Leg Length Inequality as a Chiropractic Metric: a Historical Approach

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Since the discovery of chiropractic in 1895, numerous methods have been used by chiropractors to detect where the chiropractic intervention is required on their patients including palpation, radiography, and postural evaluation. Objectively defining, analyzing, measuring and adjusting the vertebral subluxation according to a designed clinical research methodology should be central to chiropractic. Chiropractic technique developers have attempted to do so with varying levels of success. This article focuses on the measurement of leg length inequality (LLI) — mostly functional (f LLI) rather than anatomical (aLLI) — by the means of leg checks as indicators of vertebral subluxation or subluxation correction. Understanding the history related to chiropractic methodology for measuring LLI may help today’s chiropractors to better ascertain what they are doing, the value of the proce-

Historical approaches to measuring leg length inequality

Methods for measuring leg length inequality (LLI) have been used as a diagnostic tests in conjunction with spinal treatments since ancient times. Historically, one of the earliest references to LLI (900 B.C.) comes from the Holy Bible (Proverbs 26:7): "The legs of the lame are not equal." Beech mentions other examples:

"Around the 5th and 4th century B.C., Plato remarked upon the awkwardness and suffering of the person who had one leg too long or some other disproportion which was "the cause of infinite evil to its ownself."

Bampfield (1823) listed "unequal length of the lower extremities" as one of the remote causes of lateral curvature of the spine.

Barwell (1891) confirms Bampfield's findings and adds that "the starting point of many cases of curvature was obliquity of the pelvis and treatment, to be effective, should be directed to this primary pelvic obliquity."

Today, several health care disciplines, including chiropractic, general medical practice, physical therapy, podiatry, obstetrics, and surgery consider leg length measurements as an evaluation test with different purposes, significance and validity.

Measuring leg length inequality in chiropractic

Chiropractors are especially interested in functional leg length inequality (fLLI), "to help determine abnormal loading of the human frame resulting from or attributed to vertebral or pelvic malposition (subluxation). Associated altered neuromuscular function has been identified as one of the characteristics of subluxation, and LLI assessment has been found useful
in gait, locomotion, weight bearing, and postural assessment.\textsuperscript{6}(p. 65)

A chronological perspective of early technique leaders in chiropractic using a leg check test for assessing fLLL and vertebral subluxation will allow us to more fully understand the procedure, how it developed, and where it stands today.

These techniques can be divided in two main groups: those who identified fLLL with a pelvic origin and those who identified it with a cervical origin, especially at the atlas level.

Pelvic origin techniques

Pelvic origin techniques were led by doctors such as Willard Carver, Hugh B. Logan, Major Bertrand DeJarnette, Romer and Weldon Derfield. Each of these developers focused on how fLLL related to the pelvis.

Willard Carver

The first chiropractic author to discuss fLLL was Willard Carver, who referred to himself as the “Constructor” of chiropractic. Among Carver’s contribution to chiropractic was his development of the “structural approach” which visualized the spinal column as a gravity adapting, weight-supporting structure. Its areas of weakness could be studied using mechanical engineering concepts. This view was in competition with B.J. Palmer’s “segmental approach”\textsuperscript{7}.

Specifics on leg measurements found in Carver’s texts:

“... if the ankle, leg, thigh, or all of these are shorter upon one side than they are upon the other, the iliac base of that side will be more feetward than the other side, and that, therefore, the sacrum will be turned out of equilibrium in that direction”.\textsuperscript{8}

Universal Chiropractic College

Universal Chiropractic College, initiated by Joy Loban and others, published a 1924 article\textsuperscript{9} that describes a system of x-raying the pelvis and spine in an upright posture to determine the stresses created by gravity, thus enhancing the curvature, rotation, leg-length discrepancies and subluxations. The system was developed by Dr. Edwin Garbisch, the U.C.C. roentgenologist, and Dr. Leo J. Steinbach, Dean of the College\textsuperscript{10} and it would be viewed as a measure of anatomical short leg rather than functional.

Logan Basic Technique

Hugh Benedict Logan was awarded his D.C. degree in 1916 from the Universal Chiropractic College.\textsuperscript{11} In the late 1920s Logan left his practice and began an association with John Hurley, D.C., and Helen Sanders, D.C., who commissioned him to teach Aquarian Age Healing\textsuperscript{12}. By 1931 Logan had severed relations with Hurley and begun a road tour teaching his new technique, which he named "Universal Health, Basic Technique."\textsuperscript{12}

The Logan Basic College of Chiropractic opened with seven students on 1 September 1935 at 4490 Lindell Boulevard, St. Louis, Mo., and would emphasize the structural approach to spinal analysis and adjusting upon which Logan Basic Technique was based: \textsuperscript{11}

"The Primary Premise of Basic Technique is: The body of the lowest freely movable vertebra always rotates toward the
low side of the sacrum or the foundation upon which it rests, and rotates toward the high crest when that crest is high as a result of sacral subluxation."[13 pp. XI' XI'I

"Hundreds of people suffer unnecessarily from body distortions, subluxations and ailments resulting directly or indirectly from traumatic leg deficiency. Too often after an injury which produces a shortening of one limb, nothing is done to equalize the weight distribution of the body... the most common factor responsible for leg deficiency is collapse of the arch of the foot."[13 (pp. 743-744)

The importance of correcting L.I.I is central in Logan's theories.

DeJarnette and S.O.T.

Dr. Major Bertrand DeJarnette began studying the field of osteopathic manipulation after finding some relief when he was involved in a boiler explosion that threw him against a wall and crippled him. DeJarnette later graduated from Nebraska College of Chiropractic in December 1924.

DeJarnette studied the works of Jim Drain of Texas Chiropractic College, Willard Carver of Carver Chiropractic College, and B.J. Palmer of the Palmer School of Chiropractic (P.S.C.). Not satisfied with the practices of the time, DeJarnette began to divide his practice hours researching the principles of chiropractic, and writing papers on his own interpretation of chiropractic.

Between the 1930s and 1940s he developed and researched several techniques such as the vasomotor technique, occipital fiber technique and chiropractic bloodless surgery technique. Also during that time he proposed L.I.I measurement for what he termed "the sacro iliac subluxation" specially designed for low back cases. His own clinical studies concluded that when one leg remained consistently short in prone and supine measurements it was due to one of three things: lack of bone development, lack of muscle support, or a rotation of the ilium. To understand the amount of clinical study DeJarnette did on the short/long leg phenomenon in the 1930's he stated:

"For several years, we always did a standing A to P X-ray of the pelvis in the study of the short leg problem. We would then do a standing P to A exposure on the same pelvis and compare the two films. When the films would compare equally on the short leg side, we would then X-ray the extremities in an effort to determine [if] actual femoral, tibia or ankle deficiencies existed. When we could not determine a leg bone deficiency we would then assume that the cause of the short leg was a rotation of the ilium."[13 (pp. 743-744)

DeJarnette collaborated with Randolph Stone, D.O., D.C., from Chicago (author of "Polarity Therapy"), and Richard Van Rump, D.C., of New York City ("Directional Non Force Technique"). Beginning in 1939, he edited and published the Journal of Bloodless Surgery, which featured articles from them. In 1940 he also published Sacro Occipital Technic of Spinal Therapy.

His intense focus during the 1940's and 50's turned to the study of not only the short leg phenomenon but that of a long leg involvement. DeJarnette theorized that lower limb inequalities were not causes but results of SI subluxation.

DeJarnette wrote in his definitive 1984 text about the Sacro Occipital Technic categories, "All blocking (use of pelvic blocks as treatment) is determined by the short leg measured specifically for each category and you do not change the short leg side visit to visit."[13 S.O.T's view of the short/long leg phenomenon is thus also functional rather than anatomical.
Van Rumpt and D.N.F.T.

Richard Van Rumpt became a pioneer on chiropractic light force adjusting technique as well as originator of the “reactive leg reflex” test.

Although he was known as a forceful adjuster while a student at the National College of Chiropractic, one day in 1923, after a heavy palpation examination, a patient of his returned the next day feeling much better. That examination without any intervention aroused his curiosity and influenced his method of adjusting nonforcefully with the thumbs any and all parts of the body.18,19

The most relevant aspect of his work related to this article is the development of a unique leg check procedure he fully developed in conjunction to the adjusting procedure over a long number of years of personal research. He taught it from the 1930s until 1986 in New York, referring to the procedure as “Directional Non Force Technique.” (D.N.F.T.)18-20

Van Rumpt classifies his leg check as neither functional nor anatomical and it is entirely different from any other leg measuring system in chiropractic.18 In his own words:

"The reactive leg is a phenomenon which every human experiences. The body has the capacity to react to certain things in such a way that the musculature on one side of the body will contract. This contraction, if viewed on a patient in the supine or prone position, will appear as a temporary shortening of one side. It is most dramatic when viewed at the walking surface of the heel."35

The D.N.F.T. analysis of the vertebral subluxation with light touch body “challenges” and its outcomes through the use of the reactive leg, along with other techniques such as Derifield, Logan and Truscott, influenced the development of a current popular chiropractic technique, Activator Methods.6-7

Derifield

The Derifield leg check is one of the hallmark examinations taught in every chiropractic school. Drs. Romer and Mabel Derifield graduated from Palmer in 1923. Their son, Dr. Weldon Derifield graduated from Palmer School of Chiropractic in 1936. Father and son developed the “Derifield Technique,” which was first presented in 1939 at the ICA Convention in Davenport, Iowa. Later, Weldon took over the work mainly himself.21-22

Dr. Romer Derifield first worked out the case of the positive Derifield. Later, Derifield discovered quite fortuitously that prone leg lengths occasionally changed when the patient rotated the head, thus leading to the concept of “cervical syndrome.” As Thompson recounts the story,23 Derifield, who was working for a railroad in Detroit at the time, was having trouble treating a difficult case. One day the phone rang for the patient while his legs were being checked. As he turned his head to speak, the legs suddenly and unexpectedly evened. Further investigation by Derifield into this case and others revealed that thrusting into tender nodules in the (mostly upper) cervical spine would not only reduce the patients’ symptomatology but also improve prone leg length inequality. Thompson credits Dr. Alvin Niblo with the discovery of the negative Derifield.23

Dr. Romer Derifield passed away in 1966 at age 78. In 1988, Dr. Weldon Derifield and Dr. Frederick Vogel went to St. Louis to do video fluoroscopic studies of the Derifield leg check and the Atlas Orthogonal adjustment. Dr. Derifield stated, "With extensive research over the years clinically, and now with video fluoroscopic radiology, I feel we have a great deal more
to offer the profession because we can now prove what we are doing.\textsuperscript{24-25}

The Derifield leg check involves a functional prone leg-checking protocol to identify pelvic and cervical syndrome.

\textbf{Atlas origin techniques}

\textbf{Grostic, Gregory and Sweat (orthogonal-based upper cervical techniques)}

John F. Grostic graduated from the P.S.C. on March 19, 1933. He had enrolled after a lifesaving experience under B.J. Palmer's HIO care. In 1936, Grostic began his in-depth research of the upper cervical region to develop what has become known as the Grostic procedure. Grostic has been credited for the implementation of the supine leg check within the upper cervical approach. He observed a high degree of correlation between supine leg length inequality and positive Neurocalograph findings and also with the patient's symptomatic picture as a means of determining the presence of nerve interference.\textsuperscript{26} It is thought that Grostic initially derived the idea from an old osteopathic move that involved vigorously pulling the patient's short leg to balance the asymmetry temporarily. Records show that Grostic began to document the supine leg check on his patient listing cards by 1943 (some speculate it was 1941\textsuperscript{27}), although he had used the assessment for an undetermined number of years previously. Interestingly, Drs. Weldon Derifield and John F. Grostic knew each other since both lived in Michigan. Weldon was also his patient and he had attended the Grostic seminars in 1948 and 1952. We can speculate about their potential collaboration in reference to the functional leg check since both DCs began using this assessment about the same time.\textsuperscript{28}

J.D. Grostic, J.F.'s son, hypothesized a mechanism (dentate ligament-cord distortion hypothesis) whereby the effects of misalignments of the upper cervical vertebrae, via the dentate ligaments, produce mechanical distortions of the spinal cord. The clinical significance is observed in the supine leg length comparison check and related symptomatology in patients.\textsuperscript{29}

Dr. J.F. Grostic died in 1964. In 1965, Dr. Roy Sweat and four other doctors organized the Grostic Presentation Seminars and continued the specialized training seminars in Atlanta, Georgia. In 1977, Dr. Sweat organized the Society of Chiropractic Orthospinology, which presented the same specialized programs. In 1980, Dr. Sweat created the program of Chiropractic Atlas Orthogonality, which continued in the specialized educational seminars with instrument adjusting only.\textsuperscript{30,31}

Today, many of the upper cervical techniques that have their roots in the Grostic Procedure continue to use the supine leg check as an indication for adjustment, including Life Cervical, the National Upper Cervical Chiropractic Association (N.U.C.C.A.) and Spinal Biomechanics (Pettibon), among others. It should be noted though that some have significantly modified the procedure from how it was first taught.\textsuperscript{26}

Of interest for this section is Dr. Ralph Gregory, founder of N.U.C.C.A. and the "closest ally" of Dr. Sweat.\textsuperscript{31}

NUCCA was founded in 1966 with Dr. Gregory and other interested chiropractors, due to some schisms with Dr. Grostic. Although the leg check performed by N.U.C.C.A. is very similar to the one by Grostic, their hypothesis on the reticular formation and "spasticity" differentiates it - theoretically - from the dentate ligament proposed by Grostic.\textsuperscript{32}

\textbf{Truscott}

Another interesting history in tech-
nique development and LLI measurement analysis is found on B.J.'s Fight to Climb, describing the work of Dr. L.L. Truscott of San Jose. In correspondence from Granville K. Frisbie, D.C. to B.J. Palmer (Santa Monica, Calif., August 1, 1944) Frisbie describes the origins and development of the Truscott procedure. After observing that most sick persons showed with a functional short leg—and not the healthy ones—he began experimenting further, also on himself. He found that by proper light finger-tip contact "he could alter the muscular contraction of the back muscles AND CONTROL MOMENTARILY the shortness or correct length of the legs. This caused him to reason further that IF NERVE PRESSURE EXISTED AT ATLAS HIS CONTACT WOULD DRAW UP ONE LEG, IF IT WERE FREE OF PRESSURE, THE LEG WOULD GO TO NORMAL" (emphasis in original). 33(pp.209-210)

The Truscott system is rarely practiced by today's chiropractors.

BJ's opinion on LLI

B.J. Palmer was aware of other existing chiropractic methods and he had his opinions. He welcomed the developers of these systems to the P.S.C. to investigate each of those techniques and their efficacy. Technique leaders also wanted B.J.'s opinion and, better, in the cases of Truscott and Spears, his endorsement. They didn't get that endorsement, though. B.J. Palmer was probably aware of the LLI phenomena and its characteristics, at least as early as 1922, as Craven's book describes the anatomical short leg (or a tilted pelvis) as a result of an adaptive compensative curve. Craven was faculty at the P.S.C. from 1913 to 1926.

In Precise, Posture-Constant, Spinograph, Comparative Graphs (1938), B.J. describes the compensatory effects of the atlas subluxation with a right side slip wedge and head was high on right: "head leaned low on left, cervical curved lateral to right, dorsal curved lateral to left, lumbar curved lateral to right, pelvis was high on left, left leg was seemingly short, etc." 36 (p.146)

B.J. Palmer's opinion on correcting LLI was that proponents were correcting the gross observation of effects instead of adjusting the cause: the atlas subluxation. 36 (p.149)

B.J. thought that Logan technique, as well as other methods of aligning leg inequality through a manual intervention to the spine, were based on old principles and practices of orthopedic surgery which focused on returning "adaptive curves" apparently to normal (although creating new ones) by placing lifts under the short leg but leaving the atlas in its subluxated position. As a means of reducing effects, it was effective.36(p.151)

B.J., aware of the Dejarnette's osteopathic background, derided his "traveling circus of attic antiques of old and ancient discarded moves," though he gives credit to osteopathy and A.T. Still for "possessing the best method to lengthen short legs and straighten spinal columns, although the atlas subluxation will still persist as cause."36(p.151)

Besides the opinion of "treating effects instead of causes" referring to LLI-based procedures, B.J. had his own opinion on the Crostic work. In a "Personal from B.J." letter to "Jim," dated 3 December, 1956, B.J. makes clear his position that only the patient's innate intelligence knows where the adjustment settles the atlas, regardless of what "any man might think," using measurement such as a LLI leg check test.

Finally, B.J. thought that the changes of leg length that Truscott was observing
were a momentary physiological REFLEX due to results following pressure which changed musculature contraction or relaxation, and that legs could change even only through patients lying on their backs. As result, the Palmer clinic could not endorse Truscott for advancing in accuracy, efficiency, or better results.

Current situation

Currently, the ten most practiced chiropractic techniques use traditional functional leg checking procedures, although to date, reliability of LLI tests, as well as other chiropractic diagnostic tests, has not fully been validated.

Very little quantitative or qualitative information is available as to what precisely is being measured with functional LLI tests, what creates the putative functional short leg, how stable it might be, how it may be distinguished from an anatomical short leg, or what pathological significance it may have.

Cooperstein has offered a novel model which is not popular but which could explain the functional LLI changes-phenomenon observed in practice. His research conclusion: "The functional short leg is confirmed as a stable clinical reality, a multtrial mean of unloaded leg positional differences."

The author of this article has self-published an extensive book analyzing the leg check chiropractic literature on LLI.

Conclusions

Regardless of the procedure, its history, and B.J.’s opinion, current technique leaders should understand where they come from and thereby visualize where they are going.

It is time to update and confirm our findings objectively with current technology. It is time to see if our predecessors were correct regarding their procedures.

Present technology exists today to measure functional LLI changes that may occur during a chiropractic procedure and thus, show their validity. The scientific community and general public will demand someday an explanation of what are we really doing as practicing chiropractors.

Chiropractic history is necessary to know our past and evaluate our present. I hope this article helps in realizing that question.

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Notes

1 Plato, Dialogues of; Timaeus 87, trans. B. Jowett (1871).
8 Carver W. (1921) Carver's chiropractic analysis of chiropractic principles as applied to pathology, relatology, symptomology and diagnosis. Oklahoma City: Publisher unknown. P.273, 279.


36 Palmer, B.J. (1938) Precise, posture-constant, spinograph, comparative graphs; an exposition of innate natural adaptation following HIO adjustment proving measurement correction of vertebral subluxations, corrections of abnormal-normal adaptive curves, as well as curvatures. Davenport, IA: Palmer School of Chiropractic.


