A Comparative Study of Cervical Hysteresis Characteristics after Various Osteopathic Manipulative Treatment (OMT) Modalities

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Background

Purpose of the Project

- Limited objective data in the field of NMM/manual medicine to document the presence of somatic dysfunction (SD)
- If one can not document SD, how can one objectively document its improvement/elimination with OMT
- Identifying such an objective measure would strengthen many subjective research projects
- Professional needs: “D.O.” could stand for taking the time to “Document Osteopathy”
Hysteresis History

- 1850’s
- 1890 Alfred Ewing, Scottish physicist, revived the term when researching electromagnets.
- The ability to recoil to natural shape.
- Lag in the recoil = decrease hysteresis
Hysteresis Loop
Hysteresis Applied to the Human Sciences

- Medical Science
  - Respiratory system
  - Electrochemical memory in enzyme membranes
  - Knee laxity
- Clinically
  - Somatic Dysfunction
    - Zink pattern of pelvis (Michael Warner DO, FAAO)
    - Ankle sprains (Michael Kuchera DO, FAAO)
  - Recoil of the tissues post OMM treatment
The Ultralign SA201®: “Durometer Plus” (Sigma Instruments Inc; Cranberry, PA)

- FDA approval 1997
  - Spinal segmental function,
  - Segmental restriction of motion
  - Muscle condition

- Current usage
  - Spinal neck & back pain
  - Tension headache
  - Whiplash
  - Joint mobilization
  - Trigger points
  - Documenting Segmental changes
The Ultralign SA201® Analysis of the Cervical Spine

- The Ultralign SA201® prongs are placed paraspinally.
  - Similar to the placement of the fingers during palpation of the cervical articular pillars
- Piezoelectric force is induced to obtain a reading after 6lbs (2.2kg) loading (verified with IsoTOUCH® pressure sensitive palpation monitors)
- AA
- C2-C6
- C6-C8
Durometer: The Ultralign SA201®

Fixation: Resistance
Frequency: Length of the Curve
Mobility: ROM
Motoricity: Overall Dysfunction

1 = time to peak; 2 = ymax = peak; 3 = xmax = ttot = time total; 4 = area total; 5 = area to peak; 6 = [3] - [1] = attenuation

Mobility = \frac{[1]}{[3]} \times 100
Motoricity = \frac{[5]}{[4]} \times 100
Durometer: The Ultralign SA201®
Fixation: Resistance = 2

1 = time to peak;
2 = ymax = peak
3 = xmax = ttot = time total;
4 = area total
5 = area to peak
Mobility = [1]/ [3] * 100
Motoricity = [5]/ [4] * 100
Durometer: The Ultralign SA201®
Frequency: Length of the Curve = 3

3 = xmax = ttot = time total

1 = time to peak;
2 = ymax = peak;
3 = xmax = ttot = time total
4 = area total
5 = area to peak

Mobility = \left( \frac{1}{3} \right) \times 100

Durometer: Ultralign SA201®
Mobility = Range of Motion

Mobility = \left( \frac{1}{3} \right) \times 100

Motoricity = \left( \frac{5}{4} \right) \times 100
Durometer: The Ultralign SA201®

Motoricity = Overall Segmental Dysfunction

\[ \text{Motoricity} = \left( \frac{5}{4} \right) \times 100 \]

Legend:
- 1 = time to peak
- 2 = ymax = peak
- 3 = xmax = ttot = time total
- 4 = area total
- 5 = area to peak

Mobility = \[ \frac{[1]}{[3]} \times 100 \]

Motoricity = \[ \left( \frac{5}{4} \right) \times 100 \]
Ultralign SA201®

4: ME

Average of the pre-readings compared to the average of the post-readings.
### Ultralignt SA201®: Durometer Measures

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oTOUCH® Pressure Sensors

uses noninvasive, pressure deformation sensors finger pads & thenar eminences; data sent to a computer measured and documented the forces used during manual diagnosis and treatment of the somatic dysfunction.

permits a better understanding of the amount of loading and impulse pressure used manually by the examiner to diagnose a somatic dysfunction compared to that used by The Ultralign A201®.
Hypothesis

1. Objective Findings

- Cervical somatic dysfunction identified in an otherwise healthy subject will show an overall quantifiable decrease in hysteresis measurement after OMT.
Methods & Materials

Current Study

Total of 204 subjects

Treatment groups Muscle Energy (ME) & High Velocity Low Amplitude (HVLA)

Randomly divided in ME & HVLA treatment groups

Single technician performed all 13056 applications (204 subjects)
The Ultralign SA201® Results
Comparison of the change in median values between treatment groups first study

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- p=0.10
- p=0.08
- p=0.16
- p=0.16

- p=0.08
- p=0.16
Comparison of the overall change in median values between treatment groups

-0.25 -0.25 -0.25 -0.25

p=0.01 p=0.06 p=0.01 p=0.002 p=0.03 p=0.14 p=0.08
Comparison of the change in median values of only treated segments between ME & HVLA

\[ p = 0.003 \]

\[ p = 0.04 \]
Comparison of the change in median values of adjacently treated segments between ME & HVLA

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Discussion

Changes documented using a Durometer (The Ultralign SA201®) pre and post OMT adds a new objective measurement method to the literature.
Future Research Analysis & Studies

- Looking further at the individual regional outcomes
- Able to expand this pilot project to a series of regional studies
- Examining the pressures used in order to diagnosis and treat a segment
- Interexaminer studies
  - Experience of the examiner
  - The amount of pressures used for treatment
Acknowledgements

John Crunick and Sigma Instruments (Cranberry, PA) for the donation of The Ultralign SA201® equipment
Thomas Rustler, MD (Vienna) for patience, guidance and training of The Ultralign SA201® that resulted in those skills with the equipment needed for consistent application and measurement.

Terence Vardy, DO (Australia) for placement of the oTOUCH® palpation monitors
Michael L. Kuchera, DO, FAAO
Bruce C. Stouch PhD
Frank J Casella, Hilda Lai, Joseph Yoha, Blessing Odutola, Jessica Korsh, Wayne Li, Claire Bogle
References


Rustler, T. M., Tilscher, Hans MD "Treatment of the Cervical Spine with the Ultralign SA201 Results of a pilot study." From the Department of Orthopedic Pain Therapy, Orthopedic Hospital Vienna-Speising, and the +Ludwig Boltzmann Institute for Conservative Orthopedics, Austria.


References


Thank you for coming

Questions???