Annals of Vertebral Subluxation Research

CHIROPRACTIC & IMMUNITY: A COLLECTION OF RESEARCH

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REVIEW

Psychoneuroimmunology and Chiropractic

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ABSTRACT

Psychoneuroimmunology is the interdisciplinary field that explores the connections between the mind and emotions, the brain and central nervous system, and the immune system. Chiropractic is a non-surgical, drugless form of health care that seeks to optimize health and wellness via the relationship between structure, primarily the spine, and function, primarily the nervous system of the human body. In practice, most chiropractors also emphasize the role of diet, exercise, and lifestyle modification as an adjunct to the healing process. As such, chiropractic is well positioned to make a unique contribution to the field of psychoneuroimmunology.

Key Words: *chiropractic, psychoneuroimmunology, mind-body, health, stress*

Introduction

Krebiozen was a promising new cancer drug in the 1950's. Mr. Wright was a terminal cancer patient dying from advanced lymphosarcoma. His tumors in the neck, axilla, chest, abdomen, and groin were the size of oranges. He was bedridden and his doctor, Dr. Phillip West, drained two liters of lymphatic fluid from his chest due to a blockage of the thoracic duct. Dr. West was one of the doctors chosen to evaluate Krebiozen, and when Mr. Wright learned of this new experimental drug, he begged to be included in the study. However, Mr. Wright was expected to live just a few days and Dr. West had only enough medication for twelve patients. Even though it seemed pointless, Dr. West relented and gave Mr. Wright the drug.

Dr. West administered the first injection on Friday. Considering the grim prognosis, Dr. West did not expect his patient to survive the weekend. He even made plans to transfer the unused Krebiozen drug to a different patient. When he returned to the hospital on Monday, Dr. West was amazed to find Mr. Wright out of bed and well on his way toward a miraculous recovery. His large tumors had *"melted like snowballs on a hot stove."* Mr. Wright was discharged from the hospital ten days later with his cancer in full retreat.

Unfortunately Krebiozen proved to be an ineffective drug. Mr. Wright was the only patient in the large multi-clinic study to show any improvement. When he heard of these negative results, Mr. Wright became disillusioned and his condition worsened. Within two months he was back on death's door. In an attempt to help his patient, Dr. West devised an experiment. He told Mr. Wright that contrary to what he had heard, Krebiozen was indeed a promising drug, it was just that the drug lost strength when it was not fresh. He told Mr. Wright that he was scheduled to receive *"a new super-refined, double-strength"* product the next day. With this news, Mr. Wright was once again excited to receive the new medicine.

This time with great fanfare, Dr. West administered an injection of saline water. Mr. Wright regained his optimism and his second recovery was even more rapid than his first. He was asymptomatic and apparently cancer free for two months. Unfortunately, the final results of the Krebiozen study came in and the AMA announced to the press, *"nationwide tests show Krebiozen to be a worthless drug in the treatment of cancer."* When he heard this pronouncement, Mr. Wright's condition once again deteriorated and he was dead two days later.[1,2]

While this remarkable true story is often quoted as an example of the placebo effect, it also provides a vivid illustration of the power of the mind to control the body. Since 1957, when this case was first presented, much more research into the underlying mechanisms of 'mind-body' healing has been conducted.

Psychoneuroimmunology is the interdisciplinary field that explores the connections between the mind and emotions, the brain and central nervous system, and the immune system. Since the terms used in neuroscience may not correspond with the terminology used in immunology, and these two fields barely speak the same language used in psychology, the specialists in this field must be able to see the 'big picture'. These scientific 'mavericks' usually have an open mind to alternative ideas and concepts. D.D. Palmer, an alternative thinker of his time,

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founded chiropractic in 1895. It is probable that if he were alive today, the science of psychoneuroimmunology would draw D.D. Palmer's interest. In 1910 he wrote:

"While it is a fact, that thots are things, are entities, that we influence each other and ourselves for good or bad by our thinking, it is also a fact that it is a mental condition, in and of ourselves. It is one of the three methods I recognize of creating normal and abnormal nerve and muscle tension."[3]
"Love or hate, joy or grief, fear or boldness, affect the secretions of glands and follicles."[4]

The scientific foundation for psychoneuroimmunology was first laid by Walter Cannon, who wrote the classic text, *The Wisdom of the Body.*[5] Cannon coined the term *homeostasis* referring to the self regulating ability of the body to maintain a steady and stable equilibrium, despite external challenges. D.D. Palmer would surely find this in keeping with his concept of innate intelligence and 'tone'. Cannon's study of adrenal gland function helped him to define the 'fight or flight' response. When we are placed under physical or psychological danger, the adrenal gland secretes epinephrine, which causes a panorama of changes in the body. Heart rate and blood pressure rise to prepare the body for physical activity. The pupils dilate and the brain becomes very alert to all sensory input. Because digestion and immune function are not critical to the immediate danger, these functions are suppressed.

Stress Response

While the 'fight or flight' response is essential for short term survival, sustained stress can damage the body. Another medical pioneer who continued this line of research was Hans Selye. If you have not read his book, *The Stress of Life*, you have missed an entertaining look into a great mind at work. Dr. Selye was clearly one of the 'mavericks' who attempted to see the big picture. Listen to the narrative of his days as a medical student at the University of Prague in 1925:

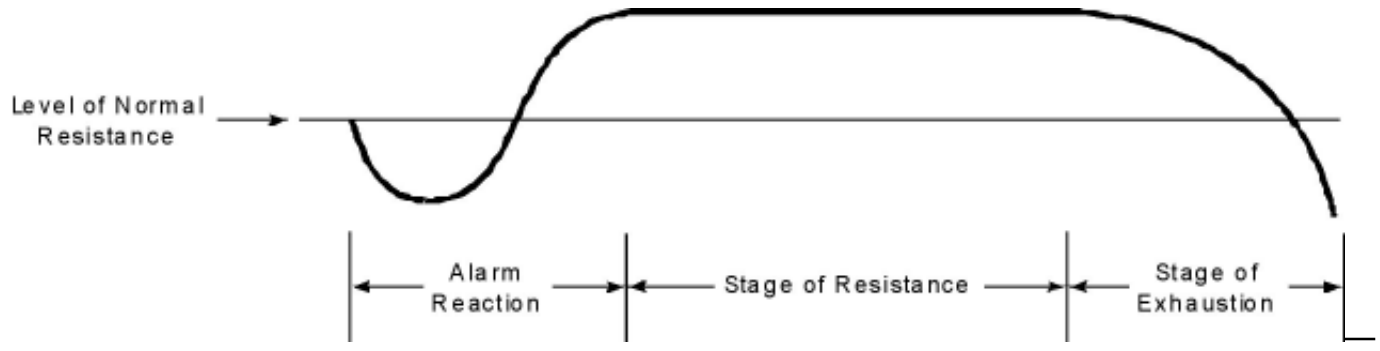
"It so happened that, on that day, by way of an introduction, we were shown several cases in the earliest stages of infectious diseases. As each patient was brought into the lecture room, the professor carefully questioned and examined him. It turned out that each of these patients felt and looked ill, had a coated tongue, complained of more or less diffuse aches and pains in the joints, and of intestinal disturbances with loss of appetite. Most of them also had fever (sometimes with mental confusion), an enlarged spleen or liver, inflamed tonsils, a skin rash, and so forth. All this was quite evident and the professor seemed to attach very little significance to any of it."
"Then, he enumerated a few "characteristic" signs which might help in the diagnosis of the disease. At present, our teacher said, most of the characteristic signs happened to be absent, but until they appeared, not much could be done."
"Even now–after half a century–I still remember vividly the profound impression these considerations made upon me at the time. I could not understand why, ever since the dawn of medical history, physicians should have attempted to concentrate all their efforts upon the recognition of individual diseases and the discovery of specific remedies for them, without giving any attention to the much more obvious "syndrome of just being sick." I knew that a syndrome is usually defined as "a group of signs and symptoms that occur together and characterize a disease." Well, the patients we had just seen had a syndrome, but this seemed to be the syndrome that characterized disease as such, not any one disease."
"Surely, if it is important to find remedies which help against one disease or another, it would be even more important to learn something about the mechanism of being sick and the means of treating this "general syndrome of sickness," which is apparently superimposed upon all individual diseases!"[6]

Dr. Selye spent his life researching the details of this 'general syndrome of sickness'. Building upon Cannon's study of the 'fight or flight' response, Selye discovered that with prolonged and repeated exposure to stressful events, laboratory rats developed a specific pattern of illness:

- enlargement of the adrenal cortex
- atrophy of the thymus, spleen, and lymphatic system
- gastrointestinal ulcers

He subjected the rats to various physical stressors, such as extremes of hot and cold, surgical trauma, strenuous exercise, as well as inflicting 'psychological' stress on the rats. He discovered that regardless of what he used to cause the prolonged stress, the physiological response pattern was remarkably consistent. Dr. Selye called this pattern the **General Adaptation Syndrome**. As he followed these animals over time he discovered three stages to this syndrome:

Figure 1. Selye's General Adaptation Syndrome



- **The alarm reaction** – The initial alarm reaction is essentially the 'fight or flight' response described by Walter Cannon.
- **The stage of resistance** – When stress is prolonged and the individual does not use physical activity to 'work off' the stress response, the body enters a prolonged resistance phase. High cortisol levels will normally trigger a homeostasis feedback loop that reduces hypothalamus and pituitary stimulation of the adrenal glands. However, prolonged stress short circuits this feedback loop and the body maintains a high level of physiological arousal. This is the phase that manifests the triad of adrenocortical stimulation, thymicolymphatic atrophy, and intestinal ulcers.
- **The stage of exhaustion** – While the time frame differs for each individual, eventually everybody will run out of energy reserves. This phase is also known as adrenal exhaustion, and in years past was referred to as a 'nervous breakdown'. Sustained cortisol levels will suppress immune function and render the individual vulnerable to disease or even death.

Hans Selye died in 1982. For 50 years he wrote 40 books and published more than 1,700 scientific articles researching how the body copes with sustained stress. Most of Dr. Selye's research was on animals and involved physical stressors. However, in humans, most of the stressors we must deal with are psychological. In 1967 Holmes and Rahe described the relationship between major life events and becoming sick.[7] The researchers assigned a point value to various life events:

100	Death of spouse	39	Addition to family
73	Divorce	38	Change in financial status
65	Marital separation	37	Death of close friend
63	Jail term	36	Change to different line of work
63	Death of close family member	30	Foreclosure of mortgage or loan
53	Personal injury or illness	29	Son or daughter leaving home
50	Marriage	29	Trouble with in-laws
47	Fired from work	26	Starting or finishing school
45	Marital reconciliation	23	Trouble with boss
45	Retirement	20	Change in residence
44	Change in family member's health	20	Change in schools
40	Pregnancy	12	Christmas season
39	Sex difficulties	11	Minor violation of the law

Based upon their research, if an individual scored 150 points within the past year the likelihood of becoming ill was approximately 50%. If the score was 300 points, that possibility rose to almost 90%. The duration of the stressful event must also be considered. While daily 'hassles' such as paying bills, difficult neighbors, or getting stuck in traffic may not qualify as a major event, they still take their toll. One of the most damaging components of the stressor is when the individual feels they have no control over the outcome.

What symptoms or conditions are likely to be experienced by an individual under chronic stress? Perhaps an even more appropriate question is to ask what conditions do not have chronic stress as a major contributing factor. It is well documented that stress can cause or worsen:

Hypertension	Crohn's disease
Cardiac arrhythmia	Skin disorders
Coronary heart disease	Insomnia
Bronchial asthma	Migraine headache
Peptic ulcer disease	Rheumatoid arthritis
Irritable bowel syndrome	Chronic pain syndromes

The fight or flight response triggers many changes in the body, such as a dramatic increase in blood flow to the muscles. However, when we do not engage in physical exertion to burn off this excess energy, this short term survival mechanism can create chronic health problems, such as hypertension. In today's high stress environment, 25% of adults suffer from high blood pressure.

Relaxation Response

Dr. Herbert Benson, another pioneer in psychoneuroimmunology, was a Harvard cardiologist searching for non-pharmaceutical treatments for hypertension. Dr. Benson's initial research involved using biofeedback to train monkeys to control their blood pressure. Upon learning of this research, a group of trancendental meditation practitioners approached Dr. Benson to continue his research using humans instead of monkeys. Initially he was reluctant to jeopardize his career by studying a modality that some might consider pseudo-scientific. However, Dr. Benson rose to the challenge and has devoted his career to researching what came to be known as 'the relaxation response'.

When he used instrumentation to study the meditators, Dr. Benson found a number of interesting results. Within a few minutes oxygen consumption dropped 17%. The heart and respiratory rate slowed and brain wave patterns shifted to a lower frequency pattern, indicative of rest and relaxation. Blood chemistry measurements showed decreased blood lactate, a chemical observed during anxiety. Paradoxically, he did not find the drop in blood pressure he had expected. He later learned that this was because these meditators had already lowered their blood pressure, and no further lowering was possible. Individuals with high blood pressure usually do benefit from practicing the relaxation response.

The trancendental meditation technique, more commonly known as TM, was originated by the Maharishi Mahesh Yogi from India. When initiated into this training, practitioners are given a *mantra* to use as a mental focus point. Dr. Benson found that the word 'One' worked equally well as a focus point. Here are the steps to elicit the relaxation response:[8]

1. Pick a focus word or phrase, such as: One, Love, Peace, Relax, Shalom, Om, or The Lord is my shepard.
2. Sit quietly in a comfortable position.
3. Close your eyes.
4. Relax your muscles.
5. Breathe slowly and naturally, and on each exhalation, mentally repeat your focus word or phrase to yourself.
6. Assume a passive attitude. Don't worry about how well you are doing. When other thoughts come to mind, simply say to yourself, *"Oh, well,"* and gently return to your focus word.
7. Continue for 10 to 20 minutes.

8. Do not stand immediately. Continue sitting quietly for a minute or so, allowing other thoughts to return. Then open your eyes and sit for another minute before rising.
9. Practice this technique once or twice daily.

Over the years there has been a tremendous amount of research documenting the health benefits of the relaxation response. Physiologically, the relaxation response almost seems to be an antidote to the stress changes observed during the fight or flight response: [9]

Physiological State	Fight or Flight Response	Relaxation Response
Metabolism	Increases	Decreases
Blood Pressure	Increases	Decreases
Heart Rate	Increases	Decreases
Respiratory Rate	Increases	Decreases
Blood Flow to Extremities	Increases	Stable
Muscle Tension	Increases	Decreases
Alpha Brain Waves	Decrease	Increase

Dr. Benson later came to believe that the effectiveness of the relaxation response is made more potent by incorporating prayer and the religious tradition of the individual into the technique.[10]

The Placebo Effect

Because of the power of belief, the placebo effect undoubtedly contributes to the effectiveness of the relaxation response. It is well documented that some patients will experience an improvement solely because of their expectation the treatment will help them. The word placebo comes from the Latin *placere*, meaning *'I shall please'*. The placebo effect is the main reason researchers use randomized controlled trials (RCT). In a double blind trial neither the patients nor the doctors administering the treatment know who is receiving the real or the placebo treatment until the conclusion of the study. In a classic 1955 study, Henry Beecher found that 35% of more than 1,000 patients showed improvement from the placebo.[11] More recent trials have found that the placebo effect may be twice as powerful as predicted by the Beecher study.[12,13] A recent review of the effectiveness of anti-depressant medications, such as Prozac, Zoloft, and Paxil, found, *"75% of the response to the medications examined in these studies was a placebo response, and at most, 25% might be a true drug effect."*[14]

At times it almost seems as if the prevailing attitude in medicine views the placebo effect as an obstacle to the process of finding new and effective treatments. Suppose a double blind trial disclosed the experimental group had a 20% better outcome than the control group. This is considered 'highly significant', and you can be sure the drug company's publicity machine will kick into high gear to promote this new wonder drug. Let's change our perspective and look at this from the point of view of a patient trying to get well. The placebo effect is acknowledged to help between 35-70% of patients, while drug therapy rarely achieves this level of significance. What is wrong with this picture? Instead of viewing the placebo effect as an obstacle to be overcome, we should be researching ways to maximize the power of the placebo effect. This a fertile area of research for psychoneuroimmunology: helping the mind to initiate and promote the healing process.

Detailing just a few studies might serve to illustrate the immense power of the mind to alter the body's physiology:

- Leaves from the Japanese lacquer tree cause a contact dermatitis similar to poison ivy. In 1962, 57 high school boys were blindfolded and one arm was brushed with leaves from the lacquer tree, while the other arm was brushed with chestnut tree leaves, that do not normally cause contact dermatitis. However, once the boys were blindfolded, the researchers switched the leaves. Specifically, when the boys were told they were being brushed with chestnut tree leaves they were actually brushed with leaves from the poisonous lacquer tree, and vice versa. Within a few minutes the arm that was brushed with what the boys thought were the poison leaves began to experience burning and itching with raised red bumps. In most cases, the arm that was touched with the poisonous leaves did not react. For these boys, the body created the physiological reaction appropriate for what the mind believed.[15]

- In a 1950 study, pregnant women who were experiencing nausea and vomiting typical of 'morning sickness' were given a drug they were told would cure their nausea. What they were actually given was ipecac, a drug given to cause vomiting. Their nausea and vomitting ceased entirely by taking a drug they believed would work. This was not just a subjective improvement. The researchers used a balloon catheter in the stomach to monitor stomach contractions before and after the drug.[16]

- A 1987 study looked at two hundred patients with non-specific complaints not attributable to any particular physical ailment. This is a very common occurence in clinical practice, and accounted for about one-half of the patients seen at this clinic. The patients received what was referred to as either a 'positive' or 'negative' consultation. In a positive consultation the doctor gave the patient a firm diagnosis and confidently remarked they could expect improvement within a few days. In a negative consultation the patient may have been told, *"I am not sure that the treatment I am going to give you will have an effect."* While both the positive and negative consultation groups thought they were receiving medication, both groups were given vitamins. 64% of 'positive' consultation patients got better within two weeks, versus only 39% of the 'negative' consultation group. In this study, when the diagnosis and treatment information were presented in a positive and confident manner the patients experienced a 25% better outcome.[17]

Dr. Benson is a medical pioneer who has generated a wealth of research documenting the innate healing ability of the body. His books are filled with clinical pearls such as:

"Other studies indicate that between 60 and 90 percent of all our population's visits to doctors' offices are stress-related and probably cannot be detected, much less treated effectively, with the medications and procedures on which the medical profession relies almost exclusively. In other

words, the vast majority of the time, patients bring medical concerns to the attention of a healing profession that cannot heal them with external tools or devices. Instead, doctors must rely on patients' internal mechanisms. Much of the success the medical profession achieves is not due to anything doctors do or dispense that is inherently healing. We should really attribute the success of many medical treatments to the inherent healing power within individuals."[18]

This *'inherent healing power'* is phenomenal. Anyone who has observed pictures of white blood cells attacking and destroying bacteria cannot help but be in awe of the power and intelligent function of the immune response. Because these immune cells can function *in vitro,* outside the body, researchers initially believed that the immune system was autonomous, and did not require nervous system input to function. Psychoneuroimmunology research has shown this to be false.

The word psychoneuroimmunology was coined by Dr. Robert Ader in 1981. In 1974, Ader was studying taste aversion in rats using classical conditioning, a technique discovered by Ivan Pavlov in the late 1800's. Pavlov rang a bell each time he fed the dogs he was studying. Later, as he sounded the bell, the dogs continued to salivate in anticipation of food, even when no food was given. The animals had been conditioned to salivate with only the sound of a bell.

In his experiment, Ader paired a saccharin flavored drink with cyclophosphamide, a drug that causes nausea. As expected, the rats quickly learned to associate the sweet drink with nausea. The purpose of his research was to determine if the rats that were given a larger dose of saccharin developed a stronger taste aversion response. However, an unexpected development was interfering with his study—the rats were dying.

Dr. Ader knew that cyclophosphamide, the drug he was using to induce nausea, was also an immune suppressant. However, even though it is a toxic drug, it was given only at the beginning of the study, and not in quantity large enough to account for the dying rats. With further research Ader discovered that just as Pavlov's dogs had been classically conditioned to salivate with the sound of a bell, his rats had been classically conditioned to suppress immune function when they tasted a sweet drink, long after the cyclophosphamide drug was withdrawn.[19]

To say that this was a groundbreaking discovery is not hyperbole. Ader's research has since been applied to the treatment of human illness. Marette was a little girl suffering from a severe case of systemic lupus erythematosus (SLE). Her medical treatment required the same cyclophosphamide drug used in Ader's research. After consulting with Dr. Ader, her doctors devised an experiment to administer a taste (cod liver oil) and smell (scent of rose perfume) at the same time as her chemotherapy session. After a few rounds of this drug–taste–smell combination, the drug was withdrawn and only the taste and smell treatment were given. The child's immune system continued to be suppressed by the taste and smell treatment, even after the chemotherapy was no longer a part of the regimen.[20]

By what mechanism does the brain and mind 'talk' to the immune system? Hans Selye's research documented that when animals are exposed to chronic stress, suppression of immune function will result. This appears to occur via an endocrine response, the hypothalamic pituitary adrenal (HPA) axis. However, is this mechanism sufficient to explain the classical conditioning of the immune system, or is there more to the story?

A few years after Ader's experiment, David Felten was an MD, PhD researcher investigating sympathetic nervous system pathways. Using electron microscopy and cell stains that highlight neurotransmitter receptors, he made a remarkable discovery: the cells of the thymus, spleen, and lymph nodes are covered with nerves.[21] The nerve to gland connections he observed were quite similar to traditional nerve to nerve synapse connections. Felten then sought to investigate the extent to which nerve to gland connections control immune function. His research found that blocking endocrine input only slightly affected immune function, whereas cutting sympathetic innervation brought the immune response to a complete halt. In effect the nervous system appears to be 'hard wired' to the immune system. We have come to assume that decreased immunity is a 'normal' consequence of growing old. One important result of Felten's research is the discovery that the weakened immune response that occurs with aging is in large part caused by nerve atrophy.[22]

Neuropeptides

It is estimated that the human nervous system has one hundred billion nerve cells. Each of these cells has between 1,000 and 500,000 synapse connections.[23] It boggles the mind to contemplate the fantastic number of connections within the human nervous system. The nervous system is usually conceptualized as electrical in nature with current travelling down the axon and 'jumping' across the synapse to the next nerve. However, the connections between nerve cells are actually chemical rather than electrical. The presynaptic neuron releases a small peptide molecule into the synaptic gap between the two cells. This neuropeptide travels across the synapse to a receptor on the postsynaptic neuron, which initiates a change in the postsynaptic neuron.

Acetylcholine was the first neuropeptide discovered in 1926. By 1975 approximately thirty neurotransmitter peptides had been identified. That number is now over sixty and one researcher has speculated that over 300 will eventually be found.[24] Neuropeptides are now referred to as *informational substances*, because of their role as messenger molecules distributing information throughout the body.[25] A number of new discoveries have forced us to rethink our understanding of how the nervous system functions:

- Neuropeptides and their receptors, once thought to function only in the brain, are now known to exist throughout the body. Peptides circulate through the body, finding their target receptors in regions far more distant than had ever previously been thought possible. The dorsal horn of the spinal cord contains high concentrations of almost every known neuropeptide receptor.
- Information transfer within the nervous system is traditionally thought to occur at the synapse. It is now known that less than 2 percent of neuronal communication actually occurs at the synapse. Information flow within the nervous

system is controlled primarily by the specificity of the neuropeptide receptors, rather than by the physical proximity of the nerve cells.[26]

- Peripheral hormones such as insulin and vasoactive intestinal peptide (VIP), also have receptors sites and are manufactured within the brain.[27]
- There are receptors on immune cells for every peptide identified in the brain. Not only is the immune system capable of receiving information from the brain via neuropeptides, the circulating cells of the immune system also manufacture neuropeptides and send this information to the brain. Because of their functional similarity with nerve cells, immune cells serve as a 'mobile synapse' conveying information within the body. The immune system can be viewed as another sensory input structure for the central nervous system. Some researchers have even used the phrase 'circulating nervous system' when refering to the white blood cells.
- Memory is encoded and stored at the receptor level. Since all cells have these receptors, it follows that all muscles and tissues of the body possess some degree of cellular memory.[28]

Candice Pert, while still a graduate student at Johns Hopkins University in 1972, perfected the techniques needed to identify the opiate receptor in the brain. This led to the discovery of endorphin and enkephalin, which in turn unleashed the flurry of research that identified a slew of new neuropeptides.

Dr. Pert continued her research at the National Institute of Mental Health where she served as chief of the Brain Biochemistry section. Her book, *Molecules of Emotion*, describes this journey of discovery and interprets its significance. What is the evidence to support calling neuropeptides 'molecules of emotion'? In 1926, while searching for a treatment of epilepsy, Wilder Penfield applied electrical stimulation to areas of the brain of conscious patients. During this research, he identified certain areas of the brain that appear to be the focal point for emotions. As Dr. Pert and her team identified previously unknown neuropeptides, they also localized the nodal points or 'hot spots' where the receptors for these neuropeptides were concentrated:

> *"Core limbic brain structures, such as the amygdala, hippocampus, and limbic cortex, believed by neuroscientists to be involved in emotional behavior contained a whopping 85 to 95 percent of the various neuropeptide receptors we had studied!"*[29]

So anatomically these neuropeptide 'molecules of emotion' are concentrated in areas of the brain that are known to regulate emotional behavior. We traditionally think of emotion in terms of love, hate, fear, anger, etc. However, when we incorporate our new understanding of neuropeptides, we may have to expand our definition of 'emotion'. We now know that the entire intestinal tract is lined with cells that contain neuropeptides and their receptors. Perhaps the phrase 'gut feeling' is more than a symbolic figure of speech. While serotonin is traditionally thought of as a brain neuropeptide, 95% of the body's serotonin is found in the enterochromaffin cells and enteric neurons of the gut.[30]

The diverse distribution of neuropeptides is even more profound than previously imagined. The techniques used to identify neuropeptide receptors in the brain have been used to study other animals. In fact, many of the human neuropeptides were first discovered in other animals. Bradykinin was discovered in snake venom, bombesin was first extracted from the skin of the *bombix bombina* frog, and the receptor for acetylcholine was first isolated in the electric eel. Single celled organisms such as *clostridium*, *E. coli*, and *tetrahymena* manufacture and have receptor sites for TSH, hCG, neurotensin, insulin, somatostatin, ACTH, endorphin, relaxin, and calcitonin. Even plants such as alfalfa, wheat, tobacco, and spinach contain messenger peptides such as LHRH, TRH, endorphin, interferon, insulin, and somatostatin.[31]

Why would plants and microorganisms use the same peptides that function as messenger molecules in man? Neuropeptides appear to be a fundamental 'building block' of creation. Just as all life forms use the same four DNA base pairs to code genetic information, it is theorized that neuropeptides are common messenger molecules that serve to transmit information throughout the organism. These molecules evolved first in the most simple plants and animals. As creation manifested higher multicellular organisms, these peptide messenger molecules were incorporated into the nervous, endocrine, and immune physiology of the organism.

This discussion of neuropeptides is incomplete without mention of the subject of excitotoxins.[32] Within the last 50 years the food industry has invented a number of substances used to alter the taste of food. Of special concern are monosodium glutamate (MSG) and aspartame (NutraSweet). Glutamate and aspartic acid are the two most plentiful amino acids within the human brain, and glutamate is the brain's primary excitatory neurotransmitter. However, even though they are always present within the brain, these amino acids are normally found in relatively small concentrations. When we eat foods laced with MSG or diet drinks sweetened with NutraSweet, the body is flooded with these excitatory neurotransmitter substances, to a level 5-20 times greater than normally present within the blood. This neurotransmitter excess can cause repetitive firing of neurons, and when this continues without rest, neurons can eventually fatigue and die. This is the origin of the term excitotoxin – the neurons are literally worked to death. Most health problems are multi-factorial. However, there is growing evidence that these artificial food additives accelerate neurodegeneration in individuals with a genetic predisposition to conditions such as Parkinson's disease, Alzheimer's dementia, and amyotrophic lateral sclerosis (ALS). Because these substances readily pass the placental barrier from mother to fetus, there is also speculation that MSG and NutraSweet have contributed toward the dramatic increase in Attention Deficit Hyperactivity Disorder (ADHD).

Conclusion

We are just beginning to uncover the mysteries of the body's inherent healing power. Just as all cells in the body are touched upon by nerves, every cell in our body is covered with thou-

sands of neuropeptide receptors. These neuropeptides are produced and move throughout the body for the purpose of transmitting information. Several chiropractic techniques place emphasis upon the normalization of cerebrospinal fluid flow. Perhaps we should borrow the line from the movie Ghost Busters, *"Who are you going to call?"* (to get your CSF flow normalized). If we keep in mind that only 2% of neurotransmitters act at the local synapse, chiropractors could play a pivotal role in researching this area of psychoneuroimmunology.

In the past, chiropractors have been labeled unscientific because we maintain that our treatment releases the flow of innate intelligence within the body. If we substitute the terms 'neurotransmitter messenger molecules' for 'innate intelligence', perhaps we are closer to a scientific explanation of how chiropractic 'works'. As our knowledge grows, we will develop a greater understanding and respect for the words of the founder of chiropractic:

> *"The Chiropractor looks upon the body as more than a machine; a union of consciousness and unconsciousness; Innate's ability to transfer impulses to all parts of the body—the coordination of sensation and volition: a personified immaterial spirit and body linked together by the soul—a life directed by intelligence uniting the immaterial with the material."*[33]

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REVIEW OF LITERATURE

Chiropractic and the Neuroimmune Connection

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ABSTRACT

Objective: To review the literature on the connections between the nervous and the immune systems, and to explore the contention that chiropractic adjustments may affect neuroimmune function.

Data Collection: Relevant articles in English were retrieved through a search of MEDLINE and the Index to Chiropractic Literature. Key search terms included: chiropractic, immune system, nervous system, sympathetic nervous system.

Articles were included if they discussed or tested the chemical or neurological links between the nervous system and the immune system and/or discussed the effect of chiropractic adjustments on immune function and general health.

Results: There appear to be numerous modes of communication between the nervous system and the immune system. It also appears, not only in theory but in practice, that chiropractic adjustments may have a beneficial effect on the functioning of both the nervous and the immune system.

Conclusion: For many years chiropractors have claimed that spinal adjustments can help improve the overall health of an individual. There is a growing body of scientific research to support this contention.

Key Words: *Chiropractic, Neuroimmune, Sympathetic Nervous System, Immune system*

Introduction

A person's body repairs damage, fights or prevents infection and destroys cancerous cells through the activity of the immune system. For a number of years researchers and neuroimmunologists have described the immune system as a continuation of the nervous system and stated that immune cells are simply the effector cells for the nervous system. These claims have been made based on the fact that the nervous system plays such a crucial roll in alerting and guiding immune system cells to where damage or an infection is located.

The nervous system is also responsible for localizing the immune response to the specific site of damage or infection. Localization of immune activity prevents a systemic or a greater immune response than the body needs. The body has the ability to heal itself and chiropractic theory postulates that when the nervous system is free from disturbance (subluxation free) the body can respond more effectively resulting in improved overall health.

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The immune system is responsible for all repair in the body. It is primarily made up of two sub-systems, innate and adaptive.[1] The adaptive part recognizes and attacks invading microbes (viruses and bacteria) while the innate system functions by engulfing foreign objects or injecting microbes with poisons. The innate system functions as the first line of defense and reacts immediately. The adaptive system works by teaming B cells, T cells, and antibodies to overwhelm the invading antigen (bacteria, virus or foreign object) and is able to store a "fingerprint" of the invader for faster recognition in the future. The innate system produces interferon, a chemical that blocks viral replication and sends a warning to the adaptive immune system. Interferon is one of many chemical messengers that is sent between the two systems.[1] Although scientists have known about the nervous system's role in regulating the immune system for years, this concept has finally come to the forefront of scientific research.[2-5]

Recently the focus of science has shifted from viewing the nervous and immune systems as separate entities to

recognizing that the brain utilizes specific pathways to the immune system for the purposes of guiding, controlling and modulating the immune response.[2,6-8] There is bi-directional communication between the nervous system and immune system.[6-9] Neuromodulators, chemical messengers of the nervous system, are released by nerves to guide immune function.[2,6,10-13] The immune system communicates its status back to the nervous system by white blood cells' secreting chemical messengers called cytokines, a type of neuropeptide -- chemicals released by cells to communicate with the nervous system.[2,6,14-18] When the immune system is activated, immune cells also send out an array of specific chemicals, immunomodulators, to influence the function of the nervous system.[7]

These immunomodulators reach specific target areas in the brain, where they induce various recuperative and protective behaviors such as shivering, sleepiness and a reduced propensity to fight attackers.[19] When people take a couple of aspirin or acetaminophen for pain and fever they may end up battling the sickness even longer because they are stopping these productive processes to feel better. Studies suggest that anti-fever therapy prolongs illness by stopping the body from inducing its natural defenses. These chemical pathways of communication are only a few of the many routes of communication that the nervous system and the immune system employ.

Review of Literature

Channels of Communication

There are multiple channels of communication between the brain and the immune system.[2,6,7,20,21] Numerous scientific and medical studies have demonstrated direct nerve supply to the immune system.[6,22-26] It has been shown that there is direct contact between nerves and lymphocytes (immune cells that kill viruses and tumor cells) in the spleen and thymus gland (the gland that develops and programs immune cells to attack foreign objects).[2,6,7,20,21] Altered nerve activity to the spleen has been found to diminish immune responses including the ability of natural killer cells to target and destroy viruses and cancer cells.[6,7,27]

As far back as 1945 it was demonstrated that the bone marrow has an extensive nerve supply[3] The nerve supply to the bone marrow is a direct link from the nervous system to lymphocytes and the immature cells that will eventually become red blood cells and white blood cells.[2,6,23,28] Nerve stimulation to the bone marrow causes an activation of the immune response by releasing the immune cells into the general circulation.[6,29]

Immunity

The lymphatic system also plays a major role in immunity.[19] All lymphoid organs including lymph nodes, spleen, etc., have a direct nerve supply for the purpose of modulating the immune response.[6,29] Disturbances in the nervous system have been shown to alter the immune response and the function of these immune cells, specifically lymphocytes.[20] Lymphocyte migration to an area are controlled by the central nervous system (CNS).[6] Due to the heavy nerve supply of the thymus gland, the nervous system is thought to play a major role in the development of immune cells.[6]

The thymus gland is responsible for developing thymocytes to T-cells and for producing surface proteins which act as signal transducers for cell differentiation and proliferation.[6] Dysfunction in the nervous system can not only slow the immune process but it can also result in overreactions or hypersensitivities, such as allergies for example.

Allergy

Allergies are an inappropriate immune response to a substance that is not harmful to the body. The sympathetic nervous system causes immune responses to be fast and localized, mobilizing mainly lymphocytes and granulocytes (neutrophils, basophils and eosinophils).[6] These cells kill bacteria, viruses and parasitic worms, produce antibodies, destroy cancer cells, release chemicals to attract more immune cells and alert the nervous system that there is something wrong, and inhibit allergic reactions.[33]

Eosinophils lessen the severity of allergies by phagocytizing antigen-antibody complexes (substances that are harmful or perceived to be harmful, which antibodies have bound for the purpose of deactivating the substance) and by inactivating certain inflammatory chemicals released during an allergic reaction.[33] These cells also inactivate the inflammatory response (immune response) when it is no longer needed.

A very powerful neurotransmitter called substance P which is approximately 100-400 times more potent than histamine in eliciting symptoms may play a role in this over reaction of the body.[30] Substance P is transported through specific types of nerves and is released in response to dangerous or noxious mechanical, thermal and chemical stimuli, to elicit the appropriate defense reaction from the body.[2] Many allergic conditions may be at least partly due to some type of nervous system dysfunction resulting in inappropriate release of substance P.

Immune System as Sensory Organ

It has also been suggested that the immune system acts as a sensory organ, like the eyes or ears, only spread out over the whole body and transmitting information to the nervous system that is just as crucial in guiding a person's actions but much less distinct than sight or hearing.[4-6,16,31,32] The immune system acts as a network of specialized biosensors designed to pick up information from within and around the body and relay that information to the brain. This causes animals or people to behave in specific ways to promote healing or to guide reactions in the interest of self-preservation.[4,5] The activation of these functions can be altered by stress.[4,5]

Stress

Stress plays a major role in many illnesses and can cause alterations in the immune response.[4,5] One of the reasons that stress has such a harmful effect on health is that certain types of immune cells responsible for attacking microbes (bacteria, viruses, fungi, etc.) are sensitive to certain brain chemicals such as stress hormones (cortisol, adrenaline, etc.), and will

become inactive when they come into contact with these chemicals. When stress hormones are released they can slow the immune response, which would explain why the immune system suffers in people under chronic stress.[4,5]

The part of the nervous system responsible for releasing these types of chemicals and guiding the stress response is the sympathetic nervous system.[33] The sympathetic nervous system is responsible for activating the "fight or flight" response, which causes specific changes to occur throughout the body in response to dangerous situations. These changes include: opening up the airways in the lungs, increasing heart rate, sending blood to the muscles, sweat glands, eyes and the lower part of the brain to activate "instinct like" responses. Blood is moved away from the digestive tract and the other internal organs.

Whenever the body comes into contact with a harmful stimulus there is an increase in activity of the sympathetic nervous system, while non-harmful stimuli generally decrease sympathetic activity.[34,35] These changes in sympathetic activity can be quantified by measuring changes in heart rate, blood pressure and other stress induced responses.[34,35] Altered regulation of the sympathetic nervous system may be associated with the immunological abnormalities seen in chronic stress, clinical depression, and aging.[36] However, the nervous and immune system responses are not only guided by stimuli being good or bad, they also depend on the frequency of stimulation.[34,37] This means that to attain correction in the nervous system, any treatment being utilized would have to be administered on a regular basis.[37]

The Role of the Chiropractic Adjustment

Nervous system dysfunction can cause immune system dysfunction, and chiropractic theory postulates that by removing the nervous system interference, spinal adjustments can help correct immune system dysfunction.[2] Poor movement in the spine can adversely affect the immune response by causing the body to incorrectly activate a stress response, which slows the ability of the immune system to react.[2,4,5,34]

Subluxations are disturbances in the nervous system, which can cause increased or decreased activity of the sympathetic nervous system.[24] A disturbance in the nervous system can affect the body in two different ways.[37] One reaction the nervous system can have is to become hyperactive--the nervous system may bombard the periphery with excessive chemical messages that drastically alter the local homeostasis, causing abnormal changes in growth and activity.[37] When the sympathetic nervous system is hyperactive over long periods of time it will tend to produce the development of abnormal conditions and disease processes in the organs or tissues to which it supplies information.[22,37]

A second way that a disturbance in the nervous system can affect the body occurs when the nervous system becomes hypoactive; cells that are normally controlled and suppressed begin working out of control, which in some cases is hypothesized to lead to cancer.[37] All cells are equipped with all the necessary genes to allow them to differentiate (reproduce), and with proper nervous system function only the appropriate set of genes is activated.[37]

Cancer cells are cells that are growing and functioning out of control because the wrong set of genes has been turned and left on because the nervous system has failed to suppress them.[37] Long term changes in the nervous system have also been shown to be mitigating factors in many disorders including autoimmune diseases, cancer, fibromyalgia and chronic fatigue syndrome.[6,34,37]

The contention is that when the disturbance in the nervous system is corrected and the abnormal activities are eliminated, homeostasis in the periphery can be re-established and the process of disease will be eliminated.[37] An abnormally functioning nerve which is either hyperactive or hypoactive tends to return to normal function upon proper stimulation.[37] However, it is crucial that corrections (adjustments) are given at a frequent interval in order for the normalization to take hold to cause a permanent correction.[37] Chiropractic adjustments correct subluxations which are disturbances in the nervous system.[2,37,39]

Vertebral subluxations are caused by an overload of either a physical, emotional or chemical stress.[40] When these types of stress exceed the limits of the body's ability to adapt, a cascade is initiated which leads to subluxation. Subluxations cause disturbances in the nervous system by initiating this sequence of events: 1) misalignment and/or abnormal motion of the vertebrae, 2) narrowing of the intervertebral foramina and/or irritation of neurological tissue, 3) subsequent tissue or fluid-related pressure on the nerve root, and 4) a resulting interference to the "flow of mental impulses".[40] Spinal adjustments are believed to correct the subluxations and eliminate these adverse effects.[2,37]

Studies that have measured the effect of chiropractic adjustments on the immune system have shown that chiropractic can influence T and B lymphocyte counts, NK (natural killer) cell numbers, antibody levels, phagocytic activity and plasma beta-endorphin levels.[41] In one study the effect of specific spinal adjustments on the immune system was measured by looking at CD4 cell counts of HIV positive individuals as measured by CD4/mm3 in the blood.[22] The CD4 cells, or T-helper cells, are the immune cells that are attacked in HIV patients.[22] The blood tests used in this study were performed by each patient's independent medical center where they were under medical supervision for the condition.

Both of the control groups, one receiving placebo adjustments the other receiving no adjustments, each experienced about an 8% decrease in CD4 cell counts over a six month period, while the group receiving real chiropractic adjustments experienced a 48% increase in CD4 cell levels over a period of six months. Although chiropractic adjustments helped to greatly improve the ability of seriously ill people with HIV to fight disease, other studies have shown that it should not be restricted to the sick.[42]

Adjustment's Reparation of Cellular Damage

One study observed the effect that chiropractic adjustments have on a person's ability to repair cellular damage and genetic mutations.[42] Three groups of people were compared: people who had been receiving long term chiropractic care, normal individuals who were deemed to be healthy, and

seriously ill individuals. All three groups were screened with battery of tests to make sure there were no other factors influencing their health such as genetic predispositions, nutrition, exercise, etc.

Particular scrutiny was given to the chiropractic group to see if there was any reason why they would have increased resistance or decreased susceptibility to disease and they were found to be perfectly normal.

Blood tests were performed on all of the groups for an enzyme that is very important in removing hazardous agents, using a battery of tests called GTTSBO. Blood tests were also performed to measure DNA repair by measuring unscheduled DNA synthesis and an enzyme called adenosine diphosphate ribosyl transferase (ADPRT).

Measuring these enzymes measures the person's ability to develop resistance to hazardous environmental exposures and oxidative stress. When these enzymes are suppressed it limits a person's life span and the person's ability to resist serious diseases.

The normal healthy individuals had roughly twofold enzyme levels compared to the seriously ill group. However, the chiropractic patients had a twofold higher enzyme level compared to the normal healthy patients, and had a fourfold higher enzyme level than the ill group.

Immune competence is also known to substantially decrease with age.[42] Expert immunologists determined that in the 96 chiropractic patients ages 21-87 there was no decrease whatsoever in immune competency. The only difference between the normal healthy people and the chiropractic group was that the people in the chiropractic group were under long-term chiropractic care (over six months of regular adjustments).

This suggests that chiropractic could potentially optimize whatever genetic abilities these people have, so that they now can fully express immune function, which the normal individuals or diseased individuals cannot. This study used peripheral blood samples to demonstrate that the nervous system and the immune system may play a great role in the regulation of disease. The researchers stated that these changes occurred due to chiropractic care, not dietary intervention or any other factors. They also stated that there is nothing else that seems to elicit these results. These changes can be initiated at any age and people can have these benefits as long as they choose.

Proactive Care

Unfortunately the way in which many people care for themselves is reactive.[43] They will wait until a health problem arises before taking any actions to improve their health. Many health issues could be avoided if people took a more proactive stance on health decisions and started to take care of themselves or their children earlier in life. Children raised under chiropractic care were less prone to infectious processes such as otitis media (ear infections) and tonsillitis, for example.[44] These children had stronger immune systems and were also better able to cope with allergens such as pollen, weeds, grasses, etc. as compared to children raised under allopathic care.

There is also a significant decrease in antibiotic therapy use among children receiving chiropractic care.[44] A Penn State University study of 654 Americans published in the Journal of Social Science and Medicine stated that persons with childhood health problems were twice as likely to develop cancer or chronic lung disease by late middle age.[45] Arthritis was about 33% higher in this group. A childhood of ill health may be parent to a full gamut of adult illnesses.[46]

It is believed that chiropractic stimulates the immune system to combat infectious processes and not only helps sick people get well but helps healthy people become much healthier.[42,44]

Conclusion

The nervous system and the immune system have such a multitude of connections that they could correctly be referred to as a single system. The nervous system senses damage, infectious agents and foreign bodies with the help of chemical releasing immune cells and deals with these problems by deploying different types of immune cells to carry out specific procedures. Disturbances in the nervous system (subluxations) diminish the ability of an individual to sense and repair damage and combat infection, cancer etc. directly, resulting in diminished health.

Research is accumulating which supports the aforementioned contentions regarding the relationship between vertebral subluxation, chiropractic adjustments and improved nervous and immune system function. However, much more needs to be done and the profession is encouraged to take a much more proactive approach towards research agenda that explores these issues more aggressively and critically.

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ORIGINAL RESEARCH

Vertebral Subluxation Correlated with Somatic, Visceral and Immune Complaints: An Analysis of 650 Children Under Chiropractic Care

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ABSTRACT

Background: We evaluated children and their neuromuscular, biomechanical, neuro-homeostatic development and patterning in order to gain some insight into the perplexing problem of health attainment. We describe the nuances and effects of a new subluxation pattern seen in children - the Pelvic Distortion Subluxation Complex (PDSC). We feel that the PDSC is responsible, partially or fully, for a number of adaptive neurological patterns and kinesiopathological reflexes that can propagate a myriad of conditions - these seem to arise in childhood and plague individuals into adulthood. The authors maintain that PDSC is an entity amenable to correction - thereby restoring homeostasis.

Objective: It is the author's contention that many, if not the preponderance of conditions seen in adults, have their origins in the childhood years. The objective of this paper is to describe a new subluxation pattern seen in children - the Pelvic Distortion Subluxation Complex which we found to be a common denoninator in many children's health issues.

Methods: We examined children of varying ages, varying complaints, and varying levels of health expression. All children in the study were chosen randomly and were patients of our Centre. All examinations were performed by 6 staff doctors with pediatric certification from the International Chiropractic Pediatric Association. The initial sample consisted of 677 children. 27 were excluded for the following reasons; No pelvic information was available, child was under the age of two, child was over the age of 18. Our final sample consisted of 327 boys and 323 girls. Analysis of examination findings, radiology, Surface Electromyography and Infrared Thermography was statistically evaluated. We took 5 parameters of complaints disclosed by children (or mentioned by their parents) and arranged them according to the class of complaint; a. Somatic b. Visceral/ Autonomic c. Behavioural d. Immune e. Other. All data was arranged according to three age groups; a. 2-4, b. 5-12, c. 13-18, and was also categorized by sex and total scores.

Results: The preponderance of PDSC is to present with a left pelvic fixation and a corresponding right hypermobility. We have found that 96% of all children seem to possess, and be subjected to the effects of the Pelvic Distortion Subluxation Complex. The PDSC was a common denominator in complaints plaguing our sample of children. These are summarized into a percentage of the total sample and the most common complaints of children in our study are mainly of a somatic nature with some visceral and immune components.

Conclusion: The process of neurological learning or programming of the central nervous system with respect to locomotion, posture, proprioception, and body kinetics begins within a few short months after birth. Our study revealed a pattern of pelvic dysfunction correlated with numerous somatic, visceral and immune complaints. These dysfunctions should be discovered as early as possible in a child's development to effect a correction and the relationship between these dysfunctions and ill health should be further studied.

Key words: *Chiropractic, Pelvic Distortion, Scoliosis, Spinal Degeneration, Asthma, Ear Infections, Headaches, Enuresis, Low Back Pain, Neck Pain, Growing Pains, Constipation, Croup, Colic, Fatigue, Hyperactivity, Learning Difficulties, Allergies, Fever, Homeostasis, Biomechanics, Subluxation, Dysponesis.*

Introduction:

A noted researcher, writer, lecturer and friend, Dr. Christopher Kent, stated that we are in the midst of a revolution in health care. A study supporting this observation, published in the *Journal of the American Medical Association*, reports that people are seeking health care which is "congruent with their own values, beliefs, and philosophical orientations toward life and health."[1] People see health as very elusive, whereas disease and sickness seem commonplace. In order to attempt to explain this phenomena, we decided to look to children and their development for possible clues to this puzzling scenario.

Chiropractors who deal with children have reported that many, if not the preponderance of conditions seen in adults, seem to have their origins in the childhood years; that sickness is often the result of childhood aberrations of physiology - a

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state of dysponesis.[2] It was Edison many think, who stated *"As the twig is bent, so grows the tree"*.

One of the objectives of this paper is to introduce the reader to a subluxation pattern observed in children - the *Pelvic Distortion Subluxation Complex*. The adult version of this distortion has enjoyed some time and allegiance of other researchers in the past however this subluxation pattern in children, although touched on by papers in the past, has rarely been applied to understanding the pathophysiology, the dynamics, and the neurophysiology of patterning in children and their particular neuro-spinal development.

Another purpose was to correlate the effects of this new subluxation construct into a configuration that revealed a pattern. We feel the implications of what we found are far reaching. This paper is the culmination of a study of 650 children.

Methods:

We examined children of varying ages, varying complaints, and varying levels of health expression. All children in the sample chosen are patients of our Centre. This ensured uniformity of examination protocols, electro-diagnostic testing, radiology, subsequent care, and follow-up. Our sample consisted of 327 boys and 323 girls. Analysis of examination findings, radiology, Surface Electromyography, Infrared Thermography, was statistically cross-referenced and noted.

We used the Insight 7000 Subluxation Station® in our electrodiagnostic testing. We must emphasize that this was a random sample - children were not hand-picked specifically to fit the parameters of the study, rather the method used was sequentially congruous. The initial sample consisted of 677 children however 22 were excluded for the following reasons;

a. No pelvic analysis information was available
b. Child was under the age of two
c. Child was over the age of 18

We took 5 parameters of complaints disclosed by children (or revealed by their parents) and arranged them according to the class of complaint;

a. Somatic
b. Visceral/Autonomic
c. Behavioural
d. Immune
e. Other

All data was arranged according to three age groups;

a. 2-4
b. 5-12
c. 13-18

And we looked at sex and total scores.

Considerable time was devoted to scoliosis and/or spinal curvatures, as well as any incidence of radiologically identifiable spinal degeneration in the above age groups - as these seem to be the most capacious adaptive results of the PDSC seen in practice. All examinations were performed by six staff chiropractors of the Centre, all possessing Pediatric Certification and Fellowship through the International Chiropractic Pediatric Association (ICPA).

Pelvic Distortion Subluxation Complex

It is our intent to present the field practitioner with a new construct of a subluxation - the Pelvic Distortion Subluxation Complex (PDSC). The name was chosen for it encompasses the sum total of the physiological, neurological, mental, and biomechanical effects of this entity on the growth, development, functional adaptability, and neuro-patterning of a child.

It was Illi and Johnston who first demonstrated that normal biomechanics of the pelvic apparatus was a prerequisite for normal homeostasis of the body.[3,4] This abnormal function of the sacroiliac mechanism produced excess expenditure in energy utilization, inefficient postural adaptation, and somato-visceral efferents with a common viscero-somatic return.[5-20]

In order to appreciate the efferent pathophysiology produced by PDSC and the effects on somatic economy, one must first have a good understanding of normal pelvic function. Many authors have dealt with gravitational adaptation as the precursive stressor which has paved the way for development of spinal curvatures, etc. The development of normal spinal curvatures, functional postural kinetics and spinal neurobiomechanical efficiency is not solely dependent upon proper adaptation to gravity however. It is also dependent upon exact and proper function of the base of support for the spine - the pelvis.[3-23] In fact, these causative factors are difficult to separate into two distinct entities as they are very much interdependent.

As early as 1940, a biomechanical model of pelvic function was proposed, later authenticated by other researchers, and centered on the concept that sacroiliac articulations are freely moveable and have very exact functions. Certainly Logan Basic, Thompson, and Sacro-occipital techniques have as their core, pelvic balance and integration. Of the vertebrates, man is the only species with freely moveable sacroiliac joints.[2,5,21]

It was then discovered that these articulations, while different in the nature of their movement and range, are true diarthrodial joints but with a different microscopic composition on either side of the sister articulation.[22] These joints appear smooth in fetal life, only to become lined with ridges, wedges, and irregularities as chronological age advances. These are early indicators of abnormal pelvic stresses and adaptive compensatory reflexes. It is interesting to note that while these articulations are primarily employed in the stress of weight transfer and load-bearing, the associated muscular components are used mainly for stability. The main function of the pelvic musculature it seems, is not to generate motion but rather to stabilize the pelvic mechanism for effective load transduction - the process of transfer of both elastic and gravitational forces between pelvic components in kinetic motion. Thus the sacroiliac articulations can be assumed to be large mechanoreceptors located in the centre of considerable force streams being transferred by the pelvis from the upper body to the lower limbs. Further, these articulations are essentially ground into shape according to impulsive loading and learned kinetics and their ligamentous apparatus shows adaptations to strong long-time stresses.[23-41]

In the model as proposed by Illi a number of years ago, sacral function can be likened to that of a gyroscope opposing the movements of the corresponding ilia during locomotion and other complex movements.[3] These antagonistic movements of

the sacrum always keep the center of gravity in proper vertical and horizontal planes according to the needs of body effort and economy. Thus the center of gravity is not only always to be found in the center of the supporting structures, but also at the exact varying height that the extent of normal locomotion and gait mechanics specifies for. This biophysical adaptation results in a posturally and functionally efficient pelvis and biomechanically sound lumbosacral interface.[5,34]

It was determined that the integrity of this complex biophysical mechanism is not only vital to efficient locomotion, but owing to the manifold duties it has to perform, it is absolutely fundamental to the general health of the individual. A dysfunction within this mechanism could mean:

1. Additional demands on body economy which lead to fatigue, muscle exhaustion, chronic neurological distress, etc.
2. A loss of aesthetic posture by alteration of gait and body movement with a general loss of body harmony and orchestration.
3. Interruption of the line of gravity and the shifting of body weight disproportionately on a single spinal supporting segment, causing compensatory spinal curvatures and vertebral subluxations, all of which produce articular strain with resultant inflammatory changes leading to early osteoarthritis, and a cascade of other adaptive effects.
4. Aberrant proprioceptive impulses affecting a variety of muscle spindle mechanisms establishing learned and programmed kinesiopathology with a loss of tone.
5. Aberrant vasomotor reflexes affecting the recurrent meningeal systems with resultant overflow to both visceral and somatic pools.
6. Referred pain, radiculitis, radiculopathies, as well as other adaptive reflex mechanisms.[5]

As can be readily seen, proper pelvic biomechanics are a prerequisite for correct development, function, and most importantly, learning of the neuromuscoloskeletal system. Often however, the mobility of the sacroiliac articulations can lead to instability, biomechanical distortion, kinesiopathologic states, postural dysfunction and neurodysfunctional abnormalities.[3,6,8,13,14,42]

A subluxation anywhere in the pelvic structure can undermine normal biomechanical patterns, creating a *biomechanical distortion* of the pelvic unit. Such a situation can adversely affect spinal function, creating multiple subluxation complexes at other sites of the spine which may be identified as distal to the initiating irritant. Adaptive scoliotic spinal curvatures for example, are most often the result of chronic aberrations in pelvic mobility and are created as a compensation for a posturally inefficient state.[5] Lewit identified these aberrations early in 1973 when he stated that as many as 40% of children exhibit such abnormalities of pelvic motility.[43] Illi's findings were similar.[3] The data from our study points to nearly 100 % of children displaying these abnormalities.

In order to have a more realistic comprehension of the developmental implications if these biodysfunctional lesions are allowed to persist, one must realize that such dysfunctions within the neuromuscoloskeletal system well as their consequential soft tissue histopathology, encroach upon the intervertebral foramina and jeopardize the neurological integrity of spinal nerve roots throughout the spinal column. This assault on neurological integrity leads to localized excitement of efferent neural pools, causing abnormal motor responses in vasomotor, visceromotor and somatomotor activity i.e dysafferentation.[5,44]

The above deals with the well-perceived "nerve irritation" and/or the "synaptic" model of subluxation. Recently, however, the "Tonal" model with its resonance centers and non-synaptic message transmission has been able to further our understanding of not only message propagation, but also of the Mental impulse.[44,45] Digressing from the widely applied linear view of neural involvement, Sturm recently proposed a chaotic construct of neuronal synchronization on a cellular level, further adding increased awareness of the number of models which tackle the understanding of the principles on which chiropractic is based.[46]

As there are a small number of varied views on what constitutes chiropractic care and in order that there may be uniformity of comprehension, we thought to take a moment and list the commonly accepted components of a vertebral subluxation as defined within the context of this study. The latest, and most clinically astute definition is that the vertebral subluxation is made up of three entities or components:

1. Dyskinesia
2. Dysponesis
3. Dysautonomia[44]

Aberrant neurogenic responses promoted by the vertebral subluxation, and/or pelvic distortion, can have far-reaching effects on development. In children, for example, such responses can not only affect vascular beds and vascular supply of growing epiphysis, but also change muscular tone leading to muscular and osseous asymmetry thereby altering normal osseous development. To further clarify this point, one must recognize that in any scoliotic curvature, more stress is placed on vertebral end plates and discal matter at the concave aspect of a curve. Unilateral stresses such as these cause alterations and remodelling within the architecture of young growing bone and disc material. Such stresses hasten an earlier onset of osteoarthritic degeneration.[5,47]

Stresses of spinal curvatures and aberrant spinal function propagated by the PDSC, produce adaptive vertebral subluxations in areas of maximal strain. These subluxation complexes alter normal neural homoeostatic reflex activity predisposing the individual to facilitated and abnormal somatovisceral and/or somato-somatic efferents with a possible viscero-somatic return.[48] Thus, the seeds of vertebrogenic disease are planted. Embarrassment to the autonomic nervous system has been noted by many as the medium between scoliotic biomechanical distortions and visceral histopathophysiology.[3,5,6-11,13,14,21,47-51] Yamada observed that this can be readily seen as sympathetic involvement affected through irritation of the dura as mediated by the PDSC.[52]

It is interesting to note that of the 677 children examined, 650 demonstrated the presence of the Pelvic Distortion Subluxation Complex. That finding translates into 96% of children in our study being affected by PDSC. We feel that children who comprised our study were average kids one would find living next door, or in a school yard, or a basketball game. To extrapo-

late this figure into the general population would mean that the vast majority of children in the developmental stages of their lives are afflicted with this entity. That fact alone would probably explain the general state of "unwellness" manifested by children in general, if one adheres to the pelvic stability-neurohomeostatic theory.

In the most simple of criteria, we determined a child to possess PDSC if there was a malfunction of either of the sacroiliac articulations - either hypo or hypermobility of the superior aspect of the articulation. It was interesting to note that while 96% of the original 677 sample of children demonstrated the presence of PDSC, the preponderance was noted as a fixation of the left SI articulation. At present, we have no explanation for this phenomena.

A fixation of one side of the pelvic mechanism results in an adaptational contralateral hypermobility of the opposing aspect in the majority of children. At the onset of this study, our assumption was to expect an approximate 50/50 distribution pattern with respect to fixation of the left versus the right SI articulation. Although there have been a small number of children who have demonstrated a fixation of the right articulation and a corresponding hypermobility of the left, or a fixation of both, the preponderance was a left fixation at the superior joint and a corresponding hypermobility of the right.

Results

Table 1 and related charts show the relative incidence of fixation in the three groups of children examined.

The charts are expressed as percentages of the total number of children in each age group.

The distribution of left fixation of the pelvic apparatus is fairly consistent across all age groups and sexes. The same can be said for the other parameters, i.e. right and bilateral fixations.

It is interesting to note that we found the PDSC does not favour any sex or age - both are affected. As you will see further in our paper, the PDSC with its left side predilection for fixation, can readily correlate with certain spinal configurations. For example, the majority of children who present with PDSC as a left fixation, also exhibit a scoliotic left - C Curve.

Taking into account that the PDSC appears to affect all age groups and sexes within the parameters mentioned, Table 2 and its corresponding chart demonstrate the total percentages of children affected across all age groups for our entire study sample of 650 children.

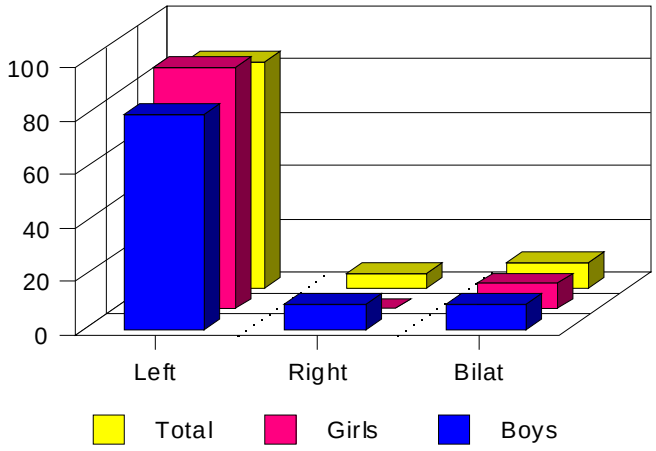
One can readily notice that the preponderance of PDSC is to present with a left pelvic fixation and a corresponding right hypermobility. Keeping in mind that the PDSC is an umbrella name given to a functional pelvic distortion regardless of side of presentation, we have found that in summary, when all the percentages are taken into account, 96% of all children in our study seem to possess, and be subjected to, the effects of the Pelvic Distortion Subluxation Complex.

If our sample of children is fairly representative of the health expression of most children in any given community then the vast majority of children experience the adaptational effects of the PDSC.

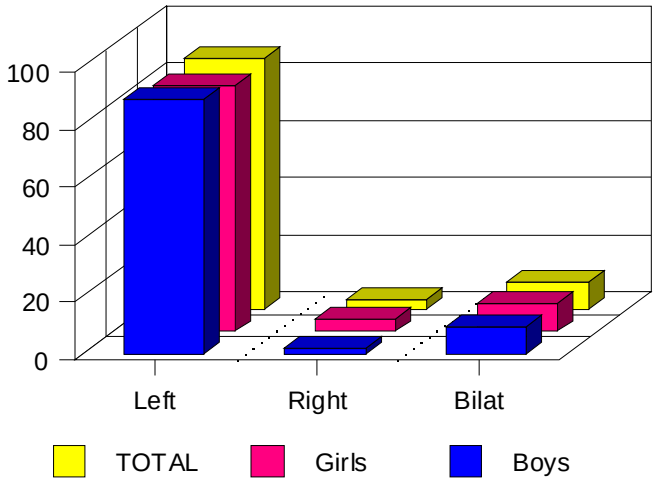
Table 1

	2 - 4 age group			5 - 12 age group			12 - 18 age group		
Fixation	Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
Left	80.5	90.6	84.9	88.6	85.9	87.2	89.7	87.1	88.3
Right	9.7	—	5.5	2.0	4.4	3.2	3.9	9.4	6.8
Bilat	9.7	9.4	9.6	9.4	9.7	9.6	6.4	3.5	4.9

Incidence of Fixation in 2-4 year group



Incidence of Fixation in 5-12 year group



Incidence of Fixation on 13-18 year group

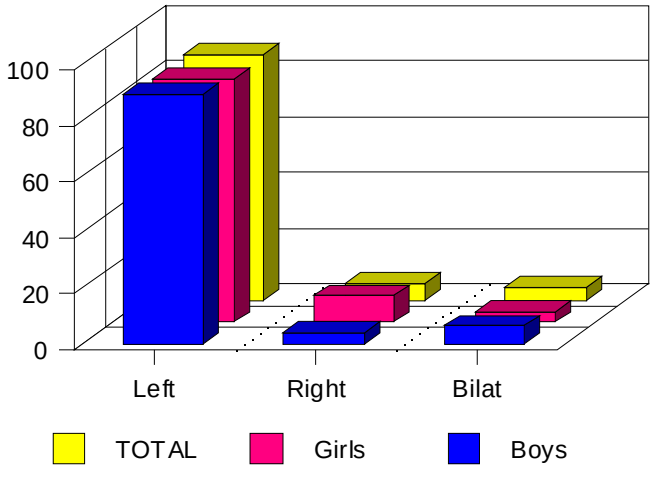
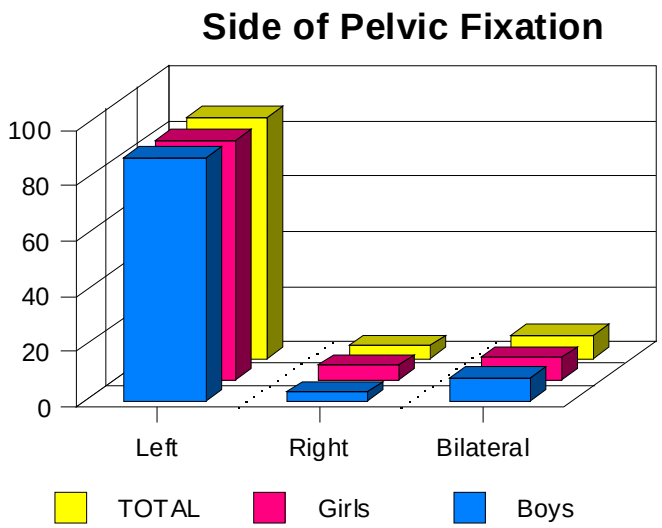


Table 2

Side of Fixation	BOYS	GIRLS	TOTAL SCORES
LEFT	87.9	86.7	87.3
RIGHT	3.4	5.3	4.3
BILATERAL	8.7	8.0	8.4



Kinetic Chain Effects

The PDSC, as commonly observed, is a factor in many reflex automatic adaptive mechanisms. One of these, we observed, is a hypertonicity of the Tensor Fascia Lata on the hypermobile side of the pelvis as well as a corresponding involvement of the Piriformis. These produce a compensatory rotation of the Femur, the Tibia, and alter the juxtaposition, as well as the dynamics, of the Tibio-Fibular articulation. This cascade of effects alters the functional mechanics of the Tibia, the Fibula, the Femur, as well as the Patella and the supporting ligamentous and muscular apparatus. The resultant kinesiopathology produces reflex hypertonicity of the muscles of the Anterior Compartment on the ipsilateral side causing a dysfunction of the ankle mortis and knee mechanism. This in turn produces stress on the Deltoid ligamentous supporting structures, thereby affecting the stability of gait mechanics.

We have observed that these are the children who complain of knee pain - even as adults. The knee pain seems to be localized to the right knee in most cases, and seems to be localized on the side of pelvic hypermobility. These are the patients who seem to have on-going knee problems which then need therapy and even surgical intervention.

Concomitant Health Complaints

Children in our sample had certain initial intake complaints which seem to be universal and affect many children. We feel that these complaints are the result of neuro-adaptive responses which have been propagated, fully or partially, by their PDSC. These complaints would, under ordinary circumstances, be relegated to the care of the family physician. However, as a result of parental choices, these parents sought chiropractic care for their children instead. We arranged these most commonly seen complaints into five primary groups:

1. Somatic
2. Visceral/Autonomic
3. Behavioural
4. Immune
5. Other

These complaints were either voiced by the child or their parents. It is important to note that in many instances, a child was found to have more that one complaint and that the diagnosis was made by a prior health practitioner. All children who had complaints in any category however, had one common denominator - the Pelvic Distortion Subluxation Complex.

Somatic Complaints

These were further broken down into boys and girls, three age classifications, and seven sub-groups of complaints:

1. *Leg /Arm Pain/Numbness* See Table 3 and related chart.

These would include diffuse leg cramps, leg pains, upper limb pains and feelings of numbness. Looking across all age groups, we found that 23.2% of girls exhibited these symptoms as compared to 19.6% of boys. In total, 21.4 % of all children experienced this complaint.

2. *Low Back Pain/Sciatica/Scoliosis* See Table 4 and related chart.

This complaint consisted of any leg pains, back discomfort, and spinal curvatures noticed by either parents or the child. Scanning all age groups, we found that 14.2% of boys experienced these complaints as compared to 19.2% of girls. In total, 16.6% of children experienced these symptoms

Again, please note that as chronological age increases, so does overt symptomatology. We noticed that even in children as young as two years, there are early beginnings of future difficulties. It is also interesting to note that in girls of the 13-18 age group, almost 50% have these problems as compared to only 32% of boys. As stated before, we feel that these are the results of a chronic adaptive pattern to a PDSC.

Table 3

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	T OTAL
7.7	5.9	6.8	15.0	13.2	14.1	37.0	54.8	46.1

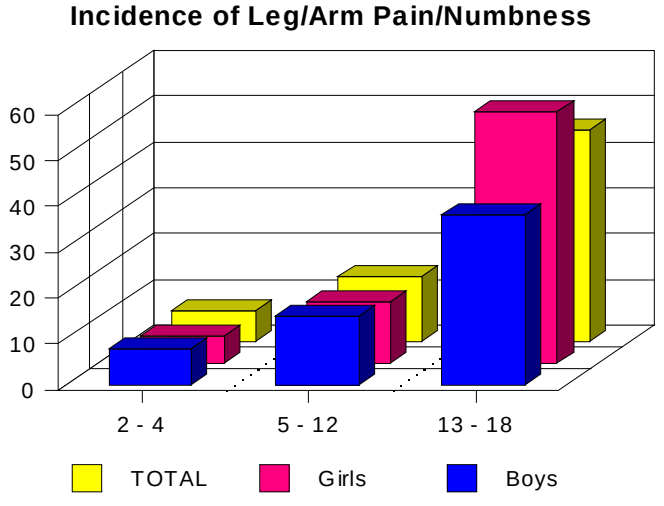
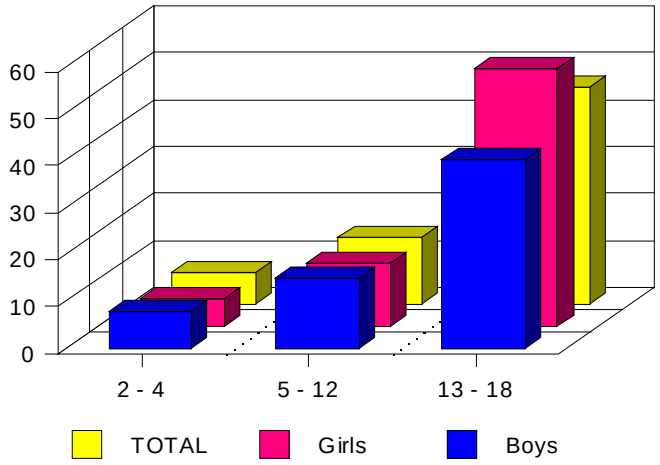


Table 4

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
2.6	—	1.6	9.2	10.2	9.7	32.1	48.8	40.6

Low Back Pain/Sciatica



3. Neck Pain

This category included pain, discomfort, stiffness, reduced range of motion, etc. 14.4% of boys were affected as compared to 13.0% of girls. In total, 13.7% of all children in our sample complained of these symptoms. See Table 5 and related chart.

Again we noticed that as children become older, there are more incidents of neck pain and related complaints. As mentioned above, these are the results of adaptive patterning to a chronic PDSC.

4. "Growing Pains"

These include the so called "Restless Leg Syndrome" symptoms, including deep leg and knee "achiness" to the point where a child often cries himself/herself to sleep. 30.0% of boys were affected followed by 26.6% of girls. In total, 26.1% of children complained of these symptoms. See Table 6 and related chart.

Although many people seem to down play "growing pains" as something that a child experiences as a normal part of the growing up process, nevertheless, the trend is unmistakable - more girls are affected than boys in the Toddler years. In the pre-teen group, boys seem to be affected more than girls and the incidence of boys affected increases almost five fold as compared to the 2-4 age group. In total, 28.3% of children in our sample complained of this problem. We hypothesize that this complaint is the direct result of adaptation to PDSC.

"Growing Pains" have always been explained away as a normal part of childhood. Parents have been told that ligaments are stretching, bones are growing, etc. It is seen as normal that they should somehow "hurt". To the average parent, this explanation seems very plausible. If that were the case however, why is it that only the legs hurt? The other body parts don't grow? Why don't they produce pain?

Table 5

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
—	—	—	13.0	9.8	11.4	24.7	26.2	25.5

Incidence of Neck Pain

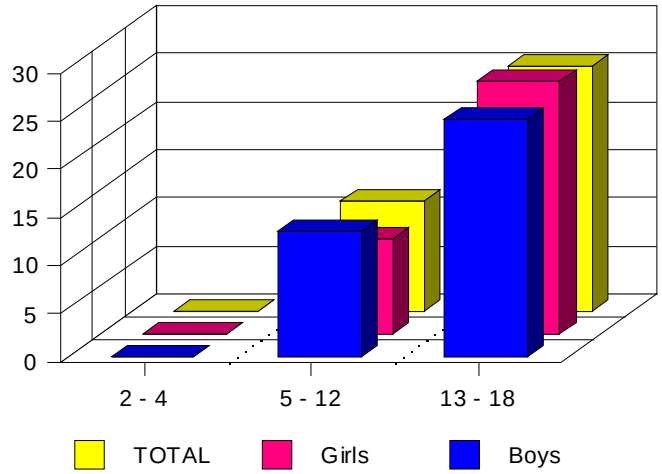
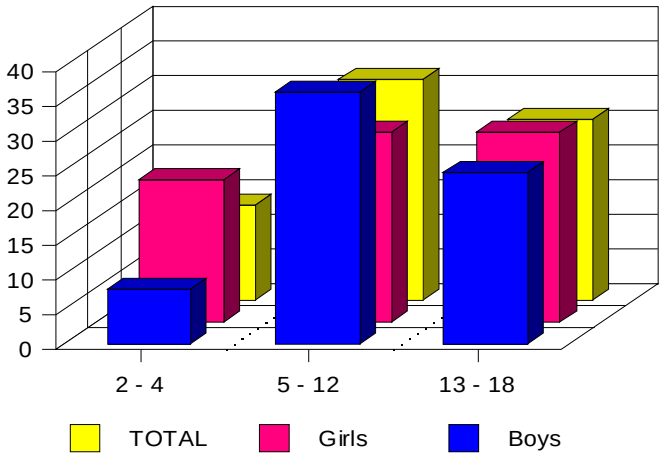


Table 6

2 - 4 age group			5 - 12 age group			3 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girl	TOTAL
7.7	20.6	13.7	36.2	27.3	31.8	24.7	27.4	26.1

Incidence of Growing Pains



5. Sinus problems

These difficulties involved chronic post nasal drip, sinusitis and sniffling. 4.0% of boys and 5.3% of girls were affected. See Table 7 and related chart.

A total of 4.6% children complained of these symptoms.

Again it is apparent, that as children become older, we see an increased incidence of these problems. In the 5-12 age group, twice as many girls are affected as boys. This finding seems to become fairly equal in the early teen years, as boys apparently catch up to girls.

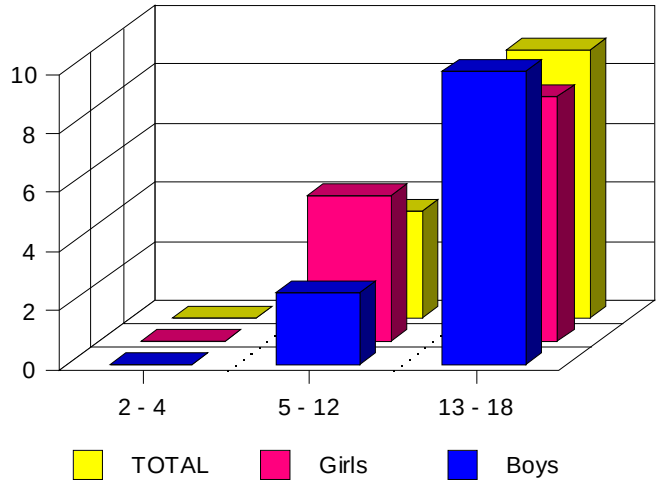
6. Headaches

This group of complaints includes all types of head pains, pressure, and discomfort - either frontal or occipital. 33.0% of boys experienced this complaint as compared to 42.4% of girls. In total, 37.7% of children complained of this problem. See Table 8 and related chart.

Table 7

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
—	—	—	2.4	4.9	3.6	*9.9*	*8.3*	*9.1*

Incidence of Sinus Problems



Again, as children age, the incidence of headaches seems to increase - of all the somatic complaints, Headaches are the most prevalent. It is interesting to note that girls are more affected across all age groups.

7. Dizziness

This complaint encompassed lightheadedness, vertigo, and fainting. 4.0% of boys experienced this problem as compared to 6.8% of girls across all samples with a total 5.4% incidence for all children. See Table 9 and related chart.

As noted previously, symptomatology seems to show an increase with the age of the child. Again, girls exhibited a considerably greater prevalence of incidence than boys.

Table 8

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
2.6	11.8	6.8	34.3	40.0	37.1	44.4	60.7	52.7

Incidence of Headaches

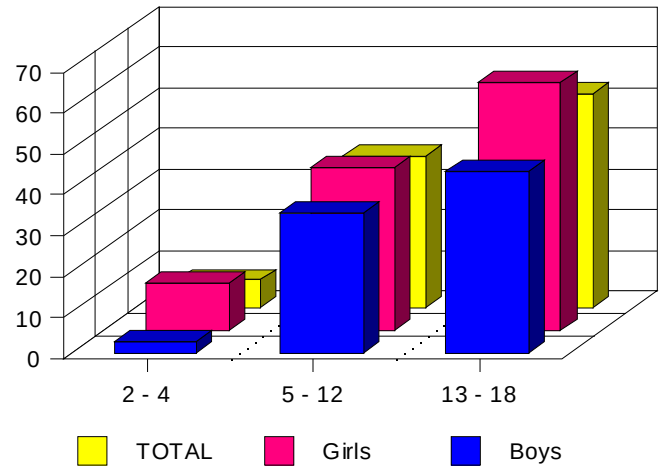
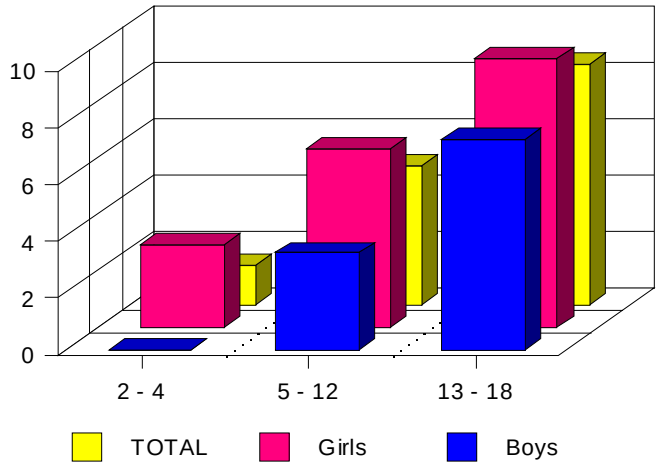


Table 9

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
—	2.9	1.4	3.4	6.3	4.9	7.4	9.5	8.5

Incidence of Dizziness



Visceral / Autonomic Complaints

These were further dissected into eight sub-classifications of complaints, three age groups, as well as sex.

1. Stomach problems / indigestion

These symptoms involved the commonly seen stomach "achiness," cramping, "tummy upsets", and other symptoms of an indescribable nature. In general, 17.7% of boys experienced these complaints as compared to 24.1% of girls. In total, 20.9% of children were affected. See Table 10 and related chart.

Once again, one can see an increase in incidence as children age. Again, the incidence appears greater in girls than boys and again there are deeply ingrained adaptive mechanisms which are becoming established patterns into adulthood at play.

2. Bed-wetting / Bladder Dysfunction

This category included frank wetting of the bed at night (nocturnal enuresis), dribbling, and loss of bladder control, even during the day. Our sample did not include children who were not toilet trained. See Table 11 and related chart.

17.1% of all boys across all age groups were affected, as compared to 9.3% of girls. The total number of children affected in our study sample was 13.2%.

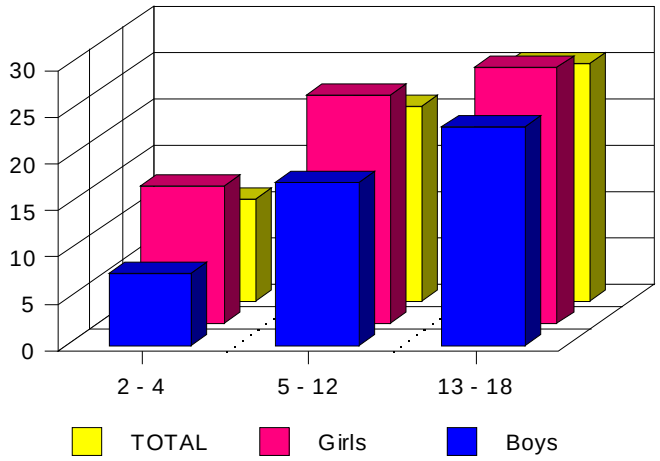
It is interesting to note that dysfunctions of the bladder are fairly evenly distributed between boys and girls in the 2-4 age group. In the 5-12 age group, more than twice as many boys as girls have bladder difficulties. It should be noted that this trend once again returns to equal sex distribution in the 13-18 age group.

One must realize however that bed-wetting is not a "boy thing" - girls are also affected. PDSC affects the neural components of the proprioceptive network as well as autonomic function vis a vis somato-visceral reflex loops. There seems more stress placed on the articulating pelvic structures in boys. This can be noticed as increased and more pronounced ridges and

Table 10

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
7.7	14.7	11.0	17.4	24.4	20.9	23.5	27.4	25.5

Incidence of Stomach Problems



irregularities in the surface of the sacroiliac articulations. As well, male centre of gravity is more ventral to the SI articulations and predisposes these to more load and torque bearing.[26,27,28,34] Although this explanation is at best a hypothesis, we have noted the above relationships over the course of dealing with thousands of children.

There have been a number of studies which have demonstrated the effectiveness of chiropractic care in the resolution of nocturnal enuresis. Borregard especially noted that the correction of pelvic imbalance brought about very positive results.[53,57]

3. Constipation / Diarrhea

11.3 % of all boys seem to be affected as compared to 14.6% of girls. In total, 12.9% of all children in our study complained of these difficulties. See Table 12 and related chart. for the percentages of occurrence in each age group.

Table 11

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
7.7	8.8	8.2	24.2	11.7	18.0	3.7	3.6	3.6

Incidence of Bed Wetting

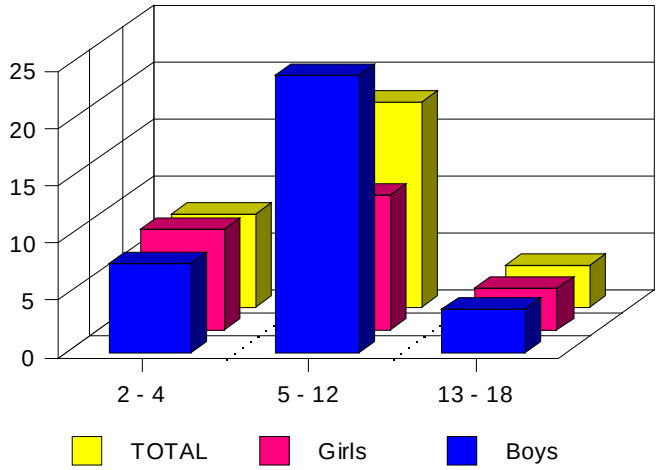
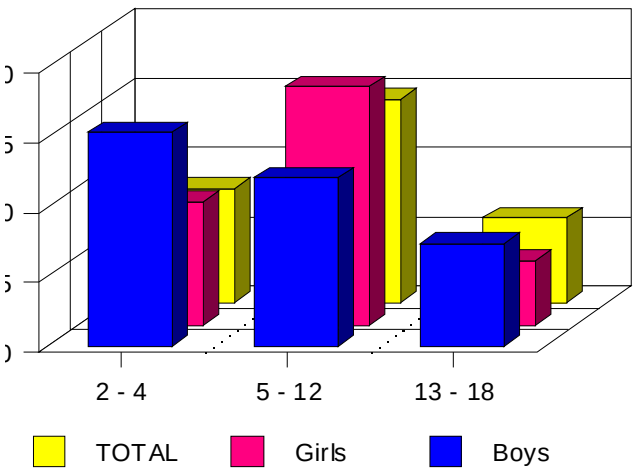


Table 12

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
15.4	23.5	19.2	12.1	17.1	14.6	7.4	4.8	6.1

Incidence of Constipation / Diarrhea



As one can see from the trends, the largest percentage on incidence seems to occur in the Toddler years - and predominantly in girls, almost twice as much as boys. It is interesting to note that once children reach puberty, the incidence is fairly equal among both sexes.

4. Asthma / Lungs / Breathing

The incidence of girls and boys affected across all age groups appears to be 17.6% and 17.7% respectively. In total, 17.7% of all children in our 650 sample were experiencing difficulty with this problem. This translates into nearly one out every five children being affected by problems with catching their breath - Asthma. We have summarized the age and incidence percentage in Table 13 and related chart.

As one can see, the percentage of children with Asthma seems to be fairly consistent in all age groups with perhaps some increase in boys Vs. girls in the teen group. There, boys seem to have more incidence than girls whereas the incidence of Asthma in girls tends to decrease slightly with age. Although many studies have shown extremely positive results with Asthma when chiropractic care was introduced, nevertheless it represents a serious problem.[58-64] Again, we feel that this complaint is either fully or partially an adaptation entity to a PDSC.[7]

A number of researchers, however, have blamed this condition on environmental factors[65-69] and a quite a few on vaccination programs.[70,71] Of those, Classen and Diodati have been the most vociferous.[72,73]

5. Fatigue

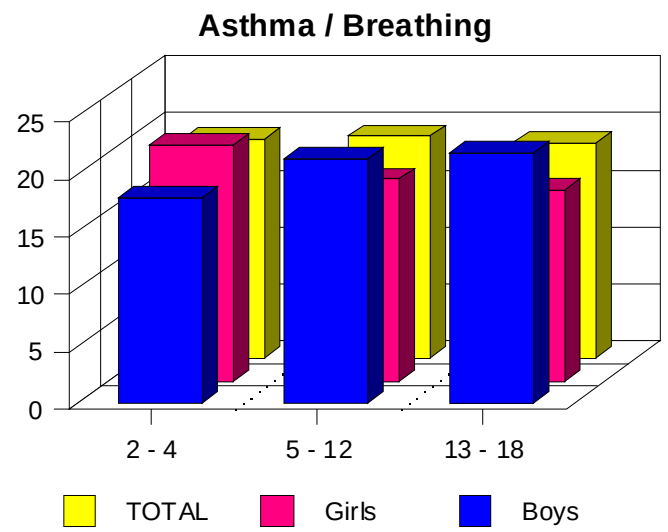
This category refers to non-specific fatigue - not related to a specific condition or disease process. These children (or their parents) have complained of being “always tired.”

Examining all children across all age groups, 6.1% of boys and 7.4% of girls mentioned this problem. In all, 6.8% of children in our sample complained of fatigue. See Table 14 and related chart.

2-4 year olds did not complain of fatigue. The complaint begins in the pre-teen group, and in boys more than girls. In the

Table 13

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
18.0	20.6	19.2	21.3	17.6	19.4	21.0	16.7	18.8



teen years, almost twice as many girls complain of fatigue as boys. We feel that it could be caused by hormonal factors and/or energy expenditure of the nervous system attempting to effect adaptation to a posturally inefficient internal environment - the PDSC. Much more study needs to be done before a conclusive statement can be made.

6. Colic / "Stomach pains" / "Stomach cramps"

This section deals with Colic (not infantile, because of the age of the children) as well as diffuse abdominal aches and pains which sometimes plague children. These complaints were not as a result of a specific disease process. 11.0% of all boys complained of this problem as compared to 11.1% of all girls. In total, 11.1% of all children in our study suffered with this complaint. See Table 15 and related chart.

Table 14

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
—	—	—	4.8	2.9	3.9	12.3	21.4	17.0

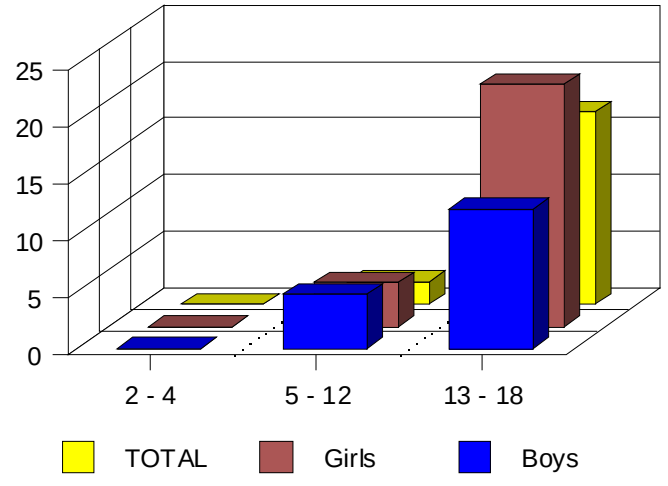
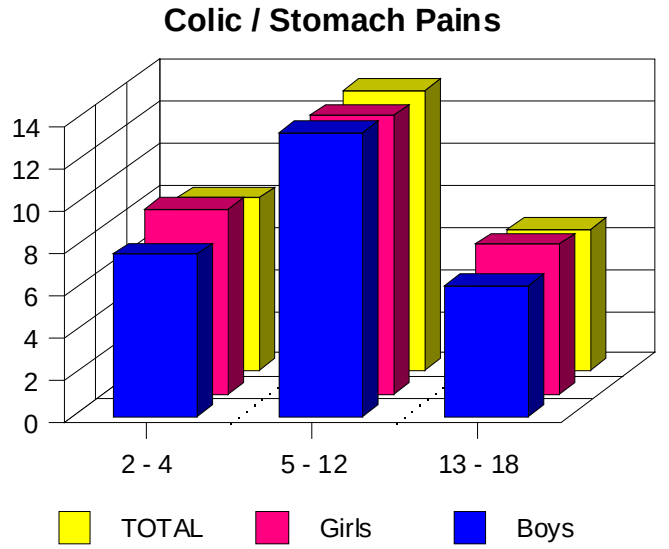


Table 15

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
7.7	8.8	8.2	13.5	13.2	13.3	6.2	7.1	6.7



The incidence of colic and stomach pains seems to be evenly distributed among the sexes in all age groups although there seems to be an increased incidence in the pre-teen group. Again, these effects could be directly caused by, or contributed to, by Pelvic Distortion and its effects on visceral neural pools.[3,5,6,45]

7. Croup

2.4% of all boys were affected as compared to 1.2% of all girls. In total, 1.8% of children in our sample complained of this problem. See Table 16 and related chart.

We have noticed that almost twice as many boys as girls are affected with croup in the 2-4 age group. In the older age groups, the incidence of Croup is minimal across both sexes and tends to be nil in girls in the teen years whereas the incidence of Croup tends to increase in boys in the teen group.

8. Menstrual Cramps / Dysmenorrhea

This was a complaint of 2.4% of the female members of the 13-18 age group only. See Table 17 and related chart.

Only girls in the 13-18 age group mentioned this complaint. We found that fact surprising as menstrual difficulties have been noted by many practitioners in the early teenage years. As well, the small number of girls presenting with this complaint was also surprising. We thought that this low percentage may be caused by the embarrassing nature of this problem. The effects of Chiropractic care as applied to girls with dysmenorrhea were encouraging.[74,75]

Behavioural Complaints

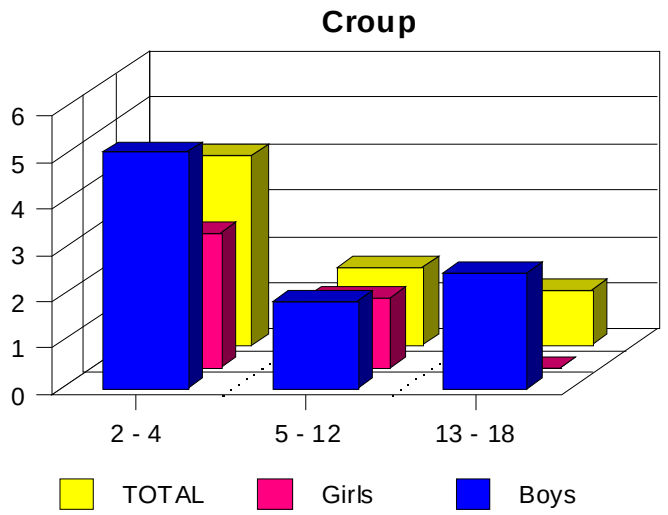
These also have been divided into sex, three age classifications and six sub-groups of complaints:

1. Hyperactivity (ADHD)

There are a number of studies showing a positive relationship between chiropractic care and Hyperactivity.[1] Hyperactivity is the name commonly given to Attention Deficit Hyperactivity Disorder (ADHD). In this section, we have attempted to

Table 16

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
5.1	2.9	4.1	1.9	1.5	1.7	2.5	—	1.2



deal with ADHD and Attention Deficit Disorder (ADD) from the perspective of occurrence, sex predominance, and age of children affected. The percentages of occurrence in each age group are listed in Table 18 and related chart. It is interesting to note that 17.4% of all boys in our sample were labelled with this diagnosis as compared to 7.7% of girls. In all, 12.6% of children in our sample wore this label.

It is interesting to note that this seems to be a predominantly male condition. There are almost three times as many boys as girls with "hyperactivity" in the 5-12 age group. In the toddler group, the ratio of boys with hyperactivity to girls is approximately 1.5:1 and this doubles as boys reach their pre-teen years. That ratio seems to revert to the toddler class level in the early teens. It is interesting to note that the percentage of girls la-

Table 17

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
—	—	—	—	—	—	—	2.4	1.2

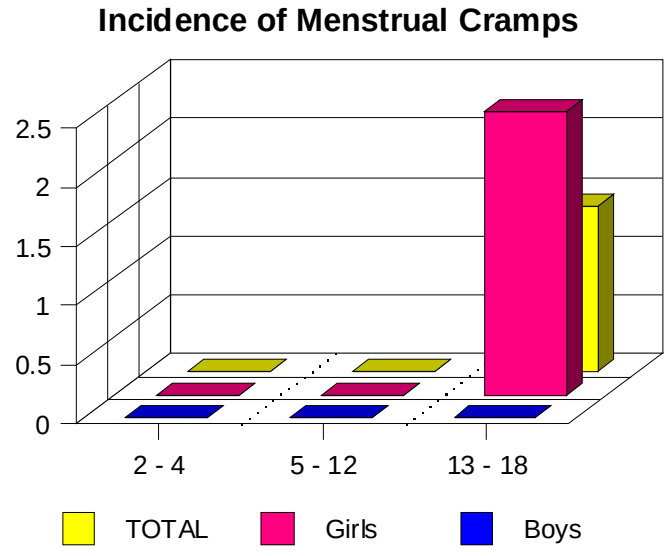
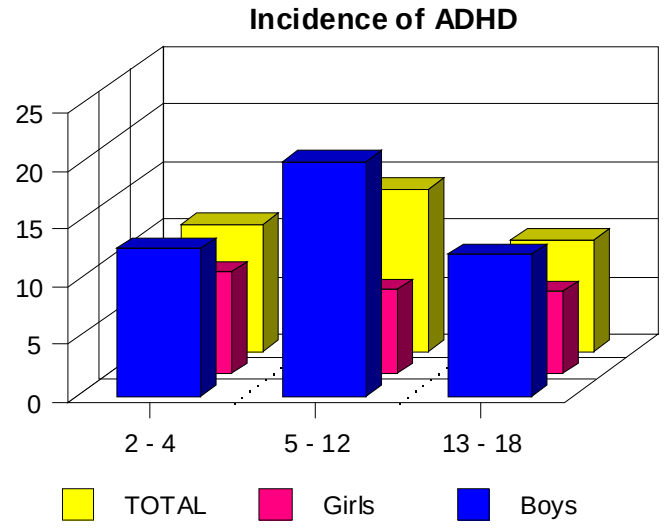


Table 18

2 - 4 age group			5 - 12 age group			13 - 18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
12.8	8.8	11.0	20.3	7.3	14.1	12.3	7.1	9.7



belled with this condition is fairly constant throughout the age groups.

It has been stated that ADHD can be traced to trauma of a difficult delivery with neurological sequella.[1] This changes a child's perception of reality and thus his/her behaviour is commensurate with that reality. This finding seems to support the hypothesis that ADHD is both a possible result of a traumatic delivery and/or behavioural and learned deportment.

If the incidence of occurrence of ADHD in girls can be taken as a baseline of the incidence of the stress of delivery producing the symptoms of ADHD, then the incidence appearing in boys less that in girls would lead to the learned and behavioural factor.

We must also add, that while this is not a political paper, a number of researchers feel the diagnosis of ADHD is in peril: There are no tests for this condition, many suspect that this diagnosis was invented and does not exist, and that the manufacturer of Ritalin is facing three separate law suits at the time of writing of this paper.[1,76,77]

2. Learning Difficulties / Slow Academics

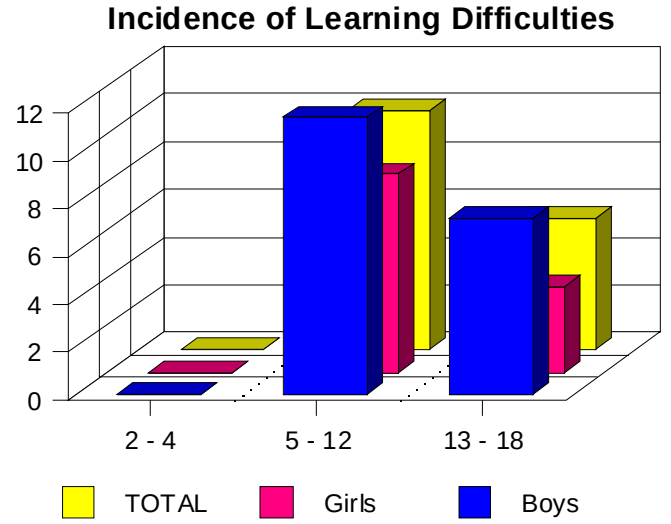
These are the children whose parents mention that they are having difficulty grasping concepts that are taught to their peer group. There is either a lack of focus or loss of concentration ability, as related by parents. 9.2% of all boys in our sample were affected by this difficulty as compared to 6.2% of girls. In all, 7.7% of children experienced this problem. See Table 19 and related chart.

It is interesting to note that none of the children in the Toddler group were affected with complaints of learning difficulties. Parents of boys in the 5-12 age group complained of these problems a bit more than girls in the same age group. 11.6% vs 8.3%. It is also interesting to note that in the teen group, twice as many boys as girls experienced this problem.

There are a number of musings which one hears in relation to this complaint; that it can be caused by trauma during birth, that it can be the result of vaccine damage, that it is genetic,

Table 19

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
—	—	—	11.6	8.3	10.0	7.4	3.6	5.5



nutritional, etc. Much more study needs to be done before a definitive statement can be made.

3. Temper Tantrums

No boys in our sample complained of this problem. In all, this accounted for 0.2% of children in our sample. See Table 20 and related chart.

At the risk of appearing sexist, it struck us as strange that Temper Tantrums should appear as a girl "thing" only, based on the statistics.

4. Memory Problems:

As in the category above, this complaint was primarily related to the girl population of our study. 0.3% of all girls seemed to be affected. In all, this represented 0.2% of the whole sample of children. I should add that only one child presented with this complaint. See Table 21 & Related chart.

Again, it is interesting to note that this complaint is mainly noted in girls. This was surprising as many people seem to feel that it is boys who have a difficulty with memory. We have not found that to be the case although only one child presented with this problem. To extrapolate into a population would not be wise.

5. Sleeping Difficulties

This complaint was related to waking up at night, not being able to fall asleep, or not being able to stay asleep. 11.3% of all boys were affected as compared to 7.1% of all girls. In all, 9.2% of all children mentioned this complaint. See Table 22 and related chart.

Sleeping difficulties seemed to be noted primarily in boys (10.3%) as compared to girls (2.9%) in the Toddler group. In total, 6.8% of children in this age group were affected. This complaint seemed to increase in occurrence (13.0%) in boys in the pre-teen group as compared to girls who only had a 4.9% occurrence. In that age group, 9.0% of children were affected with this difficulty. It is interesting to note that in the toddler group and the pre-teen group, boys are three times as affected as girls with difficulty sleeping. It is also interesting to notice that this ratio inverts drastically in the teen group.

There, girls (14.3%) are more affected than boys (7.4%). for a total of 10.9% of that age group. We feel that this inversion could be the result of neural adaptation to PDSC but also caused by social and hormonal pressures seen in teen girls.

6. Crying Spells

This complaint consisted of general crying and whining for no apparent reason and was not associated with any condition. 5.5% of all boys and 3.4% of all girls were blamed. In all, 4.5% of our sample experienced difficulty with this problem. See Table 23 and related chart.

Table 20

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
—	2.9	1.4	—	—	—	—	—	—

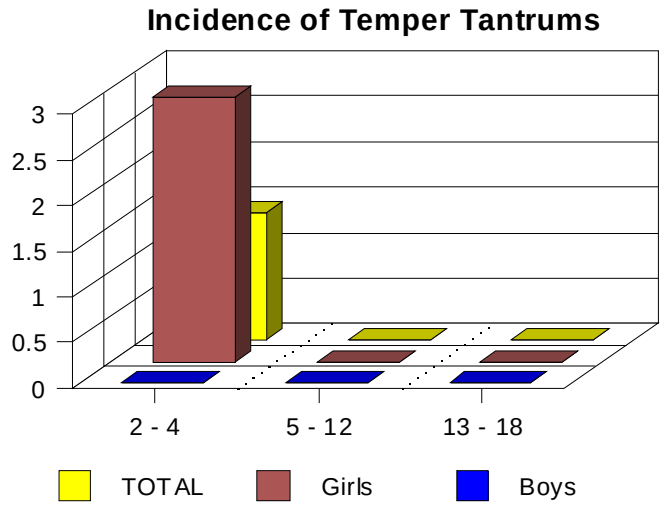


Table 21

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
—	—	—	—	0.5	0.2	—	—	—

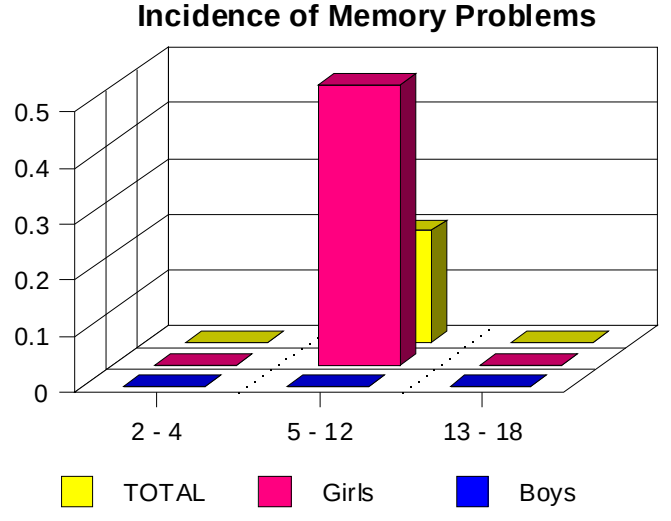
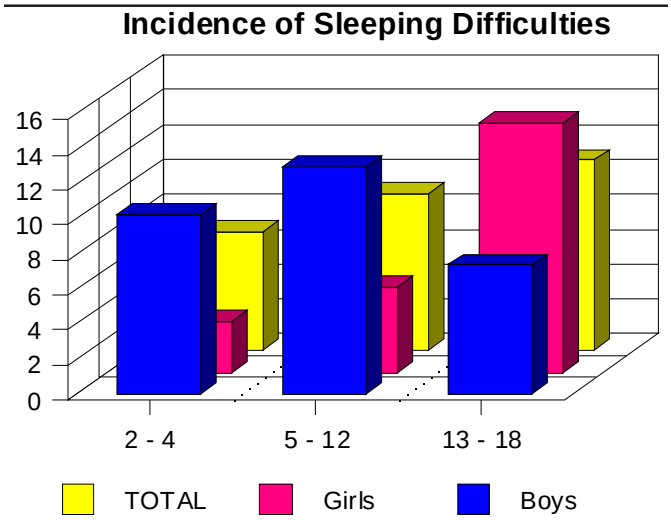


Table 22

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
10.3	2.9	6.8	13.0	4.9	9.0	7.4	14.3	10.9



To no surprise, crying spells were more frequently noted in the Toddler group where the ratio of girls (11.8%) affected outnumbered boys (5.1%), 2:1. What was surprising to note is that the ratio of boys (7.2%) far outnumbered girls (2.4%) or a 3:1 ratio, in the pre-teen group. In the teen group, girls again outnumbered boys by 2:1, 2.4% vs 1.2%. Again, this effect could be the result of hormonal and social stresses of teen girls.

Immune Complaints

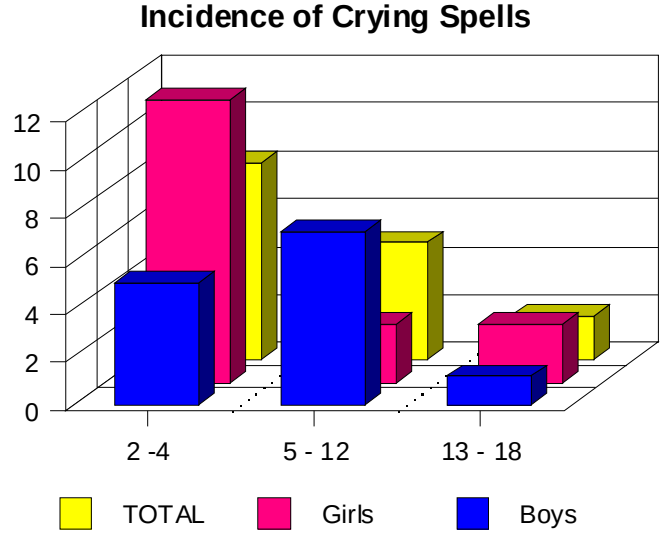
As in the other previously mentioned classifications, this section was investigated in light of the three age groups mentioned, sex distribution, and percentage of occurrence.

1. Allergies

Allergies in this section were not specific to "hayfever" only. Our context of allergies encompassed all hypersensitivities parents complained their children were plagued with.

Table 23

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
5.1	11.8	8.2	7.2	2.4	4.9	1.2	2.4	1.8



We found an incidence of 27.8% among all boys and 22.9% among girls across all groups. In total, 25.4% of children of our sample were affected by allergies. See Table 24 and related chart.

It is interesting to observe that Allergies and Ear Infections represent the largest classification of health complaints affecting children - second only to "Growing Pains" at 26.1%.

As well, it is interesting to note that the incidence of Allergies shows an almost exponential rate of rise in boys throughout the age groups. By the time a boy-child has reached the teen years, the rate of occurrence is close to 40% - almost four times the occurrence seen in the 2-4 age group.

Girls are also affected but not to quite the same degree as boys.

It would be intriguing to do a follow-up study and measure the occurrence of allergies in the adult population and its possible relation to this rate of incidence.

Again, We feel that Allergies are a possible result of the neuro-immune effects of the PDSC, although some feel that they are caused by our vaccination program.[73]

2. Colds

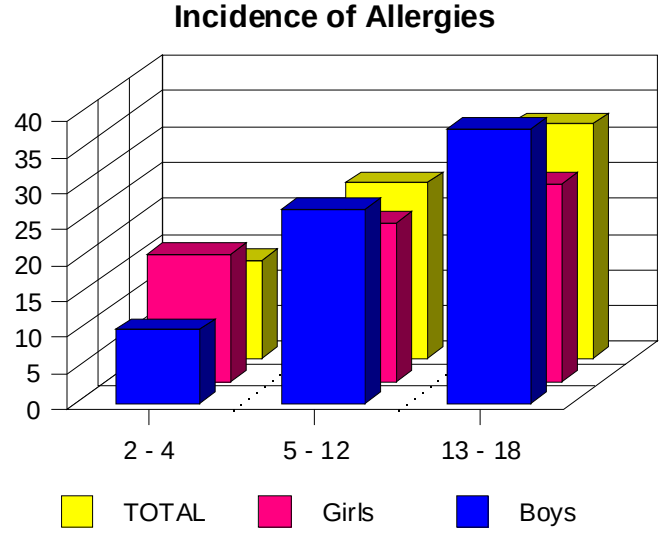
This section dealt with the frequency of colds, and rhinitis. See Table 25 and related chart.

It is interesting to note that almost 50% of girls in the 2-4 age group were affected with colds and the "sniffles". Boys were also affected but not to the same degree. As we scan the age groups, we see the incidence of colds decreasing, however, girls are slightly more affected than boys. Phillip Incao, a Colorado Ayurvedic physician, and Howard Weiner, a Harvard immunologist feel that colds, etc., are more prevalent in the toddler age group as they are needed to teach and exercise an immature immune system.[1,73,78,79] Other reasons could be the suppression of the immune system from vaccination according to the Jordan Report.[80]

We feel that it could also stem from the influence of PDSC on the developing neuro-immuno network. The response of

Table 24

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
10.3	17.6	13.7	27.1	22.0	24.5	38.3	27.4	32.7



children with Upper Respiratory Tract Infections to chiropractic care has been very promising.[81]

3. Ear Infections

Ear Infections as well as Allergies are the second most common complaint that children have -"Growing Pains" are the first. 28.4% of all boys complained of this problem as compared to 22.3% of all girls. In all, 25.4% of all children were affected by ear infections - Otitis Media. This translates into one out every four children having ear infections as a Toddler. See Table 26 and related chart.

Ear Infections, which seem to be very prevalent in the Toddler group, tend to decrease in the older age groups, although children are still affected to a fairly high degree, even in the teen group. We tend to categorize the incidence of Ear Infections in a similar fashion to Colds - both deal with a maturing immune system. What is interesting is the incidence of ear infections we noted in the teen group - a time when the immune system would have matured. This led us to propose that there may be a factor in a child having Ear Infections which is not caused by an immature immune system. Taking into account our combined 40 year experience in pediatrics, we feel that Ear Infections are not an anatomically based problem - many EENT specialists tend to blame a horizontal ear canal in children as one of the causes of ear infections. If that line of thought was followed then the following results would not have been obtained;

Van Breda showed that only 31% of children under chiropractic care had episodes of Otitis Media as compared to 80% under standard medical care. Other researchers published similar findings. Still others feel that Otitis Media may also be caused by Immune system suppression and may be contributed to by our vaccination program.[81-90]

It is interesting to note that all children with Ear Infections also experienced the adaptational stresses of the PDSC.

4. Fever

This category refers to parents presenting a child to the office with fever.

Table 25

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
33.3	47.1	39.7	17.9	21.5	19.7	7.4	9.5	8.5

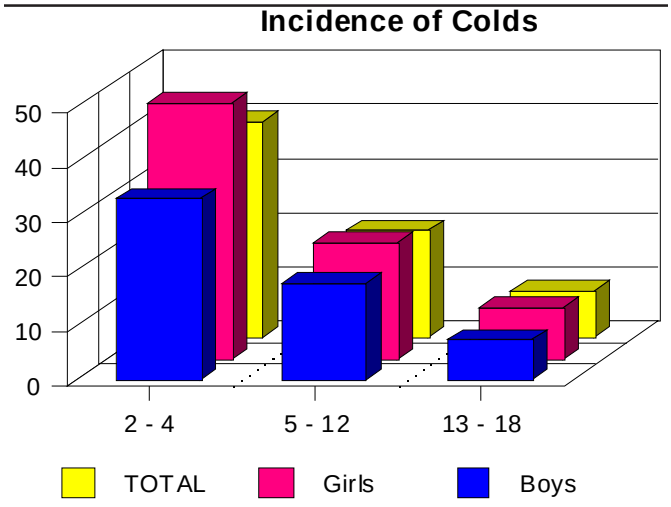
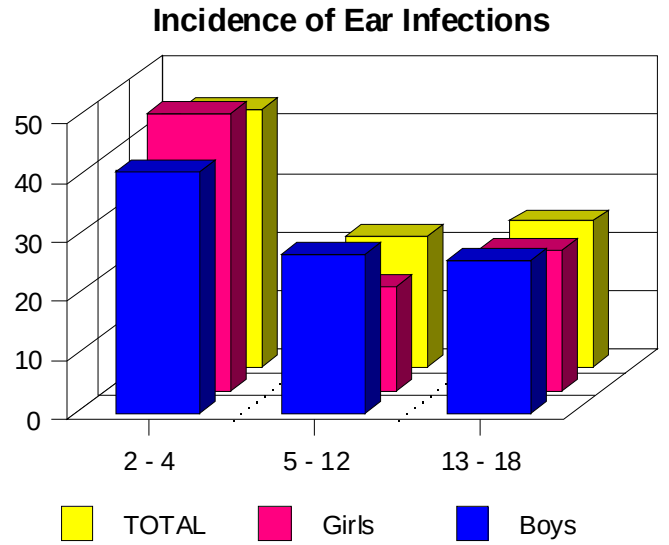


Table 26

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
41.0	47.1	43.8	27.1	17.6	22.3	25.9	23.8	24.8



6.1% of all boys complained of this problem as compared to 2.5% of girls. In total, 4.3% of our sample of children presented with this complaint. See Table 27 and related chart.

The incidence of fever is almost the same in boys as girls in the Toddler group, whereas the 5-12 group exhibits a ratio of 3:1 incidence of fever in boys as compared to girls. This finding correlates well with the high incidence of Colds and Ear Infections in the Toddler group. Although still seen in the older groups of children, Fever in those ages does not constitute a large parental problem.

5. Acne

This was a complaint whose owners were girls in the teen years only. No other children presented with this difficulty. 0.6% of all girls presented with this complaint and this represents 0.3% of our sample of children. See Table 28 and related chart.

This was not a very common complaint, much to our surprise. 2.4% of the 13-18 age group girls presented with this complaint - 1.2% of the total children in the teen group.

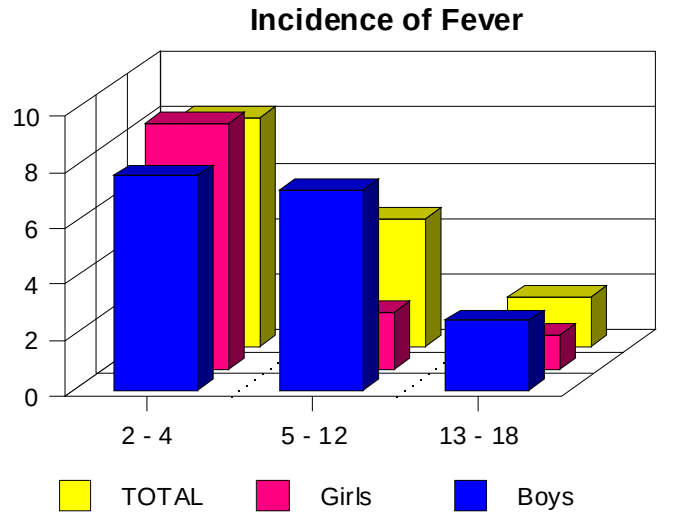
6. Throat Complaints:

This category dealt with sore throats, "Strep" throat, and Tonsilitis as presenting complaints. 0.3% of all boys complained of this problem as compared to 0.9% of all girls. In all, 0.6% of children in our sample mentioned this complaint. See Table 29 and related chart.

Sore throats, Tonsilitis, etc., seem to affect the Toddler group mainly, with girls being more involved than boys. Again, one of the reasons could be seen as an integral aspect of the normal maturation of the immune system. The other reason could be the neuro-imuno effects of Traumatic Birth Syndrome, the effects of traumatically induced vertebral subluxations, being raised under a different health paradigm, and the adaptational effects of PDSC.[88]

Table 27

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
7.7	8.8	8.2	7.2	2.0	4.6	2.5	1.2	1.8



Other Complaints

We grouped these last two categories under the sub-classes of general check-ups, and Motor Vehicle Accidents/Trauma.

1. Check-up

These were children whose parents brought them to our Centre with no complaints - 11.9% of all boys fell into this category as compared to 11.8 girls. In all, 11.8% of all children came to our Centre with no complaints mentioned initially. See Table 30 and related chart.

The only significant datum gathered here is that over 10.0% of children are brought to a chiropractic office with no complaints - parents understand , accept, and agree with the role chiropractic plays in the health plan for their family. One must keep in mind that although these children presented with no complaints/symptoms, all had the presence of the PDSC.

Table 28

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
—	—	—	—	—	—	—	2.4%	1.2%

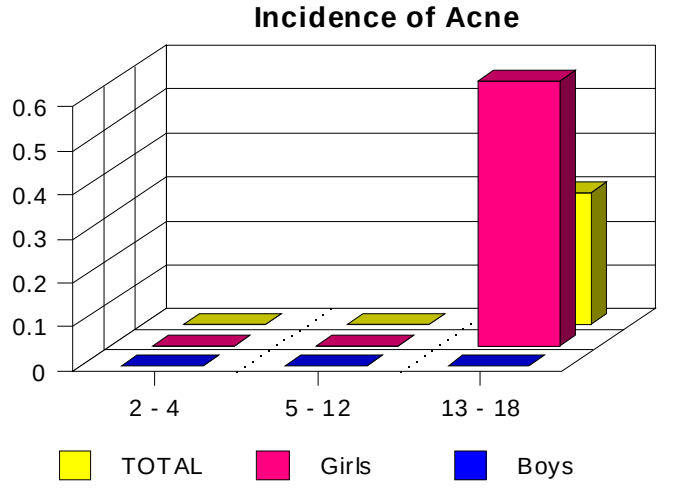
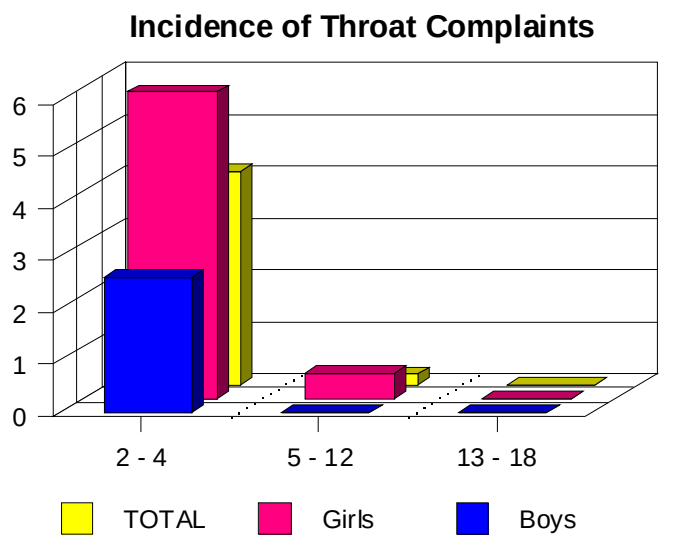


Table 29

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
2.6	5.9	4.1	—	0.5	0.2	—	—	—



2. MVA / Trauma

These children were brought to the office as a result of a traumatic event - either a motor vehicle accident, or some other traumatic incident, which may or may not have necessitated some measure of emergency care. 1.5% of all boys and 0.3% of all girls mentioned this problem for a total of 0.9% of our sample. See Table 31 and related chart.

It seems that boys in the Toddler group were more prone to traumatic incidents. It could be the result of the nature of boys in general.

To give the reader some sense of rates of occurrence, we summarized the ten most common complaints into a percentage of the total children sample: See Table 32 and related chart.

The most common complaints listed above appear to be mainly of a somatic nature with some visceral and some im-

Table 30

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
18.0	8.8	13.7	10.6	13.2	11.9	12.3	9.5	10.9

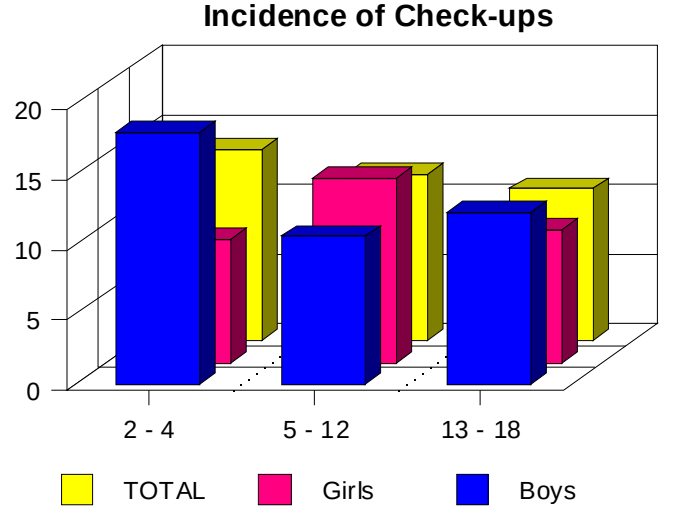
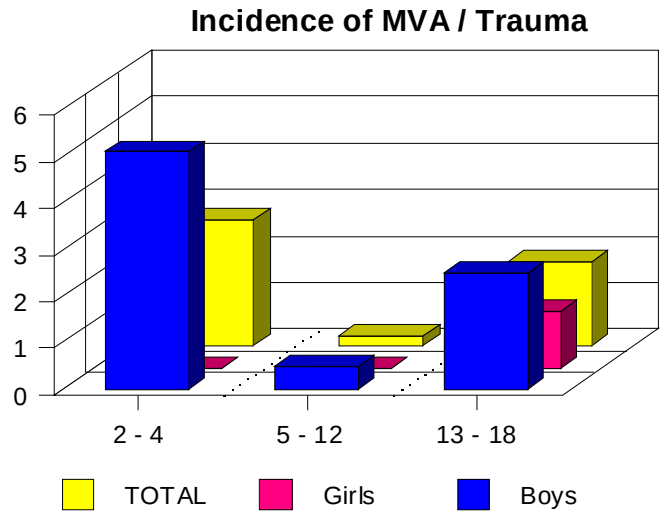


Table 31

2-4 age group			5-12 age group			13-18 age group		
Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
5.1	—	2.7	0.5	—	0.2	2.5	1.2	1.8



mune components. We feel that these are good examples of the effects of PDSC on an average developing child.

As we have mentioned earlier, we feel that this represents a fairly balanced, average health picture of the average child in any community. What is of concern is that this level of health expression has been accepted as the normal operating state for a developing child.

As well as the five complaint groups we catalogued earlier, there have been two explicit observations we made that deserve distinct and very special consideration:

1. **Scoliosis**
2. **Spinal Degeneration**

Both are adaptive responses to a stressor and are generally not complaints children would make under normal circumstances.

Scoliosis

As is well known, there are essentially two types of Scoliosis - fixed and functional. The first is mostly the result of genetic alterations in the growth and development of the pelvis and/or spinal segments. The second is primarily a result of alterations of function and is by far the most common form.[91-93] The most familiar form of this type is commonly referred to as Adolescent Idiopathic Scoliosis. We have decided to deal with this last expression only.

There have been a number of studies attempting to explain the incidence of scoliosis. No one individual has provided the correct answer. The reason, we believe, is that scoliosis is a multi factorial entity - there are a multitude of factors which need to be contemplated and addressed. Veldhuizen thought that the causes are most likely neuromuscular. After studying the effects of the PDSC we agree with his conclusions.

He felt that scoliosis is an aberration caused by defective postural equilibrium. That proprioceptive input from ligamentous, articular, and muscular components of the neuromuscoloskeletal system are an integral part of the body's postural equilibrium.

The resultant disruption in the postural reflex system - somatosensory pattern dysfunction, is likely the cause, not the result, of spinal curvatures. As a result, scoliosis tends to develop in two stages:

A. A small curve develops from a defect in the function of the proprioceptive system.
B. This curve is then exacerbated by biomechanical factors.[94,96-99]

We have found a correlation between the PDSC and the development and patterning of scoliosis. It is for this reason that we feel strongly all children should be checked for the presence of PDSC. A scoliotic curve presents with a microscopic composition of the IVD which is different on the convex and concave aspect of the curve. There is a decrease in the sulfonated GAGs on the concave aspect of the curve with a decrease in the pro and active MMP-2 and MMP-9 on the convex side, with the greatest changes being seen in the apical disc material.[95] These findings concur with Bland and are consistent with the onset of degeneration.[1]

These changes can be seen early in life and alter the composition of muscle fibers on either side of the curve. As a matter of fact, Evans found a 26% incidence of neuroanatomical abnormality in children between four and twelve years old.[97-99] This makes for a strong case that the PDSC is a most intense factor in the formation of Scoliosis.

We classified scoliosis under four distinct types of curvatures seen:

Left C-Curve
Left S-Curve
Right C-Curve
Right S-Curve

We then further classified these curvatures by the three age groups and sexes:

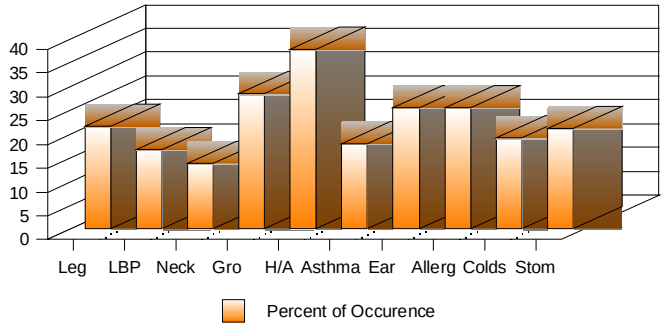
1. 2-4 Age Group:

Of our 2-4 age group sample, 23.8% of boys did not have any evidence of a spinal curvature of any sort - we would clas-

Table 32

Leg / arm pain	21.4 %
Low Back Pain	16.6
Neck Pain	13.7
Growing Pains	28.3
Headaches	37.7
Asthma	17.7
Ear Infections	25.4
Allergies	25.4
Colds	19.1
Stomach Problems	20.9

Incidence of The Ten Most Common Complaints



sify this as “normal” although some have found that this is not the best or most suited adaptive spinal configuration to deal with gravity.[4]

Girls in this age group had a 16.7% incidence of normal. In boys, 62.5% of spinal curvatures were classified into a left or right configuration while 37.5% were not.

In girls, we were able to classify 90.0% of curvatures into left or right and 10.0% defied any classification.

The table below depicts the analysis of curvatures which were classified and assigns their respective percentages of occurrence: See Table 33 and related chart.

We have found that 80.0% of Boys had left curves as compared to 72.2% of Girls. As well, right curves were found more frequently in Girls (27.8%), as compared to Boys (20.0%). It was interesting to note that the most common spinal configuration for both sexes was the Left C-Curve - 70.0% in boys and 50.0% in girls with the right C-Curve being the second dominant feature in both sexes. In total, 57.1% of children displayed the L-C curve, 17.9% L-S curve, and 25.0% the R-C curve.

2. 5-12 Age Group

14.0% of Boys in this age group could be said to be normal with 86.0% displaying lateral curvatures of some sort. Girls were similar, 11.4% were normal and 88.6% showed lateral curvatures forming. Of boys with lateral curvatures, 28.6% were not classified while 71.4% were classified into either left or a right category. Girls displayed a similar picture: 24.4% were not classified, while 75.6% were. Table 34 depicts our analysis of classified curvatures in percentages of occurrence.

As in the 2-4 age group, the 5-12 age groups shows a similar incidence of distribution of curvatures. The L-C curve is predominant in both sexes in this age group, followed by the R-C curve. In total, 54.7% of children displayed the L-C curve, 16.2% had the L-S curve, 20.1% the R-C curve, and only 9.0% had the R-S curve.

Table 33

	L-C	L-S	R-C	R-S
Boys	70.0	10.0	20.0	—
Girls	50.0	22.2	27.8	—
TOTAL	57.1	17.9	25.0	—

Types of Scoliosis (2-4 year olds)

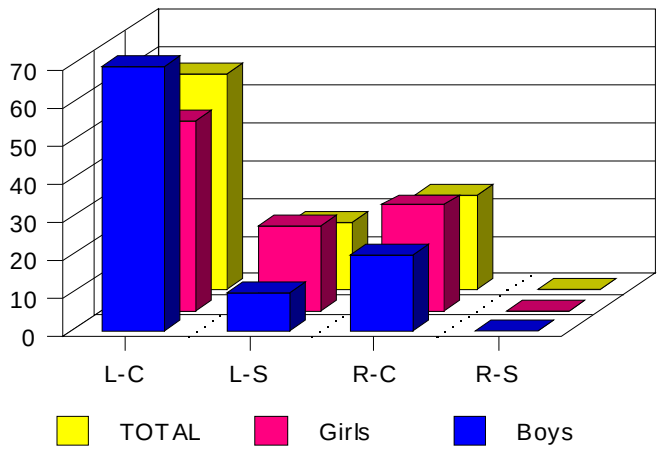
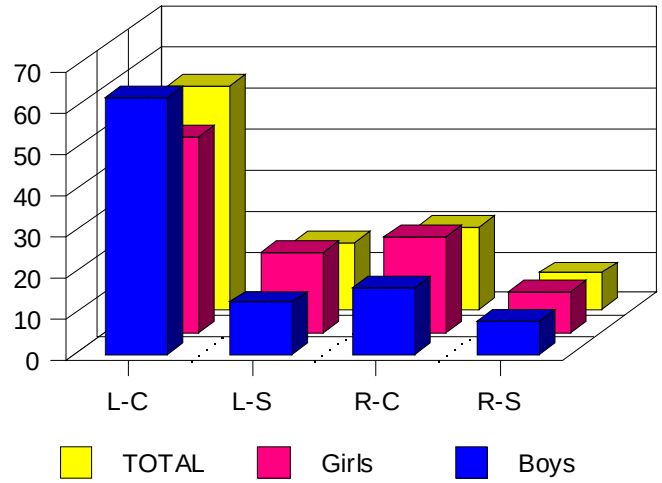


Table 34

	L-C	L-S	R-C	R-S
Boys	62.7	12.7	16.4	8.2
Girls	47.6	19.4	23.4	9.7
TOTAL	54.7	16.2	20.1	9.0

Types of Scoliosis (5-12 age group)



3. 13-18 Age Group

We found 15.6% of boys to be normal as compared to 21.2% of girls.

In boys, 29.2% of curvatures could not be classified as compared to 11.1% of girls which meant that we could classify 70.8% of boys’ curvatures and 88.9% of girls.

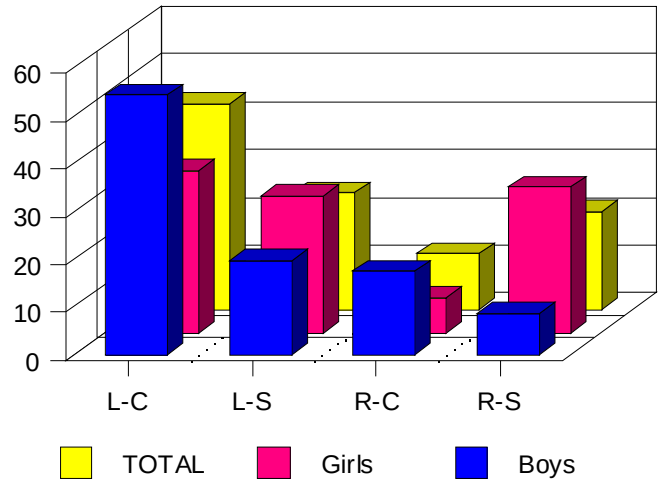
Table 35 shows our analysis of percentages of occurrence of classified curvatures

As in all the other groups, the left-C curve is most common, however it is beginning to lose its frequency. What is interesting to note is that the right-S curve, and to some degree the L-S curve, have increased in occurrence in the female population

Table 35

	L-C	L-S	R-C	R-S
Boys	54.3	19.6	17.4	8.7
Girls	33.9	28.6	7.1	30.4
TOTAL	43.1	24.5	11.8	20.6

Types of Scoliosis (13-18 age group)



of this age group - the occurrence almost equal to the L-C curve. This is a very different profile compared to boys of the same age group where the C curve is very dominant.

In total, the L-C curve shows a very strong occurrence with the L-S, and the R-S curves showing less than half the same occurrence. This makes a very strong case for the causality of PDSC - both are left side inclined.

Incidence of Spinal Curvatures by Sex:

In order to gain a better understanding of the distribution of spinal curvature types in boys and girls, we used Table 36 to depict the percentages of **total** occurrence.

Table 36

	L-C	L-S	R-C	R-S
Boys	60.8	14.5	16.9	7.8
Girls	43.9	22.2	19.2	14.7

We noted that boys exhibited 15.2% of normal - no spinal curvatures, while girls enjoyed a 14.5% incidence of normal. We found that to be statistically essentially identical.

This meant that boys had a 84.8% incidence of spinal curvatures with girls noted at 85.5%. We found these figures very high and quite surprising.

Table 37 shows the total distribution of occurrence of the four types of curves noted across both sexes.

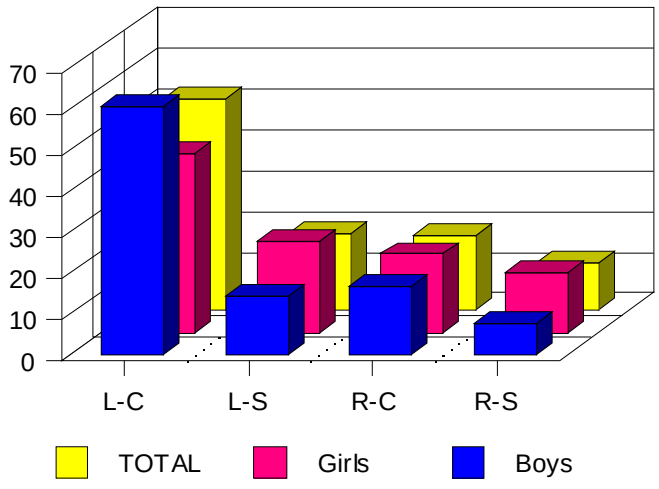
Our findings certainly challenge the long held belief that scoliosis is more common in girls than boys. As a matter of fact, the commonly upheld doctrine has been that the ratio of girls having scoliosis as compared to boys is in the neighbourhood of 80/20.

We have not found that to be the case. We have found that the incidence of scoliosis in boys as compared to girls is 84.8% and 85.5% respectively. From the statistical evidence presented, the ratio seems to be almost exactly equal. In other words, as many boys as girls are afflicted with scoliosis - and in quite significant numbers. This means that over 80% of boys and girls have some sort of an abnormal spinal curvature. In the broadest sense, we took any lateral spinal curvature of more than 5 degrees as our base-line definition of "Scoliosis".

Table 37

	L-C	L-S	R-C	R-S
Total %	51.7	18.7	18.1	11.5

Incidence of Types of Scoliosis Patterns



Many find it difficult to determine exactly when a spinal curvature should be classified as "Scoliosis". Some feel it should be so called when it reaches 20 degrees. Some feel that 8 or 10 degrees should be the enchanted number. If that criteria was to be followed, it would translate into a conundrum where a child whose spinal curvature measures 19.5 degrees for example, would be mis-diagnosed as not having scoliosis, by definition. There is little congruency and agreement in the scientific community regarding an adequate definition of what constitutes an agreeable numerical definition of this occurrence.

For the purpose of clarification and uniformity of acceptance within the profession, we felt that any lateral spinal curvature of 5 degrees or more should be classified as Scoliosis, and that it should be given some degree of numerical latitude so as not to be restrictive.

Spinal Degeneration

There seems to a mystical aura of an unmentionable taboo surrounding the issue of spinal degeneration (SD) in children. Clinically and even ethnically and ethically, spinal degeneration has been universally accepted as an integral consequence of aging. This is one of the reasons why osteoarthritis is ill suited, by society, to encompass children - no one expects it. Yet it is the product of various pathobiomechanical alterations in joint function.[99] It has been incorrectly regarded for years as a "wear and tear" sequella to a traumatic incident.[99-106]

Any notion or thought even remotely associated with attenuating, arresting, or, most certainly, reversing this condition, has been looked upon until recently as some exalted "heresy."[99,105] And those who spoke of such things have been prosecuted.[100]

We have found that the process of degeneration has to start somewhere. In the adult we often see the end product of that process - the beginnings are most often seen in children.[99] Lawrence mentioned that it can be noticed in 35% of the population by age 30. He found a 10.0% incidence of radiologically identifiable osteoarthritis in a 15 to 24 years old age group.[101]

In order that the reader may have a clear understanding of the issues involved, we felt it would be prudent to address the commonly held parameters of what constitutes spinal degeneration (SD) as identified radiologically, and as seen from the perspective of the vertebral subluxation model.

Clinically, SD - osteoarthritis, has been compartmentalised into four advancing stages or phases - each essentially blending into a continuous process terminated only until recently by ankylosis.[99,102,104,105] This concept has been applied and refined by others into a construct of damage initiated by the vertebral subluxation.[99,102,103]

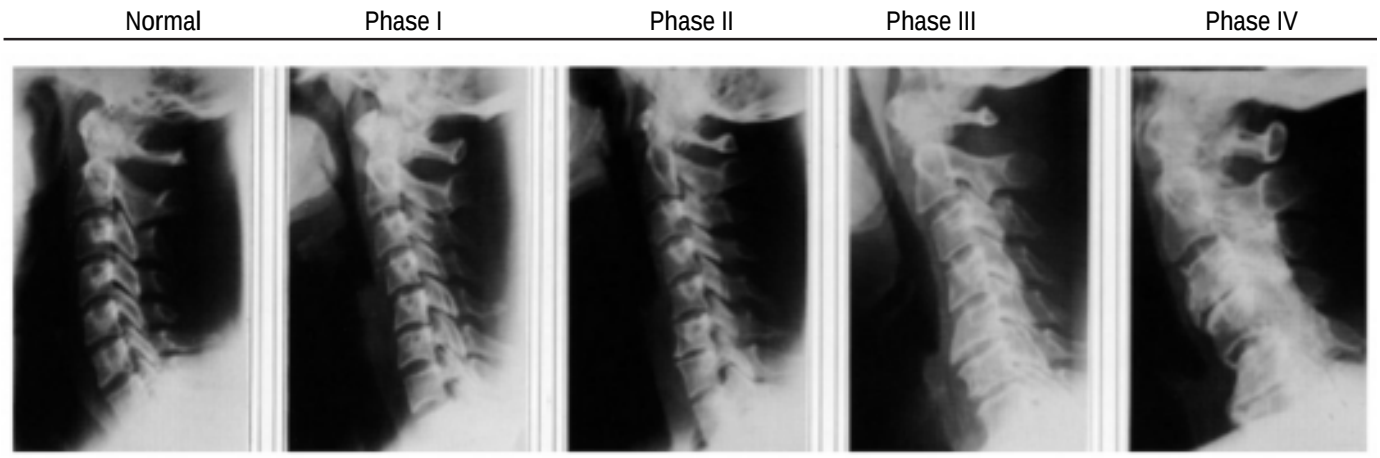
An example of this progressive concept is presented in Figure 1 courtesy of Professional Design Group;

Phases Of Progressive Spinal Degeneration

Phase I:

Phase I is characterized mainly by unit instability which results in loss of biomechanical and neurological integrity. There is radiological evidence of obvious vertebral subluxation or kinesiopathology.

Figure 1 - Phases of Progressive Spinal Degeration



Phase II:

Phase II is characterized radiologically by an alteration in disc height, osteophyte formation, articular sclerosis, and a general increase in the severity of the vertebral subluxation complex.

Phase III:

Phase III is characterized by massive spur formation, facet sclerosis and eburnation, loss of congruity of articular surfaces, disc collapse, and the onset of vertebral deformity.

Phase IV:

Phase IV is characterized by loss of form and function of the vertebral units, by ankylosis, bone deformation and necrosis, and by calcification of most spinal ligaments.

We looked to our sample of children for evidence of degeneration. Table 38 presents the incident rates expressed as percentages of occurrence;

You will notice that we did not use the Phase III criteria as we know of no child with a degenerative condition advanced to that point. It is interesting to note that as children accrue time, the percentage of those with no degenerative changes tend to decrease. This has led other researchers to assume that SD is a time/age process. However, we now know that SD is time related but not dependant.[99,104,106]

The corollary of this is also true - as children age, the incidence of SD tends to increase. By the time someone has reached the age of 70, the condition seems almost universal.[101]

If we look at all the graphs and statistical tables, one can safely state that the process of degeneration tends to increase in incidence as children age. But we must caution the reader not to reach the same assumed conclusions that have hampered understanding of this process for decades.

Very simply, if SD was the product of aging, then all children would manifest SD by late teens. That is simply not the case.

The precipitating factor in SD and IVD degeneration is considered by most clinicians to be attributable to either a gross biomechanical derangement of the vertebral motor unit, or, more subtly and more commonly, to microtraumatic events, ie., biomechanical alterations of function - the vertebral subluxation.[99,102,105]

The initiating and common denominator in this degenerative process is an alteration in the normal biomechanics and functional stress of load transduction of involved spinal segments.[107-180] It is seen as a cumulative response to microtrauma which, once started, with the passage of time, tends to accelerate into a series of progressive stages.[174-183]

There is a shift in the axis of rotation in the involved vertebral segments, which produces a unilateral fixation, a contralateral hypermobility, and an alteration in both, the stress of weight transfer, and in the dissipation of vertical force. These factors increase and alter the adaptive capability of the posterior zygapophyseal articulations, the capsular supportive elements, and the annular matrix of the IVD. This intrinsic kinesiopathology eventually leads to tearing and fragmentation of the annular fibers with effusion of sequestrated nuclear material into these annular fissures in advanced stages.[180-195]

This process gives rise to an alteration in discal function and compressibility, producing articular telescoping and disarray, further advancing the pathobiomechanical state of the motor unit. The innate tissue response is to add order and stability. Hence the formation of traction and claw spurs with the eventual goal of ankylosis.[99,105,147,175-195]

The initiating process in SD is on a microscopic and molecular plane - the process is commenced by a change in the microenvironment of the chondrocyte.[105,106] Once this is initiated, the process is inexorably progressive to ankylosis, unless it is interfered with. Correction of vertebral subluxation has been shown to interfere with this process thereby making SD open not only to attenuation, but also to arrest and reversal.[99,105,106,109,194-203]

Unfortunately, SD reversal frequently goes unnoticed in private offices because many times the initial examination is not adequate or detailed enough, there is little follow-up in terms of regular progress examinations and often initial and subsequent radiological examinations are not performed.[99,183] We feel an examination of a young developing spine is of paramount importance in the early identification and recognition of PDSC and subsequent SD.

Patterns and habits of abnormal spinal and pelvic neuromuscoloskeletal and vertebral biomechanical segmental programming should be recognized early. These are the early seed-

lings of spinal osteoarthritis and should be eliminated as early as possible in life.[5,6,102,104]

Conclusions

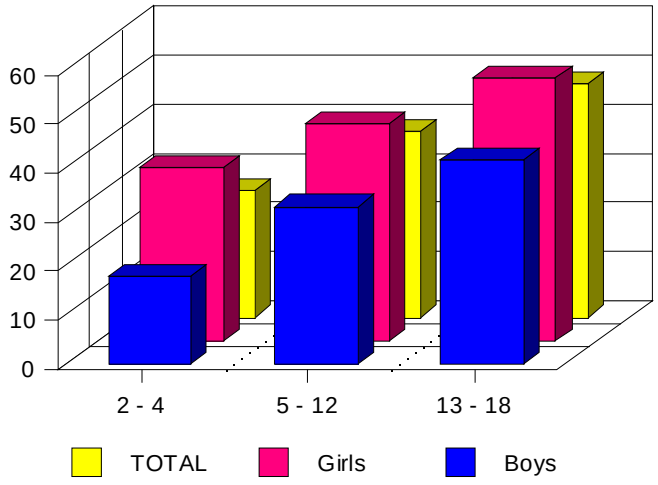
In the child, neuromuscular and functional adaptive reflex development represents a critical period of time when the young developing nervous system assimilates, differentiates, and adapts to external and internal stimuli. By means of these processes, the nervous system learns proprioceptive patterns and acquires future habits and reactions by responding to repetitive stimuli.

However, such a developing nervous system is not always able to distinguish between proper and improper stimuli; therefore it responds to both. This is the conundrum - the response is neither "good" nor "bad", but rather adaptive to the presented

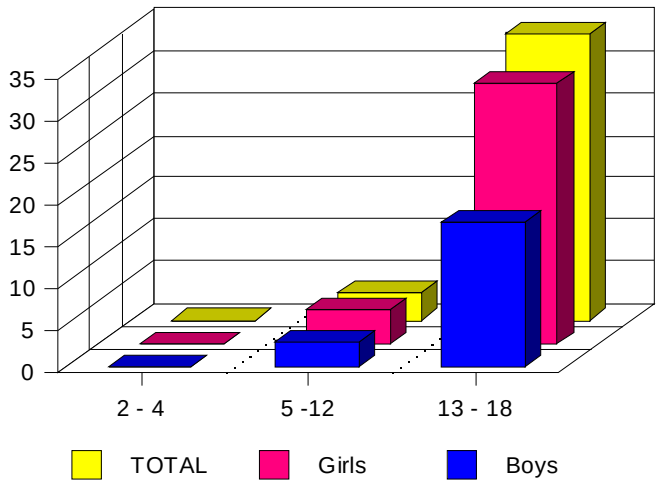
Table 38

	2-4 age group			5-12 age group			13-18 age group		
Type	Boys	Girls	TOTAL	Boys	Girls	TOTAL	Boys	Girls	TOTAL
Phase I Cervical	17.9	35.3	26.0	32.0	44.4	38.2	41.5	53.6	47.6
Phase II Cervical	—	—	—	2.9	3.9	3.4	17.1	31.0	24.1
Phase I Lumbar	2.6	—	1.4	6.3	8.3	7.3	22.0	21.4	21.7
Phase II Lumbar	—	—	—	4.4	4.9	4.6	9.8	13.1	11.5
No Degeneration	35.9	35.3	35.6	45.1	36.1	40.6	23.2	6.0	14.5

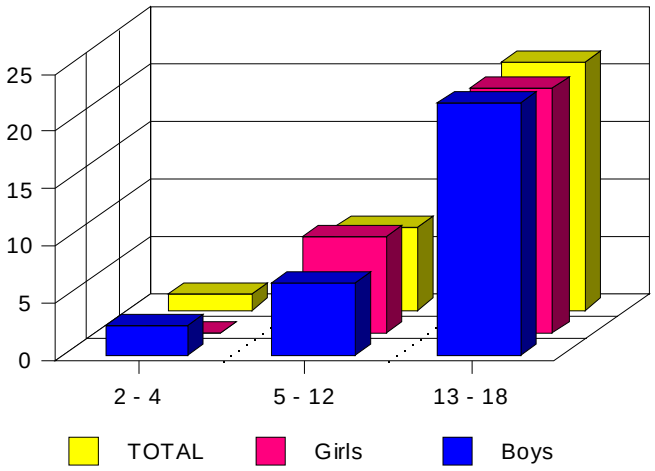
Incidence of Phase I Cervical Degeneration



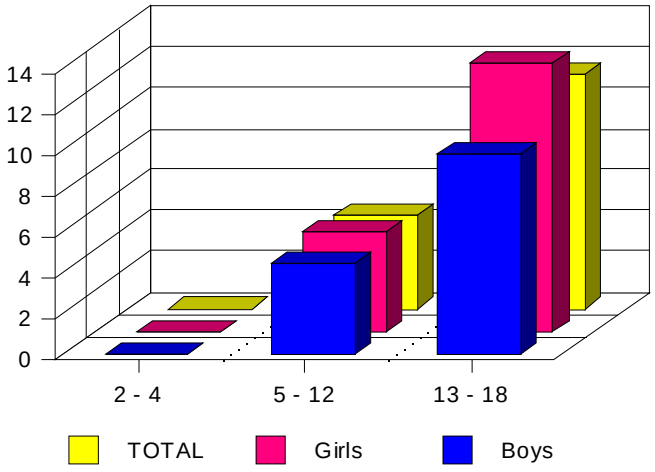
Incidence of Phase II Cervical Degeneration



Incidence of Phase I Lumbar Degeneration

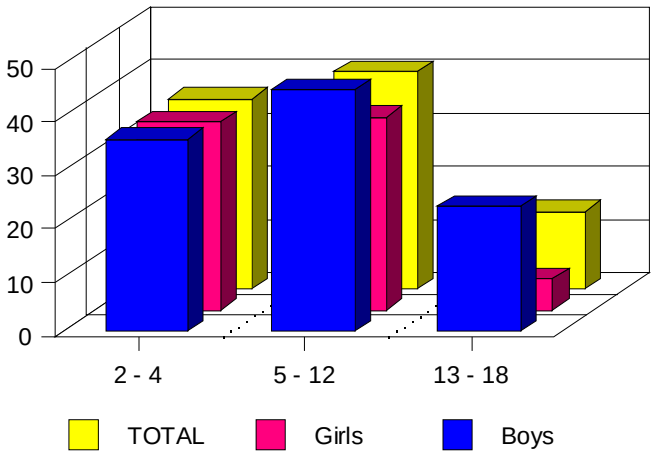


Incidence of Phase II Lumbar Degeneration



Incidence of Normal

No Degeneration



stimulus. These adaptive responses are remembered and patterned and thus the young nervous system is conditioned for future response.

This process of neurological "learning" or "programming" of the central nervous system with respect to locomotion, posture, proprioception, and body kinetics begins within a few short months after birth.[5,99]

As clinicians, our main course should be concerned with chronic "low-grade" efferents from the autonomic nervous system that result from and thereby not only disturb this neurological "learning" but also initiate "learned" and adaptive reflex kinesiopathology. It is then of paramount importance to eliminate any faulty programming as soon as possible.[99]

Specific corrective procedures designed to alter and change learned and adaptive kinesiopathological patterns, correct vertebral subluxations, restore normal articular function, reduce disc stress, and optimize neurological integrity should be instituted.

It is important for the clinician to resolutely strive to reach his goal - the aim being the correction of the PDSC, the vertebral subluxation, and the arrest and possible reversal of the degenerative process, not merely the achievement of temporary relief. The regimen of care should not be rushed, and patient care should not be based on symptomatology - recovery should be measured by objective findings.

Most of the children in our study sample have been placed on long-term schedules of corrective care, with very frequent initial contact - often daily. We have found that such an approach tends to change neural programming and learned patterning much faster and more completely than any other approach.[99,202,203]

This paper is the culmination of a five year effort and is intended to stimulate my fellow colleagues to re-evaluate their rationale for the care of children who cross their office thresholds, with the hope that with increased interest and enthusiasm they can give children the hope they so rightly deserve.

We are adamant in redefining the role we, as chiropractors, play in the health care of children. Too many times we have seen a family come under care of a chiropractor and the care of children is "thrown in", so to speak, as long as the parents are under care. We are obstinate when we state that children are not little adults - their physiology, metabolism, hormone, and neurodevelopmental interface is different than that of an adult. As a result, the approach we must take is one which encompasses an understanding of these fundamental differences as well as similarities.

Acknowledgments

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ORIGINAL RESEARCH

Long Term Assessment of Blood Indices and Immune Panel Profiling of Subjects Receiving Chiropractic Care: A Pilot Study

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ABSTRACT

Objective: A pilot study to evaluate the approach of monitoring immune status as a feasible means of assessing physiological health in longitudinal studies that seek to ascertain changes in patient health status under chiropractic care.

Methods: The study presents findings profiling blood indices and the immune status of 11 novice chiropractic subjects (7 males, 4 females) at baseline, with re-assessments at 3 months and 9 months duration. The New Zealand group was compared to several other non New Zealand healthy populations.

Results: Although significant changes occurred in blood indices and the immune profile in the present study group at 3 and 9 months re-assessments, the study values remained within the reference range for healthy adults. Significant positive correlations were seen for CD3% and CD8% at baseline and 3 months, suggesting a proportional increase or decrease over the range of values. It may be that the positive correlation is a reflection of the hosts' resistance to viral infection and destruction of virus infected cells. Negative correlations were observed for CD56% and CD20% and CD56% and CD3% at 3 months and 9 months. CD 56% was also negatively correlated with CD8% and CD4% at different sampling periods. The inverse relationship among these lymphocyte subpopulations may reflect a natural balancing or redistribution of the overall lymphocyte subpopulation as individual cell types respond to a variety of immune challenges. The subjects in this pilot study sustained physiological health from the standpoint of maintaining a panel of blood indices and lymphocyte markers within normal reference ranges throughout the 9 months period. Further, the subjects' blood indices and immune panels were comparable with population findings from other countries and ethnicities.

Conclusion: It is concluded that the approach of monitoring immune status is feasible as a means of assessing physiological health in longitudinal studies that seek to ascertain changes in patient health status.

Key Words: *Lymphocyte subpopulations, reference ranges, immune response, T lymphocytes, B lymphocytes, NK cells, CD4/CD8 ratio, chiropractic*

Introduction

This is the first of two papers investigating subjects, normal with respect to physiological and immunological indices, while receiving long term chiropractic care. This paper characterizes the immune panel of the 11 subjects completing the study, while the second paper reports on changes in the immune status in regard to the chiropractic care received.[1]

It is clear that a number of variables may affect immune status other than response to invading organisms. These variables are diverse and include such events as exercise, psychological stress, and several therapeutic modalities. As well, studies have shown that immune status is affected by age,[2,3] gender and race,[4,5] population,[6,7] mood,[8] smoking, quality of sample, and brand of monoclonal antibodies.[9] Others have found that age, ethnicity, smoking, and alcohol consumption[10] produce no statistically significant changes.

Murray et al.,[11] have shown a sharp rise in T suppressor/cytotoxic (CD8) and natural killer cells (CD56) as well as killer cell activity with moderate increases in T helper (CD4) and B cells (CD20) following strenuous exercise. These authors conclude that an increase in sympathetic activity might be responsible for the changes in immune cells as lymphoid tissue is richly

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innervated by sympathetic fibers. They state further, since T suppressor/cytotoxic cells have the greatest density of beta 2 adrenergic receptors, this could account for the greater rise in T suppressor/cytotoxic cells.

From the standpoint of sympathetic effects, a number of studies have looked at immune status in response to psychological stress. In that regard, while strenuous exercise enhances NK cell activity and elevates suppressor/cytotoxic cells, strenuous exercise under stress conditions, such as heat, lowers levels of NK killer cell activity.[12-14] As well, Manuck et al.,[15] showed a marked increase in CD8 lymphocytes in high reactors (measured though cardiovascular and catecholamine responses) to a modified Stroop color-word interference test and a mental arithmetic test compared to no change for low reactors. Both groups, however, had similar decrease in CD4 cells. Naliboff et al.,[16] using mental arithmetic as psychological stress with age as a factor divided females into a 21-41 and 65-85 age group. Younger subjects exhibited an increase in NK cell activity, numbers of circulating CD8 suppressor/cytotoxic T cells and NK lymphocytes, while older subjects showed no stress related NK activity. Older subjects, however, did experience increases in CD8 cells and NK lymphocytes, as did the younger subjects.

Brosschot et al.,[17] studied self-reported life stress to a brief mild interpersonal stressor (solve a 3-dimensional puzzle, not knowing it had no solution). Male teachers, 24-55 years old were assessed for CD8, CD4, NK, and B cells. Blood was drawn after a preliminary 30-minute rest session and 12 minutes after the test. The number of NK cells and CD8 cells appeared to increase, while the CD 4 level decreased.

Alternatively, Diego et al.,[18] showed an increase in NK cell number (CD56) and CD56+CD3- in HIV positive adolescents after receiving massage therapy twice weekly for 12 weeks. This group was matched with a similar group receiving relaxation therapy which showed no changes. The massage therapy group also showed an increased CD4/CD8 ratio and increase in CD4 cell number.

A similar study by Ironson et al.,[19] was conducted on 29 men, 20 HIV+ and 9 HIV-. A subset of 11 of the HIV+ men received a month of massage therapy and a month without therapy for comparison with the HIV- men who also received massage therapy for one month. Following the month of massage therapy, significant increases were observed in NK cell number, NK cell activity, soluble CD8, and CD8 cells. There were also significant decreases in cortisol and anxiety perception with an increase in relaxation, all of which were significantly correlated with increases in NK cell number.

Allen,[20] in a literature review, cited a number of earlier studies suggesting that the nervous system plays a role in the modulation of immune response. He concludes that there is a need for clinical trials to measure short and long terms effects of specific chiropractic care on immune status. He further concludes that these should include a broad range of parameters of immune competence accompanied by assessments of the clinical significance of the parameters.

Prior to consideration of clinical trials, the present pilot study seeks to assess the variability (range of normal) of the immune system while long-term care is being provided. This is viewed as important in light of the wide range of values for immune markers characteristically observed in healthy individuals. In agreement with Allen, this should be done to avoid possible error in assigning significance to immune responses that are actually within normal ranges.

Objective of the Present Study

This paper reports the physiological status (blood indices) and the immune profile of the subjects prior to and during a 9 months period of chiropractic care. A second objective of the present study was to draw initial comparisons of blood indices and standard lymphocyte markers with other non New Zealand populations.

Methods

Study Design and Measurements

The subjects were all receiving chiropractic care for the first time. Each patient was cared for according to standard clinic procedures at the New Zealand College of Chiropractic Health Center, in Auckland.[21] Human consent was obtained from each patient, and the study was reviewed by the Ethics Committee of the Auckland University of Technology. Student interns, supervised by duly registered professional chiropractic clinical staff members, provided chiropractic care.

Subjects were introduced to care through an initial chiropractic physical examination and placed on a plan of care unique to their initial chiropractic findings. Generally, throughout the study period, subjects visited the clinic 2-3 times per week during the first few weeks, increasing to monthly thereafter. During visits, patients were evaluated for the presence of vertebral subluxation [22] and received chiropractic adjustments when indicated. Subjects were formally reassessed at intervals of 3 and 9 months after the initial visit (baseline). At baseline, and at each formal reassessment, subjects were asked to complete a questionnaire designed to determine if they might be immune compromised.

Additionally, at baseline and at each formal reassessment, a qualified laboratory technician at Auckland Hospital drew peripheral blood samples. Laboratory tests included a complete blood count and immune panel of lymphocyte populations (lymphocyte markers) including: T cells (CD3, CD3%), T helper/inducer cells (CD4, CD4%), T suppressor/cytotoxic cells (CD8, CD8%), B cells (CD20, CD20%), NK cells (CD56,CD56%), and CD4/CD8 ratio. Complete blood count indices included hemoglobin (Hb), hematocrit (Hct), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), red cell distribution width (RDW), red cell count (RBC), red cell morphology, platelet count, white cell count (WBC), differential count for segmented neutrophils, basophils, eosinophils, monocytes, lymphocytes, and blood film for white blood cell morphology. Subjects' indices, including lymphocyte cell markers were determined by standard laboratory methods (flow cytometry for lymphocyte cell markers) and compared to established reference values used by Auckland Hospital.

Subjects

The pilot study, conducted between 4/November/99 and 13/December/00 (13 months), was initially comprised of 8 males and 8 females. Of the 16 subjects, data reported in this study is

Table 1. Present Study Demographic and Peripheral Blood Indices Compared to a Non-New Zealand Population

	Assessment Intervals				
	Baseline	**3 Months Duration**	**9 Months Duration**	**Reference Values**	**Comparison* Population**
Demographics					
Number of Subjects	(N=11)	(N=11)	(N=11)		(N=107)
Gender (M/F)	7/4				13/94
Age (years)**	22-52 (26)				15-75 (53)
Mean ± SD	29.5 ± 9.0				
Males (age)	22-52 (26)				
	29.6 ± 10.2				
Females (age)	22-36 (29.5)				
	29.3 ± 7.8				
Blood Index					
Hemoglobin	14.5 ± 13.1	14.4 ± 15.3	14.4 ± 14.1	11.5 - 16.5	13.0± 1.14
Platelet Count	270.0 ± 86.1	273.9 ± 64.1	273.3 ± 51.8	150 - 400	213.0 ± 48.0
WBC	6.6 ± 1.4	6.1 ± 1.0	6.2 ± 1.4	4.0 - 11.0	4.3 ± 7.0
Neutrophils	3.8 ± 1.1	3.2 ± 0.7	3.6 ± 1.0	2.0 - 7.5	2.1 ± 2.0
Total Lymphocytes	2.1 ± 0.6	2.0 ± 1.4	2.0 ± 0.7	1.5 - 4.0	1.8 ± 6.0

* Healthy adult population (Hove et al. Cytometry 1997 Jul 1; 28(3): 220-7). ** Age ranges are shown with the median in parentheses.

representative of 11 (7 males and 4 females) subjects that completed the duration of the study. The average age of the group was 29.5 ± 9.0 (range 22-52 yrs, median of 26). By gender, the age for males was 29.5 ± 10.2 (range 22-52 yrs, median 26 yrs) and 29.3 ± 7.8 (range 22-36, median 29.5 yrs) for the females. Not all subjects commenced the study at the same time, thus their respective baseline and reassessment values encompassed nine months each, but were staggered over the 13 months time frame.

Statistical Treatment of Data

Blood Indices and Lymphocyte Markers

Although the blood indices and immune lymphocyte markers were shown to be parametric, in addition to Pearson correlation coefficients and independent t-tests, the data for baseline and the two follow-up reassessments were compared by the Wilcoxon Signed Ranks test, which does not require an assumption of normal distribution, and tests for two-tailed significance among ranked pairs $P<0.05$.

To assess the clinical significance of changes in either the blood indices or lymphocyte markers mean values, the method of Cohen [23] was used to determine the effect size (mean 2 – mean 1/standard deviation of mean 1). By this method, 0.20 is considered a small clinical effect, 0.50 is considered moderate and 0.80 or greater is considered a large clinical effect.

Results

Population Demographics and Blood Indices

The eleven subjects (New Zealand) who were profiled according to gender, age and certain blood indices were compared to a healthy non-New Zealand population to ascertain the similarity of blood indices (Table 1). The comparison population

Table 2. Significant Differences in Blood Indices Across Time in Novice Chiropractic Patients

	Assessment Intervals			
	Baseline	**3 Months Duration**	**9 Months Duration**	**Reference Range**
Blood Index *				
Hemoglobin	14.8 ±1.41	14.3 ±1.56	14.4 ±1.41	11.5 -16.5
Baseline/3 Months		(p =0.00)**		
Baseline/9 Months			(p =0.00)	
Hematocrit	45.6 ±4.25	43.6 ±4.48	42.9 ±3.56	*36 - 47*
Baseline/9Months			(p =0.01)	
Mean Corpuscular Hemaglobin	29.6 ±1.40	29.1 ±1.44	29.7 ±1.15	*27 - 32*
3Months/9Months			(p =0.04)	
Red Cell Distribution Width	13.5 ±0.52	13.4 ±1.26	12.4 ±0.61	*11.5 -13.5*
Baseline/9Months			(p =0.00)	
3Months/9Months		(p =0.01)		
Basophils	10.0 ±3.30	8.0 ±4.03	6.0 ±1.43	*2 - 10*
Baseline/9Months			(p =0.01)	

* Hemoglobin (Hg) [g/100ml], Hematocrit (Hct) [cL/L], Mean Corpuscular Hemoglobin (Mcv) [Hg/RBC], Red Cell Distribution Width (RDW) [pulse/unit volume].

** All p values represent significant difference from Baseline using a two tailed repeated measures Student's T- test and Wilcoxon Signed Ranks test.

was distributed as 13 males and 94 females with an older age range of 15-75 yrs and a median of 53 yrs.

The New Zealand population revealed higher values for Hb, platelet count, WBC, total lymphocytes and percentage of neutrophils compared to the non-New Zealand population. However, both populations fell within normal reference ranges.

Complete Blood Count

Red Blood Cells

Significant differences in certain blood indices for subjects in the present pilot study are shown in Table 2. Hemoglobin values were significantly decreased at both the 3 month (14.3 ± 1.56, p = 0.00) and 9 month (14.4 ± 1.41, p = 0.00) reassessment periods when compared with the baseline value (14.8 ± 1.41). Hematocrit values also decreased in the group from baseline (45.6 ± 0.04) to 3 months (43.6 ± 0.04), becoming significant by 9 months duration of care (42.0 ± 0.03, p = 0.01). As well, mean corpuscular volume decreased from baseline to 3 months (29.6 ± 1.40, 29.1 ± 1.44) but reversed by 9 months of care elevating significantly to 29.7 ± 1.15, p = 0.04. Red cell distribution width remained constant from baseline to 3 months duration (13.5 ± 0.52, 13.4 ± 1.26, respectively) but dropped significantly lower than baseline and the 3 months reassessment value to 12.4 ± 0.61 at 9 months duration of care (p= 0.00 and 0.01, repectively). Although significant changes occurred in the group, all values remained within the reference ranges.

Table 3. Range of Absolute Values* and Percentages for Certain Lymphocyte Cell Markers Contrasted to Reference Range Values**

	Sample Interval		
	Baseline	**3 Months Duration**	**9 Months Duration**
Cell Marker			
CD3	620-2528	809-3158	839-2203
Median	1490	1582	1498
CD3%	57-82	57-88	57-81
Median	72	75	74
Reference Range	780-2600		
CD4	441-1327	454-1993	503-1387
Median	887	936	938
CD4%	25-53	28-53	39-57
Median	47	45	47
Reference Range	500-1650		
CD8	168-1474	209-1193	250-882
Median	446	512	478
CD8%	16-42	15-38	16-35
Median	22	25	23
Reference Range	210-1200		
CD20	84-474	125-414	155-370
Median	247	246	271
CD20%	7-18	7-17	9-16
Median	12	12	13
Reference Range	80-600		
CD56	22-393	20-454	76-317
Median	215	177	181
CD56%	1-26	1-32	3-12
Median	12	10	8
Reference Range	40-500		
CD4:CD8 Ratio	0.6-3.1	0.7-3.3	1.4-2.9
Median	2.4	1.8	2.0
Reference Range	1.5-3.0		

**Absolute values for subjects and reference ranges (Auckland Hospital) are expressed as cells/microliter. Percentages are a ratio of the cell type to the total lymphocyte cell count.

Table 4. Absolute and Percentage Values* for Certain Lymphocyte Cell Markers in Novice Chiropractic Patients over Nine Months of Care

	Assessment Intervals		
	Baseline	**3 Months Duration**	**9 Months Duration**
Cell Marker			
CD3	1513 ± 595	1482 ± 647	1514 ± 444
Reference Range	780-2600		
CD3 %	73.3 ± 8.7	73.8 ± 7.2	73.8 ± 7.15
CD4	943 ± 299	940 ± 397	938 ± 256
Reference Range	500 -1650		
CD4 %	46.2 ± 6.1	46.9 ± 6.1	47.5 ± 5.7
CD8	509 ± 293	485 ± 260	478.4 ± 169.1
Reference Range	210-1200		
CD8%	23.4 ± 7.7	24.9 ± 6.7	23.2 ± 5.0
CD20	267 ± 126	248 ± 97	271 ± 56.2
Reference Range	80-600		
CD20 %	12.3 ± 3.1	12.3 ± 2.4	12.7 ± 1.9
CD56	178 ± 85	181 ± 96.4	181 ± 68.7
Reference Range	40-500		
CD56%	10.1 ± 7.3	10.6 ± 8.8	8.4 ± 2.6
CD4:CD8 Ratio	2.1 ± 0.7	2.1 ± 0.7	2.1 ± 0.4
Reference Range	1.5-3.0		

*Absolute values for subjects and reference ranges (Auckland Hospital) for healthy adults are expressed as cells/microliter. Percentages are a ratio of the cell type to the total lymphocyte cell count. Reference ranges for % values were not available for Auckland Hospital.

White blood cells

In regard to white blood cells, the number of basophils in the study group decreased from 10.0 ± 0.03 at baseline to a 3 months reassessment value of 8.0 ± 0.04. The 9 months basophils value for the study group (6.0 ± 0.01, p = 0.01) also decreased significantly from baseline. White blood cell indices reported as decreasing or increasing significantly nevertheless remained within the normal reference ranges.

Immune Status

Prior to subjects' peripheral blood draw, a questionnaire was administered to assist in determining if there were indications of immune compromise (Figure 1). There were no reports of any negative event or other factor(s) that would indicate a state of immune compromise.

Lymphocyte Markers

Table 3 shows the range of lymphocyte cell markers in the study population in relationship to the Auckland Hospital Clinical Laboratory reference values. Reference values were only provided for absolute cell marker counts, as the laboratory did not report reference values for percentage of total lymphocytes.

Cell Markers were generally within their respective reference range for absolute numbers. In regard to specific cell markers, values that were outside of the reference range reflected either a single subject or two (not always the same individual) within the group. That is, the CD3 reflected a value range of 620-2528 (reference range 780 – 2600). The value of 620 reflected a single subject as the remaining 10 subjects were within the reference range.

Although considerable variation occurred between assessment intervals, the study group exhibited mean cell marker values that all fell within the reference range for absolute values established by Auckland Hospital (Table 4).

A comparison of reference ranges for absolute cell markers values and percentage values from different populations is shown in Table 5. This information was provided in the absence of cell marker percentage reference values from Auckland Hospital. Populations as diverse as Italian, Kuwaiti, Caucasian, African-American, Hispanic Ethiopian, and Dutch are represented.

Mean cell marker percentages in the present study fell within or were close to the reference ranges for the wide diversity of populations of healthy adults described in Tables 5 and 6. The one or two individual absolute CD values in the present study (Table 3) that appeared either high or low for CD56 and CD3 were also out of reference range for the diversity of healthy adults populations shown in Table 5. The low absolute value for CD3 in the present study (Table 3, baseline), while out of range by Auckland Hospital reference values, would have been within normal limits for the Italian population represented in Table 5. As well, the low value for CD20 relative to the New Zealand range would have been in range for the Ethiopian and Dutch populations (Table 5). These authors were unable to find CD20% reference values in the literature for comparative purposes.

The 11 subjects in the present study, taken as a group, are compared to other populations in Table 6. Using available data for non New Zealand study populations, the New Zealand group was relatively consistent with regard to being higher, lower, or about equal in regard to the respective lymphocyte subpopulations. That is, the present study group was approximately the same with regard to CD3, CD3% (Italian and Saudi), and CD56% (Saudi) study populations. In regard to other populations, higher values for the present study group were seen for CD4 compared to Saudi and Ethiopian, CD4% compared to Saudi and Iranian, CD20 compared to Ethiopian and Greek, CD20% compared to Italian, CD4/CD8 ratio compared to Saudi and Ethiopian. Lower values for the present study group were seen for CD8 compared to Saudi, Ethiopian, CD8% compared

Table 5. Reference Ranges for Absolute and Percent Values* for Certain Lymphocyte Cell Markers in Healthy Adults from Different Populations

	Range[A] (Present Study)[1]	Other Population Ranges[B-D]		
Cell Marker	A	B	C	D
CD3	780 -2600	605 -2460[2]	830 -2710[3]	
CD3%	-	60 - 87[2]	64 - 85[3]	54 - 88[5]
				40 - 80[6]
CD4	500 -1650	493 -1666[2]	450 -1650[3]	522 -1594[4]
		259 -1919[5]	237 -1660[6]	
CD4%	-	32 - 61[2]	34 - 54[3]	32 - 59[4]
				33 - 60[5]
				28 - 55[6]
CD8	210 -1200	224 -1112[2]	290 -1170[3]	135 -1047[4]
CD8%	-	14 - 43[2]	20 - 42[3]	15 - 36[4]
				9 - 39[5]
				11 - 43[6]
CD20	80 - 600	51 -419[7]	110 -670[7]	
CD20%	-			
CD56	40 - 500		60 -580[3]	
CD56%	-		4 - 22[3]	
CD4:CD8 Ratio	1.5 - 3.0		0.8 -4.5[5]	0.7 -3.11[4]
			0.7 -3.20[6]	

* Values standardized to cells/microliter, % = ratio of cell type to total lymphocyte count.

1. Reference values from Auckland Hospital, Auckland, New Zealand
2. Santagostino, et.al., Haematologica (Italian population) 1999; 84:499-504
3. Kabba et al., Kuwait University, (Kuwait population) kaaba@hsc.kuniv.edu.kw
4. UTMB Lab Survival Guide.(mixture of races) utmb.edu/lsg/labsurvival guide/hem/cd4%20.html.
5. Howard et al. Clinical Cytometry; 1996 26:231-232 (Caucasian, Afro-American, Hispanic populations pooled).
6. Howard et al. Clinical Cytometry; 1996 26:231-232 (Asian population).
7. Tsegaye, et al., Ethiopian and Dutch populations. Clinical and Diagnostic Laboratory Immunology, May 1999; 6(3): 410-414.

to Italian and Iranian, CD56 compared to Saudi and Ethiopian, CD56% compared to an Iranian population.

In all instances, however, the lymphocyte marker percentages were in similar proportions. That is, in the group represented in the present study as well as the other populations represented in Table 6, lymphocyte subsets as a percent of total lymphocytes generally reflect similar proportions for CD3 (70.9% - 73.7%), CD4 (39.4% - 44.4%), CD8 (23.4% - 28.4%), with CD20 (8.5% - 12.4%), and CD56 (11.5% - 15.8%) being similarly matched. The ration for CD4/CD8 did vary from population to population ranging from the present study group of 2.1 to a low of 1.2 for the Ethiopian population.

Though the present pilot study was limited to 11 subjects, a gender comparison (Table 7) revealed that the 4 females had higher values than males over the three assessment intervals for CD3, CD3%, CD4, CD4%, CD8, and CD8%. Values for CD20, CD20%, and CD4/CD8 ratios were essentially the same for the 7 males and 4 females. Males exhibited higher values for CD56 absolute and CD56% at all 3 assessment periods. There were no significant differences, however, with the exception of an increase in the CD4% between baseline and 9 months assessment among the females (48.3 ± 3.6 to 50.3 ± 4.3, $P = 0.016$).

As well, when males and females in the present study group were compared to males and females in Iranian and Ethiopian populations (Table 7), present study males and females expressed higher CD4, CD20 than males and females in the Ethiopian population, but lower CD8 and CD56 levels. Compared to the Iranian study population genders, the present study group males and females expressed higher CD4% and CD4/CD8 ratios, but lower CD8% levels.

Table 6. Comparative Values* for Certain Lymphocyte Cell Markers in Adults in the Present Study and Other Healthy Populations

	Present Study [A]	Other Populations [B,C]	
Cell Marker	A	B	C
CD3	1539.1 ± 533.6	1532.9 ± 463.4[1]	1564 ± 485.0[2]
CD3 %	70.9 ± 8.0	73.7 ± 6.7[1]	72.9 ± 7.7[2]
CD4	937.3 ± 263.3	775.0 ± 225.0[3]	869.0 ± 310.0[2]
CD4 %	44.4 ± 7.5	42.1 ± 6.9[4]	39.4 ± 7.9[2]
CD8	539.4 ± 351.4	615.0 ± 278.0[1]	747.0 ± 333.0[3]
CD8%	23.4 ± 7.7	27.6 ± 7.5[1]	28.4 ± 8.5[4]
CD20	267.1 ± 118.5	191.0 ± 94.0.0[5]	230 ± 130.0[3]
CD20 %	12.4 ± 3.2	8.5 ± 3.0[6]	
CD56	214. 8 ± 101.2	262.0 ± 278.0[2]	250.0 ± 137.0[3]
CD56%	11.5 ± 6.7	11.7 ± 5.9[2]	15.8 ± 6.9[4]
CD4/CD8 Ratio	2.1 ± 0.7	1.6 ± 0.7[2]	1.2 ± 0.5[3]

*Values are expressed as cells/microliter. Percentages are a ratio of the cell type to the total lymphocyte count. Present Study (New Zealand population).

[1] Santagostino, et al., Italian population. Haematologica 1999; 84:499-504

[2] Abdulla, et al., Saudi population. Clinical and Diagnostic Laboratory Immunology, March 2002, 9 (2): 279-281.

[3] Tsegaye, et al., Ethiopian population. Clinical and Diagnostic Laboratory Immunology, May 1999; 6(3): 410-414.

[4] Shahghasempour et al., Iranian population. Pearl.sums.ac.ir/aim/0142.html

[5] Androtti, et al., Greek population. Haema 2003; 6(1): 54-60.

[6] Ferrari, et al., Italian population. Oncology Reports 2002; 9: 107-1113.

CD Marker Correlations

Table 8 shows Pearson correlation coefficients (r) that were significant at $p<0.05$ for lymphocyte markers as percents of the total lymphocyte count. As can be seen, positive and/or negative correlations were expressed between lymphocyte subpopulations both at the same and different assessment periods. That is, CD3% at baseline was positively correlated to CD8% at baseline ($r = 0.624$, $p = .040$) as well as both showing positive correlation at the 3 months assessment period ($r = 0.679$, $p = .022$). Moreover, CD3% at baseline was also positively correlated to CD8% at the 3months assessment period ($r = 0.630$, $p = .038$) and CD3% at the 3 months assessment period showed positive correlation to CD8% at the 9 months assessment period ($r = 0.654$, $p = .029$). In a complementary fashion, CD8% at baseline was positively correlated to CD3% at the 3 months assessment period ($r = 0.662$, $p = 0.027$) and CD8% at the 3 months assessment period showed a positive correlation with CD3% at the 9 months assessment period ($r = 0.614$, $p = 0.044$).

CD3% at baseline also showed a negative correlation to CD56% at the 3 months assessment period ($r = 0.864$, $p = .001$) while CD3% and CD56% were also negatively correlated at the 3 months assessment period ($r = -0.857$, $p = .001$) and the 9 months assessment period ($r = -0.737$, $p = .010$). CD 56% at baseline was also negatively correlated to CD8% at the 3 months assessment period($r = -0.647$, $p = .043$). CD4% at baseline showed a negative correlation to CD56% at the 3 months assessment period, while CD20 showed negative correlation with CD56% at baseline ($r = -0.672$, $p = .033$), 3 months assessment period ($r = -0.651$, $p = .030$), and at the 9 months assessment period ($r = -0.778$, $p = .039$).

Discussion

Blood Indices

Comparing blood indices, including lymphocyte subpopulations, over the course of the present study, served as one monitor of the physiological health of the eleven subjects. While the Auckland Hospital laboratory provided reference values for healthy adults, it is well known that values vary among populations for many indices. Thus, to characterize the study population globally, several comparisons with other populations were also made.

Relative to the complete blood count, the present population, when compared with another population of non-New Zealanders revealed higher values for hemoglobin, platelet count, white blood cell count, and total lymphocytes. These values were all within reference levels for healthy adults and do not have clinical significance. Rather, it is more likely that diet, and environmental factors may account for the geographical differences.

In regard to the indices of the complete blood count in the present study, the eleven subjects exhibited a significant decrease in hemoglobin between baseline, the 3 months and the 9 months re-assessment periods. Although the decrease was nu-

merically small, dropping by a mean percent of 3.3, it was consistent as the standard deviations were also quite small reflecting consistency among the subjects. However, the hemoglobin levels at baseline and 3 and 9 months were well within the reference range for healthy adults, and the clinical effects (effect size) were small (0.35, and 0.28).

As well, the hematocrit, mean corpuscular hemoglobin, red cell distribution width, and percentage of basophils also decreased at 3 months compared to baseline. None of these decreases were statistically significant and the clinical effect remained small with the exception of the decrease in basophils that expressed a small to moderate clinical effect, being 0.47, 0.35, 0.19 and 0.60 respectively. All values, however, remained within the reference values for healthy adults.

The Hematocrit, red cell distribution width, and number of basophils continued to decrease at the 9 months reassessment period being significantly lower than baseline values, but still within reference levels for healthy adults. The clinical effect, however, was large for red cell distribution width (2.11, where 0.80 is a large clinical effect), and decrease in basophils (1.21), and moderate for Hct (0.60). The 9 months level for mean corpuscular hemoglobin increased significantly from the 3 months level to slightly higher than the baseline value, expressing a small clinical effect (0.41) while red cell distribution width was significantly lower than the 3 month value resulting in a large clinical effect (0.80). The increase in mean corpuscular hemoglobin and decrease in red cell distribution width, however, were still within the reference values for healthy adults.

In evaluating the overall significance of these changes, clinical effect as well as statistical differences were considered. In that regard, the 3 month decrease in hemoglobin would not be considered clinically significant by virtue of the small clinical effect and the fact that it was still within normal limits, even though it was consistently found among the eleven subjects. The same would apply to the small decreases in hematocrit, red cell distribution width and number of basophils as these were not statistically significant and having only a small clinical effect. The moderate clinical effect associated with the decrease in basophils, compared to its borderline high count at baseline, suggests that the decrease might have been related to the season during which the values were obtained. The samples were collected in mid-November, which would be late spring/early summer in New Zealand. Since Basophils have been associated with allergic reactions [24] it may be that the population was experiencing normal seasonal adaptation to heavy pollen drifts. This is born out by the continued significant decrease at 9 months compared to the baseline value.

The significant decreases in hematocrit and red cell distribution width at 9 months compared to baseline would likely be dismissed as being physiologically insignificant. The large clinical effects are likely due to the consistency of the population's decrease (small standard deviation). While a low hematocrit is associated with anemia, and red cell distribution width is low

Table 7. Gender Differences for Lymphocyte Cell Markers and Comparison to Available Cell Marker Data from other Populations

	Cell Markers					
	CD3	**CD3%**	**CD4**	**CD4%**	**CD8**	**CD8%**
Males						
Baseline	1398 ± 623	70.1 ± 9.2	878 ± 332	45.0 ± 7.2	459 ± 290	22.2 ± 6.2
3 months	1325 ± 397	70.6 ± 9.2	852 ± 228	45.7 ± 6.6	414 ± 182	22.0 ± 6.8
9 months	1459 ± 474	71.6 ± 7.9	885 ± 266	45.9 ± 6.1	452 ± 216	22.4 ± 6.5
Females						
Baseline	1713 ± 564	76.2 ± 5.3	1057 ± 225	48.3 ± 3.6*	596 ± 319	25.5 ± 7.3
3 months	1757 ± 962	78.3 ± 5.6	1096 ± 609	49.0 ± 5.2	609 ± 358	26.8 ± 7.6
9 months	1610 ± 434	77.8 ± 3.6	1031 ± 244	50.3 ± 4.3	523 ± 211	24.8 ± 5.9
Comparison Populations						
Males	1564 ± 485[2]	69.9 ± 6.3[1]	753 ± 227[2]	40.4 ± 6.9[1]	777 ± 362[2]	28.4 ± 8.3[1]
Females	1539 ± 423[2]	71.5 ± 6.3[1]	816 ± 218[2]	44.2 ± 6.4[1]	692 ± 269[2]	28.4 ± 8.9[1]
	CD20	**CD20%**	**CD56**	**CD56%**	**CD4/CD8 Ratio**	
Males						
Baseline	267 ± 145	12.5 ± 2.9	192 ± 85	11.5 ± 8.0	2.2 ± 0.7	
3 months	236 ± 83	12.5 ± 2.2	212 ± 127	12.9 ± 9.8	2.3 ± 0.7	
9 months	270 ± 70	12.8 ± 0.9	184 ± 77	8.8 ± 3.0	2.1 ± 0.3	
Females						
Baseline	266 ± 106	12.0 ± 4.0	154 ± 91	7.8 ± 6.2	2.0 ± 0.7	
3 months	269 ± 130	12.2 ± 3.2	128 ± 83	6.8 ± 5.9	2.0 ± 0.7	
9 months	272 ± 22	12.6 ± 2.9	175 ± 62	7.7 ± 1.8	2.1 ± 0.7	
Comparison Populations						
Males	186 ± 96[2]	9.0 ± 3.5[2]	277 ± 143[2]	11.7 ± 5.9[3]	1.6 ± 0.5[1]	
Females	203 ± 91[2]	12.8 ± 5.7[2]	258 ± 153[2]	14.7 ± 5.9[1]	1.7 ± 0.7[1]	

1. Shahghasempour et al., Iranian population. http://Pearl.sums.ac.ir/aim/0142/shahghasem0142.html.

2. Tsegaye et al., Ethiopian population. Clinical and Diagnositc Laboratory Immunology. May 1999; 6(3): 410-414.

3. Al Qouzi, et al., Saudi population. Clinical and Diagnostic Laboratory Immunology. March 2002; 9(2): 279-281.

* CD4% baseline interval vs 9 months, two tailed repeated sample (t-test), p = 0.016.

Table 8. Correlation Between CD Cell Markers over Three Assessment Periods in Novice Chiropractic Patients

	Assessment Interval			
	Baseline	3 Months Duration	9 Months Duration	Correlation Coefficient(r)
Positive Correlations				r *P**
1.	CD3% -CD8%			0.624(.040)
2.		CD3% - CD8%		0.679(.022)
3.	CD3%	CD8%		0.630(.038)
4.	CD8%	CD3%		0.662(.027)
5.		CD3%	CD8%	0.654(.029)
6.		CD8%	CD3%	0.614(.044)
Negative Correlations				
1.	CD3%	CD56%		-0.864(.001)
2.		CD3% -CD56%		-0.857(.001)
3.			CD3% - CD56%	-0.737(.010)
4.	CD56%	CD8%		-0.647(.043)
5.	CD4%	CD56%		-0.632(.037)
6.	CD20% - CD56%			-0.672(.033)
7.		CD20% -CD56%		-0.651(.030)
8.			CD20% -CD8%	-0.778(.039)

* Numbers in parentheses indicate p values for significant r coefficients.

in cases of macro or microcytic anemia, there were no other indications among the red blood cell indices that suggested anemia, nor were any abnormal morphology reports associated with the subjects. This is further supported by the fact that the hematocrit is normally three times the value of hemoglobin, which was the finding in this study. It is most likely, therefore, that the variations occurring were consistent within the population, thus rendering a large clinical effect, but not physiologically significant as borne out by the other blood indices.

Characterization of Immune Profile

In conditions that compromise the immune system it is clinically useful and important to assess patient progress or recovery. This is often done by monitoring changes in lymphocyte sub-populations such as T cells (CD3, CD3%), T helper/inducer cells (CD4, CD4%), T suppressor/cytotoxic cells (CD8, CD8%), B cells (CD20, CD20%), NK cells (CD56,CD56%), and the CD4/CD8 ratio.

That is, the establishment of reference values for healthy (non-diseased) adults is useful to signal potential problems with immune response if aberrant values appear. In the absence of aberrant values, attempts to describe or define a "healthy" immune system become more complex, as greater or lesser values do not necessarily reflect greater or lesser degrees of being "healthy." [25] This study points out the immense variation that can occur among circulating immune cells both within and between different adult, physiologically healthy populations.

This is in part explained by considering the body's natural and normal immune response to a number of variables such as exercise, psychological stress, allergens, seasonal shifts in viral populations (i.e., "flu") and other common infections. Since people encounter any number of these "stressors," the immune system responds accordingly. Changes occurring in the cells described above can vary greatly in a healthy human. Thus, on any given sampling, based on the "stressors" that have been encountered, a person could express a wide range for any of cell type involved in the normal immune response. For example, CD4 cells lead the attack on invading organisms and hence might be high at a time of initial infection, but drop off when CD8 suppressor cells have ended the immune response, consequently rising in number. Thus, in the absence of sure knowledge regarding a person's status relative to everyday stressors, presuming that a higher or lower number of these cells indicates a healthy or unhealthy immune system could likely be incorrect since these cells could readily fluctuate during the course of natural adaptation to "stressors." Published reference values provided by Auckland Hospital in New Zealand indicate that within normal limits CD3 and CD4 cells fluctuate by as much as 2.4 fold (244%), CD8 by 4.7 fold (471%), CD20 by 6.5 fold (650%), and CD56 by as much as 11.5 fold (1150%). Moreover, within that spectrum of fluctuation one individual may express a healthy immune system with lymphocyte marker levels far lower or higher than another individual with an equally healthy immune system. These authors consider it to be important that these concepts be considered when interpreting changes in immune profiles in healthy individuals.

This study has provided evidence that the wide range of lymphocyte markers found in the eleven subjects is typical of a population of healthy subjects. This is substantiated by a number of observations and comparisons. Assessments of the population in this study (for baseline, 3 and 9 months reassessment periods) fall within the reference range for physiologically healthy (non-diseased) adults.

In the present study, gender differences were apparent. This is also seen in other non-New Zealand study populations. Comparisons with these populations substantiate variations among humans. There are, however, some commonalities. For example, females and males in the New Zealand study group reported higher absolute CD4 and CD20 compared to a study population of Ethiopians. Moreover, in both populations, females had higher levels than males. As well, the proportion of CD markers is the same in all of the populations compared to the New

Zealand study group (Italian, pooled Caucasian, African-American, Hispanic, Kuwaiti, Iranian, Italian, Asian, Ethiopian and Dutch). That is, proportions descended from CD3 (highest), to CD4, CD8, with CD20 and CD56 being in the lowest proportion.

Thus, while considerable variations occur within and between populations, the relative proportions between the CD markers seem common. As well, gender differences may or may not be consistent from race to race or population to population within the same race. The range of "healthy" appears broadly described indicating that the consistency of reference values for non-diseased adults within any given population is the most definitive index of the health of that population.

Immune Response

It is clear that different health care approaches and modalities such as exercise, and "relaxation" approaches such as massage therapy appear to elicit an immune response. Studies described in the Introduction point out that CD4 and CD8 cells, and in some instances CD56 and CD20 cells increase in different proportions based on the study reported, while essentially the reverse is reported under psychological stress.

The majority of the studies mentioned above were conducted on adults presumed to be healthy (disease free), usually investigating an immediate or short-term immune response following a particular event. This investigation was consistent with that concept, but varied in regard to intent. The present study was designed to provide characterization of the immune status within a group, not as an immediate or short-term response to any particular event, but rather as a longitudinal profile over a period of time during which chiropractic care was a component of the group's lifestyle. In that regard, it has been shown that within the group followed over 9 months, the immune profile remained essentially constant and well within reference levels for healthy adults in New Zealand and to a large extent in comparison with a diversity of other non-New Zealand populations.

Inter-relationships between Lymphocyte subpopulations

Significant Positive Correlations

This study has also provided information regarding the interrelationship of immune cell levels that could be useful in future studies that attempt to understand the interactions of the lymphocyte markers in health and disease. In this regard, significant positive and negative correlations were shown for several of the lymphocyte sub-populations over the 9 months duration. All correlations were determined for absolute values expressed as a percent of the total lymphocyte count, as that expression is more stable or less noisy due to the wide ranges incurred with absolute values.

The positive correlation pattern between CD3% and CD8% suggests that these two cell types are strongly linked. There appears to be no change in the relationship between baseline and 3 months, as 3 months levels are also significantly correlated with their respective counterparts at baseline. However, the two are not directly correlated at 9 months, but find significant correlation with their respective counterparts at the 3 months reassessment period. The lack of significant correlation at the 9 month interval may be explained by the fact that among the 11 subjects, 7 did not exhibit changes of the same magnitude at 9 months compared to the levels at 3 months for CD3% whereas the CD8% values remained essentially the same. Thus, an overall shift downward in the group relative to CD3% occurred, though not to the point of statistical significance from the 3 months level, but sufficient to lose its significant correlation with CD8%.

Within this subject group, since the levels of each cell marker remained within reference limits, it is not likely that the changes have clinical significance, but do suggest a direct link between the levels of production between the two cell markers. CD3 and CD8 cells are both important in host resistance to viral infection and killing of cells infected with virus. It may be that the two cell types act synergistically, increasing or decreasing proportionally, even if they are distinct quantitatively.

Significant Negative Correlations

Significant negative correlations seen for CD20% and CD56%, CD3% and CD 20% were observed. While this pilot study cannot provide any specific substantiation, it may be that the inverse relationships between these cell markers reflect a natural balancing or redistribution of the overall lymphocyte subpopulation as individual cell types respond to a variety of immune challenges.

Although absolute values for any given subject varied considerably within the group, percent changes were generally fairly close (0% - 25%). Two subjects, however, expressed unusual spikes in activity at the 3 months sampling period compared to baseline. One subject exhibited spikes of 80% (CD4) returning to 25%, 79% (CD8) returning to 25%, 83% (CD20) returning to 8 % and 77% (CD3) returning to 23% at the 9 months sampling period. In this particular case, the blood draw was taken shortly before the subject commented on taking two weeks leave for not "feeling, quite right," even though there had been no report of any negative events on the subject's screening questionnaire. A second subject experienced a dramatic 800% increase in CD56 cell count. Interestingly, this subject had a low normal of 50 cells/microliter CD56 count at baseline where 40-500 represented the reference range. The blood draw for the 3 months sample followed shortly after this subject received an adjustment. Because of earlier reports of lymphocyte responses following an adjustment, care was generally taken to adjust the patient after their blood draw to avoid short-term effects. In this instant the results may be indicative of the individual's response to the adjustment, as has been previously reported.[26] The subject had returned to a cell count of 116/microliter at the 9 months sampling period. All other cell markers were stable.

The findings of this pilot study must be cautiously interpreted as the size of the subject population lacked statistical power, increasing the probability of a type I or type II error. As well, there was no complementary control group, although each subject could be viewed as their own control in this study design. In consideration of these factors, it is suggested that there is, nevertheless, substantial evidence that the population remained physiologically healthy over the 9 months duration of the study.

Summary and Conclusions

A pilot study was completed at the New Zealand College of Chiropractic in Auckland, New Zealand in 2000. The study followed 11 novice chiropractic subjects (7 males, 4 females) as

outpatients over the course of 9 months. A summary of the objectives of the study and conclusions are as follows:

To monitor physiological status through blood indices and the immune competence of subjects prior to and during a 9 months period while receiving chiropractic care.

To draw initial comparisons of blood indices and standard lymphocyte markers with other non-New Zealand populations.

Blood Indices Summary: The initial physiological status of the population was assessed through a complete blood count including Hb, Hct, MCH, MCV, RDW, RBC count, Platelet count, WBC count, differential count for neutrophils, lymphocytes, monocytes, eosinophils, basophils, and blood smear for morphology. Values for all of these parameters were within reference range for healthy adults at baseline and the two subsequent reassessment periods. Though likely to be physiologically and clinically insignificant (normal reference ranges and small effect sizes), a statistically significant decrease compared to baseline was seen for Hb at the 3 and 9 months reassessments, MCV at the 9 months reassessment, and number of basophils at the 9 months reassessment. RDW was also statistically decreased from baseline as well as the 3 months reassessment period, while Hct was increased at 9 months compared to the 3 months reassessment period. The decrease in basophils is attributed to possible decrease in allergic response to seasonal pollen counts as the baseline sample was collected in mid to late Spring, the 3 months value in Summer and the 9 months value in late Fall.

The present population, when compared with another population of non-New Zealanders revealed higher values for hemoglobin, platelet count, white blood cell count, and total lymphocytes. The values were all within reference levels and do not likely have any physiological significance. Rather, it is more likely that diet, and environmental factors account for the geographic differences as will be pointed out in the following section.

Conclusion(s): It was concluded by history and baseline blood indices that the subjects represented a healthy population exhibiting no clinically significant physiological changes detectable through the complete blood count.

Immune Status Summary: Specific immune cell markers (well established through clinical studies as representative indicators of immune competence) were monitored. These included T cells (CD3, CD3%), T helper/inducer cells (CD4, CD4%), T suppressor/cytotoxic cells (CD8, CD8%), B cells (CD20, CD20%), NK cells (CD56,CD56%), and CD4/CD8 ratio. Values for these parameters were monitored at baseline, 3 months and 9months after commencing chiropractic care. Findings indicated that:

Although fluctuations occurred, the study group of 11 subjects all remained within the reference range established by Auckland Hospital in New Zealand for each of the 3 sampling periods for all immune cell markers studied. Comparisons were made with other population studies from Ethiopia, Kuwait, India, Iran, Italy, Asia, Caucasian-American, Afro-American, Hispanic American pooled, Saudi, and Greece. While ranges and population means varied from population to population, the present study subjects were within reference ranges for all populations. Gender trends did vary by population with some common elements shared by all, but no uniform pattern was discerned. In the New Zealand study group females had higher CD3, CD3%, CD4, CD4%, CD8 and CD8% levels. Males and females reflected similar levels for CD20, CD20%, but were higher for CD56 and CD56% among the males. CD4/CD8 ratios were the same for females and males in the present study. It was further observed that in all populations studied the proportions of lymphocyte subsets as a percent of total lymphocytes were distributed as CD3 (70.9% - 73.7%), CD4 (39.4% - 44.4%), CD8 (23.4% - 28.4%), with CD20 (8.5% - 12.4%), and CD56 (11.5% - 15.8%) showing a similar range of percentages. CD4/CD8 ratios, however, did vary from population to population ranging from the present study group of 2.1 to a low of 1.2 for the Ethiopian population.

Significant positive and negative correlations between lymphocyte cell types revealed that CD3% and CD8% were positively correlated at baseline and 3months, suggesting a direct proportional production over the range of values found within the study group. These markers were also correlated indirectly from one sample period to the next, suggesting loss of level primarily with regard to CD3% at baseline. However, at all sampling periods the same positive correlation trend was observed. It may be that the positive correlation is tied to their immune functions of providing host resistance to viral infection and destruction of virus infected cells.

Negative correlations were found for CD56% and CD20% across all sample periods. As well, CD56% was negatively correlated with CD3% at 3 months and 9 months, but reciprocally correlated at baseline and 3 months. This appeared to be due to a reduction of CD3% at baseline and a lowering of CD56% at 3 months. CD56% was also negatively correlated to CD8% and CD4% at different sampling periods. It may be that the inverse relationships between CD56%, CD3%, CD4%, CD8% and CD20% reflect a natural balancing or redistribution of the overall lymphocyte subpopulation as individual cell types respond to a variety of immune challenges.

Conclusion(s): It is concluded that long term monitoring of blood indices and immune status is feasible, and suggested, for any study considering health care as an intervention or variable. Further, it is concluded that the present study group maintained a healthy immune profile throughout the duration of the study. This is based on no variations outside reference values for healthy New Zealand adults, an the consistency of the immune profile across time within the study group. Significant positive and negative correlations between cell markers signify normal interactions, likely associated with balancing the extent of response among cell types to a variety of immune challenges.

This pilot study has also provided some preliminary information regarding blood indices and the characterization of an immune profile that may be useful for comparisons to other non-New Zealand population studies regarding immune status. Limited numbers of subjects, however, preclude definitive conclusions. Larger studies that investigate the parameters presented herein will be necessary to verify the conclusions presented in this study.

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ORIGINAL RESEARCH

Physical, Physiological, and Immune Status Changes, Coupled with Self-Perceptions of Health and Quality of Life, in Subjects Receiving Chiropractic Care: A Pilot Study

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ABSTRACT

Objective: A pilot study to gather preliminary information regarding chiropractic care and possible links to immune status and improved aspects of health and quality of life.

Methods: The study followed 11 novice chiropractic subjects (7 males, 4 females) over a period of 9 months. Other than presenting with biomechanical complaints, the subjects represented a healthy population as determined by history, complete blood count, and immune status. Over a 9 months period, subjects received chiropractic adjustments when indicated. A self-reported quality of life questionnaire was completed by each subject following the initial visit (baseline), and at 3 and 9 months reassessment periods. At the same intervals, a complete blood count and an immune panel including absolute counts and percentages for CD3, CD4, CD8, CD20, CD56 and CD4/CD8 ratio were determined.

Results: Subjects demonstrated significant reductions in all chiropractic indicators at 3 months ($p = 0.00$) and 9 months ($p = 0.00$) compared to baseline. A positive change in Life Enjoyment occurred from 3 months to 9 months ($p = 0.026$), representing a large clinical effect (0.80). Significant negative correlations were also observed between motion palpation findings and CD56% and absolute CD56 count at baseline, suggesting a stress related link. Overall, The subjects appear to have maintained a healthy physiology. This conclusion is based on the complete blood count and immune profile throughout the duration of the study, as variations overall remained within reference values for healthy adults established by Auckland Hospital (New Zealand).

Conclusion: This pilot study has provided some preliminary information regarding chiropractic care and possible links to immune status and improved aspects of health and quality of life. Limited numbers of subjects, however, preclude definitive conclusions. Larger studies, including ill and healthy populations, to investigate the parameters presented herein and others such as killer cell activity will be necessary to test the conclusions presented.

Key words: *Chiropractic, immune status, motion palpation*

Introduction

The benefits of chiropractic care have been widely reported, especially among subjects that have been diagnosed with medical conditions.[1-10] There are also reports of patients experiencing health related quality of life changes.[11-17] While biomechanical explanations have been offered to account for physical improvements,[18] the health related quality of life changes require further exploration. The purpose of this study, therefore, is to study a physiological and immunological healthy population. The expectation is to gain insight into the physiology and immunology dynamic(s) that might contribute to self-perceptions of health and quality of life while receiving chiropractic care.

The Role of the Nervous System

Because of the close association of the nervous system and the immune system,[19,20] the relationship between chiropractic care and immune response has gained interest. Selano et al.,[21] followed five HIV positive individuals and five controls. After six months CD4 cells declined by 7.96% in the control group

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and increased by 48% in those receiving upper cervical adjustments. Fidelibus [22] suggested that spinal manipulation, by correcting spinal fixations, might eliminate adverse effects of somatosympathetic reflexes inhibitory to sympathetic innervations to lymphoid tissue, thus affecting the modulation of T lymphocytes. Brennan et al,[23] following the principle that phagocytes emit light during phagocytosis, demonstrated after a thoracic spine manipulation a short burst of light from polymorphonuclear neutrophils and monocytes that was greater than sham manipulations or soft tissue manipulation.

However, Brennan et al.,[24] found no clinical effect on either absolute numbers or percentages of B-lymphocytes, T-lymphocytes, T-helper, and T-suppressor NK lymphocytes following spinal manipulation of low back pain patients compared to controls receiving lectures on low back pain. This diversity of findings is understandable when considering that a number of variables may affect immune response, including: exercise and psychological stress,[25,26] age,[27,28] gender and race,[29,30] population,[31,32] mood,[33] smoking,[34] quality of sample,[34] and brand of monoclonal antibodies.[34] Others have found that chiropractic manipulation,[24] age, ethnicity, smoking, and alcohol consumption[35] produce no statistically significant changes.

Allen,[36] in a literature review concludes that there is a need for clinical trials to measure short and long term effects on immune status of specific chiropractic treatment and that these should include a broad range of parameters of immune competence. As well, he includes the concept of assessing whether the parameters measured are clinically significant.

These authors argue that, in addition to clinical trials, more long-term in-depth assessments are necessary regarding the immune status in healthy patients while receiving chiropractic care.

Methods

Study Design and Measurements

The subjects were all novice patients. Each patient was cared for according to standard clinic procedures at the New Zealand College of Chiropractic Health Center, in Auckland.[37] Human subject consent was obtained from each patient, and the Ethics Committee of the Auckland University of Technology reviewed the study. Student interns, supervised by duly registered professional chiropractic clinical staff members, provided chiropractic care.

Although clinically assessed at or near the end of each period of 12 visits, for this study, subjects were formally reassessed at 3 and 9 months after the initial visit (baseline). At these intervals, subjects were eligible for a blood draw if they answered in the negative to a questionnaire designed to determine if they might be immune compromised. Each participant was also asked to complete a Health Related Quality of Life (HRQL) questionnaire at the same intervals. Domains of the questionnaire included: Physical State, Mental/Emotional State,

Table1. Physical Assessment Mean Changes* in Novice Chiropractic Patients Over a Nine Month Period of Care.

	Assessment Period				
	Baseline	**3 Months Duration**	**Mean% Change**	**9 Months Duration**	**Mean % Change**
Assessment** Totals (Mean ± SD) (N=11)					
GRM Possible score (12)	2.18 ± 1.16	0.63±0.76 +	71.0	0.81 ±0.87+	60.0
P value		(0.000)		(0.000)	
Ortho Possible score (49)	2.63 ± 1.57	1.64±1.03 +	38.0	1.27 ±0.90+	52.0
P value		(0.049)		(0.031)	
MP Possible score (26)	6.45 ± 2.07	4.18±2.36 +	35.0	3.27 ±1.95+	49.0
P value		(0.012)		(0.000)	
SP Possible score (26)	7.45 ± 2.16	3.18 ± 2.23 +	57.0	4.09 ±2.26+	45.0
P value		(0.000)		(0.000)	
All Assessments Possible score (113) Mean ± SD	4.68 ± 2.90	2.57 ± 2.14+	45.0	2.36 ±2.08+	49.6
P value		(0.000)		(0.000)	

*Changes are express as outlined in Methods. Four Categories, with parameters ranging from 12 to 49, were assigned a value of 1 for each parameter exhibiting a positive finding.

**GRM = Global range of motion, Ortho = Orthopedic test, MP = Motion palpation, SP = Static palpation.
+Significant (Student's T test, two-tailed repeated samples) differences from Baseline values. Significant P values are in parentheses.

Level of Stress, Life Enjoyment, and Overall Quality of Life.[11] Chiropractic findings were also assessed.

The chiropractic examination was quantified by expressing assessment indicators numerically. The indicators included: Global range of motion (GRM, 3 or 4 planes each for cervical, thoracic, and lumbar spine), [38] orthopedic tests (Ortho, 49 tests covering cervical, thoracic, and lower spine), [39] motion palpation (MP, occiput through the first sacral segment), [40] and static palpation (SP, occiput through the first sacral segment). [41] In each category, if a positive finding appeared for any parameter it was assigned a value of 1. This was applied to each plane, muscle, segment, or test. Thus, a total of positive findings were reported for each category. If no positive findings were present the total would be zero for that category.

Immune Markers

At baseline and at each formal reassessment, a qualified laboratory technician at Auckland Hospital drew peripheral blood samples. Laboratory analysis included an immune panel of lymphocyte populations (lymphocyte markers) including: T cells (CD3, CD3%), T helper/inducer cells (CD4, CD4%), T suppressor/cytotoxic cells (CD8, CD8%), B cells (CD20, CD20%), NK cells (CD56,CD56%), and CD4/CD8 ratio.

Subjects

The pilot study was conducted between 4/November/99 and 13/Dec/00 (13 months). Eleven subjects (7 males and 4 females) completed the study. The average age of the group was 29.5 $\pm$ 9.0. The age for males was 29.5 $\pm$ 10.2 and 29.3 $\pm$ 7.8 for females. Not all subjects commenced the study at the same time, thus their respective baseline and reassessment values encompassed nine months each, but were staggered over the 13 months time frame.

Statistical Treatment of Data

Chiropractic indicators, assigned values of 1 (positive finding) or 0 (no finding), were determined at baseline and the two subsequent reassessment periods at 3 and 9 months after baseline. The paired samples were compared by a two-tailed Student's T test, $p < 0.05$.

Questionnaires were scored according to the method of Blanks et al. [10] Paired samples were compared by a two-tailed Student's T test, $p<0.05$.

Although the immune panel profile and chiropractic findings were parametric, the data for baseline and the two follow-up reassessments were also compared by Wilcoxon Signed Ranks test, which does not require an assumption of normal distribution, and tests for two-tailed significance among ranked pairs $p<0.05$.

Results

Numeric values for physical indicators decreased at the 3 months and 9 months reassessment periods compared to baseline. These included GRM ($p = 0.001, 0.001$), Ortho ($p = 0.049, 0.031$), MP ($p = 0.012, 0.000$), SP ($p= 0.000, 0.000$), and all assessments grouped together ($p = 0.000, 0.000$). There was no significant decrease between the two-reassessment periods for any of the indicators (Table 1).

Self-reports of health and quality of life domains remained essentially constant throughout the duration of the study, with the exception of the domain of Life Enjoyment (Table 2). The group of eleven subjects reported consistent mean scores from the initial visit to the first reassessment period of 3 months post baseline ($0.57 \pm 0.10 - 0.57 \pm 0.10$). However, the group reported a significant increase in Life Enjoyment to 0.65 ± 0.13 compared to baseline ($p = 0.026$), and the 3 months reassessment period ($p = 0.040$).

As well, the increase in Life Enjoyment by 9 months duration represented a large clinical effect (0.80), or effect size, between the initial visit and the 3 months reassessment period. Combined Wellness (sum of all domains) remained constant from baseline to 3 months, increasing slightly by 9 months from 0.34 ± 0.07 to 0.36 ± 0.08.

Significant correlations were observed between numeric values for motion palpation (MP), CD56%, and CD56 absolute values (Table 3). Negative correlations were shown for MP and both CD56% ($r = -0.693$, $p = 0.026$) and CD56 absolute values ($r = -0.736$, $p = 0.015$) at baseline. Because of the multi-comparisons, the data were also subjected to a Tukey analysis and a Bonferroni correction, which confirmed the t-test p values.

Discussion

Quantifying chiropractic indicators was a modification of the method of Vanquaethem and Gould.[42] In this study, the method permitted a numeric assessment of changes occurring within the group. The changes in physical assessments, collectively decreasing, suggest a steady physical improvement among the 11 subjects.

Table 2. Changes in Self-Reported Health and Quality of Life Domains, Clinical Effect, and Combined Wellness* in Novice Chiropractic Patients

	Assessment Periods		
	Baseline	3 Months Duration	9 Months Duration
State Evaluated			
1. Physical	0.28 ± 0.15	0.26 ± 0.10	0.24 ± 0.11
2. Mental/ Emotional	0.28 ± 0.12	0.31 ± 0.12	0.29 ± 0.11
3. Stress	0.23 ± 0.11	0.22 ± 0.13	0.25 ± 0.11
4. Life Enjoyment	0.57 ± 0.10	0.57 ± 0.10	0.65 ± 0.13
P value+		*(p = 0.040, 3 vs.9)*	*(p = 0.026, baseline vs. 9)*
Effect Size**		(0.80)	(0.80)
5. Overall Quality of Life	0.31 ± 0.10	0.32 ± 0.12	0.28 ± 0.09
6. Combined Wellness	0.34 ± 0.09	0.34 ± 0.07	036 ± 0.08

*Scores are transformations from the raw metric according to Blanks et al. JVSR 1997 1(4): 15-30.

**Cohen J. Statistical power analysis for the behavioral sciences. New York: Academic Press, 1977:8.

+Student's T-test, two tailed paired samples.

It was observed that the greatest health related quality of life outcome for this small group was Life Enjoyment. Case history and other data collected suggest that this group was at baseline, save for a biomechanical problem(s), a healthy population. As stated by the World Health Organization (WHO), in 1956: "Health is a complete state of physical, mental, and social well-being, not merely the absence of disease or infirmity." [43] Studies have shown that many individuals perceive themselves as healthy though they may be physically impaired or otherwise disadvantaged.[44] In that regard, study of a healthy population may account for the present self-assessment. The 11 questions that constitute the Life Enjoyment domain are: (1) Openness to guidance to your "inner voice/feelings," (2) Experience of relaxation or ease or well-being, (3) Presence of positive feelings about yourself, (4) Interest in maintaining a healthy lifestyle (e.g. diet, fitness, etc.), (5) Feeling of being open and aware/connected when relating to others, (6) Level of confidence in your ability to deal with adversity, (7) Level of compassion for, and acceptance of, others, (8) Satisfaction with the level of recreation in your life, (9) Incidence of feelings of joy or happiness, (10) Level of satisfaction with your sex life, (11) Time devoted to things you enjoy.

Statistically significant changes in certain indices of the CBC were also observed. However, the changes remained within the reference range for healthy (non-diseased) adults. This suggests that the values did not constitute a clinically significant change, as the clinical effect (effect size)[45] was small for each (< 0.2).[46]

Motion palpation detects restrictions or impairments in the fascia. Further, impaired fascia inhibits spindle cell function, thus limiting muscle stretching and contraction as well as nerve and blood vessel movement. Structural stress often accompanies the shortening of muscles and nerves and vascular entrapment resulting from restrictions in the fascia.[40]

In this regard, significant negative correlations between motion palpation findings, CD56, and CD56%, at baseline, were observed. These observations, interpreted cautiously, suggest a link between the extent of physical stress (greater motion palpation findings) and lower CD56 and/or CD56% levels. This concept is also consistent with studies that indicate a drop in CD56 cells in association with psychological stress.

This relationship with motion palpation findings is to some degree also reflected in other areas of the data. The reference range for CD56 cells is 40-500. As positive MP findings decreased over the duration of the study, CD56 levels increased from a baseline low range of 22 cells/microliter (lower than reference values) to a 9 months level of 76 cells/microliter (Table 4), while the high end remained within the reference range. This indicates that CD56 cells increased as an absolute number from the low end as well as rising to a higher percentage of total lymphocytes from 1% to 3% by 9 months (Table 4).

Table 3. Correlation Between Motion Palpation and CD56 Cell Markers in Novice Chiropractic Patients

Sample Interval			
Baseline	3 Months Duration	9 Months Duration	Correlation Coefficient (r)
			r *P**
Negative Correlations			
1. MP – CD56%			-0.693(.026)
2. MP - CD56			-0.736(.015)

* Numbers in parentheses = p values for significant r coefficients.
** MP = Motion Palpation

Table 4. Changes in the Low Range of Absolute Values* and Percentages for CD56 Cell Markers Contrasted to Reference Range Values**

	Sample Interval		
	Baseline	3 Months Duration	9 Months Duration
CD56	22	20	76
Reference value Low end of Range	40		
CD56%	1	1	3

*Reference values for CD56 range from 40-500 at the high end. High end values for subjects remained within the reference range throughout the study period.
**Absolute values for subjects and reference ranges (Auckland Hospital) are expressed as cells/microliter. Percentages are a ratio of the cell type to the total lymphocyte cell count.

Although normally distributed, the findings of this pilot study are cautiously interpreted as the study lacked statistical power. Larger studies are necessary to test the findings of this study. Further, there was no complementary control group, although each subject could be viewed as their own control in this study design. In consideration of these factors, it is suggested that this study has provided evidence that chiropractic care over the long term provides benefits. This is seen in the significant reduction of indicators of biomechanical and neurological deficits while recipients of care exhibit long-term maintenance of a healthy immune profile and improved self-perceptions of Life Enjoyment. Positive changes in indicators of biomechanical and neurological status may also be linked to changes in immune response believed to be associated with reduction of psychological stress.

Conclusions

In addition to subjective findings by the senior interns (supervised by New Zealand registered chiropractors) a numeric point system was implemented that assigned a +1 for any positive finding in a category or a zero for no finding. A significant reduction in all categories of biomechanical and neurological assessments used to evaluate progress was achieved by 3 months of care continuing through 9 months of care.

Thus, based on objective findings, it is concluded that the plan of care with appropriate chiropractic adjustments was successfully assessed. It is further concluded that the care was successfully implemented with positive outcomes as all categories of indicators decreased significantly over the course of the study.

It is concluded that long-term chiropractic care provides benefits to recipients. In addition to positive improvements in chiropractic indicators of biomechanical and neurological status, a large clinical effect regarding improvement in self-reported perceptions of Life Enjoyment were associated with care.

The authors conclude that the subjects remained healthy in regard to their immune status. The CD cell markers, when studied over the three intervals, fluctuated. However, the study group of 11 subjects remained consistently within the reference range established by Auckland Hospital in New Zealand. In the instance of CD56 cells, however, the data suggests that as MP findings decreased, the quantity of CD56 cells rose at the low end of the range, thus increasing the percentage of CD56 cells among the total lymphocyte population. The initial conclusion is that, based on other literature, this study also suggests a relationship between stress (positive MP findings) and the level of CD56 cells.

As well, it is concluded that numeric changes in certain CBC indices were not clinically significant owing to stabilization within reference ranges and small effect sizes.

This pilot study has provided some preliminary information regarding chiropractic care and possible links to immune response and improved quality of life. Limited numbers of subjects, however, preclude definitive conclusions. Larger studies, with ill and healthy populations, will contribute to a greater understanding of immune status relative to chiropractic care.

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CASE STUDY

Chiropractic Care of a Pediatric Patient with Asthma, Allergies, Chronic Colds & Vertebral Subluxation

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Abstract

Objective: To provide supporting evidence on the effectiveness of chiropractic care in relieving asthma and allergies and overall improvement in a pediatric patient's immune system and health.

Clinical Features: A 7-year-old male was presented by his parents for chiropractic evaluation and possible care. The suffered from chronic colds, allergies, and asthma since the age of 5 months. At the time of initial evaluation, the patient was on a 1x/day dose of prescription Alavert for allergies and Albuterol for asthma. The patient's illness caused him to miss approximately 1-2 days a month of school due to colds and symptoms of asthma. His parents also indicated that his health problems resulted in monthly visits to his medical doctor.

Interventions and Outcomes: The patient was cared for using specific, low-force adjustments with the Activator Instrument to address areas of vertebral subluxation in the cervical, thoracic, and lumbosacral spine. Within two weeks of initiating chiropractic care, the patient was able to discontinue his allergy and asthma medications (as decided upon by his parents) and the use of his nebulizer. In the first 5 months after beginning chiropractic care, he has had only wellness checkups at the medical doctor. In the past school year, the patient has not missed any days of school due to illness. **Conclusion:** This case report provides supporting evidence that chiropractic care can help balance immune system functioning and relieve asthma symptoms as well as colds and allergies. It is recommended that further research be done on this subject to support the findings of this case study.

Key Words: *Chiropractic, spinal manipulative therapy, adjustment, subluxation, asthma, allergies, immune system*

Introduction

Chiropractic has demonstrated much success in the care of patients with musculoskeletal conditions such as neck pain and low back pain[1]. Continuing surveillance studies supports this phenomenon with only a small percentage of patients reporting improvement in non-musculoskeletal conditions[2] in the adult population.

In an effort to identify patient and practice characteristics that might contribute to people's seeking chiropractic care for nonmusculoskeletal complaints, Hawk and colleagues[3] estimated that nonmusculoskeletal complaints accounted for approximately 10.3% of the chief complaints in their patient population.

Furthermore, according to Hawk and colleagues[3], the following characteristics allow for patients to more likely present with non-musculoskeletal chief complaints: being less than 14 years of age; being female; presenting in a small town/rural location; reporting more than 1 complaint,

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especially nonmusculoskeletal complaints; having received medical care for the chief complaint; and having first received chiropractic care before 1960.

The chiropractic care of the child is simply not a scaled-down version from that of an adult. The most obvious reason for this is predicated upon the unique biomechanical features of the pediatric spine such as growth, malleability, and overall immature neuromusculoskeletal system[4]. In addition, the types of patient complaints associated with the care of the child are mainly non-musculoskeletal in nature[5-6]. To further contribute to evidence-based practice, we present the successful chiropractic care of a pediatric patient with asthma, allergies and chronic "colds."

Case Report

Clinical Features

The patient was a 7-yr-old male presented by his parents for chiropractic consultation and possible care to one of the co-authors (LVR). According to the boy's parents, the patient suffered from chronic colds, allergies, and asthma since the age of 5 months. At the time of presentation, the patient was medicated on a once-a-day dose of prescription Alavert for allergies and Albuterol for asthma on an "as needed" basis." The patient received 6 Albuterol physician-treatments in the past year prior to initiating chiropractic care. Additionally, Claritin was prescribed for his allergy complaints, then changed to Singulair and finally Alavert. His mother reported that the patient's suffering from the flu or flu-like symptoms was associated with asthmatic attacks. He would then require nebulizer treatments for these asthmatic episodes. Steroid injections were also used "regularly", as reported by his mother, for his asthma.

The patient, while in his first year of school (kindergarten), missed 1-2 school days per month due to "colds", asthma and "being sick", according to his mother. The patient required at least once-monthly medical visits due to his various illnesses prior to beginning chiropractic care.

Other past notable history examination findings include the patient experiencing several episodes of tonsillitis and bronchitis in his life. The most recent episode of bronchitis was in the year preceding his initial chiropractic visit. His allergies were primarily in response to molds and mildew allergens.

Pre-natal History

The pre-natal history revealed that the patient's mother had gained 70 lbs during her pregnancy. This was mostly "water-weight" according to the patient's mother and stated that she had a lot of swelling during her pregnancy. Three ultrasound imaging studies were performed during her pregnancy, the last of which was to confirm the size of the baby, as the mother was measuring larger than what was originally calculated. The delivery was induced by Cervadil four days past the calculated delivery date. An epidural was given as well as Pitocin, due to a failure to progress during labor.

The first stage of labor lasted 17 hours, at which time a Cesarean-section was performed with local anesthesia. The patient was born weighing 9 lbs, 2 oz and 23½ inches long at birth. According to the patient's mother, her son's vaccination history followed the standard medical schedule and at the time of his initial chiropractic visit, the patient was current on receiving all his scheduled vaccinations. The patient was breastfed for the first 3-4 weeks after birth and his developmental history revealed that he did not crawl but eventually walked at 10 months of age. At the age of two years, he had surgery for a "trigger finger" of the right third digit.

Chiropractic Examination

The chiropractic examination revealed the following. Postural evaluation revealed a left head tilt and low left acromio-clavicular joint as compared to the right. Active thoracolumbar range of motion (ROM) on right lateral bending and right rotation were restricted when compared to the contralateral sides. On active ROM of the cervical spine, the patient was restricted on left rotation when compared to right rotation. All other directions of ROM were symmetric.

Neurological testing involving dermatome, myotome and deep tendon reflexes were unremarkable for both the upper and lower extremities. Static palpation of the patient's spine and paraspinal soft tissue elements revealed paraspinal muscular changes. Notably increased muscle tone and tenderness were observed on the right side of C_1 vertebral body (VB), the left side of T_6 and T_8 VBs, to the right side of the L_5 VB, and in the area overlying the left sacroiliac joint. Craniosacral examination[7] revealed restricted cranial bone motion at the sphenoid bilaterally, and at the right parietal bone. The craniosacral protocol briefly involved visualization and palpation of the cranium as well as the application of light palpation to determine misaligned cranial bones.

On visual examination/observation, facial symmetry or any abnormalities in alignment such as one eye relatively more elevated or smaller than the other, one ear relatively more elevated than the other or had greater flaring of the nostrils were noted. The center of the forehead (glabella) was visualized for alignment or lack thereof with respect to the patient's nose and with the center of the chin.

On the cranium itself, ridges were palpable indicating for possible overlap. Measurements from the external occipital protuberance (EOP) to the glabella were measured bilaterally. A difference of ¼ inch or more indicates an overlap of the cranial bones at the coronal suture on the side with a longer EOP-glabella measurement. Palpation for the cranial pulse/rhythm was made. Additionally, palpation was made to determine restrictions of the individual cranial bones beginning with the frontal bones, then the parietal bones, the sphenoid, ethmoid, temporal, and occipital bones, and temporomandibular joint. If any restrictions in motion or misalignment was palpated during this digital palpation examination, a light/gentle sustained pressure was applied to correct the misalignment. For cranial adjustments to correct coronal suture misalignment, a light sustained pressure was applied to correct the overlap misalignment. We stress that this type of adjustment is unlike that of the generic high velocity, low amplitude (HVLA) type thrusts.

Static and motion palpation of the patient's spine revealed restricted intersegmental motion and vertebral subluxation complex at the C_1 VB (ASR subluxation or [-θX;-X]), at the T_6 VB and T_8 VB as PR subluxation or [-Z; +θY], at the L_5 VB as PL subluxation or [-Z; -θY], and the left ilium as PI subluxation or [-θX].

Intervention and Outcomes

An initial treatment frequency of three times a week for 4 weeks was scheduled. Chiropractic adjustments were applied to the segments mentioned above on the initial visit, as well as to other subluxated vertebrae on successive visits, utilizing the Activator Technique[8].

The most frequently adjusted segments during the course of the patient's care were subluxations at the C_1, T_6, and L_5 VBs. The patient's response to care was positive.

Within two weeks of first receiving chiropractic care, the patient's mother indicated that the patient no longer dependent on his prescription medication for allergies, and they (the parents) had independently discontinued providing their son with the medication. The patient's mother reported that his asthmatic episodes were "lessening" with respect to frequency and intensity of the asthmatic attacks. Furthermore, the patient no longer required his nebulizer treatments since beginning chiropractic care.

Due to the patient's positive response in the first 2 weeks of chiropractic care, his treatment frequency was abated to treatments every 4 days. Following another 6 patient visits, the patient's treatment frequency was again abated due to continuing response to chiropractic care and improvement in symptoms.

Approximately 2 months into care, the patient developed a sinus infection, but did not accompany an asthmatic episode, which was expected to occur as in the past prior to chiropractic care. The patient's mother indicated that this sinus infection resolved much faster and was "easier" on her son than previous similar infections. Shorty thereafter, based on his mother's assessment, all the patient's initial complaints were addressed successfully.

As a result of the patient's overwhelmingly positive response to chiropractic care, the patient's mother requested continued "wellness visits." The patient was placed on treatment frequency of care at once every 3-4 weeks. In the 5 months after his initial visit, the patient had medical visits designated as "wellness checkups" (i.e., medical visits not due to illness) only.

We emphasize that these medical visits were not to address any physical complaints or illness on the part of the patient. A follow up 16 months since initiating chiropractic care revealed the patient continued to attend chiropractic care at the designated treatment frequency of once every 3-4 weeks at the continued request of his mother. During this period of time, the patient experienced only 1-2 minor "colds" or sinus infections and required the use of his nebulizer on only two occasions. The patient nor his mother did not report any adverse reactions to the chiropractic care provided.

Discussion

The combined asthma and allergic morbidity represent the sixth leading cause of chronic illness and disability in the United States and the leading cause of chronic illness and disability among children[9]. Despite the serious implications of the epidemiology of these diseases, its impact on children does not adequately reflect the physical and emotional toil the disease has on the affected individual, their families, and to society as a whole. Nor does it reflect the enormity of the negative impact of these diseases on the economies of countries, continents and the entire planet[9]. Our discussion in this case report will impact of these diseases in more detail as well as focus on the clinical aspects of care and the implications on the chiropractic care of children.

Epidemiology of Asthma

The United States National Health and Nutrition Survey revealed trends in the cumulative prevalence of asthma for children (0-17 years of age) in the United States. A significant increase in prevalence has been observed from 4.8% in NHANES 1 (1971-1974) to 7.6% in NHANES 2 (1976-1980) [10].

In 2002, 30.8 million people (111 people per 1,000) had been diagnosed with asthma during their lifetime. Among adults, 106 per 1,000 had a lifetime asthma diagnosis which translates to approximately 21.9 million people. When compared to children 0-17 years, this figure was much larger with 122 per 1000 children and translating to 8.9 million children[11] overall. For allergies, the statistics are not much different. According to data obtained from the National Health Interview 2006[12], the number of children in the United States with reported hay fever in the past 12 months number some 6.8 million.

What are the economic effects of this disease? In the U.S., health care spending for asthma medication alone has been approximated to $1 billion per year. Furthermore, it has been estimated that the total cost of asthma in the U.S. in 1985 was almost $4.5 billion and $6.2 billion when extrapolated to 1990. Approximately $2.4 billion accounts for direct costs and $2 billion for indirect costs. Inpatient hospitalization accounted for the greatest portion of direct costs[13]. In other industrialized countries, the economic cost of asthma is also burdensome. In New South Wales, $209 million was spent on asthma based on 1989 figures. Of this amount, $142 million was for direct health care costs, $19 million to direct non-health care costs and $48 million for indirect costs[14].

In a study to compare generic health-related quality of life (HRQOL) across ten chronic disease clusters and 33 disease categories/severities from the perspectives of patients and parents, Varni et.al.[15] found that patients with asthma self-reported significantly lower overall HRQOL, physical health, psychosocial health, emotional functioning, and school. Parents of patients with asthma reported their children as having lower overall HRQOL, physical health, psychosocial health, emotional functioning, and school functions.

Implications to Chiropractic Care

The extent of documentation in the scientific literature on the

complementary and alternative medicine (CAM) use of children with asthma supports the findings that indeed, CAM therapies for children with chronic conditions remain popular and extensive. A Pubmed search using the subject heading "alternative medicine AND asthma" revealed 1,396 entries. It is beyond the scope of this manuscript to review the available literature but sufficient for our purpose, we recommend to the reader the most recent review on this subject by Mark[16]. CAM therapies such as nutritional and dietary supplements, herbal medications, traditional Chinese medicine (including acupuncture), homeopathy, mind-body techniques, and manual therapies are reviewed by the author. Although it is our opinion that his interpretation of the available literature is somewhat biased, this review nonetheless reflects the extensive literature-base on the topic. Mark's bias is reflected in his comments on the effectiveness of chiropractic in asthmatic patients and may reflect his views overall on the CAM therapies reviewed. In citing the conclusions of the Cochrane review of manual therapies for asthma[17], Mark chose to comment that "… there is insufficient evidence to support the use of manual therapies in the treatment of asthma." To the contrary and arguably, Hondras et.al.[17] concluded that, "Currently, there is insufficient evidence to support or refute the use of manual therapy for patients with asthma."

Review of the Chiropractic Literature

More instructive for the purpose of this manuscript was a selective review of the literature on the chiropractic care of patients with asthma. We performed a search on the chiropractic care of asthmatic patients using Pubmed (1966-2008) and MANTIS (1965-2008). Pubmed was searched using the subject headings "asthma AND chiropractic" and specified to the English language. The search revealed 36 papers. MANTIS was similarly searched in ALL for "asthma" specified to the Chiropractic Discipline, the English language, in Refereed Journals and of High Clinical Relevancy. The search revealed 56 papers.

The abstracts were of these articles were then examined by applying the following eligibility criteria: (1) the study was a primary investigation/report (i.e., case reports, case series, case control, randomized, controlled trials, and survey or surveillance studies); (2) part or all of the study population was 18 years or younger and; (3) the manuscript involved the chiropractic care of a patient with asthma as the primary or co-morbid complaint. Due to the lack of literature involving patients less than 18 years of age, we expanded the search to include all age groups.

A similar search was performed with the care of patients with allergy. Pubmed was searched using the subject "allergy AND chiropractic" and MANTIS was searched using "allergy." Many articles are published in the peer-reviewed literature[2,18-34] as well as in conference proceedings and non-peer-reviewed literature[35-42] on the chiropractic care of patients with asthma. The same may not be said for the chiropractic care of patients with allergy[2,43-46].

Three clinical trials involving the care of patients with asthma[47] have been published in the scientific literature . The first of these involved the trial by Nielsen et. al. [48]. This group examined the effects of chiropractic care on 31 adults with chronic to moderate asthma in a randomized, controlled, 4-week, crossover trial. The subjects received treatment at two times per week with active or sham treatments followed by a 2-week washout period. The primary outcome measures were: forced expiratory volume in the first second (FEV1), forced vital capacity (FVC), daily use of inhaled bronchodilators, patient-rated asthma severity and non-specific bronchial reactivity (n-BR).

According to Nielsen et.al. [48], "No clinically important or statistically significant differences were found between the active and sham chiropractic interventions on any of the main or secondary outcome measures." The objective lung function did not change during the study, but over the course of the study, non-specific bronchial hyperreactivity (n-BR) improved by 36% and patient-rated asthma severity decreased by 34% compared with the baseline values. The second clinical trial was performed by Balon et. al[49]. The investigators examined 91 children with medically controlled chronic asthma in a randomized, controlled, blinded trial. The subjects received an average of 20 active or sham treatments over a 16-week period. The investigators found no changes in lung function, small increases in peak expiratory flow rate, substantial improvement in symptoms and quality-of-life scores, and a reduction in β-agonist use. According to Balon et. al. [49], no clinically or statistically significant differences between active and control groups and essentially, both groups responded similarly. In the third study, a prospective, randomized, pilot trial with a 1-year follow-up was performed by Bronfort et. al.[50]. The study allocated 24 children to an active care group and 12 to a sham group and provided each with 20 treatments over a period of more than 3 months by one chiropractor. The children rated their quality of life substantially higher and their asthma severity substantially lower. These improvements were maintained at the 1-year follow-up assessment. There were no important changes in lung function or hyper-responsiveness at any time. Based on their findings, Bronfort et.al. [50] concluded that the results were unlikely as a result of the spinal manipulative therapy (SMT) alone but other aspects of the clinical encounter that should not be dismissed readily.

A fourth clinical trial examining asthma and chiropractic has been presented at various conferences by Hayek et.al.[38-41]. In addition to established outcome measures, this group examined the effects of chiropractic care on the endocrine and immune system in patients with asthma. The subjects were randomly allocated into 4 groups: a chiropractic group at treatment centers scheduled 3 times per week, a group with no treatment presenting to treatment centers, a group with no treatment and at home, and a control group of non-asthmatic patients with no treatment at home. The study period spanned a period of 14-weeks consisting of a 2-week pretreatment, 6-week treatment, and 6-week post-treatment protocol with numerous quality of life measures and biochemical outcomes without lung function measures. Based on the results obtained from 110 subjects, clinically important changes in quality of life measures and endocrine measures were observed in the treatment group. Salivary IgA and cortisol levels increased in the treated group but not in the controls.

Given that three clinical trials have already been performed to study the efficacy of chiropractic in asthmatic patients, the question that must be addressed involve the unique

contribution/purpose of this case report. The trial by Nielsen et.al.[48] and Bronfort et.al.[50] involved spinal manipulative therapy (SMT) utilizing drop mechanisms to perform the active and sham treatment. The Balon et. al. trial involved care using HVLA-type thrusts. Hayek et.al.[38-41] utilized techniques including HVLA spinal adjustments such as Diversified Technique in addition to passive wedging (as in the Sacro-Occipital Technique) and Activator Methods. On the issue of technique alone, this case report contributes to the scientific literature on the use of Activator Methods in combination with cranial technique with successful results. The specifics on the type of care employed is of paramount importance to determine the optimum care approach and for reproducibility in subsequent clinical trials. Studies have since been published to demonstrate that manual SMT versus Activator Methods have different effects[51-52].

In the Balon et.al. trial[50], the sham treatment consisted of procedures of questionable inertness. The patients in the sham group received non-specific side-posture maneuvers (bilaterally), thrusts to the thoracic spine with contact over the scapulas and while tractioning the legs of the supine patient position, a clinician performed a thrust maneuver to the EOP. First, we are not aware of any study that the sham treatment employed by Balon et.al.[50] does not have an effect on asthmatic patients. In our opinion and those of others (particularly practitioners of none-force techniques), one can argue that the sham treatment in the Balon et.al.[50] study did have an effect. Balon and colleagues[50] further describe in their protocol of performing soft-tissue massage on the sham group prior to the sham SMT treatment. Studies by Field and colleagues[53,54] have demonstrated that massage is effective in alleviating the symptoms of asthma. To this day, Balon and colleagues[50] have never addressed these limitations and continue to propagate the falls conclusions of their study[47].

On the issue of sham treatment, the use of the Activator Technique provides for an acceptable sham treatment by setting the Activator instrument to the zero setting. However, according to Hawk et.al.[55], given our current lack of knowledge about the active agent in manual chiropractic procedures, placebo-controlled trials may be unfeasible and certainly difficult.

Despite its lack of generalizability, case reports still provide an important contribution to evidence-based practice. Descriptive surveys and case reports are part of the Levels of Evidence hierarchy for evidence-based medicine[56]. Case reports/series describe the clinical encounter, the starting point for all clinical research. Case reports describe the clinical encounter from examination/evaluation, the formulation of a diagnosis and prognosis, the interventions and outcomes of care. Case reports/series assist to address educational, administrative as well as overall effectiveness and safety concerns[57]. Case reports stimulate further research and "help develop practice guidelines and critical pathways"[57]. They illustrate "how clinicians integrate the best available research evidence, clinical experience, and patient choice"[57].

Conclusion

This case report provides contributing data on the safety and effectiveness of chiropractic care in patients with asthma and allergies. We encourage further research on the chiropractic care of children with asthma and allergies.

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CASE STUDY

Restoration of Olfaction in a Child with Chronic Sinusitis Undergoing Subluxation-Based Chiropractic Care: A Case Report

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Abstract

Objective: The purpose of this case study is to report evidence of improved sinus function and return of olfaction in a patient with chronic sinusitis after receiving chiropractic care and, thus, add to the body of evidence supporting the beneficial effects of chiropractic in somatovisceral conditions.

Clinical Features: The subject of this case was an 11-year-old female who had suffered from chronic sinusitis for many years and reported a loss of her sense of smell for the past year. After one week of care (three visits), the patient's olfaction returned temporarily and sinus function was reported by the patient to have improved. After 3 months of care, complete restoration of olfaction was evident and sinus function was normal. All medications were discontinued. More than four years later, the patient continues chiropractic care once per quarter and remains mostly symptom free.

Interventions and Outcomes: Specific chiropractic adjustments were delivered after clinical necessity was ascertained by physical exam. Chiropractic exam included postural evaluation, static and motion palpation. The presence of subluxation was noted along with a concomitant loss of olfaction. The reduction of the subluxation(s) when indicated was temporally associated with a return of her sense of smell.

Conclusion: In this case, when vertebral subluxation was found and corrected, the patient experienced a return in her ability to smell and resolution of sinusitis. She experienced subjective and objective improvement from the delivery of specific chiropractic care. Further research is recommended.

Key Words: *chiropractic, subluxation, adjustment, sinusitis, olfaction*

Introduction

Much is known about the effects of chiropractic care in musculoskeletal conditions. However, there is little evidence in the literature to support the outcome of chiropractic care in somatovisceral conditions, such as sinusitis.

Sinusitis is a common somatovisceral complaint of many patients seeking chiropractic care. In cases of chronic sinusitis, it is not uncommon for patients to experience a loss of olfaction. The neuroanatomy of the sinus and nasal cavities suggests a relationship between the inflammation of sinusitis and a loss of olfaction.

Our sense of smell originates from the stimulation of receptor cells (olfaction cells) located in the roof of the nasal cavity.

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These cells have multiple olfactory hairs or cilia which project into the thin layer of mucus that coats the inner surface of the nasal cavity. Odorant chemicals enter the nasal cavity and diffuse through the mucus to come in contact with the ciliated olfactory cells.[1] One can understand, then, that compromises in olfaction are a common occurrence with chronic and acute sinusitis because the associated inflammation and accumulation of mucus would serve as a barrier to the stimulation of the ciliated olfactory cells.

Chronic sinusitis includes disorders characterized by inflammation of the nasal mucosa and paranasal sinuses. While chronic sinusitis is a common cause of olfactory dysfunction, smell loss is very often overlooked. And instead attention is focused on respiratory complaints related to nasal obstruction, secretion, facial pressure and pain.[2]

Case Report

This patient was introduced to chiropractic care in April 2004 by her mother. She was an 11-year-old female with the chief complaint of sinus problems and a loss of olfaction. In this patient's case, the escalating medical and pharmaceutical recommendations associated with her condition, their concomitant potential for side effects and the patient's continued inability to smell warranted the parent's investigation of conservative methods for assisting her daughter with her health care needs.

She was a Caucasian youth, slight of stature, athletic and alert. Her symptoms included constant stuffy nose, difficulty breathing through her nose, and inability to smell even when her sinuses felt clear. Her previous treatment consisted of prescription medications that only offered temporary relief of her congestion symptoms, and her sense of smell was not improved with any of the interventions. She had suffered from chronic sinus problems for most of her life with little lasting relief.

The patient is the third child of a healthy mother who had a normal pregnancy. The patient's history revealed that her hospital birth was preceded by three hours of labor, with her mother receiving an epidural at the onset of labor. The child was in the normal presentation for birth and, according to the mother's recall, no extra force was used beyond what she had experienced in the birth of her previous two children as routine obstetric manual traction. The patient had her tonsils and adenoids removed in 1997 to help reduce sinusitis and was taking Rhinocort (budesonide) twice daily with minimal results at the time of her initial consultation. She also complained of inability to smell for approximately 1 year. Her otolaryngologist suggested additional steroid treatment to improve her symptoms. Her mother decided to seek chiropractic care in order to improve her daughter's health without the escalating drug therapy and associated potential side effects.

Postural assessment of the patient revealed right translation and flexion of the head. Palpation revealed loss of segmental motion at C2 with edema surrounding the segment and muscle spasm at levels C2 and S1. The sacral apex was palpated and found to be elevated on the right with reduced motion on hip flexion and extension on the same side. With the clinical diagnosis of cervical and sacral subluxations, a course of specific chiropractic adjustments was initiated for the purpose of restoring normal neurological function, biomechanics and segmental position. Specific chiropractic adjustments were rendered to reduce subluxations of the second cervical vertebra and sacrum and a mirror-image postural correction was rendered as well. After her first adjustment, the patient's mother reported that her sense of smell returned for approximately six hours.

During the second visit, the assessment revealed a reduction in the biomechanical compromise of C2, with concomitant reduced paravertebral muscle spasm. Due to ongoing indicators of the presence of subluxations, specific chiropractic adjustments were rendered to C2 and sacrum. After this visit, olfaction returned for approximately 12 hours.

On a routine follow-up to her medical doctor two weeks after beginning chiropractic care, a significant improvement in the physical appearance of the patient's sinuses was noted. After subsequent chiropractic visits, improvement in olfaction continued until full function was restored after three months of care. A correlation between the presence of subluxation and loss of olfaction was observed. In addition, the reduction of the subluxation(s) when indicated and a return of her sense of smell were strongly correlated. The patient and her parents opted to discontinue all medications. The patient has had normal olfactory function for the past four years. This patient currently is evaluated for subluxation approximately once per quarter and adjusted when indicated.

Discussion

This patient's results indicate support of the application of chiropractic principles in the pediatric population with health care problems outside the musculoskeletal arena, specifically sinusitis. Results of this case study indicate a potential association between the correction of subluxation and the return of olfaction along with a reduction in symptoms related to sinusitis. This association may be explained in part by the anatomical relationship of the cervical lymphatic chain to the sternocleidomastoid (SCM) muscle. In particular, correction of cervical subluxation would improve SCM muscle tone and, thus, facilitate proper lymphatic drainage.[3] This would favor an improvement in the ability of the olfactory cells to respond to odorant stimuli. In addition, the correction of subluxation would improve neurological function to the mucous membranes, olfactory cells and other related structures of the nasal and sinus cavities.

Studies have been performed on the effect of subluxation correction and improved immune function.[4,5] Although some authors dispute this connection,[6] it cannot be ruled out as an additional contributing factor in this case.

Kaluza notes that there are a number of reflexes related to the nose having both sympathetic and parasympathetic influences. The reflexes span from the nasal-pulmonary reflex to sexual responses from olfactory stimulation. Kaluza discusses manipulative treatment of the eye orbits, nose, temporal region and maxillary sinuses in order to promote drainage.[7]

Kuchera groups systems of the body by their common autonomic and lymphatic elements and discusses structural and functional osteopathic manipulative approaches emphasizing physiology and reflexes. The goal being to enhance homeostasis through a variety of techniques to enhance circulation and drainage.[8]

A review of the chiropractic literature revealed only a single case study by Fedorchuk reporting improvement in sinus infection following the introduction of subluxation based chiropractic care which also resulted in restoration of the patient's cervical curve.[9] One other recent case study by Alcantara describes improvement in chronic colds following subluxation reduction.[10]

While there were no studies involving improvement in olfaction or any others involving sinusitis there are a number of chiropractic and osteopathic papers including small clinical studies, case studies, reviews and descriptive studies on chiropractic care of respiratory and pulmonary disorders as well as otitis media.[11-53] It is suggested that the benefit in the cases of respiratory, pulmonary and otolaryngologic disorders from chiropractic and manual therapies is similar to what has already been discussed here in terms of lymphatic drainage, circulatory improvement and immune stimulation.

Conclusion

Although further study is warranted, the return to normal sinus function and complete restoration of olfaction in this patient after receiving chiropractic care is supportive of the benefit of chiropractic in somatovisceral conditions. Results of this study indicate a potential correlation between the correction of subluxation and the return of olfaction and normal sinus function.

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CASE STUDY

Applied Kinesiology Management of Candidiasis and Chronic Ear Infections: A Case History

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Abstract

Objective: To describe the use of Applied Kinesiology (AK) in the management of a pre-adolescent female with candidiasis, recurrent ear infections, and severe postural imbalances that occurred when these infections were present.

Clinical Features: This six-year-old patient had painful earaches on a monthly basis since the age of 4-months. She had undergone antibiotic treatment 25 times in her life, suffered two urinary tract infections, and displayed oral thrush. Exposure to water and cold air consistently produced an ear infection according to her parents.

Intervention & Outcome: AK methods were utilized to diagnose and treat this patient with rapid resolution of her candidiasis, ear pain in cold air and water, and ear infections. She has been symptom-free for 2 years since her first 4 AK treatments over a three-month period.

Conclusion: In this case a multi-modal chiropractic system for the evaluation of muscle-joint subluxations were useful for the discovery of a number of complex causative factors underlying this patient's digestive and immune system compromise, as well as her recurring infections and earaches.

Key Words: *Candidiasis, chiropractic, vertebral subluxation, Applied Kinesiology, ear infections*

Introduction

Acute otitis media, AOM, is the most common childhood complaint in which many children suffer multiple episodes during the first years of life. Although the most common treatment for this condition has historically been the administration of antibiotics, for which prescriptions are written worldwide, [1] there are numerous problems with this intervention. Among these are the facts that (a) over half or more of ear infections may not even be caused by bacteria,[2] (b) bacterial resistance may be expected to increase with widespread application of antibiotics,[3] (c) undesirable side effects may accompany the use of antibiotics,[4] (d) clinical research has indicated that the effectiveness of antibiotics in managing AOM is limited and that antibiotics should not be routinely prescribed at the first visit,[5] and (e) prescribing methods for antibiotics in managing AOM have been shown in some instances to be anything but scientific.[6]

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Recurrent candidiasis, an overgrowth of the yeast *candida albicans* throughout the intestinal tract, including the sinuses and ears, and/or the vagina, is common in people who are immune-compromised and who have undergone repeated antibiotic therapy.[1] As the problem of candidiasis progresses, in both males and females, the yeast often spreads to the mouth, larynx, and pharynx, as well as to the stomach and esophagus. When candidiasis is actively present in the system at the same time as an infectious agent, the toxicity of the latter is greatly enhanced and can result in fatal toxic shock syndrome.[1]

Several modern drugs are effective against candida infection and side effects are minimal when used orally, especially if only a single dose is prescribed. However, as in this case, the drugs are frequently used repeatedly and are not used with a comprehensive antifungal approach that would encourage a healthier digestive tract and immune system.

Regarding the mechanism of AOM, deficits in eustachian tube function may impede normal drainage of the ear to the nasopharynx and thereby creating a negative pressure within the middle ear as compared to atmospheric pressure. This negative pressure may permit the inhalation or reflux of nasopharyngeal contents into the middle ear. Upper cervical subluxations and muscle imbalances are important physiological factors in cases of head pain and earache, and are often ignored when therapy involves using antibiotics alone.[2, 3] Yet manipulation of the upper cervical region has been found to lead to the rapid resolution of AOM.[7-9]

Case Report

History

A six-year-old female presented with a chief complaint of recurrent AOM, oral thrush, fatigue, and immune-system compromise. The child acquired an AOM on a monthly basis, and invariably after exposure to cold wind and/or water, so much so that she never went swimming and always wore a beret that covered her ears when she went outdoors.

When she suffered AOM she would lose her balance, walk into walls, and constantly cough. The latter symptom was an indication to her parents that an ear infection was beginning and that a visit to her pediatrician was called for. These problems had been treated with 25 rounds of antibiotic therapy since the patient was 4 months of age until her presentation for treatment.

Examination per Applied Kinesiology Protocol

The methods used in AK for the investigation of digestive dysfunctions and the viscero-somatic or viscero-muscular reflexes involved in these cases have been described previously.[10] Applied Kinesiology suggests that subluxations might result from 3 areas of concern, which comprise chemical and mental elements in addition to structural.[11] AK recognizes how nutritional,[12] hormonal,[13, 14] and emotional[15, 16] elements influence neural function as reflected by muscle tone that is evaluated by an established muscle testing protocol[17, 18] whose reliability and validity have recently been shown.[19]

Applied Kinesiology essentially sees muscle function as a transcript of the central integrative state of the anterior horn motoneurons, summing all excitatory and inhibitory inputs.[20] In other words, the locus of dysfunction ultimately rests with the nervous system, which brings us back to D.D. Palmer and his concept of "tone". Thus, AK advocates a multi-model program with treatment inclusive of spinal adjustment for subluxations, cranial manipulative therapy, specific muscle testing and correction, biochemical evaluation and treatment, and psychosocial evaluation and treatment in order to improve muscle dysfunction, reflective of neural dysfunction, throughout the body in a holistic way.

Applied Kinesiology, AK, methods are utilized for diagnosis and correction according to the findings. (See Table 1) In AK, diagnosis of a dysfunction moves seamlessly toward correction because the challenge and/or therapy localization methods guide the clinician toward the most effective therapy for the diagnostic finding, inhibition during manual muscle testing, or MMT.

In AK, once the dysfunctional muscle has been identified with the MMT, several treatment options are open to the doctor. The option, whether adjustive, myofascial, reflex, nutritional, meridian, or cranial-sacral related, most effective in restoring strength to the inhibited muscle, using the challenge and therapy localization test procedures, indicates the best treatment for the patient.[11] (See Appendix 1)

Intervention

In this case AK challenge to the TMJ, to the reflex areas LI-4 (large intestine 4, the so-called "Source point" for the large intestine meridian in Traditional Chinese Medicine) and to the thymus gland reflex area produced an immediate weakening in all indicator muscles. Manipulation to the lateral and medial pterygoid muscles and insalivation of nutritional supports corrected the muscular impairments that formerly resulted from challenge to the TMJ and the LI-4 areas. The nutritional products were from the nutritional company Nutri-West ™ and are called *Spore-X* and a probiotic called *Lacto-Plus*, which have been effective in previous cases of *candidiasis* treated by SCC.[21]

A number of recent published reports have demonstrated the effectiveness of the AK system of analysis for acupuncture system, digestive system, craniosacral, viscero-somatic, and viscero-muscular dysfunctions.[19] Manual corrections of myofascial trigger points in the lateral and medial pterygoid muscles, as was done in this case, have been shown to resolve ear pain.[22, 23] Muscle imbalances affecting the medial pterygoid may compromise the diameter of the eustachian tube and affect its patency and drainage potentials.

Mense and Simons also suggest that the recognition of the muscle weakness caused by MTrPs is often a critical step in the restoration of normal function. Other muscles suffer from compensatory overload due to the inhibition created by the MTrPs in the inhibited muscles in their view.[23] After one minute of percussion upon the MTrPs in the medial and lateral pterygoid muscles, the AK challenge and therapy localization tests for jaw movement became negative, and pressure on the MTrPs that previously produced referred pain into her ear and

lateral face no longer occurred.

It is thought that the immediate effect of percussion is to modify the physical nature of the myofascial matrix.[22, 24] Percussion may also press fluid from the nuclear bag of the muscle spindle cells, part of the MTrPs pathophysiology, reducing the tension in the capsule of the spindles.[23, 24] Addressing soft tissue, upper cervical, and cranial dysfunctions, with CMT appeared to facilitate a return of normal eustachian tube function in this child. (Figures 1-6)

Outcome

The first consultation, examination and treatment lasted for 1 hour. After 4 visits (over a 3 month period) the patient's oral thrush, ear aches and ear infections and their associated muscular imbalances were resolved. It was now possible to expose the patient's ears to cold air and/or water without complaint. The patient's distressing 5 ½ years of ear infections, oral thrush, and immune system compromise have not returned for the past 2 years.

Conclusion

Successful management guided by AK MMT methods (involving biomechanical, biochemical, and meridian system factors in the treatment) for a 6-year-old child with a 5 ½ year history of recurrent ear infections, candidiasis, and immune system susceptibility is presented. Four treatments that consisted in the analysis of muscular impairments (inhibition on MMT) and their relationship to articular, soft tissue, and nutritional disorders that were treated with chiropractic adjustments, resulted in elimination of the muscle weaknesses found and elimination of 5 ½ years of previous suffering.

Many of these muscular and viscero-somatic impairments have been shown to be reversible: improvements in muscle function after CMT has been documented in the literature.[19, 25] Applied to the general pediatric population with ear infections and oral thrush, strategies designed to optimize muscle strength and associated neurophysiologic components may have the potential to reduce a vast burden of disability, dependence, and cost.

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Table 1 -- AK Examination Findings and Proper Corrective Treatment

AK examination finding	Corrective Treatment/Outcome
• Sternocleidomastoid (SCM) on the left and anterior scalene muscles inhibited bilaterally	• Right inspiration, left expiration assist cranial fault corrections to the temporal bones bilaterally (strengthened SCM on left and anterior scalene bilaterally)
• Positive therapy localization (TL) and challenge (producing inhibition to previously strong indicator muscles) to the left TMJ on sagittal opening of the jaw	• Strain-counterstrain and percussion used on the medial and lateral pterygoid muscles (this muscle surrounds the eustachian tube) and abolished challenge and TL to the left jaw on sagittal opening [12] (See Figures 3 & 4)
• Positive challenge (producing inhibition to previously strong indicator muscles) for a category I pelvis with a right posterior ilium	• SMT pelvis (DeJarnette wedges) abolished challenge to the pelvis and strengthened the left hamstring muscle
• Positive TL to acupuncture point Large Intestine 4 (LI-4) (TL to LI-4 produced inhibition in previous strong indicator muscles)	• Insalivation of a probiotic corrected positive TL to LI-4 (See Appendix I)
• Positive TL to neurolymphatic reflex (NL) for the thymus gland (produced inhibition in previous strong indicator muscles)	• Insalivation of an immune system supportive nutrient corrected positive TL to the NL for the thymus gland
• Bilaterally inhibited gluteus maximus muscles	• SMT for upper cervical fixations strengthened gluteus maximus muscles bilaterally (See Figures 1 & 2)

Appendix I -- Glossary of Applied Kinesiology Terms Used

Manual Muscle Test -- The actual testing of the muscle had been previously and firmly established by Kendall and Kendall,[17] who held that a muscle from a contracted position against increasing applied pressure could either maintain its position (rated as "facilitated" or "strong") or break away and thus be rated as "inhibited" or "weak". The testing of muscle strength itself has been widely practiced in manual medicine for decades by such authorities as Daniels, Worthingham, and the use of the MMT for functional conditions continues today with the work of Goodheart, Janda, Chaitow, Sahrmann, Bergmann, Lewit, Liebenson, and Hammer.[18, 26-30] The American Medical Association has accepted that the standard method of MMT used in AK is a reliable tool and advocates its use for the evaluation of disability impairments.[31] According to this rating system, a grade 5 MMT is normal muscle strength, demonstrating a complete (100%) range of movement against gravity, with firm resistance offered by the practitioner. Grade 4 is 75% efficiency in achieving range of motion against gravity with slight resistance with decreasing increments of 25% efficiency with each lower grade to a minimum of 0. Muscles graded 4 or less were considered weakened, warranting interventions as described in the report.

Challenge -- A diagnostic procedure unique to AK that is used to determine the body's ability to cope with external stimuli, which can be physical, chemical, or mental. Cranial and vertebral challenge has been described in the literature previously.[11, 32-34] After an external stimulus is applied, muscle-testing procedures are done to determine a change in the muscle strength as a result of the stimulus. Through this approach, ineffective therapies that produced no improvements in muscle strength were rejected, and only those that elicited a positive muscle response were used. This guided the treatments given to the patient.

"Weak" muscle -- A muscle that may or may not develop full power, but on MMT it does not neurologically function at its full capacity. Preferable terms for muscles that test weak or strong are termed conditionally inhibited and conditionally facilitated, respectively.

Appendix I -- Glossary of Applied Kinesiology Terms Used cont

Therapy localization -- A diagnostic procedure unique to AK that consists of placing the patient's hand over areas of suspected involvement and observing for a change in the MMT. This method is assists the doctor in rapidly finding areas that are involved with the muscle dysfunction found on MMT and has been used clinically for over 30 years.[11, 34] Pollard et al in a recent literature review outlined research supporting the AK concept of therapy localization.[35] Collectively these data suggest that stimulating or stabilizing the muscles, joints, ligaments, and skin -- and their associated cutaneomotor reflexes -- can produce changes in muscle function.

Indicator muscle -- A muscle tested to determine if there is a change in its strength as a result of some testing mechanism (challenge or therapy localization, for instance) applied to the body. Generally an indicator muscle is strong prior to the test, and weakens as a result of the testing procedure.

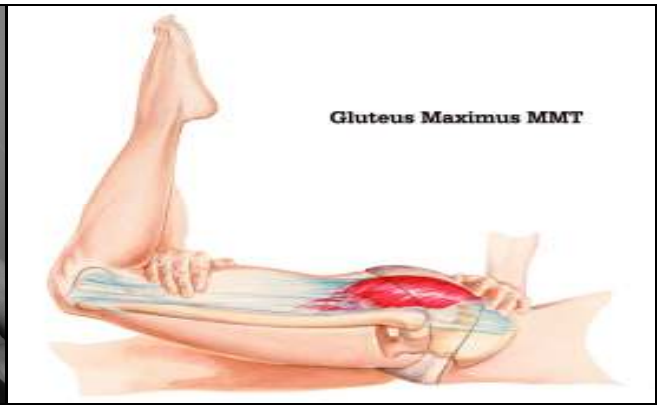
Myofascial trigger points (MTrPs) -- According to Leibenson[26] the combination of muscular inhibition, joint dysfunction and trigger point activity is the key peripheral component leading to functional pathology of the motor system. In AK, the presence of myofascial trigger points can be objectively identified using the muscle stretch procedure that produces detectible changes in muscle strength on MMT.[11, 22-24, 34] The percussor instrument was used to deactivate the myofascial trigger points in these muscles. (Figures 3, 4 and 6)

Oral nutrient evaluation -- In this case report, "insalivation" of the nutritional supplement for this patient refers to the fact that the taste buds on the tongue can detect extremely small concentrations of substances within a fraction of a second.[36] Oral nutrient evaluations are used clinically in AK in the assessment process. Exposure to taste elicits a variety of neurological, muscular, digestive, endocrine, cardiovascular, thermogenic, and renal responses.[37] The relationships between muscle function and specific nutritional deficiencies have been described by Travell and Simons.[22] The nerve pathways causing change in muscle function as observed by MMT are still unclear; however, there is considerable evidence in the literature of extensive efferent function throughout the body from stimulation of the gustatory and olfactory receptors with actual insalivation[36] rather than merely the contact of a substance with the hand or belly as often taught and erroneously labeled AK by some practitioners.[38]

Influence of cranial faults upon the sternocleidomastoid and anterior scalene muscles

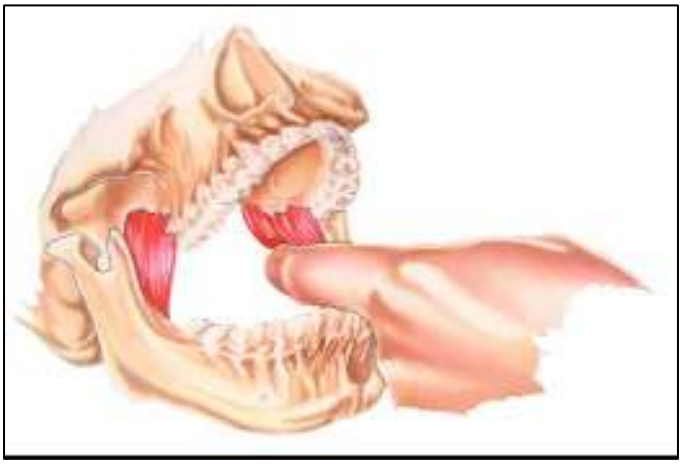
Cranial faults -- Involve the failure of the skull to move in its normal, rhythmic manner, as discovered by Sutherland and Cottam and researched by many others. The open border between the jugular process of the occiput and the petrous portion of the temporal bone begins at the jugular foramen, and this area remains open throughout life. (Figure 5) It is not actually a sutural joint or articulation at all but a kind of extended crevice. It has been remarked by many researchers in the cranial field that at the very center of the cranial base two of the main bony structures do not articulate along a part of their common border – an architectural arrangement that maximizes malleability and motion. This open architectural design at the jugular process and the petrous temporal makes the cranial base portion of the temporal and the occiput vulnerable to displacement, because they lack the mutual bracing of a suture.

Figures 1 & 2 -- An upper cervical fixation correction strengthened bilaterally inhibited gluteus maximus muscles. [11,34]



Figures 3 & 4 – Treatment of the medial pterygoid muscle.

The medial pterygoid muscle is in close approximation to the eustachian tube. Extrinsic obstruction of the eustachian tube can result from cranial faults and/or TMJ disturbances to the soft-tissue attachments of the tube. Myofascial trigger points in the medial pterygoid muscle can refer pain into the ear. [11,22]



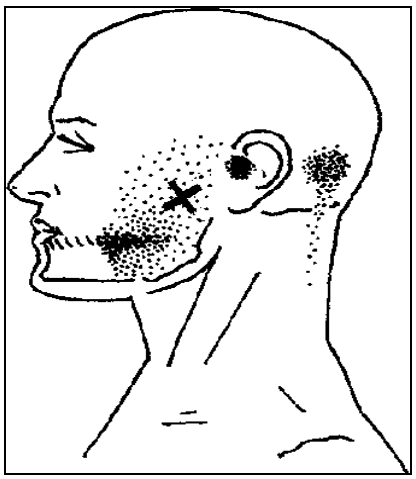


Figure 5 – The jugular foramen is located between the petrous portion of the temporal bone and the jugular process of the occipital bone. (Appendix I) In this patient's case, cranial nerve XI and its motor supply to the left sternocleidomastoid and anterior scalene muscles bilaterally were improved by treatment to these two bones.

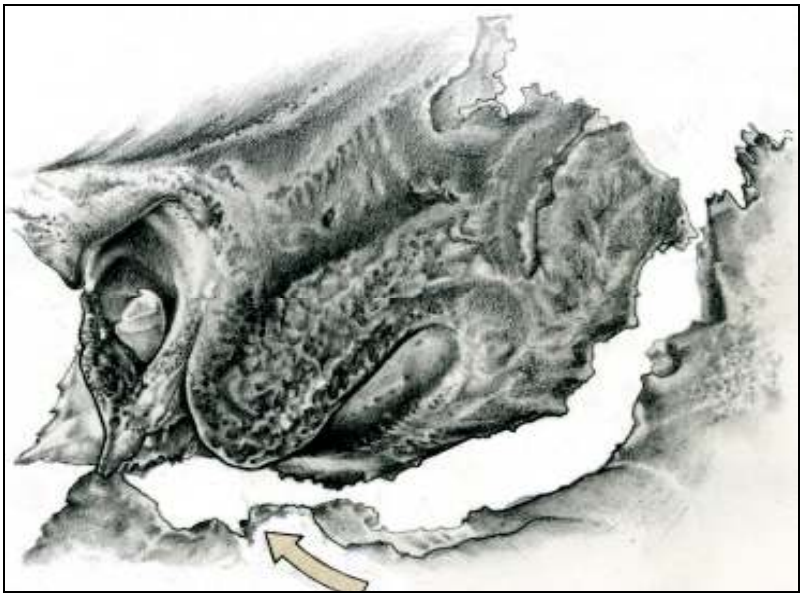
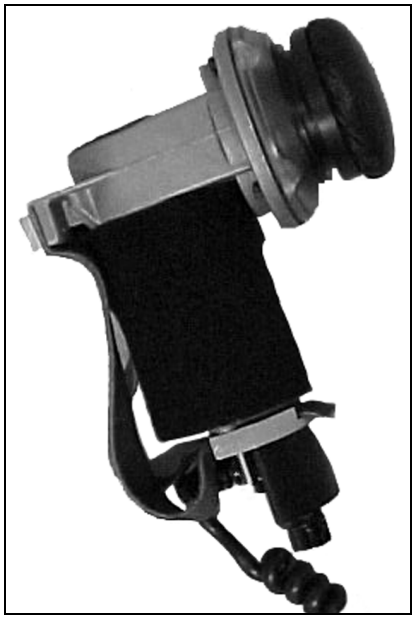


Figure 6 –The Percussor instrument (from IMPAC) used to deactivate myofascial trigger points and improve muscle tone. [39]



CASE STUDY

Chiropractic Care of a Pediatric Patient Suffering from Recurrent Otitis Media and Respiratory Syncytial Virus: a Retrospective Case Report

Francesca M. Marino, B.S., D.C.[1] & Awais Butt, D.C.[2]

Abstract

Objective: To describe the chiropractic care of a pediatric patient suffering from recurrent otitis media (OM) and respiratory syncytial virus (RSV).

Clinical Features: A twenty-one-month-old girl presented with previous diagnoses of OM and RSV. As an infant she was not breastfed. She was diagnosed with her first ear infection when she was one- month-old and RSV at nine months. Her pediatrician managed the ear infection with oral antibiotics and managed the RSV with a bronchodilator via nebulizer. The patient's mother brought her daughter to the chiropractor because she was frustrated by the length of time in which her child had been ill and was not comfortable with the prescribed allopathic care plan. After a thorough pediatric examination, the chiropractor, using Diversified chiropractic analysis, located subluxations at the level of the pelvis and atlas.

Intervention and Outcomes: The patient received low-force, high-velocity chiropractic adjustments as needed, three times a week for three months. After the first month of chiropractic care, the child's mother reported that she discontinued the use of oral antibiotics because there was no recurrence of OM. This was an improvement as it previously occurred twice monthly for the last year-and-a-half. By the end of three months of chiropractic care, nebuilzer treatments for RSV ceased. The patient has since remained symptom free and continues to get her spine checked weekly as a wellness patient.

Conclusions: This report describes the successful treatment of OM and RSV in a pediatric patient, using Diversified chiropractic technique. It is uncertain whether the chiropractic care by itself caused the child's favorable immune response or if other factors played a role in resolving her conditions. Despite this uncertainty, the clinically relevant objective findings are substantial to warrant more research pertaining to the chiropractic care of pediatric patients.

Key Words: *Chiropractic, Vertebral Subluxation, Pediatric, Respiratory Syncytial Virus, RSV, Otitis media*

Introduction

Chiropractors treat a wide variety of pediatric health conditions[1] and there is some evidence that suggests chiropractic is an effective technique for reducing the frequency and severity of recurrent otitis media (OM) in children.[2] In the United States, OM is the most frequent reason

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for physician visits for children under the age of fifteen and the second most common diagnosis in medicine.[3,4] Clinicians do not agree on the specific criteria for the diagnosis of OM but the list of common symptoms includes: ear pain, fever, swollen neck lymph glands, possible GI distress, a red and bulging ear drum or purulent discharge.[5] While OM remains the most frequent reason for prescribing antibiotics to children in the U.S., prior antibiotic use is considered to be associated with an increased risk of OM, as well as not being breastfed.[6,7] Other studies show that infants who are not breastfed have double the odds of developing recurring OM whereas, infants who are breastfed for the first four months of life are protected against single and recurrent episodes of OM. [8,9]

Respiratory syncytial virus (RSV) is the most common cause of viral lower respiratory tract infection in infants and children with 90% of children infected by 2 years of age.[10] The Pathologic Basis of Disease classifies RSV as a pathogen which expresses itself as bronchiolitis or pneumonia.[11] Weisman describes RSV as a ubiquitous pathogen that produces seasonal epidemics most frequently affecting immunocompromised children, premature infants, and infants with congenital heart disease or chronic lung disease.[12] According to Durani, the combination of cough, wheezing and retractions accurately predicts RSV in children presenting with acute respiratory illness during the winter season, but research states a definitive diagnosis for RSV is based only on tissue culture.[10]

Unfortunately, research trends show that family physicians and pediatricians continue to diverge from the published principles and quickly prescribe a host of various medications.[10,13] RSV is contracted by coming into contact with surfaces which contain infected nasal secretions. While good hand washing has been identified as the key to preventing the spread of this infection, a 2006 article from *Pediatrics* suggests a possible prevention strategy beginning at birth.[8] Chantry et al document that full breast feeding (for greater than or equal to six months) provides greater protection against developing respiratory tract infection, suggesting that infants who are not breastfed could have an increased risk.[8] Via several mechanisms, it has been identified that human milk can actively stimulate the immune system of the breastfed infant, thus reducing the risk of respiratory tract infection and otitis media.[14]

Case Report

History

The female pediatric patient presented to the clinic with previous diagnoses of recurrent otitis media (OM) and Respiratory Syncytial Virus (RSV). The mother brought her daughter to the chiropractor at twenty-one-months-old because she had become exasperated by the length of time in which the child had been sick and exhausted by the care plan prescribed by her pediatrician which consisted primarily of prescription medication over the course of a year-and-a-half with no resolution of her child's symptoms.

When the child was one-month-old, she experienced her first ear infection. The mother described her daughter as having red ears and a high pitched scream. The pediatrician prescribed antibiotics for OM and she was sent home. With each new episode, the mother would receive antibiotics to give her child. At nine months old, the little girl was diagnosed with RSV and the mother was to administer a bronchodilator to her daughter with a nebulizer, in addition to the antibiotics she was already taking for OM.

The mother reported no family history of OM or RSV, only mentioning that she is not clear as to how her daughter contracted either of these illnesses, and is confused as to why she had been sick for this duration. She mentions that she had tried to breastfeed her daughter but discontinued due to difficulty. Her mother was also concerned that her daughter had been on a nebulizer for RSV for the past year and found the current care plan by the pediatrician of antibiotics and bronchodilators to be frustrating because her daughter was not getting well. The mother states she decided to pursue other options regarding her daughter's health.

The child began chiropractic care for the first time in her life at the age of twenty-one-months. Upon recommendation, her mother brought her to the clinic to be examined and checked for vertebral subluxations.

Chiropractic Assessment

Diversified technique utilizes many different indicators of subluxation including, but not limited to: posture, motion palpation, the location of any sites of palpatory pain, leg length symmetry and thermography.[15,16] Of the aforementioned, static and motion palpation are commonly used to determine chiropractic subluxations in pediatric patients.[7]

The objective of static palpation is to digitally locate areas containing edema and tenderness noting the child's reaction upon statically palpating their spine. Upon static palpation of the patient's spine, edema and tenderness were identified over the right sacroiliac and right atlanto-axial joints.

Motion palpation was then used to determine if there was restriction at the joint spaces identified by static palpation. The goal of motion palpation is to determine how much the joint moves within its given range of motion.[15] In the pediatric pelvis, lifting one leg at a time enables the chiropractor to feel for restriction in the sacroiliac joints. At the atlanto-axial joint, restrictions are found when a global loss of motion exists upon passive head rotation. Motion palpation of these areas determined a right pelvic restriction and a right atlas restriction. Unfortunately, motion and static palpation have limited intra-examiner reliability and it is significant to mention that analysis and detection of chiropractic subluxation involves a multitude of components. [16]

Once restrictions have been noted, x-rays are taken to accurately determine the level and direction of vertebral malposition. A rationale for using plain film imaging in the chiropractic office is first, to rule out the presence of pathology that would contraindicate manipulative therapy; second, to identify anomalies that would influence how an adjustment is applied; and last, to obtain static and functional biomechanical relationships that may have clinical relevance to the patient's symptoms.[15] Lateral cervical and anterior to

posterior pelvic views were taken and analyzed using Gonstead x-ray mensuration. Listings of Posterior Inferior (PI) of the right pelvis and Anterior/Superior/Right (ASR) of the right atlas were determined. A PI subluxation reveals a "longer" ilium on x-ray because the ilium moved posterior and inferior to the sacrum. An ASR subluxation is specified by a visibly open wedge in the front of C1 between C1 and C2 on a lateral cervical x-ray, because atlas has moved anterior and superior to C2. The third potion of the listing (R) was determined by palpation.

Intervention

The mother brought her daughter in to be checked for subluxations three times a week, for three months, during initial intensive care. The chiropractor located and reduced her pelvic subluxation twenty-five times and her atlas subluxation twenty-eight times using Diversified adjustments. The pelvis was adjusted while the patient was in a prone position on the adjusting table. The doctor gently lifted the patient's right leg with his left hand and delivered a high velocity, low-force impulse into the right sacroiliac joint with the thumb of his right hand, reducing the subluxation. The patient's atlas was adjusted while the mother held her daughter in her arms. The doctor stood in front of the mother and contacted the child's right atlas with his right index finger delivering a precise low-force impulse in a right to left vector. Immediately following each adjustment, the doctor re-checked the segments through motion palpation to determine that the subluxations were reduced and ranges of motion improved.

Results

The mother reported an improvement in the child's quality of sleep within the first week of care which consisted of three visits in which her right pelvis and right atlas were adjusted. Within one month of care, the child had no recurrence of OM and her mother elected to stop giving her child the oral antibiotics. Within three months of care, she brought her child back to the pediatrician and was told the child no longer had RSV, therefore nebulizer treatments were discontinued. The patient who is now four years old has had no further occurrences of OM or RSV. The patient continues to have her spine checked for chiropractic subluxations on a weekly basis.

Discussion

Current medical management of otitis media is geared towards the eradication or removal of the bacteria in the middle ear with use of antibiotics as the first line of defense.[17] However, the accepted guidelines for management of recurrent OM stress the importance of limiting antibiotic use.[18] Regarding RSV, there is little evidence to support the administration of bronchodilators as treatment for RSV. Weisman suggests vaccinating against RSV as a preventative measure within the high-risk population but his study ultimately concluded that the vaccine did not prevent RSV in high risk infants, only reduced the number of cases.[12]

In other research, the American Academy of Pediatrics recommends exclusive breastfeeding for infants during the first six months of life in order to provide greater protection against respiratory illness.[8] Since the pediatric patient in this case report was not breastfed as an infant, one could theorize that her immune system lacked the anti-infectious capacity uniquely acquired through breastfeeding, but unfortunately, there is no evidence to support this claim.[14]

The chiropractic profession has claimed favorable clinical responses for otitis media and other upper respiratory infections for nearly 100 years and evidence is increasingly suggesting that the nervous system is capable of modulating the immune system.[7,19] Therefore, such a connection creates the possibility that a chiropractic adjustment can influence the immune system because of its effect on the nervous system.[20] In fact Brennan et al, in an effort to better understand the efficacy of spinal manipulation, assessed the changes in biological markers such as polymorphonuclear neutrophils (PMN) after spinal manipulation, concluding that a high-velocity, low-amplitude thrust primes PMN for an enhanced respiratory burst, i.e. a viscerosomatic response.[21] Based on those findings one could presume that the Diversified chiropractic adjustment, such as the one received by this patient, could initiate a parasympathetic response, based on the location of the autonomic nerves, thus improving her condition.[22] However, large scale studies assessing this relationship are needed.

Conclusion

This report describes the successful treatment of OM and RSV using Diversified chiropractic technique on a pediatric patient. It is uncertain whether the chiropractic care by itself enabled the child's favorable immune response or if other factors played a role in the resolution of her conditions. Despite this uncertainty, the clinically relevant objective findings are substantial to warrant more research pertaining to the chiropractic care of pediatric patients. With that being said, we are seeing an increase in the number of children being brought to alternative health care practitioners and since the majority of those practitioners are chiropractors, it is imperative that the chiropractic profession work towards establishing standards of care for the management of common childhood conditions. [23]

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CASE STUDY

Improvement in Cystic Fibrosis in a Child Undergoing Subluxation-Based Chiropractic Care: A Case Study

Craig Warhurst, DC[1], Ryan Warhurst, DC[2] & Aryn Gabai, DC[3]

Abstract

Objective: The objective of this report is to retrospectively document subluxation-based chiropractic care provided to an 8 year old male who was seen for a year and a half.

Clinical Features: An 8 year old male presented for care with complains of recurring infections, inability to sleep, and inability to participate in age-appropriate sports. He was diagnosed with cystic fibrosis at birth.

Intervention & Outcomes: The course of care involved chiropractic spinal adjustments, Network Spinal Analysis care, and trigger point therapy. Improvements were observed in the patient's resistance to recurrent infection, activity level, sleep ability, and overall quality of life.

Conclusion: With previous studies examining the relationship between subluxation reduction and autonomic function, immune function and somatovisceral reflexes, this case suggests that more research is needed to examine the short and long-term impact of subluxation-based care for those children with cystic fibrosis.

Key words: *subluxation, subluxation-based chiropractic care, cystic fibrosis alternative care, CAM treatment of cystic fibrosis.*

Introduction

Cystic Fibrosis (CF) is a serious autosomal recessive disorder than occurs frequently in Caucasian populations, with a prevalence of 1 in 3500 live births.[2] The prognosis for this condition involves a shortened life span, recurrent infections and imposing medical costs.[3] When first diagnosed in 1931, the average life expectancy was less than two years.[4] Due to more modern practices, the current median predicted age of survival has increased to 37 years for populations in North America and European countries.[2,5] Among children, CF is more common than phenulketonuria and galactosemia and less common than congenital hypothyroidism and sickle cell disease.[6] While treatment has significantly improved the life span of CF patients, the pathophysiology of the condition is still burdensome to treat with current therapies and involves a multidisciplinary approach to provide a high level of care.

CF begins as a recessive genetic mutation effecting over 1,000 genes that produce a transmembrane conductance protein. This results in abnormal salt transportation in epithelial cells, causing a variety of other deleterious effects to the normal function of the body.[2]

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Diagnosis of CF is primarily made shortly after birth using the sweat test (pilocarpine inotophoresis).[5] While the diagnosis of CF is not immediately life-threatening, there are life-threatening sources of concern due to abnormal lung function and pancreatic insufficiency which rely heavily upon proper cellular excretion.

The health of the lungs is of particular importance to CF patients because they produce thick, sticky mucus that can block small airways leading to acute inflammation, chronic respiratory infections, and airway obstructions.[5] The relative importance of lung function can be demonstrated by the fact that forced expiratory volume (FEV_1) is the strongest indicator for mortality from CF. The other major predictor for lung function in CF is peak oxygen uptake (peak VO_2). [7,8] These two measurements are improved through increased activity and decreased incidence of pulmonary infection, both of which are inherently limited by the chronic obstruction seen in CF.

Pancreatic insufficiency is of concern for the reason that the pancreatic enzymes are vital for the proper digestion of most foods. The decrease in absorption of nutrients can lead to low absorption of fat soluble vitamins, an inability to meet appropriate energy demands and can cause a failure to thrive. [5] This can be further exacerbated by the fact that there is an increase in resting energy expenditure is also noted in CF kids. Higher energy demand creates a higher demand for nutritional balance, further complicating improper digestion.

Nutritional factors have been seen as a limiting reason for age-associated growth of kids, with 25% of CF children in the $<5^{th}$ percentile for height, and 20% in the $<5^{th}$ percentile for weight. [9] Whether low weight is a cause or an effect of declining pulmonary function has yet to be determined.[7] Another significant finding in CF patients is that diabetes has been associated with many moderate to severe cases of CF. This refers to the fact that pancreatic function is highly dependent upon the secretion of circulating hormones, and the secretion mechanism in CF patients has been genetically altered.

Children have an additional variety of symptoms due to CF, including shortness of breath, salty-tasting skin, persistent coughing, and decreased activity level. Bone dysfunction is also prevalent with decreased bone mineral density and content, increased fractures, excessive kyphosis and arthritis. Back pain is also evident in 94% of all CF patients. [10]

No cure has been developed for cystic fibrosis. The Cystic Fibrosis Foundation currently recommends a multidisciplinary approach to care mainly focused on lung clearance, pancreatic function, and proper nutrition.[2] The current care provided includes routine antibiotic therapy, lung clearance exercises and pancreatic enzyme supplementation.

Lung clearance exercises have been shown to help decrease exacerbations, but despite several methods attempting to clear the lungs, no single lung clearance has been proven to be the most effective at clearance.[3,11,12] As is consistent with long-term obstructive pulmonary disease, lung transplant is commonly used in end-stage CF patients.

Conservative chiropractic treatment of CF has been limited in peer reviewed publications, but is increasingly being used by CF patients. Complementary and alternative medicine (CAM) treatment for CF is being used by 75% of patients in some form, with 14.5% seeking manual therapy of some sort. Ten percent of CAM patients sought chiropractic care specifically.[1]

A literature search of peer reviewed journals also found two articles citing the use of chiropractic care with CF. Stern et al. reported relief from back pain and arthralgia in CF patients, including a high perceived benefit from care and no indicated risks associated.[13] Wittman et al. demonstrated a case of a 10 month old Caucasian male who had increases in physical development and growth, behavior, diet, sleep and social development as a result of subluxation-based chiropractic care. [14]

Case Report

History

An 8 year old Caucasian male presented at a chiropractic office with parents interested in improving, "the quality of life" for the patient. The areas of major concern included recurring infections, the lack of ability by the patient to participate in age-related activities, and an inability to sleep. The patient was diagnosed with CF at birth and was confirmed at 30 days old using the sweat test.

Since birth, the patient's father reported an average of 3 hospitalizations per year due to infections and respiratory distress, totaling between 2-8 weeks of hospitalization per annum. He was diagnosed as having a Pseudomonas aeruginosa infection in his lungs at 3 months old, and Methicillin Resistant Staphylococcus Aureus (MRSA) in his lungs at age 5. The patient also was diagnosed as having nasal polyps. The patient reported having gastrointestinal distress as a regular occurrence.

He was also diagnosed as having an impaired glucose tolerance level with a glucose tolerance test reading around 200 mg/dl. His most recent hospitalization was a two week course of treatment for a respiratory tract infection completed several days prior to initial chiropractic examination.

The patient's main caretaker is his grandmother. She supplied a list of active medications for the patient. He was taking an antibiotic-antiviral-antifungal cocktail (sulfamethoxazole-trimethoprim, cefuroxime, azithromycin, tobramycin, dornase alfa and itraconazole), a chewable multivitamin, two liquid laxatives (ethylene glycol and polyethelene glycol), a steroid hormone (mometasone), a proton pump inhibitor (omeprazole), and lung function medications (Singulair, atrovent, advair). Despite this regimen, the grandmother reported that the patient was often struck with illness. He would feel ill with a change of the seasons and caught most sicknesses that are endemic to his age group. She reported a significant number of school days missed each year due to illnesses.

Due to his respiratory illness, the patient was frequently short of breath and unable to participate in athletic activities such as

gym class, sports, and regular neighborhood group play. He also had difficulty falling asleep and remaining asleep, as his caretakers reported him staying up until 4 AM routinely. His attention span and focus were both said to be limited.

Physical Exam

A physical exam was performed including range of motion study, electromyography, thermography, orthopedic exams, cranial nerve evaluation, palpation and sensory exams. The child was found to have significant decreases in ranges of motion of cervical flexion, extension, right lateral flexion, right rotation and left rotation, as well as thoracic extension restriction and bilateral lumbar lateral flexion restrictions.

Thermal scan identified moderate to severe heat imbalance throughout the cervical and upper thoracic regions. Surface EMG found hypertonic musculature at the mid-cervical, mid-thoracic, and upper lumbar regions. Tenderness upon palpation was observed at the levels of C1, C2 and C5, T3-6 and T11, and L1. Faber-Patrick test elicited a positive sign on the right side. The child presented with short, rapid breaths and severe thoracic cage tension. Subluxations were identified at the levels of C1, C5, T5, T11 and L3.

Intervention

The child's initial treatment plan included chiropractic adjustments and Network Spinal Analysis (NSA) care three times per week to address presenting vertebral subluxations. Cervical adjustments, thoracic adjustments and NSA treatments were administered on every visit. Lumbar adjustments were administered routinely, but not every visit as the cervical or thoracic adjustments were.

An Erchonia Percussor and Adjuster were occasionally used to address trigger points and fibrotic adhesions of the thoracic cage. Cervical adjustments were performed using side posture upper cervical specific corrections, as well as supine cervical corrections, thoracic adjustments were delivered using diversified prone techniques and lumbar adjustments were administered in a side-posture position.

The NSA care was used according to the method developed by Donald Epstein, DC. NSA is a technique that utilizes systemic indicators to identify specific locations of adverse mechanical tension in the spinal cord and, using a specific low-force contact to release these adhesions. NSA incorporates both doctor's use of adjustment techniques and patient's innate self-directed corrective force.[15]

For this child, NSA care was specifically important for the emphasis on improving respiratory wave function. Spinal cord tension release and increased cerebrospinal fluid flow are entrained to ventilation, providing an opportunity for the practicing chiropractors to improve the respiratory function of the child through subluxation correction. [16]

Outcomes

Over the course of the first few months of chiropractic care, reassessments were made after 9 visits and the care plan remained consistent. Improvement in breathing function was reported by the patient on several occasions. The patient was able to fall asleep easier and remain sleeping throughout the night. A recommendation for an increase in calorie consumption as well as the addition of a probiotic supplement (LactoFlamX, produced by Metagenix) was made 3 months into care.

The child's improvement was documented in the notations of the chiropractor and observations by the child's care takers. After 1.5 years of continuous care ranging from 1-2 adjustments per week, there was a significant alteration in the physical findings and in the patient's lifestyle. Thermal scan showed a significant reduction in the imbalance demonstrated by temperature readings for the cervical and upper thoracic region. Surface EMG was improved yet hypertonic muscular was noted in the mid-thoracic and upper lumbar regions. Range of motion studies provided no significant changes in age-related degree norms.

The patient significantly increased his physical activity, demonstrated by his actively seeking and attaining a black belt in karate. He was free from hospitalization for over 8 months, had reduced absences from school, and increased in both height and weight. He still had occasional cold symptoms, but when they did arise, chiropractic care was sought and symptoms resolved within a day, as reported by the care takers. Long-standing cold symptoms, including respiratory distress, have ceased according to the patient's care providers and to the attending medical physicians' notes of care. There was also a decrease in the number of hospital visits for exacerbations.

While under care, caloric intake was adjusted to reduce weight gain due to significant increase in appetite and weight gain. The care providers also reported actively seeking to reduce medications being taken by the patient under recommendations from their acting medical physician due to the recent surge in energy, activity and decrease in clinical symptoms.

Improvement was noted in the child's sleeping ability throughout the course of care. His care takers reported him falling asleep in a normal fashion, as well as sleeping through the night consistently. This has resulted in an increase in focus by the patient, coupled with a decrease in the number of absent school days.

Objective measures taken in a hospital setting are summarized in Table 1. These measures display an increase in weight and height, a slight decrease in BMI and relatively no change in FVC and FEV_1 during the course of chiropractic care.

Discussion

Cystic fibrosis is an underlying genetic mutation that impacts the function of all cells in the body through impacting salt transportation in epithelial cells. This manifests most severely on the visceral function of both the lungs and the pancreas. This dysfunction results in a decreasing innate ability by the patient to exercise, move and digest optimally. The standard course of treatment for this disease aims at combating the recurrence of bacterial infection and nutritional concerns, but is limited in addressing visceral function improvement within

the constrictions of the patient's condition. [17-19]

Evidence suggests that correction of vertebral subluxations or vertebral subluxation complexes (VSC) positively impact the function of a multitude of visceral functions. [20,21] Cases have been reported in which cervical VSC corrections led to the resolution of vascular complaints and where lumbar VSC correction was found to positively influence the recurrence of dysmenorrhea. Both conditions are similar to this case in that they are not pathological in nature, but instances of dysfunctional (pathophysiological) manifestations of the body. [20]

CF has specific dysfunctional issues related to the secretion of mucus and malproduction of enzymes. These visceral functions are directly impacted by both the autonomic nervous system and somatovisceral reflexes. The centers for these functions are located at the individual spinal level, the supraspinal reflex center, and the central nervous system, all areas of impact from VSC. [22] Chiropractic adjustments have been illustrated to have an ability to alter the function of the autonomic nervous system and somatovisceral reflexes due to subluxation correction in the spine and its effects on the spinal cord and peripheral nerves. [23, 24]

Through the application of chiropractic adjustments, it is plausible that the improvements in respiratory function seen in this patient were made due to correction of subluxations. Research findings have suggested this connection through examination of VSC correction and its impact on asthma patients and pulmonary function in several previous studies. [25-28]

CF visceral dysfunctions are propagated by the lack of a patient's ability to exercise, breath fully, and consume proper nutrients as a result of the limitations of the disease. This often leads to a negative spiral that can increase health maintenance costs and decrease the patient's quality of life. Through the application of subluxation-based chiropractic care and improvement of visceral function, the patient in this case was able to halt the negative feedback loop of symptomatology and re-establish positive lifestyle gains. This was seen in the patient's increase in physical activity through martial arts, a decrease in hospitalizations, and significant gains in height and weight..

There are several suggestions to the cause of such a drastic reversal in condition given that the child was under chiropractic and medicinal treatment simultaneously. However, due to the fact that no new methods were implemented by the attending medical doctor that have been proven to have a significant impact in the symptomatology of CF during the time period that he received care, the indication is that VSC correction reduced the recurrence of symptoms.

VSC correction has been previously demonstrated to have a positive response in autonomic function in long-standing diseases. Specifically with cerebral palsy, chiropractic care has shown increased ability to perform activities of daily living, mobility and feeding, all of which are also limiting factors in patients with cystic fibrosis. [29] These findings suggest that even in permanent conditions, improvements can be made to motor and visceral function. The method by which this occurs is currently unknown, but several theories on the impact of VSC on the autonomic system are covered thoroughly by Rome.[21]

Another major factor to consider with the application of chiropractic care to CF children is the impact of immune system function. Chiropractic has been extensively reported to increase the effectiveness of the immune system through application of VSC correction. [30-41] For CF patients, this would immediately impact the patient's ability to resist and fight chronic infections that result in a high incidence of chronic obstructive pulmonary disease.

In this case, the patient's immune function was increased as demonstrated by a much better response to seasonal pathogen exposure, as the child had not been burdened with major illness which required any hospitalization for over 8 months for the first time in his life. Also, the quick resolution of cold symptoms is significant given the fact previous to chiropractic care, similar symptoms would exist for several weeks at a time.

Objective measures taken during this study have serious challenges to validity. Firstly, there are a relatively few number of data points for pre-chiropractic treatment compared to during chiropractic treatment, giving a bias towards the chiropractic treatment period. Secondly, a single measurement does not reflect the overall function of the patient. Despite increases or decreases in FVC or FEV_1 during quarterly evaluations, the daily functional rate of these measurements cannot be determined due to insufficient data.

Therefore, an overall improvement in quality of lung function cannot be directly inferred from these measurements. It is noted that even though the FVC and FEV_1 measurements did not improve during the chiropractic treatment period, physician notes in the quarterly hospital reports reflected the care takers' observations of increased energy, sleep balance and overall improvement.

Conclusion

Chiropractic care through specific upper cervical adjustments, diversified adjusting, and Network Spinal Analysis appears to facilitate and improve the visceral and immune function of the body. The emphasis on increased ventilation through NSA and vertebral subluxation correction produced a marked difference in the physiological function and the quality of life of this CF patient.

There is research emerging that fills the void of why this is happening, but there is a high demand for more studies to understand the underlying mechanisms of correction. With more children with CF living into adulthood, the possibility of improving physiological and visceral function through chiropractic care represents a major ability to improve the quality of life of individuals with CF over decades of time. Long term studies involving the use of chiropractic care in CF patients will be needed to better determine the role of the chiropractor in the standard course of treatment for this disease.

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TABLE 1: Rates of change taken during in-hospital visits

Objective Measure	Pre-chiropractic care		During chiropractic care	
	Total units	Per month	Total units	Per month
Weight (lbs)	+ 1.7	+ 0.200	+ 4.6	+ 0.263
Height (cm)	+ 1.5	+ 0.176	+ 9.3	+ 0.531
BMI (kg/m^2)	+ 0.73	+ 0.086	- 0.050	- 0.003
FVC (L)	+ 0.1	+ 0.012	+ 0.07	+ 0.004
FEV_1 (L)	+ 0.17	+ 0.020	- 0.03	- 0.002

Instrumentation

Figure 1 – Initial Thermal Scan

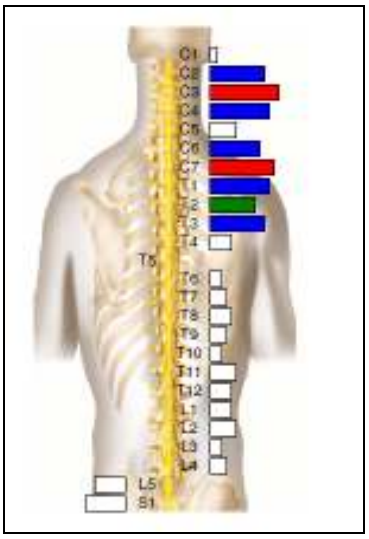


Figure 2 –Thermal Scan – 2 Months After Care Began

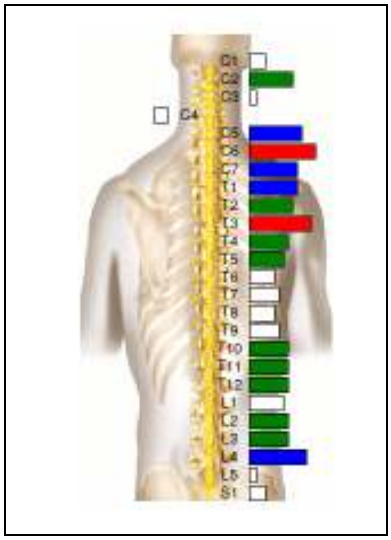


Figure 3 –Thermal Scan – 4 Months After Care Began

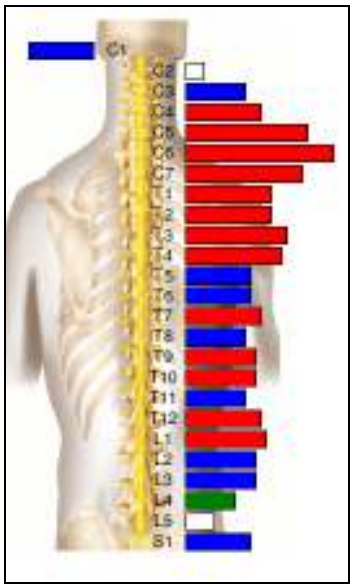


Figure 4 –Thermal Scan – 10 Months After Care Began

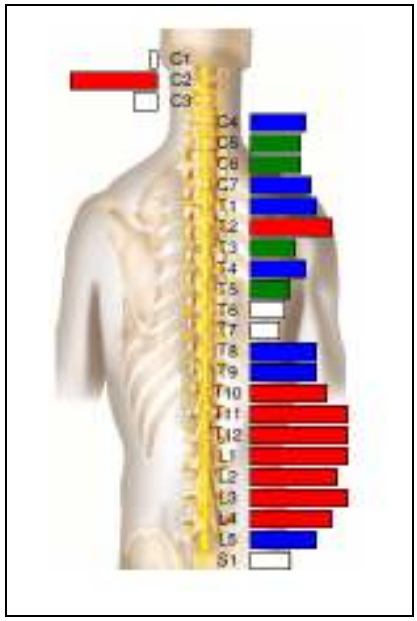


Figure 5 –Thermal Scan – 22 Months After Care Began

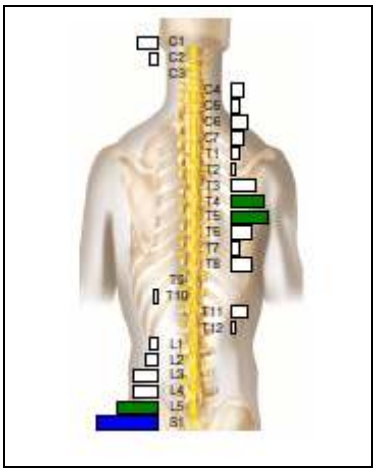


Figure 6 – Initial Surface Electromyography Scan

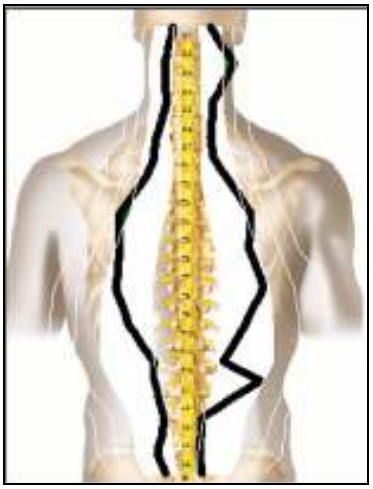


Figure 7 –Surface Electromyography Scan – 2 Months After Care Began

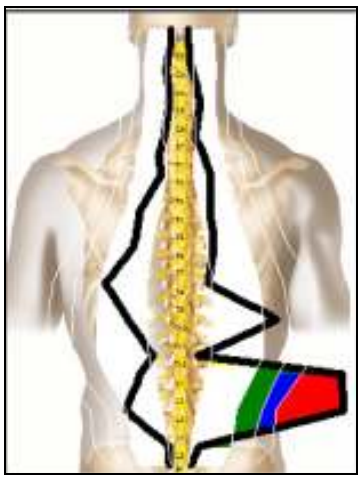


Figure 8 –Surface Electromyography Scan – 4 Months After Care Began

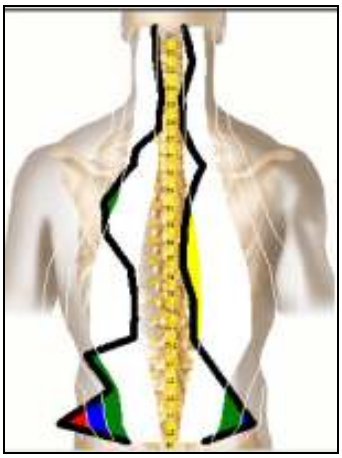


Figure 9 –Surface Electromyography Scan – 10 Months After Care Began

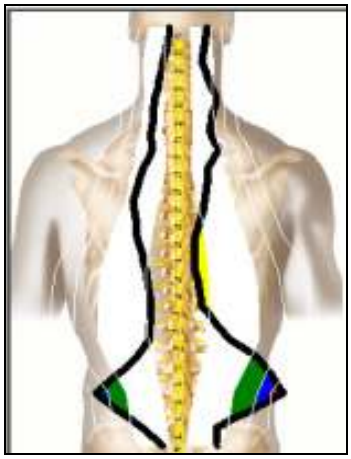
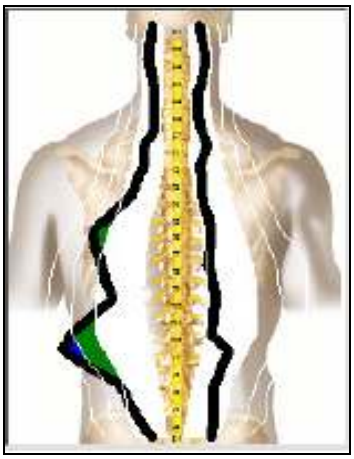


Figure 10 –Surface Electromyography Scan – 22 Months After Care Began



SPECIAL REPORT

The Flu: Special Report

Matthew McCoy D.C., MPH - Editor

It's that time of year again – flu season. You are no doubt being encouraged to "Stop Fluin' Around" and get your annual flu shot and apparently many folks are listening since Novartis made $1.1 Billion on flu shots in the first quarter of 2010 alone.[1] For the younger crowd "Scrub Club" has the evil *Influenza Enzo* to scare the heck out of children so they want to get the flu shot.[2] If you're too busy, lazy or out of shape you don't even have to get out of your car these days to get your flu shot – you can just get it from a drive through.[3] And if all of that wasn't bizarre enough Publix was giving out flu shots in the deli – "I'll have a half pound of ham sliced thin – and a flu shot please"[4]

If you question the wisdom of this annual rite of passage you are not alone in your disdain for the flu shot. According to the most recent data from the Centers for Disease Control and Prevention, a significant number of health care professionals declined to get a flu shot during the 2006-07 flu season, with only about 40 percent opting for the shot.[5]

You'll be happy to know that science is also on your side as well as those health care folks who opt out of the shots. For example, there is the study that was done in Ontario to determine whether the incidence of influenza there decreased following the introduction of their Universal Influenza Immunization Campaign (UIIC) in 2000.[6] They found that there has not been a decrease in the mean monthly influenza rate following the introduction of their campaign. The authors concluded:

"Despite increased vaccine distribution and financial resources towards promotion, the incidence of influenza in Ontario has not decreased following the introduction of the UIIC."

In another study in the Archives of Internal Medicine that looked at the role of the flu vaccine in relation to benefit, the authors attributed the decline in influenza related mortality among people aged 65 to 74 years in the decade after the 1968 pandemic to the acquisition of immunity to the emerging A(H3N2) virus.[7] The researchers could not correlate increasing vaccination coverage after 1980 with declining mortality rates in *any age group* (emphasis mine). They concluded that because fewer than 10% of all winter deaths were attributable to influenza in any season, that observational studies substantially *overestimate vaccination benefit (emphasis ours)*.

In another study in the British Medical Journal published in 2006 and funded by the Cochrane Collaboration, an independent non-profit foundation, the safety and efficacy of the current flu vaccine recommended policy is challenged.[8] They begin their paper by stating:

"Each year enormous effort goes into producing influenza vaccines for that specific year and delivering them to appropriate sections of the population. Is this effort justified?"

Their report summary was alarming and questioned the use of the flu vaccine as follows:

- Public policy worldwide recommends the use of inactivated influenza vaccines to prevent seasonal outbreaks
- Because viral circulation and antigenic match vary each year and non-randomized studies predominate, systematic reviews of large datasets from several decades provide the best information on vaccine performance
- Evidence from systematic reviews show that inactivated vaccines have little or no effect on the effects measured
- Most studies are of poor methodological quality and the impact of confounders is high
- Little comparative evidence exists on the safety of these vaccines
- Reasons for the current gap between policy and evidence are unclear, but given the huge resources involved, a re-evaluation should be urgently undertaken

Another study in *The Lancet* questions the benefits of flu shots for elderly people and says the benefits are "greatly exaggerated."[9] The researchers stated that the public policy for the elderly getting flu shots is based on flimsy, even nonexistent, evidence.

Dr. Lisa Jackson was quoted in a news story about her research stating:

"The message is: We should not be basing our vaccine policy on data that is faulty"

They went on in their paper:

"We find it peculiar that the claims that influenza vaccination can prevent half, or more, of all winter deaths in elderly people have not been more vigorously debated."

Their study showed that unvaccinated seniors died at a higher rate for reasons unrelated to flu and they also stated that increasing vaccination rates since 1980 have not lowered death rates among the elderly. Jackson calls for a more realistic assessment of the vaccine's benefits that may push researchers to begin studying other strategies to help the elderly avoid flu and its complications.

In terms of side effects, some studies have shown an association between Guillian Barre' syndrome (GBS) and flu shots.[10,11] Interestingly the author of the second study - Jurrlink - was quoted in a news story as comparing the risk of getting GBS from the vaccine to being struck by lightning. Lightening, it turns out, killed 47 people in 2006.

In terms of the risk benefit ratio, reports claim that influenza kills 30,000 to 40,000 Americans every year. Though the CDC lumps the flu and pneumonia in together for these numbers. According to Mercola the actual number of deaths attributable to the flu itself is less than 1000 a year.[12]

Add to all of this that the majority of influenza vaccines distributed in the United States contain Thimerosal and that, while highly controversial, this methyl mercury based preservative has been claimed to be linked to autism, Alzheimer's, and ADD.

So as you get ready to begin the holiday season take a look at your options – drive through, deli style, or mist style… or you could take the advice of the National Vaccine Information Center[13] (Table 1). Notice the recommendation by the NVIC that people add chiropractic to their strategy for warding off and fighting the flu and its effects this season.

Spinal adjustments can have a positive effect on immune function, according to a growing number of researchers who are exploring the common denominators in disease processes, and the role of the nervous, immune, and hormonal systems in development of immune related illnesses. Chiropractic corrects spinal abnormalities called vertebral subluxations that result in interference of the nervous system by affecting the function of nerves. Since the nervous system controls all functions of the body -- including the immune system -- chiropractic care can have a positive effect on immune function.

According to well known chiropractic researcher Dr. Christopher Kent: "Contemporary research is beginning to shed light on the neurobiological mechanisms which may explain the outstanding clinical results chiropractors have experienced when managing patients with viral and infectious diseases."[14]

Dr. Kent explained: "A comprehensive review of the research literature reveals the current understanding that the brain and immune system are the two major adaptive systems in the body. During an immune response, the brain and the immune system 'talk to each other' and this process is essential for maintaining homeostasis or balance in the body."

Since its inception, chiropractic has asserted that viruses and microbes don't threaten us all equally and that a healthy immune system easily repels most invaders. The immune system protects us from the flu, as well as any other infectious disease, and strives to get us well again when we do fall ill. Our immune system, like every other system in the body, is coordinated and controlled by the nervous system.

Chiropractors are also aware of the importance of positive health life style practices (rest, drinking ample quantities of water, diet, exercise, proper food choices, use of high potency multivitamins and minerals, and stress reduction approaches) that can also positively influence the nervous system and immune response. According to a large study of the chiropractic profession recently conducted by the Institute for Social Research, Ohio Northern University chiropractors also customarily advise their patients as to the benefits of these other modalities in optimizing overall body function.[15]

Chiropractors helping patients battle the flu is not a new occurrence either. During the 1917-18 influenza epidemic, which brought death and fear to many Americans, it has been estimated that 20 million people died throughout the world, including about 500,000 Americans. It was chiropractic's success in caring for flu victims that led to the profession's licensure in many states. Researchers reported that in Davenport, Iowa, out of the 93,590 patients treated by medical doctors, there were 6,116 deaths -- a loss of one patient out of every 15. Chiropractors at the Palmer School of Chiropractic adjusted 1,635 cases, with only one death. Outside Davenport, chiropractors in Iowa cared for 4,735 cases with only six deaths -- one out of 866. During the same epidemic, in Oklahoma, out of 3,490 flu patients under chiropractic care, there were only seven deaths. Furthermore, chiropractors were called in 233 cases given up as lost after medical treatment, and reportedly saved all but 25. In another report covering 4,193 cases by 213 chiropractors 4,104 showed complete recovery.[16,17]

These results are not so surprising given what we now know about the interaction between the nervous system and the immune system. Through research we know that chiropractic has beneficial effects on immunoglobulins, B-lymphocytes (white blood cells), pulmonary function and other immune system processes. One series of studies, conducted by Patricia Brennan Ph.D and her team, found that when a chiropractic "manipulation" was applied to the middle back, the response of polymorphonuclear neutrophils (white blood cells) taken from blood collected 15 minutes after the manipulation was

significantly higher than blood collected 15 minutes before and 30 and 45 minutes after the chiropractic procedure. This research demonstrated an "enhanced respiratory burst" following the chiropractic adjustment. This "burst" is needed for our immune cells to destroy invading viruses and bacteria.[18,19]

Another small study of HIV positive patients was conducted to study the effects of specific chiropractic adjustments to correct vertebral subluxations in the upper neck on the immune systems of HIV positive individuals. Over the six-month period of the study, the group that did not receive chiropractic care experienced a 7.96% decrease in CD4 cell counts, while the adjusted group experienced a 48% increase in CD4 cell counts over the same period.[20]

A large retrospective study conducted by Dr. Robert Blanks and colleagues studied 2,818 individuals undergoing chiropractic care. These individuals reported an average overall improvement, ranging from 7-28%, in a battery of physical symptoms including stiffness/lack of flexibility in the spine, physical pain, fatigue, incidence of colds and flu, headaches, menstrual discomfort, gastrointestinal disorders, allergies, dizziness and falls. The incidence of colds and flu was reduced by an average of 15% in this large population who were undergoing regular chiropractic care.[21]

It is not like the nerve-immune connection is anything new – not to science and not even to the popular press. The relationship between the nervous system and the immune system was reported by the New York Times back in 1993. According to that article "Scientists have found the first evidence of an anatomical connection between the nervous system and the immune system. Nerve cell endings in the skin and white blood cells of the immune system are in intimate contact, and chemicals secreted by the nerves can shut down immune system cells nearby." Our health care system just needs to catch up with the research.[22]

Any person concerned about the upcoming flu season should add chiropractic to their list of things to do to remove interference to their nervous system, enhance their immune function and give their body every extra bit of security it needs.

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Table 1

Recommendations from the National Vaccine Information Center

1. If you have the flu, stay home until you are well
2. If you know a person sick with the flu, avoid contact until they are well
3. Wash your hands frequently
4. Drink plenty of fluids, especially water
5. Get adequate rest
6. Eat a wholesome diet rich in vitamins and minerals, especially foods containing vitamin D (such as cod liver oil)
7. Spend a few minutes a day in sunlight to help your body make and store vitamin D.
8. Consider ***chiropractic adjustments***, homeopathic remedies and other natural options for healing and maintaining health.
9. Exercise regularly when you are well.
10. Lower stress through meditation and other healthy lifestyle changes.

A Note to Patients: This Special Report is provided as a public service from The Journal of Pediatric, Maternal & Family Health - *Chiropractic*. You should discuss any questions you have about your particular health needs with your chiropractor or other primary health care provider.

CASE STUDY

Resolution of Juvenile Idiopathic Arthritis & Improved Immune Function in a 16 year old Undergoing Chiropractic Care: A Case Study

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Abstract

Objective: To describe the remission of oligoarticular Juvenile Idiopathic Arthritis in a 16 year old female undergoing chiropractic care.

Clinical Features: A sixteen year old female medically diagnosed with Juvenile Idiopathic Arthritis presented to a chiropractic clinic for care with a chief complaint of joint pain. Medical management up to that point included symptomatic relief through prescription medication which had little effect.

Intervention and Outcome: The patient's spine was analyzed through the use of static palpation, a weight-bearing postural evaluation, paraspinal thermography, and Activator Methods Chiropractic Technique analysis. Vertebral subluxations were found at spinal levels C1, C5, T4, L5 and sacrum. Cervical segments were adjusted using Activator Methods Chiropractic Technique, while all other vertebral subluxations were adjusted using Diversified Technique. After six weeks of chiropractic care, the patient was considered in remission and taken off of her medications by her rheumatologist.

Conclusion: The results documented in this case study suggests that chiropractic care may be successful in the non-traditional management of Juvenile Idiopathic Arthritis.

Key words: *Chiropractic, Juvenile Idiopathic Arthritis, Diversified Technique, Activator Methods Chiropractic Technique, paraspinal thermography, vertebral subluxation*

Introduction

Juvenile Idiopathic Arthritis (JIA), also known as Juvenile Rheumatoid Arthritis or Juvenile Chronic Arthritis, is a chronic inflammatory disease that can begin anywhere from infancy to age 17.[1,2] Although there are many theories on the etiology of JIA, a definite cause has yet to be proven. The effects of JIA include joint pain and decreased range of motion in the effected joints, which over time can result in significant disability.[1] As the most common inflammatory arthritis of childhood, it is estimated that one in every one thousand children world-wide develop JIA.[3,4] Depending on the source, between 33-60% of JIA patients never achieve remission, and residual symptomatology continues into adulthood.[2,4]

There are four main subtypes of JIA including oligoarticular, polyarticular, systemic onset, and enthesitis-related.[3] This case focuses on oligoarticular JIA, which is defined as JIA that

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effects up to four joints.[2] The average onset of oligoarticular JIA is 5 years of age and is predominant in the female population.[3]

This case study will explain the chiropractic management of a sixteen year old female with oligoarticular JIA and vertebral subluxation. It will explore the effects of vertebral subluxation on the autonomic nervous system and immune system, and describe how the correction of those vertebral subluxations may result in the remission of JIA.

Case Report

Patient History

The patient is a 16 year old female with a chief complaint of low back and joint pain, and a secondary complaint of digestive dysfunction. The patient also suffered from seasonal allergies and asthma. She was diagnosed with oligoarticular Juvenile Idiopathic Arthritis at the age of 12 after presenting to her medical doctor with joint pain. The patient denies any family history of Rheumatoid Arthritis. She was prescribed Nabumetone and Neurontin in an attempt to diminish the inflammation and pain associated with JIA.

The patient history also revealed daily bouts of diarrhea and significant abdominal pain. It is unclear as to whether these symptoms were secondary visceral effects of JIA or resulting side effects of the above prescribed medications. According to Physician's Desk Reference, the side effects of Nabumetone can include but are not limited to diarrhea and abdominal pain.[5]

Blood work was ordered by her rheumatologist and several significant findings were revealed with regards to the patient's immune system. An anti-nuclear antibody test was positive, indicating that the immune system had begun to attack the tissues within the patient's own body.[6] A low white blood cell count was also found. Because white blood cells, or leukocytes, are the main disease-fighting cells of the immune system, it can be concluded that fewer leukocytes in the blood stream leads to a compromised immune system.[7] Vitamin D, a modulator of the immune system, was also found to be less than the normal limit. SCL-70, a marker for systemic sclerosis, was present. Systemic sclerosis is a subtype of scleroderma, which is another category of autoimmune disease.[8]

Thermography

Because paraspinal thermography provides a window into the physiology of the nervous system, it is often used to measure the presence of vertebral subluxation.[9] One of the neurological components of the vertebral subluxation is dysautonomia, or dysfunction of the autonomic nervous system.[10] An unique effect of dysautonomia includes the inability of the body to regulate skin temperature, which can be observed using the infrared technology of the Insight Subluxation Station.[9,11] The Insight Subluxation Station paraspinal thermography is performed by running an instrument up the spine, comparing differences in the temperature of the skin from right to left at each spinal segment. Ideally at each level, the temperature readings would be symmetrical when comparing right to left.[12] Greater than 1°F of asymmetry is considered significant, and is directly correlated to dysautonomia and vertebral subluxation. Paraspinal thermography has been shown to be a reliable technique.[12] A study was performed to test the intra-examiner and inter-examiner reliability specifically when using the Insight Subluxation Station. It was concluded that both intra and inter-examiner reliability were deemed exceptional.[9]

Paraspinal thermography was performed using the Insight Subluxation Station during the initial examination. The scan revealed mild asymmetries present at the C1, C2 and C6 spinal levels which indicate irregular function of the sympathetic nervous system and vertebral subluxation. After approximately four months of regular chiropractic care, a second thermal scan was performed which displayed one area of mild asymmetry present at the spinal level T2.

Chiropractic Examination

A weight-bearing postural evaluation revealed anterior head translation, left head rotation, a high right ilium and left pelvic rotation. Active lumbar range of motion revealed a decrease in lumbar extension with pinpoint pain at the L5-S1 junction. All other active and passive cervical and lumbar ranges of motion were within normal limits. Muscle testing of the upper and lower extremities corresponding with each spinal nerve root were graded at a 5 out of 5. Reflex testing of the biceps, brachioradialis, triceps, patellar and achilles tendons were all within normal limits at 2+. Static palpation of the upper cervical spine revealed hypertonicity of the right paraspinal musculature, with point tenderness at the right atlas transverse process. Edema was noted at the inferior aspect of the L5 spinous process, with point tenderness at the L5-S1 articulation and the left SI joint.

The analysis of Activator Methods Chiropractic Technique (AMCT) was used to evaluate the presence of vertebral subluxation. The AMCT analysis is based off the idea that the prone leg check is altered when the specific articulation being evaluated is not moving appropriately, or is fixated.[13] While lying prone, a baseline leg check is performed at the start of each visit. The patient is then taken through a series of stress tests, pressure tests, and isolation tests to evaluate certain articulations of the spine for vertebral subluxation. The doctor performs a stress test by applying a light force with the thumb or index finger over an articulation in the direction of the subluxation, while a pressure test occurs in the direction of correction.[13] An isolation test is a provocative test that is actively performed by the patient.[13] Observation of the prone leg check is completed after each of these tests are performed. Based on findings of the prone leg check, the doctor is able to pinpoint the level/s of subluxation.

Diagnoses

After compiling data from the weight-bearing postural analysis, paraspinal thermography, static palpation, and AMCT analysis, it was determined that the patient had vertebral subluxations present at spinal levels C1, C5, T4, L5 and sacrum.

Intervention

The patient was evaluated three times per week for six weeks and adjusted as necessary. During that first phase of care, AMCT analysis regularly revealed subluxations at C1, C5, T4, L5 and sacrum. Two of the most commonly used chiropractic techniques for patient care are Diversified Technique and instrument assisted adjusting using the Activator Adjusting Instrument (AAI).[14] The cervical spine subluxations were adjusted using an AAI, the Activator 4, which delivers a thrust with a low duration with a low peak force.[13] Because of the low force and low amplitude nature of the AAI, it is considered to have a relatively low risk of injury as compared to other adjusting techniques.[13]

Due to the possibility of upper cervical instability associated with ligament laxity, the AAI was chosen to adjust the cervical segments. The thoracic, lumbar and sacral subluxations were adjusted using Diversified Technique, which is a technique integrating an assortment of adjustments created by several different chiropractors.[15] The one thing in common with every Diversified Technique adjustment is that before the delivery of the thrust, the affected joint is pre-stressed by taking the slack out of the tissue that overlies the joint.[15] Once the slack is removed, joint tension is achieved and a high velocity, low amplitude adjustment is delivered.[14,15]

Outcomes

The patient began chiropractic care while under the co-management of her rheumatologist for JIA. After six weeks of care, the rheumatologist declared that the patient's JIA was in remission. The patient ended her JIA medication regimen at that time per recommendations of her rheumatologist. The most recent blood work revealed that the white blood cell count was now within normal limits, and there was no longer a concern for systemic sclerosis as her lab workup was "essentially normal". It was recommended that the patient be seen by her rheumatologist for a follow up visit in 2-3 months.

Chiropractic evaluation also showed marked improvements. As previously mentioned, a second paraspinal thermography scan was performed to assess the patient's progress. There was a single level of mild asymmetry reported as compared to her initial scan showing three levels. Static palpation and AMCT analysis has also shown an increase in the ability of the patient to hold an adjustment. Therefore, she is currently being evaluated one time per week for vertebral subluxation. At the latest reassessment, the patient shared that she is no longer taking medication for allergies and asthma as the symptoms have resolved. She also stated that her bowel movements have been of regular consistency with no abdominal pain.

Discussion

Medical Management

The goal of traditional medical management of JIA includes pain relief, maintaining function, minimizing toxicity, and reducing the inflammatory process with an end goal of achieving remission.[16] The treatment itself is focused around a regimen of medications and injections. Nonsteroidal anti-inflammatory drugs are recommended for patients that have JIA showing little activity, excluding those that also show evidence of joint contracture; this particular treatment is not to exceed two months duration.[16] Methotrexate, classified as a disease-modifying anti-rheumatic drug (DMARD), is also recommended for the treatment of JIA, particularly those with the oligoarticular type.[16] Methotrexate is effective in decreasing the pain and swelling of affected joints and has also been shown to decrease long-term joint damage.[16,17] Lastly, intra-articular corticosteroid injections, most commonly used for oliogarticular JIA, are used for patients in the active stage of arthritis.[16] Although these three drug therapies are standard in treating JIA, many patients never achieve remission and continue in the active stage of the disease.[16]

Review of Literature

Although there are few studies to suggest the positive effects of chiropractic adjustments on JIA, research has shown favor in successfully managing Rheumatoid Arthritis (RA), the adult form of JIA, with conservative chiropractic adjustments. In a case study done by Pero and Jockers[18], a 54 year old woman presented to a chiropractic office with a chief complaint of bilateral pain in her hands and fingers with concomitant swelling and myalgia in her hands, fingers, knees, feet and toes.

She was diagnosed with RA seven years prior to her examination in the chiropractic office. At the time of her initial visit, she was being medically managed through the use of Methotrexate to decrease the pain and swelling, as well as Prednisone which is meant to suppress the immune system. When asked to rate the severity of her joint pain on a scale from 0 to 10 with 0 being no pain and 10 being the worst possible pain, she described her pain as 9/10 when she did not take her medication, and 3/10 when she did.

The patient was evaluated and adjusted as needed utilizing Diversified Technique three times per week for three months. In addition to her weekly adjustments, she was also performing Pettibon cervical traction to restore the cervical lordotic curve. After that initial intensive phase of care, her frequency was reduced to one time per week due to marked improvements in pain, the reduction of swelling, and partial restoration of the cervical curve. It was at that time she requested that she be taken off the medication regimen for RA, and her medical doctor approved the request. After ten months of regular care, the patient rated her joint pain as 1/10. Activities of daily living such as dancing, exercising, and walking up her stairs could now be done without pain.

Pathophysiology

The autonomic nervous system is composed of the sympathetic nervous system and the parasympathetic nervous system. Along with the hypothalamic-pituitary-adrenal axis of the brain, the autonomic nervous system is responsible for regulating inflammation in tissues of the body.[19] "In JIA patients, autonomic dysfunction is characterized by an increase in overall sympathetic tone and decreased activity of the vagus nerve."[19] The immune system is highly affected by immune cells that are created and released by the spleen into

the body's bloodstream.[19] The spleen is under direct innervation of the sympathetic nervous system, and lacks any innervation by the vagus nerve.[19] Increased sympathetic activity forces the spleen to increase production of T helper cells (TH1 cells), which attack the body's own tissues.[19]

An increase in sympathetic function also leads to an increased production of cortisol from the adrenal cortex, decreasing the number of receptor sites available to bind Vitamin D3.[20] With fewer binding sites, there is an overall decrease in absorption of Vitamin D3 which is noteworthy because Vitamin D3 is an important component of regulating the immune system.[3,20] Normal physiology says that an increased production of Vitamin D3 has been shown to decrease the body's TH1 immune response by down-regulating inflammatory cytokines such as interleukin-2 (IL-2).[21] However, because an increase in the production of cortisol leads to a vitamin D3 deficiency in the body, there is an increase in TH1 cells and ultimately an increase of autoimmune attacks on the tissues of the body.

Vertebral Subluxation

Vertebral subluxation is a term commonly used in the chiropractic profession to describe the misalignment of spinal bones. When the spinal bones are not in their proper alignment, there is partial occlusion of the intervertebral foraminae which house the exiting nerve roots.[22] There may be impingement of the nerve roots when a misalignment is present, and the impulses being sent through the affected nerves are hindered, resulting in disease or dysfunction.[22] The neurodystrophic model of vertebral subluxation "suggests that neural dysfunction is stressful to body tissues and that lowered tissue resistance can modulate specific and nonspecific immune responses".[23]

A chiropractic adjustment is performed to realign the spinal bones to their proper position, restoring suitable motion to that joint. The optimal size and shape of the intervertebral foraminae is also restored when appropriate alignment of the vertebrae is reinstated, which ultimately reduces interference on the nervous system and neural dysfunction.[22] Research has shown that a chiropractic adjustment has many positive effects on the autonomic nervous system with regards to neural dysfunction.

A study performed by Welch and Boone[24] was completed to observe the effects of a chiropractic adjustment on blood pressure, because blood pressure is controlled by the autonomic nervous system and is elevated specifically by sympathetic stimulation. It was concluded that the cervical adjustment decreased the diastolic blood pressure, suggesting that a parasympathetic dominance was achieved.

For this reason, by adjusting the spine to remove vertebral subluxations and restore neurological homeostasis, it is hypothesized that sympathetic overload can be decreased. Because the pathophysiology of JIA is focused around an increase in sympathetic tone, the chiropractic adjustment should in theory decrease the body's autoimmune attack on its tissues and maintain the balance between TH1 and TH2 immunity by introducing a parasympathetic dominance.[24,25]

Conclusion

The purpose of this case study was to explore the role of non-traditional management of JIA through chiropractic care. This study showed favorable results in the remission of JIA, as well as the reduction of several other unrelated symptoms (asthma, allergies, diarrhea and abdominal pain).

The patient was initially assessed three times per week for six weeks and was adjusted based on the presence of vertebral subluxation. Because no other lifestyle changes were made throughout those six weeks, it is suggested that chiropractic adjustments may play a role in the remission of JIA. Further research should be conducted on the effects of chiropractic care with regards to overall immune function, specifically in an individual with JIA.

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ORIGINAL RESEARCH

Long Term Remission and Alleviation of Symptoms in Allergy and Crohn's Disease Patients Following Spinal Adjustment for Reduction of Vertebral Subluxations‡

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ABSTRACT

Background: An association between visceral disease and immune dysfunction from sympathetic segmental disturbances secondary to vertebral subluxation has been put forward by chiropractic, osteopathic and medical practitioners. We report on the positive results of a controlled study using chiropractic adjustments to reduce subluxations in patients with Crohn's disease and allergies. We also discuss possible mechanisms for the relationship between visceral and immune dysfunction and subluxation.

Methods: We divided 57 Crohn's disease patients into two groups. A treatment group consisting of 17 patients and a control group consisting of 34 patients. 6 patients were excluded from the study because of their symptoms, progress and changes in blood test values and because vertebral subluxations were present only in the lumbar region. With all patients continuing their present medication, we subjected the treatment group of 17 patients to spinal adjustment in order to reduce the vertebral subluxations in the thoracic and lumbar regions and compared them with the 34 patients who did not receive spinal adjustments.

Results: Of the 17 patients who received spinal adjustments, 12 showed long-term and stable remission of their symptoms and 9 experienced an alleviation effect. We found that vertebral subluxation is a common and characteristic finding in patients with allergies and Crohn's disease.

Conclusion: According to the results of this study the possibility may be considered that chronic nerve compression secondary to vertebral subluxation in the thoracic and lumbar regions had a significant effect on the immune function of these allergy and Crohn's disease patients. It is further postulated that this nerve compression leads to a chronic functional disorder having a significant effect on digestion, absorption of nutrients and liquids, conveyance of food as well as various other functions of the digestive tract extending to excretion.

Key words: *Vertebral misalignment, vertebral subluxation, Crohn's Disease, allergies, immunity, radiographs, eosinophils, c-reactive protein*

Background and Introduction

This study on Crohn's disease has its origin in the observation that of 3,013 patients with atopic dermatitis, bronchial asthma, pollinosis (hay fever), allergic coryza, drug allergies, food allergies, etc. a high ratio also had Crohn's disease.

As result of a treatment that involved chiropractic care directed at improving spinal misalignment, subluxation and loss of curvature of 4 Crohn's disease patients who concurrently suffered from atopic dermatitis and bronchial asthma, it was shown that the Crohn's symptoms, such as diarrhea, abdominal pain, and enteritis improved along with the atopic dermatitis and bronchial asthma symptoms.

As result of a follow-up study of these 4 patients, it was found that the eosinophil count and CRP values improved toward normal. As it was surmised that allergies, such as very severe atopic dermatitis and bronchial asthma, have a strong connection to Crohn's disease, a multi-faceted comparative study and detailed analysis was continued on patients with allergies and Crohn's disease.

Out of 3013 allergy patients a detailed multi-faceted comparative study of 57 allergy patients who also had Crohn's Disease was conducted. The analysis of the study results

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showed that particular characteristics were shared by allergy patients and Crohn's disease patients. It was found that vertebral subluxation was present in both Crohn's disease patients and allergy patients. Changes in vertebrae caused by vertebral subluxation were present in particular regions of the spine and chronic narrowing of the vertebral foraminae due to the changes in the vertebrae were present. Moreover, it was found that these vertebral subluxations, their location in the spine, and the changes in the vertebrae were remarkably similar.[1] It was found that the muscular system that supports and maintains the spine was in noticeably poor condition in Crohn's disease patients and allergy patients alike.

Vertebral subluxation in allergy patients and Crohn's disease patients was present from the 8th to the 10th thoracic vertebra and due to the vertebral subluxation the 8th to the 10th thoracic vertebrae were changed in a forward and downward direction and a slight lateral direction. Because of the chronic neurotripsy, caused by the chronic narrowing of the intervertebral foraminae due to the changes in the vertebrae, it may be considered that reciprocal innervation between the brain and the organs is continually and severely impacted.[2]

Because of the chronic neurotripsy,[3] caused by the intervertebral narrowing of the foraminae due to changes in the 8th to the 10th thoracic vertebra in a forward and downward direction, the immune function related to innervation of organs, such as the adrenal glands and the adrenal cortex, is chronically and severely impaired.[4]

Because of the continuation of this chronic and severe condition, it is considered that there is a high probability that the following chronic conditions are present:[5]

1. The presence of chronic and various reciprocal innervation disorders between the brain and the adrenal glands.[6]
2. The presence of chronic hormone secretion dysfunctions of the adrenal glands based on the reciprocal innervation between the brain and the adrenal glands.[7]
3. The presence of a chronic negative feedback related to the adrenal glands based on intracerebral stimuli.
4. The presence of a chronic norepinephrine cycle dysfunction related to the adrenal glands based on intracerebral stimuli.
5. The presence of a chronic dysfunction in the susceptivity for ACTH in the adrenal glands (adrenal cortex).[8]
6. The presence of chronic dysfunction of the adrenal glands and adrenal cortex themselves caused by blood circulation dysfunction in the adrenal glands.[9]
7. The presence of chronic backache.

If the probability of the presence of glucocorticoid secreted from the adrenal cortex as a result of the secretion dysfunction is very high, it may be considered that the following conditions are chronically and continuously present.[10, 11]

1. The presence of a restraint at the cellular and molecular level to the production of cytokine, such as IL-4, 5, 13, and TNF.[12, 13]
2. The presence of a restraint at the cellular and molecular level to the translation and transcription for the production of cytokine.
3. The existence of a restraint at the cellular and molecular level for the protein that is needed in the translation and transcription.[14]
4. The presence of a restraint to the production of a strong inflammation inducer.[15]
5. The presence of a restraint to the production of IgE.[16]
6. The presence of a restraint to the activation of mast cells.[17]
7. The presence of a dysfunction that restrains and directly modifies the immunity against the production of ACTH and -endorphins.[8]
8. The presence of a restraint to the activation of helper T2-cells and eosinophils.[19, 21, 22 -29, 30, 31]

As a result of the significant presence of chronic neurotripsy in the intervertebral foraminae caused by the chronic narrowing of the same, together with the complications from the changes in the vertebrae due to the vertebral subluxation from the lower thoracic vertebrae to the lower lumbar vertebrae, the following chronic conditions may be considered.

1. The presence of reciprocal innervation dysfunction between the brain and the nervous system of the digestive tract.
2. The presence of digestive juice and digestive enzyme secretion dysfunction in the digestive tract.
3. The presence of digestive and peristaltic (movement, segment, oscillation) dysfunction of the digestive tract.
4. The presence of blood circulation dysfunction in the digestive tract.
5. The presence of nutrient und liquid absorption dysfunction in the digestive tract.
6. The presence of backache and lower backache.

As a result of the continued presence of these conditions, the following conditions may result:

1. The presence of chronic blood circulation dysfunction in the digestive tract, which can develop into and be an element in the expansion of the inflammation.
2. The presence of chronic liquid absorption dysfunction as a cause of diarrhea and constipation.
3. The presence of chronic nutrient absorption dysfunction as a cause of basic physical and immune dysfunctions.
4. The presence of digestive juice and enzyme secretion dysfunction as a digestive function disorder.
5. The presence of digestive tract peristalsis dysfunction as a cause of constipation and abnormal fermentation in the digestive tract.

As a result of these various chronic dysfunctions, it may be considered that the following symptoms can result:

1. The presence of chronic decline of immunity caused by weight loss and decline of basic physical strength.
2. The retention of food and abnormal fermentation in the intestines.
3. The possibility of an abnormal increase of bacteria in the intestines.
4. The possibility of continued, slight, chronic inflammation in the digestive tract.
5. Chronic and frequent abdominal pain.
6. Chronic and frequent constipation and diarrhea.
7. The presence of chronic back and abdominal pain and discomfort.

Crohn's disease patients with severe symptoms have suffered from very frequent diarrhea and abdominal pain, as well as hemafecia symptoms with inflammation, abnormal increase of bacteria in the inflamed region, loss of weight caused by continuing anorexia, and chronic anemia. And, as a result of the vicious circle of malnutrition etc., have not only lost significant basic physical strength, which is considered to be the reason for the loss of immunity, but also serious psychological stress.

In order to alleviate these severe conditions, these patients have dealt with the particular disease symptoms with medicines such as adrenocorticoid hormone drugs, antihistamines, various antibiotics, antiphlogistics, sulfa drugs, and immunosuppressants. When exposed to antigens above the limit of the patient's immunity while chronic, abnormal conditions continue to be present, it may be considered that allergic symptoms appear in a more conspicuous form.[32, 19]

This is especially true in patients whose adrenal cortex secretions are temporarily declining due to long-term use of adrenocorticoid hormone drugs, and as a result various allergic symptoms may appear in more severe forms. Allergy symptoms appear in epithelial tissues (cutis, trachea, bronchial tunica mucosa, and in the digestive tract region) where many mast cells can trigger an allergic reaction.[17]

For Crohn's disease patients in a chronic, severely weakened condition, especially a physically weak condition, it may be considered that their adrenocorticoid hormone secretions have significantly declined due to the efforts to cope with the allergic reactions. For patients with these conditions, the possibility may even be considered that their ability to produce Th1 cells against Th2 cells is significantly lowered.[18]

Regardless of the treatment of the symptoms with adrenocorticoid hormone drugs and immunosuppressants, even if temporary relief and check of the symptoms may be realized, the improvement of the disease itself may be very difficult because of the difficulty to discern improvement from the appearance of unstable inflammatory symptoms and the eosinophil count.[33]

It may be considered that damage by further abnormal allergic reaction in the innervated organ that is being continuously and severely impacted by chronic neurotripsy in the intervertebral foraminae due to the vertebral subluxation, will appear as a more serious symptom.[34, 35] It appears most likely that this is the major difference between patients with mild symptoms and patients with severe symptoms.

(Note: In patients with spondylosis and spondylolithesis the cause of chronic diarrhea, constipation, enteral abnormal fermentation, and swelling and discomfort in the lower abdomen may be a relatively mild change of the lumbar vertebrae when compared to Crohn's disease patients.)

It can be said that the fundamental treatment of these diseases is the improvement of the chronic narrowing of the intervertebral foramina secondary to vertebral subluxation (commonly seen in those patients), along with the alleviation and restraint of inflammation, allergic reactions, abnormal increase of bacteria by particular medical treatment, and the improvement of the dysfunction of the adrenal glands, adrenal cortex, and the small and large intestine.

What is important for the patient is to have the responsibility and determination to try to improve the muscles supporting the vertebral column and to engage in sufficient sleep, rest, active stress reduction, and nutrition to improve basic physical strength (immunity and resistance) for the recovery from the disease.[31, 36]

Methods and Analysis

We investigated the following on 57 Crohn's disease patients:

1. The number of the Crohn's disease patients among the 57 who presently have allergies or have had allergies in the past.
2. The allergy each patient presently has or has had in the past.
3. The number of Crohn's disease patients who never had an allergy.
4. The symptoms and the severity of symptoms of Crohn's disease in patients who presently have allergies or had allergies in the past.
5. The symptoms and severity of symptoms of Crohn's disease in patients who never had allergies.
6. The spinal column X-ray (and palpation of the spine) of Crohn's disease patients who presently have allergies or had allergies in the past.
7. The spinal column X-ray (and palpation of the spine) of Crohn's disease patients who never had allergies.
   a. X-ray examination of the thoracic region.
   b. X-ray examination of the lumbar region.
8. Assessment of the muscles supporting the spinal column in Crohn's disease patients.

We further investigated the following on 57 Crohn's disease patients:

1. The severity and frequency of inflammation.
2. The severity and frequency of diarrhea.
3. The severity and frequency of abdominal pain.
4. Whether an ulcer had developed and its severity and frequency.
5. The severity and frequency of backache and lower backache (lumbago).
6. Blood tests (eosinophil count and CRP values) on Crohn's disease patients.

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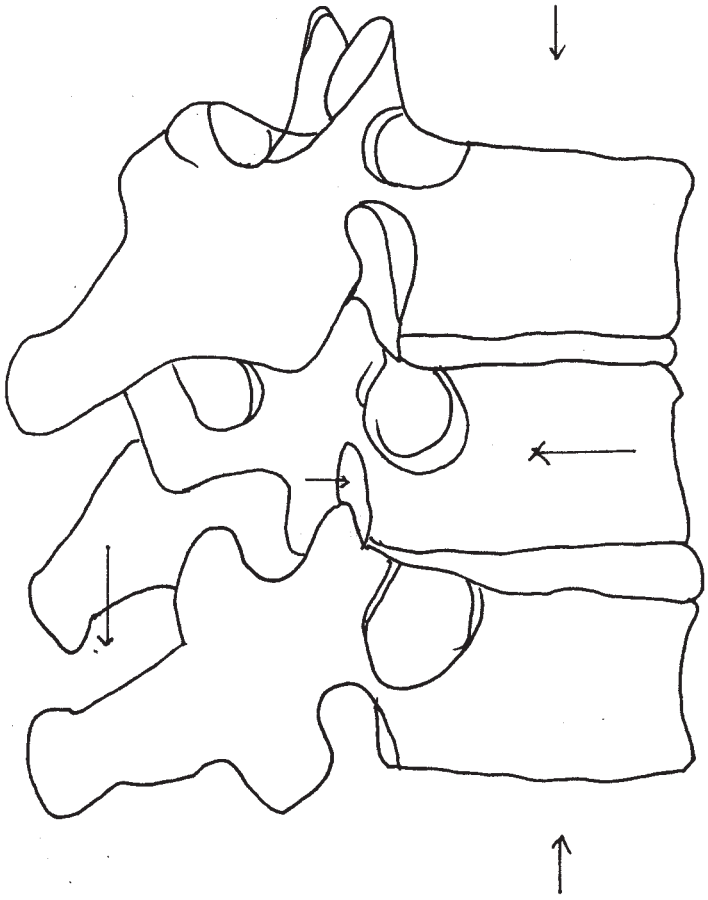


Figure 1 - Changes in the 5th to the 3rd lumbar vertebra caused by vertebral subluxation

Changes of vertebrae caused by vertebral subluxation in the lumbar region are present from the 5th (sometimes from the 1st of the sacrum) to the 3rd lumbar vertebra.

These changes of the individual vertebrae are those with a slight backward shift of the vertebrae and a slight movement to the right and downward.

1. The vertebra moves in a backward direction as a natural result of vertebral subluxation in the lumbar region.
2. The vertebra that moves in backward direction also tends to move in a downward direction due to gravity.
3. The rear part of the intervertebral disc is compressed by the movement of the vertebra in backward and downward direction.
4. The spinal process of the vertebra that is undergoing the change, therefore, moves downward and slightly forward and gets close to the spinal process of the vertebra that is located below the changed vertebra.
5. The transverse processes of the vertebra undergoing the change move similarly downward and slightly forward.
6. The articulating process on the lower side of the vertebra undergoing change moves backward and downward against the upper side of the adjacent vertebra, and as a result, the front/back and up/down opening of the intervertebral foramina in the changed vertebra is continuously forced into a chronically narrowed condition.

The changes in the lumbar vertebrae caused by vertebral subluxation, although there was a rather slight movement backward and downward in the atopic dermatitis and bronchial asthma patients, could be diagnosed as within the normal range. However, in Crohn's disease patients, the degree of vertebral subluxation and changes in backward and downward movement was significant. Also, in Crohn's disease, the severity of the changes in the vertebrae were reflected in the narrowing of the intervertebral foraminae.

It may easily be considered that neurotripsy in the intervertebral foraminae by chronic narrowing of the foramina of multiple vertebrae caused by changes in lumbar vertebrae in Crohn's disease patients continues to impact the innervation of organs and the reciprocal innervation between the brain and the organ, and this severe chronic condition should not be ignored.

At Tokai University, Graduate School of Engineering, Department of Human Engineering, in order to develop an effective and safe technique for the alleviation of the downward direction of vertebrae we referred to the techniques of traditional chiropractic but changes of lumbar vertebrae in backward and downward direction was not considered to exist in some chiropractic colleges in the United States. However, as the result of diagnosing and analyzing x-ray pictures of the lumbar vertebrae of many Crohn's disease patients in our project, we reconfirmed that backward and downward changes in the vertebrae of the lumbar region certainly exist. It is thought that the fact that Crohn's disease patients have not been studied thoroughly in the field of chiropractic may be the reason for the opinion of some of the schools.

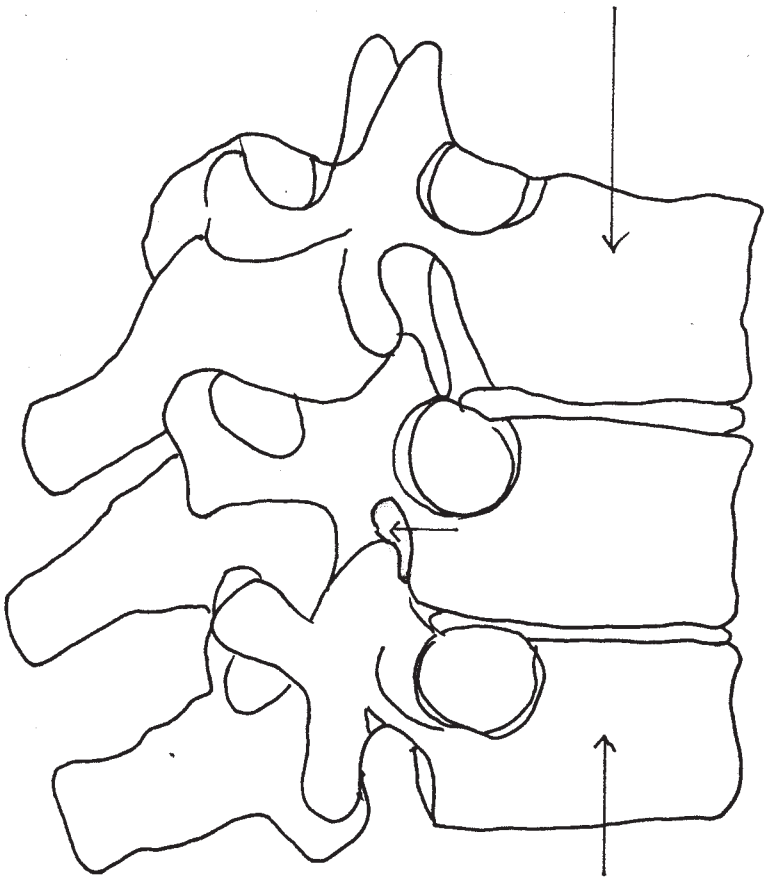


Figure 2 - Changes in vertebrae from the 11th thoracic vertebra to the 2nd lumbar vertebra caused by vertebral subluxation in two regions of the thoracic and lumbar vertebrae

Because of the vertebral subluxation of 2 regions of the thoracic and lumbar vertebrae, the 11th thoracic vertebra and the 2nd lumbar vertebra are arranged perpendicularly (on one straight line).

In the normal condition of the spinal curvature, the gravitational load for each vertebra from the 11th thoracic vertebra to the 2nd lumbar vertebra are dispersed, but the changes in the vertebrae in downward direction and the perpendicular arrangement have created the chronic condition where the gravitational load rests directly on the vertebrae and the intervertebral disc.

The changes in the vertebrae between the 11th thoracic and 2nd lumbar vertebra were those with an axis either to the right or the left in downward direction of the vertebrae.

1. The vertebra is compressed due to the changes in multiple vertebrae in downward direction, and the intervertebral disc is compressed by enormous gravitational loads. As a result, the intervertebral foraminae present a chronically narrowed condition in vertical direction. (Presence of chronic narrowing of the perpendicular opening of the intravertebral foramina.)
2. Due to the thinning of the intravertebral disc by gravitational loads, the articulating process on the lower side of the vertebra comes close to the articulating process on the upper side of the adjoining vertebra. (Pressure inside the vertebral foramina by the articulating process.)
3. Not only the articulating processes but also the vertebrae come close.

These changes in the vertebrae were also present in the 5th lumbar vertebra and the 1st sacral vertebra in Crohn's disease patients who suffered from these symptoms to a high degree.

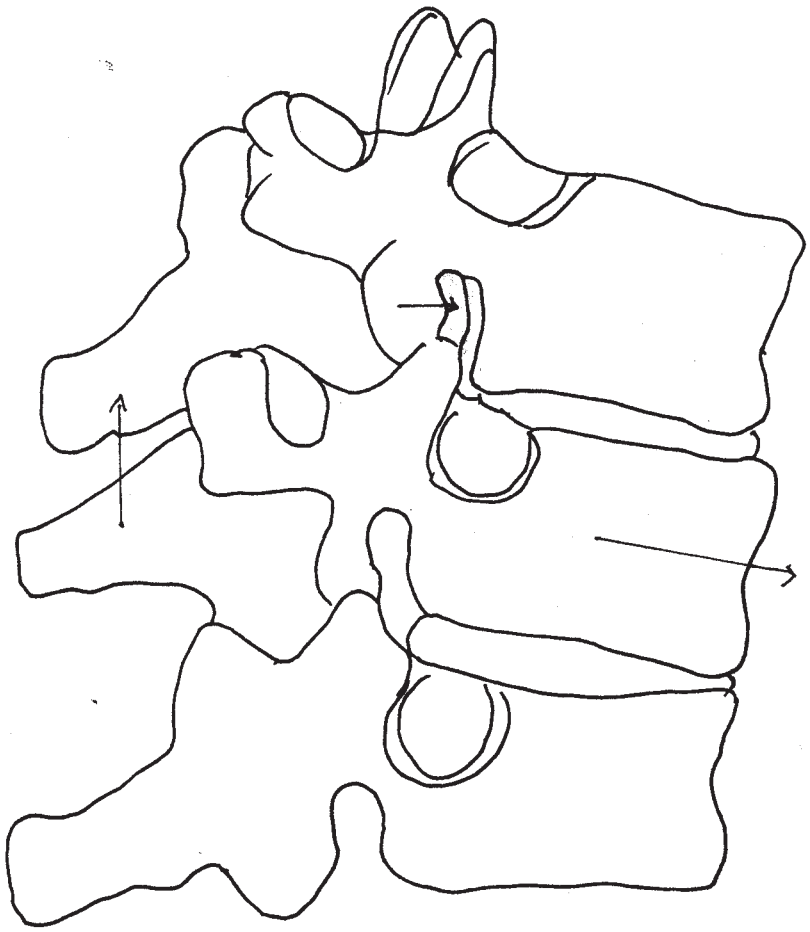


Figure 3 - Changes in vertebrae from the 8th to the 10th thoracic vertebra caused by vertebral subluxation

The changes of the vertebrae from the 8th to the 10th thoracic vertebra caused by the abnormal spinal curvature are associated with the vertebral subluxation of the normal S-shaped spinal curve to the outer top of the 7th thoracic vertebra. The changes of the vertebrae caused by this abnormal subluxation can cause multiple changes in the vertebrae that influences not only the forward and downward direction of the vertebrae along an axis either to the left or the right, but also a change in the vertebrae in downward direction, depending on the condition of the vertebral subluxation.

1. The changes in the vertebrae caused by the vertebral subluxation is present from the 7th or 8th thoracic vertebra to the 10th thoracic vertebra.
2. On the affected vertebra, changes in forward and downward direction are present, and sometimes this was influenced by changes in the vertebra in a downward direction.
3. The vertebrae that are changed in forward and downward direction move in that direction and as a result, the inclination of the vertebrae is realized in the same direction.
4. When the intervertebral disc is compressed forward and downward by changes in the vertebra, further downward pressure will thin the front area of the disc.
5. The direction of the spinous process becomes horizontal due to the inclination of the front side of the vertebra in a downward direction.
6. The upper articulating process that is causing the changes in the vertebrae is pushed forward and can penetrate the intervertebral foramina in the upper part of the changed vertebra.
7. The thinner the front area of the intervertebral discs become and the thinner the intervertebral discs as a whole become, the further incline the vertebrae that support them in a forward direction and alter the downward direction.

Thirty eight year old female with severe CD symptoms, also suffers from allergic rhinitis and allergic skin rashes.

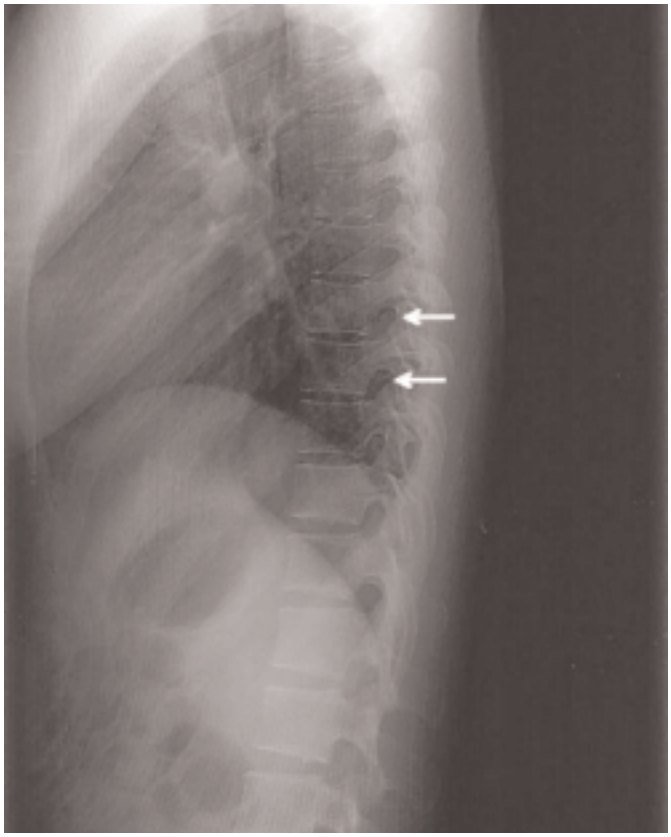
1. The vertebral curvature disappearance between the lumber and thoracic region.
2. The existence of the narrow condition of the gap between S1and L5 by vertebral posterior and inferior displacement. (Fig-1)
3. The existence of narrowed intervertebral foramina by the vertebral displacement of L5 and L3. (Fig-1)
4. The existence of narrowed vertebral gap by the vertebral displacement between T12 and L1. (Fig-2)

Twenty one year old female with moderate CD symptoms, also suffers from atopic dermatitus.

1. The existence of a narrowed gap between S1 and L5. (detailed explanation, see Fig-2)
2. The existence of a narrowed condition of the intervertebral foramina by the vertebral displacement at S1 and L2. (Fig-1)
3. The existence of a narrowed vertebral gap by the vertebral displacement between T12 and L1. (Fig-2)

Twenty four year old female with mild CD symptoms and does not have any other allergic disease.

1. The existence of a narrowed gap between S1 and L5. (Fig-2)
2. The existence of narrowed intervertebral foramina by the vertebral displacement of S1 and L4. (Fig-1)
3. The existence of a narrowed vertebral gap by the vertebral displacement between T12 and L2. (Fig-2)



Twenty six year old male patient with severe symptoms of atopic dermatitis and also suffers from asthma.

1. The vertebral curvature disappearance of thoracic region.
2. The existence of the anterior and inferior vertebral displacement between T8 and T10. (Fig-3)
3. The existence of narrowed intervertebral foramina by the vertebral displacement between T8 and T10.

Note: In all radiographs, there is a difference in degree but all vertebral displacements exist from S1 to L3 and from T12 to L3.

Tables 1-5
Improvement Results from Chiropractic in 17 Crohn's Disease Patients

Table 1
Study Results of Group 1a

Age	Sex	Cure Period	CRP value	Eosinophil count
25	male	12 months	28 → 0.8mg/dl	32 → 9 %
19	female	9 months	42 → 0.0mg/dl	22 → 8 %
24	male	9 months	33.8 →0.9mg/dl	27 → 12 %
48	female	12 months	27.8 → 3.2mg/dl	35 → 17 %

Table 2
Study Results of Group 1-b

Age	Sex	Cure Period	CRP value	Eosinophil count
24	male	12 months	32 → 0.8mg/dl	28 → 12 %
32	male	12 months		19 → 9 %
29	male	12 months	46 → 0.2mg/dl	14 → 5 %
19	female	9 months	54 → 1.6mg/dl	31 → 13 %

Regarding the patients in Group 1a: All 1a Crohn's disease patients continued to present symptoms of severe anorexia, chronic anemia, weight loss caused by nutrition absorption dysfunction, and degradation of basic physical strength because of the sustained chronic, severe symptoms of the disease. The eosinophil counts of groups 1a and 1b showed relatively high scores. Even with combination treatment, it was not easy to lower the scores of the eosinophil count toward normal values and more days were required. Regarding the Crohn's disease patients, patients with severe atopic dermatitis, and patients with bronchial asthma, the eosinophil count yielded better real-time and accurate information on inflammation, changes in disease symptoms, and progress as compared with the CRP values.

Table 3
Study Results of Group 1c

Age	Sex	Cure Period	CRP value	Eosinophil count
24	female	12 months	32 → 0.4mg/dl	18 → 4 %
19	female	9 months		32 → 5 %
21	male	12 months	16 → 0.0mg/dl	12 → 8 %

Table 4
Study Results of Group 2a

Age	Sex	Cure Period	CRP value	Eosinophil count
27	male	12 months	18 → 0.2mg/dl	14 → 10 %
53	female	9 months		12 → 7 %
26	male	9 months	42 → 0.0mg/dl	22 → 8 %

Table 5
Study Results of Group 2b

Age	Sex	Cure Period	CRP value	Eosinophil count
44	male	12 months		14 → 6 %
19	female	9 months	34 → 0.0mg/dl	9 → 5 %
16	male	9 months	33 → 0.8mg/dl	17 → 12 %

The more the intravertebral foramina narrowed due to the changes in the vertebrae, the more severe became the inflammation, abdominal pain, diarrhea, hemafecia, anemia, and loss of weight of the Crohn's disease patients. Those Crohn's disease patients who presented changes in vertebrae caused by vertebral subluxation in the 3 regions from the 8^{th} to the 10 thoracic vertebra, from the 5^{th} to the 3^{rd} lumbar vertebra, and from the 11^{th} thoracic vertebra to the 2^{nd} lumbar vertebra showed the most severe conditions.

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We executed the Takeda Chiropractic Method on 17 of the 57 Crohn's disease patients with vertebral subluxation and changes in vertebrae and compared the changes in symptoms and blood test values with those of 34 patients with similar symptoms and changes in vertebrae. We compared both groups under the condition that they continued their usual medical treatment. The remaining 6 Crohn's disease patients were not included as subjects in this comparative study because of their symptoms, progress, and changes in blood test values and because vertebral subluxation was present only in the lumbar region.)

We separated 17 Crohn's disease patients into the following 2 groups based on vertebral subluxation and changes in the vertebrae.

1. 11 Cohn's disease patients who presently have allergies or have had allergies in the past.

    a. 4 Crohn's disease patients who have severe Crohn's disease symptoms with severe changes in the 8th to the 10th thoracic vertebra, the 5th to the 3rd lumbar vertebra, and the 11th thoracic vertebra to the 2nd lumbar vertebra with vertebral subluxation in the thoracic and lumbar region.
    b. 4 Crohn's disease patients who have comparatively severe Crohn's disease symptoms with severe changes in the 8th to the 10th thoracic vertebra, the 5th to the 3rd lumbar vertebra, and the 11th thoracic vertebra to the 2nd lumbar vertebra with vertebral subluxation in the thoracic and lumbar region.
    c. 3 Crohn's disease patients who have mild Crohn's disease symptoms with changes in the 8th to the 10th thoracic vertebra and the 5th to the 3rd lumbar vertebra with vertebral subluxation in the thoracic and lumbar region.

2. 6 Crohn's disease patients who never had any allergies.

    a. 3 Crohn's disease patients who have comparatively severe Crohn's disease symptoms, to the same degree as group 1-b, with changes in the 8th to the 10th thoracic vertebra and the 5th to the 3rd lumbar vertebra with vertebral subluxation in the thoracic and lumbar region.
    b. 3 Crohn's disease patients who have mild Crohn's disease symptoms, to the same degree as group 1-c, with changes in the 5th to the 3rd lumbar vertebra and vertebral subluxation in the thoracic vertebrae.

The Takeda Chiropractic Method

This is a method to correct changes in vertebrae due to vertebral subluxation and to improve the chronic narrowing of the intervertebral foraminae. It was developed within one year starting in 1994 at the University of Tokai, Graduate School of Engineering, Department of Human Engineering, with the objective of executing the correction of the vertebral subluxation more safely and reliably. This method was developed based on various comparative experiments.

This method differs from the traditional orthopedic method in that it requires a treatment technique that incorporates 9 physical elements in order to safely and reliably correct the patient's posture during treatment along with correction of the targeted vertebrae. Also, to attain the best effect from this technique, maximum pleural pressure and abdominal cavity pressure was applied.

Regarding the frequency and duration of the treatment to correct changes in the vertebrae caused by vertebral subluxation, it is noted that the results of comparative studies on Crohn's disease patients and patients with atopic dermatitis and allergies such as bronchial asthma showed that daily corrective treatment for the first one and one half to two months of the course of treatment had the best improvement effect.

Analysis of Study Measurements

1. Total Crohn's disease patients who have or had allergies: 31
2. Details on allergies
    a. Patients with severe atopic dermatitis: 16
    b. Patients with bronchial asthma: 7
    c. Patients with atopic dermatitis: 9
    d. Patients with allergic coryza: 23
    e. Patients with pollinosis (hay fever): 20
    f. Patients with food and drug allergies: 12

    (Note: There were cases with overlapping symptoms)

3. Crohn's disease patients who never had any allergies: 26
4. Symptoms and severity of symptoms of 31 patients who have or had allergies.

    a. 22 out of 31 patients presented with severe Crohn's disease symptoms and it was impossible to predict the onset of the occurrence of severe inflammation. It was frequently observed that severe and frequent abdominal pain caused severe and frequent diarrhea and hemafecia.
    b. 14 out of 31 patients experienced the development of an ulcer.
    c. 11 out of 14 patients required the operative removal of the ulcer.
    d. 23 out of 31 patients showed a very high eosinophil count and CRP values, and it was difficult to bring them back to normal values.
    e. It was difficult for traditional medical treatment to improve and stabilize the symptoms.
    f. In many cases there was a frequent and large amount of steroid use.

5. 26 Crohn's disease patients who never had any allergies.

    a. Crohn's disease symptoms in 21 of 26 patients were comparatively moderate and stable. In the case of the occurrence of inflammation, it was rare that the condition appeared suddenly and unpredictably. The severity and frequency of diarrhea and abdominal pain was relatively mild and moderate.
    b. Development of an ulcer occurred in 5 out of 26 patients.
    c. 3 out of 26 patients required the operative removal of the ulcer.
    d. There were many cases in which it was comparatively easy to bring the CRP values and the eosinophil count back to normal values.
    e. An alleviation effect was obtained more safely compared to traditional medical treatment.
    f. Treatment with steroids was not frequent in this group, and in many cases a stable treatment effect was obtained within a short period of time.

(Note: There were some cases in which mild symptoms of allergies of Crohn's patients clearly disappeared as result of the treatment with steroids, and in some cases, the symptoms recurred as soon as the use of steroids was stopped.)

Results of the detailed analysis of 31 patients who have or had any allergies and in which changes in vertebrae caused by vertebral subluxation are present, and their symptoms:

1. The Crohn's disease symptoms in two Crohn's disease patients with changes in the 5th to the 3rd lumbar vertebra caused by vertebral subluxation were stable and moderate.
2. Various Crohn's disease symptoms of 11 Crohn's disease patients with chronic changes caused by vertebral subluxation from the 8th to the 10th thoracic vertebra and from the 5th to the 3rd lumbar vertebra were unstable and severe.
3. Various Crohn's disease symptoms of 18 Crohn's disease patients with chronic changes caused by vertebral subluxation from the 8th to the 10th thoracic vertebra, from the 11th thoracic vertebra to the 2nd lumbar vertebra, and from the 5th to the 3rd lumbar vertebra were the most severe and unstable.

Results of the detailed analysis of 26 patients who never had any allergies and in which changes in vertebrae caused by vertebral subluxation are present, and their symptoms:

1. The Crohn's disease symptoms in 9 Crohn's disease patients with changes in the 5th to the 3rd lumbar vertebra caused by vertebral subluxation were stable and moderate.
2. Various Crohn's disease symptoms of 13 Crohn's disease patients with chronic changes caused by vertebral subluxation from the 8th to the 10th thoracic vertebra and from the 5th to the 3rd lumbar vertebra were relatively unstable but comparatively mild.
3. Various Crohn's disease symptoms of 4 Crohn's disease patients with chronic changes caused by vertebral subluxation from the 8th to the 10th thoracic vertebra, from the 11th thoracic vertebra to the 2nd lumbar vertebra, and from the 5th to the 3rd lumbar vertebra were comparatively severe and unstable.

(Note: 44 out of 57 Crohn's disease patients complained about pain, heaviness, and discomfort in the back and abdominal region with some differences in frequency and severity. 32 out of 44 patients complained about pain in the abdominal region after continued pain in the back and lower back.)

In the analysis of the follow-up observations regarding the effects of the Takeda method on the changes in vertebrae caused by vertebral subluxation present in Crohn's disease patients, the detailed analysis of patient's CRP values and eosinophil counts were necessary and useful for understanding the direct and indirect effects on the symptoms of the disease.

We considered that the CRP values and the eosinophil counts were an effective means to assess the severity of the patient's inflammation and the direct and indirect changes of their inflammatory condition. These values provided important indirect information regarding recovery of the patient's adrenocorticoid hormone secretion function and the recovery of function in the inflammed region and its surroundings. These values were also a useful means to directly and indirectly assess the presence of the patient's inflammation, severity of inflammation and the presence and severity of abnormal immune reaction. Furthermore, we considered that these values might be used as a reference index to judge whether the patient's basic physical strength that is needed for recovery from the disease had improved.

In the tests, no case of recurrence of the disease was found in those patients who had been improved. We consider that a recurrence of the disease will not easily occur in patients whose organ innervation and physical strength have recovered with this combination treatment.

However, recovery of parts frequently and continuously impacted over a long period of time is almost impossible. Therefore, even after the cure from the disease by total treatment in the traditional medical method and the new treatment method has been accomplished, each patient needs to continuously deal with restrictions on caloric intake, sufficient hours of sleep, rest, and stress control, etc.

It is considered that improvement of the vertebral subluxation is the effective realization of the normal S-shaped spinal curvature with the 7th thoracic vertebra being the outermost vertebra on the curve, and that realization and maintenance of the normal spinal curvature is achieved by improvement and strengthening of the muscles that support the rachis.

With this combination treatment, it has been shown that the symptoms of atopic dermatitis and bronchial asthma were improved along with the improvement of Crohn's disease symptoms such as diarrhea, abdominal pain, and enteritis in Crohn's disease patients who were suffering concurrently from atopic dermatitis and bronchial asthma.

Based on the test results, we can state that the only treatment that can demonstrate fundamental effects on allergies such as atopic dermatitis, bronchial asthma, and pollinosis will have the potential to treat Crohn's disease.

In other words, we can state that a treatment that cannot fundamentally treat Crohn's disease cannot fundamentally improve conditions such as atopic dermatitis, bronchial asthma, pollinosis, and allergic coryza.

Conclusion

We were able to obtain significant alleviation and remission of these diseases by improvement of the neurotripsy caused by the chronically narrowed intervertebral foraminae from the 8th to the 10th thoracic vertebra. This is the innervation region relating to the adrenal glands and adrenal cortex and was impacted by changes in the vertebrae caused by vertebral subluxation in the thoracic region. This was commonly present in Crohn's disease patients and patients with allergies. Because of the improvement of the chronically narrowed intervertebral foraminae that are related to the innervation of the digestive tract with changes caused by vertebral subluxation in the region from the thoracic vertebrae to the lumbar vertebrae (in some cases to the sacrum) that are present in Crohn's disease patients, we came to the following conclusions:

1. There is a high possibility that allergies and Crohn's disease closely relate to the innervation of organs that relate to the immune function which are affected by changes in the vertebrae caused by vertebral subluxation.
2. There is a high possibility that the strength of the muscles supporting the rachis is closely related to the development and changes of symptoms common in patients with allergies and Crohn's disease patients.
3. There is an expectation of restraint, improvement, and prevention of the symptoms of these diseases by correcting the changes in the vertebrae caused by vertebral subluxation, which is common in patients with allergies and Crohn's disease patients.
4. There is an expectation of alleviation, remission, and prevention of development of symptoms by correcting the changes in the vertebrae caused by vertebral subluxation, which is common in Crohn's disease patients.
5. There is a high possibility that a preventative effect and significant reduction of the improvement period can be obtained by reinforcing and improving the muscles supporting the rachis.
6. There is an expectation of reduction of the improvement period, prevention of the disease, extension of a stable symptom remission period, and reduction of side effects of drugs by using a treatment that combines the Takeda Chiropractic Method with traditional medical treatment.

According to the results of this study the possibility may be considered that chronic nerve compression secondary to vertebral subluxation in the thoracic and lumbar regions had a significant effect on the immune function of these allergy and Crohn's disease patients. It is further postulated that this nerve compression leads to a chronic functional disorder having a significant effect on digestion, absorption of nutrients and liquids, conveyance of food as well as various other functions of the digestive tract extending to excretion.

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MERIDEL I. GATTERMAN, MA, DC, MED, **Process Consultant, Relating Patient-Centered Evidence Based Guidelines to Subluxation Based Practice**

A three-tiered process to revise the current Oregon Practice and Utilization Guidelines is described. The focus of this process is patient-centered and evidence-based. The new guidelines will make recommendations to guide patients and practitioners in making appropriate health care decisions. Where strong evidence exists, standards of quality that address minimum competency will also be included. While guidelines are designed to be flexible and non-binding educational tools, standards of quality provide administrative tools on which to base peer review criteria. The strength of this process is that it is profession-initiated with broad representation and it differentiates guidelines from standards of quality.

INDEX TERMS: MeSH: CHIROPRACTIC, STANDARDS; EVIDENCE-BASED; GUIDELINES; PATIENT-CENTERED CARE; OREGON; QUALITY ASSURANCE; HEALTH CARE.

KATHRYN T. HOIRIIS, BS, DC, DAVID EDENFIELD, BA, **Chiropractic and The Immune Response: A Literature Review**

Introduction: It has been known for more than a century that there are nerve endings in various organs and tissues comprising the immune system (1). The mechanisms by which neuroendocrine agents can act as messengers within the immune system, and immunological cell products can participate in the control of the CNS functions have been described in the scientific literature (2). Anecdotal and scientific evidence have been shared by doctors and students of chiropractic, and patients, concerning improved health status, in addition to resolution of musculoskeletal complaints, from receiving chiropractic care (3,4). In 1993, Allen conducted a review of the literature to determine whether there was scientific evidence on the effects of chiropractic on the immune system (5). He reviewed 12 articles specifically related to spinal manipulative procedures, 4 book references and 11 other supportive articles as the body of evidence that investigated an effect on the immune system through chiropractic care. Allen concluded that the need for further research existed and that there was a need for trials to determine clinical significance. Since the chiropractic profession continues to promote the wellness aspect of chiropractic care, we have chosen to examine the literature with the hope of finding new evidence. Our review of the literature focused on the scientific evidence related to the mechanisms by which the nervous system influences the immune response, and whether the presence and correction of spinal subluxation by chiropractic adjustment has a beneficial effect on the immune system.

Methods: Online searches were performed using National Library of Medicine PubMed, Mantis and world wide web medical and non-medical search engines using key words: chiropractic, chiropractic adjustment, spinal manipulation, mechanical stimulation, neuroimmunology, neuropeptides, vasoactive intestinal peptide (VIP), Substance P, Somatostatin, and immunology. In evaluation of the literature, we used a checklist for the inclusion of key components in the scientific report and a scoring system (12 items rated 0-5, max score = 60) to rate the quality of the publication. (Appendix A).

Results: From April 1st to August 1st, 2000, thirty-eight articles and one abstract were retrieved from the search. Peer-reviewed journal articles with statistical analysis of formatted data were preferred for inclusion in this review. Three articles were literature reviews and one was a commentary. Seventeen articles were specifically related to chiropractic care, reporting on clinical trials with relevant findings to the specific effects of nervous system by quantifiable methods i.e. detecting concentrations of cells and/or soluble factors of immunity. One comparative study on the health of children under chiropractic care and a pilot study of the relationship between incidence of childhood disease and chiropractic care intensity were included. Nineteen other citations reported on various biological rationales for neuroimmune mechanisms and the relationship to the spine, including seven animal studies. The results of evaluation are being tabulated. Appendix B contains a list of all the articles retrieved from the search organized by category and year.

Discussion: Our specific aim was to investigate and document the scientific evidence that supports a correlation between spinal subluxation, chiropractic adjustments and the immune system. Our approach was to first examine anatomical and experimental studies of the neurological and chemical pathways, then to examine evidence from clinical and case studies. Several studies discuss the extensive connections between the nervous system and both the endocrine and immune tissues, which provide a pathway for modulation (5,6,7). For example, there is evidence of the presence of sympathetic noradrenergenic nerve fibers and alpha-adrenergic receptors in lymph nodes of rats, which supports the proposition that lymph flow through the lymphatic vessels and nodes is modulated by the sympathetic nervous system (8). Also, selective release of immunoregulatory cells into the circulation, which changes the cellular immune function, and is mediated by acute sympathetic stimulation (9).

If the chiropractic adjustment has an influence through these pathways then it should have a measurable effect on the immune system through monitoring informational substances of the immune system such as, antibodies, cytokines, substance P, Somatostatin, B and T lymphocytes. In fact, there were two chiropractic studies of patients with musculoskeletal complaints that were found to have significantly fewer natural killer cells than asymptomatic control patients (10,11). A trial monitoring antibodies, cytokines, substance P and cell counts is currently in progress (12).

Conclusions: There is compelling evidence in the literature that demonstrates the nervous system has an influence the immune system, but the scientific evidence that does exist which could be categorized as specifically chiropractic research studies is limited. Just as Allen found in 1993, more research is still needed including well designed clinical trials to study short

and long term effects and to document that chiropractic care has the ability to significantly benefit the immune response in patients. The study by Injeyan is one step in that direction.

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Appendix A
Literature Review Evaluation Form

Article Title: _____

Author(s): _____

Year: _____ Journal / Source: _____ Peer- Reviewed: Yes No

Type: Experimental Randomized Clinical Trial Cohort Retrospective Cross-sectional
Single-subject Time Series Case Series Case Study Commentary

Literature Review Other: _____

Circle the most appropriate score for each item. Item score of 5 = excellent (maximum score = 60).

0 1 2 3 4 5 1. The title is appropriate

0 1 2 3 4 5 2. The abstract adequately reflects content of paper

0 1 2 3 4 5 3. The study design and methodology are clearly described
Blinding: Yes No
N = _____

0 1 2 3 4 5 4. The methods include sufficent controls (or N/A = not applicable)

0 1 2 3 4 5 5. The data are adequate (or N/A)
Measurements: objective subjective
Type: _____

0 1 2 3 4 5 6. The statistics are clear and concise (or N/A)
Type: _____

0 1 2 3 4 5 7. The intrepretation is appropriate

0 1 2 3 4 5 8. The discussion is relevant, clear, and supported by the data

0 1 2 3 4 5 9. The illustrations and tables are sufficient

0 1 2 3 4 5 10. The references are relevant and supportive

0 1 2 3 4 5 11. The manuscript style is appropriate, of sufficient length (not too brief nor comprehensive), and is well arranged

0 1 2 3 4 5 12. Overall judgement:
____important
____timely
____interesting
____original
____well written / edited

_____ Total Score

Appendix B
Annotated Bibliography

CATEGORY	YEARS
Experimental: Anatomy and Physiology	1980 - 1998

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CATEGORY	YEARS
Clinical: Chiropractic and Immune System Interaction	1977 - 1999

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CATEGORY	YEARS
Reviews and commentaries	1987 - 1993

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MIKE CLUSSERATH, DC, **Rationale for Multiple Common Indicators of Vertebral Subluxation**

The research agenda of Sherman College includes developing vertebral subluxation (VS) measures and determining the effect of VS on quality of life. The VS measures and experimental design of Sherman College suggest using common measures that would allow for comparison of techniques for effectiveness in location and analysis of vertebral subluxation. (1) The reasons stated for the use of common, multiple measures are as follows. There is no irrefutable standard and the measures used commonly are hypothetical and subjective. There is a covariance of neurologic and articular function that leads to confusion about the reliability of specific measures. Until research into the reliability of a specific technique to measure the VS becomes more prevalent, it would be logical to use multiple indicators for analysis of the presence and location of a subluxation. (2) These indicators, to be useful, would have minimal overlap in the structure or functional attributes being investigated. For example, the palpation of the bony processes of the spine and the use of instrumentation are clearly different in technique and in the effects of subluxation being measured. (3) The motion of a joint and the x-ray analysis of the segment being palpated provide different measures that could both, arguably, be strong measures of the subluxation, or aspects of the subluxation. The combination of analysis is superior at the determination of the presence and location of subluxation when compared to any single method of analysis.

VALIDITY

Validity is a strong reason for the lack of consensus as to the appropriate or best indicators of vertebral subluxation. The difficulty in establishing a very strong standard of measure lies in the lack of a clear definition of the subluxation and the varying talents of those who have become experts in specific measuring techniques. There is no profession wide consensus as to the definition of a subluxation. There is a range of views of what a subluxation is: from a simple fixation to a vertebral subluxation complex including several components to a misalignment that causes interference to the mental impulse acting through the nerve system. The choice of indicators to determine the presence, location and analysis of the vertebral subluxation clearly would depend on the chosen definition of subluxation. A particular indicator, for example static palpation, may be relatively invalid should the chosen definition of subluxation be exclusively based on joint fixation. (4,5,6)

RELIABILITY

There is clearly a wide diversity in analyses, which may lead to the conclusion of a weakness in the underlying premise of the presence of subluxation, and the chiropractor's ability to recognize and analyze and potentially correct it. The opposite view makes more sense to experienced practitioners in most professional fields. That is: there is no absolutely irrefutable models or applications. All professionals must take the best available models, science, technology, and practical circumstances and use their knowledge, understanding and experience to provide their patient or client with the best possible outcome. The indicators of vertebral subluxation that are used presently, specifically at Sherman College, are consistent with the common, widely used and institutionally accepted methods currently in the profession. Palpation (motion, static, muscle), x-ray, instrumentation, posture, and balance are very common and well established methods for analysis of the subluxation. These indicators are also consistent with one of the more prevalent definitions in the profes-