

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 Enjoy-

ment 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. Fidelibus²² 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 consumption³⁵ 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 compe-

tence. 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,

Table 1. 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 ± 9.0 . The age for males was 29.5 ± 10.2 and 29.3 ± 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 ⁺		$(p = 0.040, 3 \text{ vs. } 9)$	$(p = 0.026, \text{baseline vs. } 9)$
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	0.36 ± 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

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

	Sample Interval			Correlation Coefficient (r)
	Baseline	3 Months Duration	9 Months Duration	
<i>Negative Correlations</i>				
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	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.

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).

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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