus and under the court's direction, Torque Release Technique, P300 wave testing, surface EMG and thermography by Insight Subluxation Station were added to the existing treatment regimen as the patient continued residential addiction treatment receiving counseling, group therapy, psychotherapy Narcotics Anonymous and Alcoholics Anonymous meetings daily. The Addiction Severity Index and Psychosocial assessments were again administered to the patient to track both behavioral and psychological progression.

During the second eight month period following the 3rd P300 wave analysis, a specific chiropractic adjustment regimen for the adjustment of vertebral subluxation was delivered to the patient three times per week. This consisted of a series of adjustments using the Torque Release Technique (TRT) protocol combined with the use of the Integrator adjusting instrument. The main focus of TRT is to promulgate a differential diagnosis to rule out secondary subluxations and rule in the primary subluxation for the purpose of improving quality of life, state of well-being and human potential.<sup>12</sup>

Due to decades of chronic behavioral, psychological and physical dependence for cocaine and other drugs, the patient was seen three times a week for subluxation management. The care plan was modified in accordance to outcome measures. Psychosocial assessments measuring chemical dependency, financial stability, sexual addiction, and legal problems were measured pre and post care and recorded to track patient compliance and progress. During this period the patient exhibited a substantial increase in quality of life ratings and a considerable decrease in presenting symptomatology.

Initial patient presentation data showed scores of 4 out of 4 on the ASI index in the psychological and emotional categories. In the family and social problem section the patient scored himself 3 out of 4. The patient also scored 4 out of 4 on his willingness to undergo treatment for psychological and emotional problems, a very poor prognosis for recovery.

However, after introducing TRT into the residential addiction treatment program milieu, considerable improvement in the Addiction Severity Index (ASI) scores occurred. Data revealed a continual decrease in both depression and anxiety scores. ASI index scores decreased to 1 out of 4 in the psychological and emotional categories. Family and social problem scores decreased to a 1 out of 4. Patient's willingness to receive treatment continued with a score of 4 out of 4. These improved ASI scores not only showed better patient compliance but is suggestive of decreased relapse potential.

Patient P300 wave potentials at initial phase of care showed steady decrease in cognition, attention, cognitive function, and

decision making ability. P300 amplitude in drug-dependent patients is influenced by a complex interaction between CNS pathology that predates and promotes the onset of drug dependence and CNS pathology that should resolve during the process of recovery from drug dependence.<sup>25,14</sup>

The initial patient P300 wave testing trials performed over a period of eight month's previous to the introduction of TRT are shown in Appendix I. Figure 1 shows a continual decrease in P300 amplitude before chiropractic care was administered. Amplitudes remained extremely low with no change in latency. Figure 1 suggests damage to frontal and parietal loci as sequelae of chronic cocaine dependency. Figure 2 shows P300 wave progression after chiropractic care was added to patient's treatment plan. Figure 2 shows improvement in P300 amplitude scores after eight months of TRT.

Comparable thermal and EMG scans were taken at the onset of TRT and new scans were retaken every 30 days. Post EMG amplitude and asymmetry scans show improvement in overall asymmetry and severity of paraspinal muscle activity. Post thermal scans show not only a decrease in overall absolute temperature but side to side differentials as well. Appendix II shows pre and post EMG amplitude and asymmetry scans and Appendix III shows pre and post thermal scans. Both EMG and thermal readings were taken while under subluxation based chiropractic care and traditional residential addiction treatment. There was a substantial improvement in overall EMG amplitude and asymmetry, as well as thermal readings.

### **Discussion**

The purpose of this case study was to document outcomes that occurred when combining traditional addiction treatment methods with TRT chiropractic care. This case study objectively documents the positive effects on the patient's quality of life and CNS cognitive function as measured by the Addiction Severity Index scores and P300 wave analysis.

For decades addiction treatment programs have strived to find an answer for continued drug relapse in patients suffering from a multitude of addictions. There has been a major effort in recent years to determine the cellular and molecular changes that occur during the transition from initial drug use to compulsive intake. We now know many naturally occurring brain and spinal cord substances play a role in both emotions and pain reduction, leading to an increased sense of wellbeing.<sup>2,3,7</sup>

For decades scientists have been looking at the brain and spinal cord as separate entities. Today science is proving that the body is a tensegrity structure and all parts are continuously dependent on one another for proper function. In this regard, Pert and Diefenbach (1988) and Lewis and colleagues (1981) suggested the limbic system should include not only the amygdala and hypothalamus, but also the dorsal horns of the spinal cord. In fact they point out that a number of neuropeptide receptors having psycho-physiological effects can be found in the dorsal horn of the spinal cord.<sup>26</sup>

It has also been stated that among many types of drug-induced adaptations, it has been proposed that changes in brain-derived neurotrophic factor (BDNF), or related neuro-trophins, and

their signaling pathways alter the function of neurons within the ventral tegmental area (the cell body region of the mesolimbic dopamine system) and the nucleus accumbens (a terminal region of the mesolimbic system). Together this system works to modulate the motivation to take drugs like cocaine.<sup>4,6,14</sup> Chronic cocaine use also increases dopamine reuptake eventually leading to an unrelenting urge for dopamine to feel good. If dopamine reuptake is not produced the body goes into a state of withdrawal increasing drug hunger and the risk of relapse. Results from studies using systemic drug injections indicate that dopamine neurotransmission mediates cocaine-induced re-instatement.<sup>27</sup>

Continual cocaine reinforcement can also be linked back to the rate at which the drug is intravenously injected into the bloodstream. Studies are now showing that increased speeds of transmission in monkeys enhance the ability of cocaine and nicotine to support self drug administration behavior.<sup>28</sup> These observations have led to the proposal that the drug induced neuroplastic changes that underlie psycho-motor and/or incentive sensitization might also contribute to addiction.<sup>28</sup>

Historically there has not been adequate scientific evidence supporting the effects that subluxation based chiropractic care have on addiction treatment. However, recent studies describe how brain reward circuitry and the reduction of vertebral subluxation may have a huge impact on the improvement of neural interference, RDS, brain and spinal cord function, addiction relapse, addiction program retention rates, depression, anxiety and overall health and state of well-being.<sup>29, 2, 3, 6, 7, 17</sup>

## Conclusion

This case study outlines the history, symptomatology and treatment associated with a 63 year old white male addicted to free base and crack cocaine over the past 40 years and who has attended 11 addiction treatment programs unsuccessfully. The patient suffered from severe depression, anxiety, and many other secondary health characteristics and multiple life threatening medical conditions as a consequence of long term drug abuse.

After approximately eight months of Torque Release Technique at the Exodus Addiction Treatment Center, while being co-managed with traditional drug addiction treatment professionals in a residential setting, the patient has seen improvement in health and vitality as revealed with P300 wave results, Thermal/EMG scans, and ASI scores. The patient is currently living on his own in a 3/4 way house and has been free from cocaine addiction for over two years. The patient has chosen to continue chiropractic care.

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**APPENDIX I:** Figure 1 and 2 show pre/post P300 Event Related Potential (ERP) used to measure cognitive function providing an objective measure of brain activity that is very sensitive to central nervous system (CNS) disruptions.<sup>21</sup>

**Figure 1.** P300 Wave Assessment (Traditional Addiction Treatment Only)

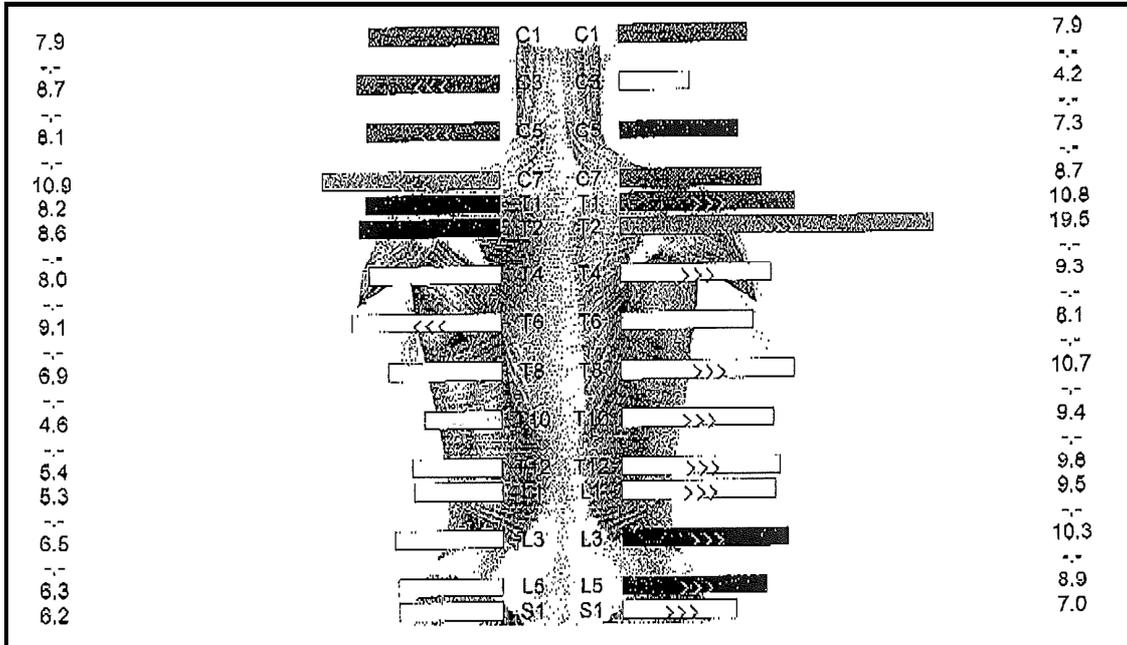
Date	Type	Outcomes
<b>11/3/2009</b>	Target N100 Amplitude	-5.94
	<b>Target P300 Amplitude</b>	<b>4.39</b>
	Target N100 Latency	89.06
	Target P300 Latency	378.13
<b>12/3/2009</b>	Target N100 Amplitude	-5.54
	<b>Target P300 Amplitude</b>	<b>3.25</b>
	Target N100 Latency	92.97
	Target P300 Latency	374.22
<b>7/1/2010</b>	Target N100 Amplitude	-3.14
	<b>Target P300 Amplitude</b>	<b>3.03</b>
	Target N100 Latency	116.41
	Target P300 Latency	339.06

**Figure 2.** P300 Wave Assessment (Traditional Addiction Treatment & Chiropractic Care)

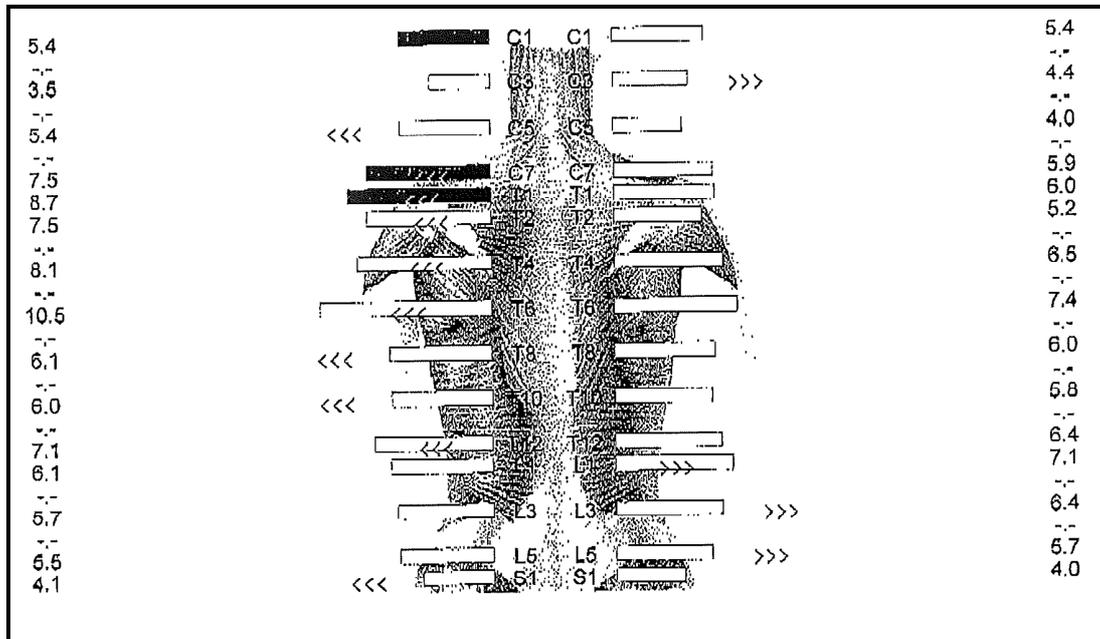
Date	Type	Outcomes
<b>9/3/2010</b>	Target N100 Amplitude	-2.4
	<b>Target P300 Amplitude</b>	<b>6.09</b>
	Target N100 Latency	98.05
	Target P300 Latency	340.71
<b>12/3/2010</b>	Target N100 Amplitude	-1.62
	<b>Target P300 Amplitude</b>	<b>7.2</b>
	Target N100 Latency	98.97
	Target P300 Latency	335.44
<b>3/3/2011</b>	Target N100 Amplitude	-1.01
	<b>Target P300 Amplitude</b>	<b>9.1</b>
	Target N100 Latency	101.16
	Target P300 Latency	320.18

APPENDIX II

Static EMG Amplitude 1

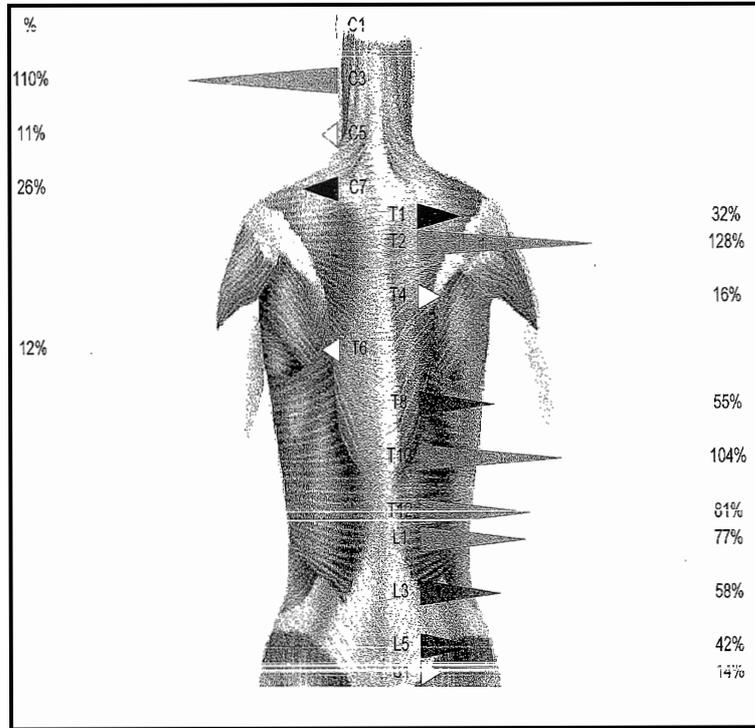


Static EMG Amplitude 7

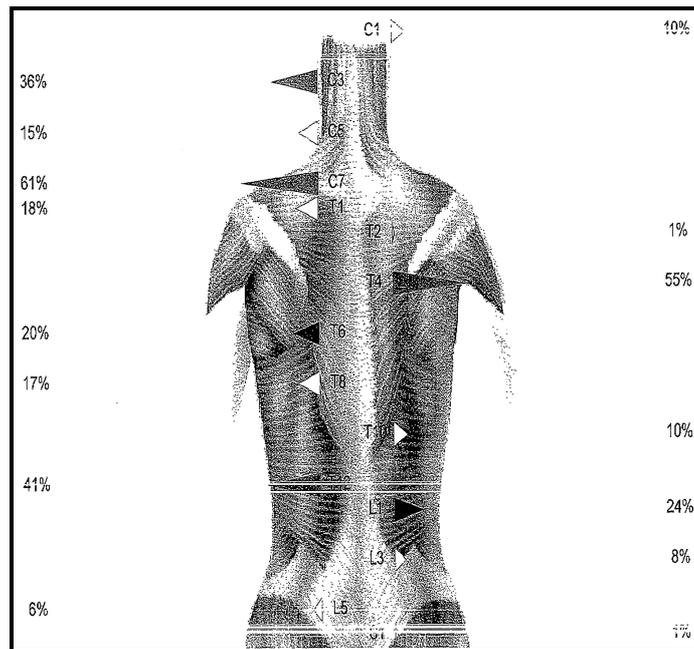


**APPENDIX III**

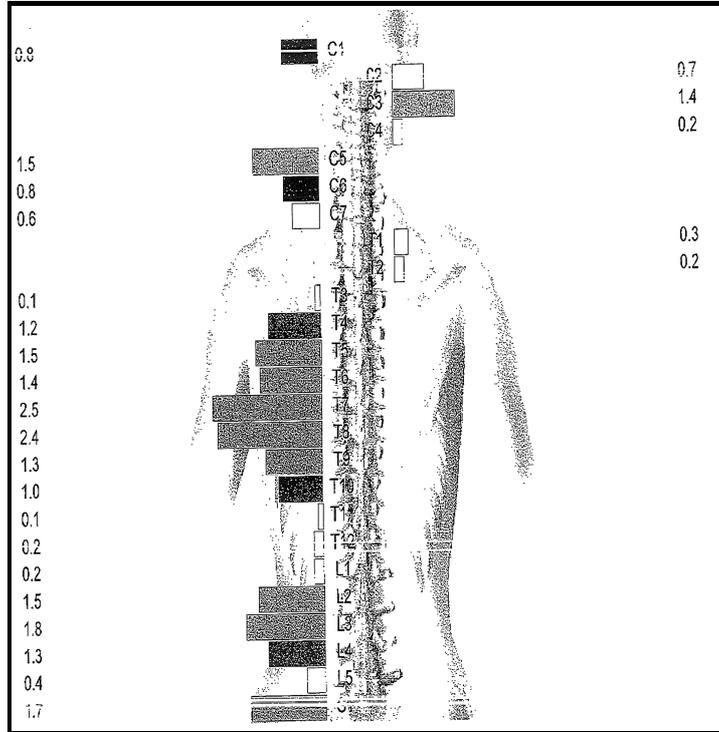
**Static EMG Asymmetry 1**



**Static EMG Asymmetry 7**



**Thermal Scan 1**



**Thermal Scan 8**

