

STATIC AND DYNAMIC SURFACE ELECTROMYOGRAPHY (SEMG)



Static and Dynamic Surface Electromyography(sEMG)

CLA's INSIGHT™ scanning technology helps bridge the gap between known advantages of chiropractic adjustments and concrete measurements. Static and Dynamic Surface Electromyography (sEMG) is an essential part of our INSIGHT™ system, providing a major piece of the puzzle of general well-being by assessing paraspinal tension.

What is sEMG and how can it support chiropractic care?

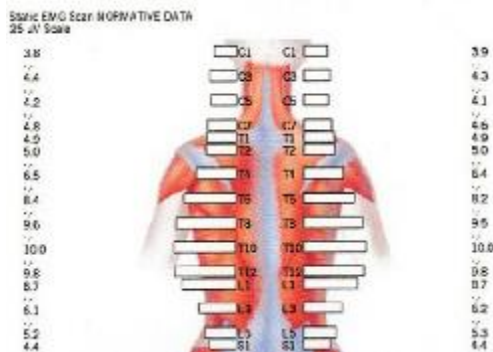
This technology reads electrical activity (action potential) in order to measure paraspinal tension, similar to the use of electromyography in EKG/heart rate measurement machines.

The electric current pattern is a critical component in how your body functions. The muscles on either side of your spine should be balanced: if they are not working equally well, the body is forced to compensate, which takes energy. This imbalance can be monitored by sEMG technology. Alterations in electrical activity in the paraspinal muscles can shed light on the muscular changes linked to vertebral subluxations. As such, chiropractors can use sEMG to establish a baseline for paraspinal electrical activity.

In contrast to EKG/heart rate monitors, the sEMG used within CLA's INSIGHT™ technology has sensors that are 1,000 times more sensitive. This enables them to read the electrical activity of paraspinal muscles, which is much weaker than that of the heart. The sensitivity and accuracy of the Insight technology is unsurpassed.

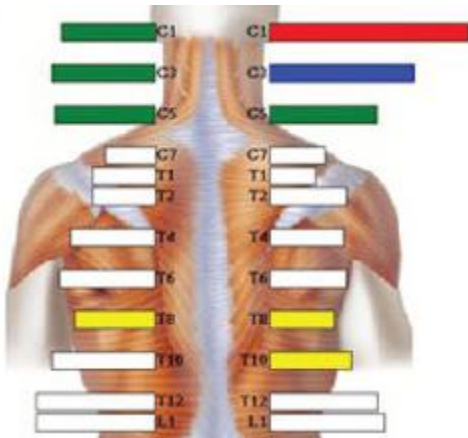
What do these results look like?

With CLA's sEMG system, chiropractors can access action potential measurements through the following methods:

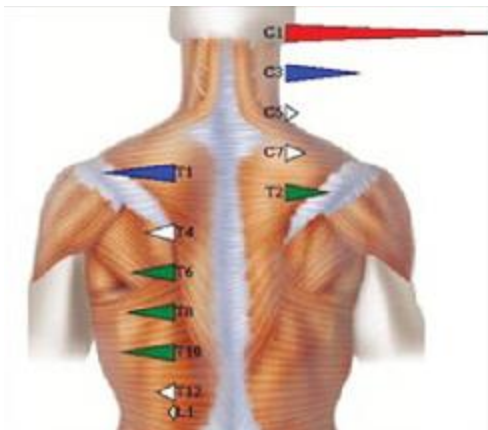


Normal scan – This establishes normal levels of electrical activity for reference during treatment. The normal scan will have a pear-shaped

pattern.



- **Amplitude scan** – This scan reveals the amplitude (tension) among paraspinal electrical activity, noting areas of hyper or hypo-tonicity as it compares to a normal population. CLA’s chiropractic tools use a color-coded system: Green bars show mild elevation (compared to the normal scan), blue bars convey moderate elevation, red bars indicate high elevation and yellow bars display readings below normal amplitude.



- **Asymmetry scan** – This reading depicts the amount of muscle pull from one side to another along the spine using the same color-coded system. White triangles indicate normal.
- **Dynamic graph** – With CLA’s sEMG, chiropractors can track up to four channels of muscle activity as their patients are guided through different physical movements. The ‘event marker’ feature assists interpretation by marking the position of the patient during the test. This graph is accompanied by a dynamic narrative report.



sEMG-Pattern view – This cutting edge graph is patent-pending and unique to CLA's INSiGHT™ technology. It highlights patterns in how energy is distributed throughout the spine and whether this system is efficient or not. With this view, chiropractors can easily visualize underlying imbalances and room for improvement for patients who are interested in better wellness.



— Quantifications Report: The Quantifications Report Graph documents each patient's progress.
The Science Behind sEMG

1 – SEMG – AN ACCEPTED TECHNOLOGY FOR CLINICAL USE

According to other sEMG manufacturers who market to the medical profession, the following medical specialties have utilized surface EMG since the late 1980s:

- Urologists for diagnosis and treatment of urinary incontinence

- Orthopedists for muscle rehab and training
- Physiologists for anxiety, tension/migraine headaches, rehab
- General practitioners for circulation problems, anxiety, desensitization, dystonia [muscle tonus], incontinence, spasms, relaxation, psychosomatic symptoms
- Family practitioners for circulation problems, anxiety, desensitization, dystonia [muscle tonus], incontinence, spasms, relaxation, psychosomatic symptoms
- Neurologists for anxiety, muscle training and rehab, spasms
- Speech pathologists for anxiety, relaxation
- Sports Medicine for muscle training and rehab
- Corporate Medicine for muscle training and rehab
- Psychiatrists and psychologists for anxiety, desensitization, psychosomatic symptoms, tortocollis, writer's cramp, phobias
- Rehab centers for muscle training, relaxation, spasms, and urinary incontinence
- Occupational therapists for muscle training/rehab, relaxation, migraine headaches
- Dentists for TMJ, anxiety, tension/migraine headaches

Go to www.bio-medical.com to see how sEMG is currently being used by physical therapists, physiatrists, massage therapists, and RNs.

2 – INDEPENDENT STUDIES

Christopher Kent, DC, FCCI, JD, CLA Co-Founder and Research Director, and one of the chiropractic profession's leading researchers, sums up the issue on reliability of sEMG: "Studies spanning decades consistently report high levels of reliability. Quite simply, no other procedure I am aware of in chiropractic, except measurements on x-rays, approach the reliability of sEMG. Studies from the Mayo Clinic to the NZ Chiropractic College have demonstrated this. NONE OF THESE STUDIES WERE PERFORMED OR FUNDED BY CLA."

Price, Clare, Ewerhardt (1) observed that surface electrode paraspinal electromyography has been employed since 1948 to measure muscular activity. Cobb et al (2) concluded that "...muscle spasm (even when mild) is accompanied by muscular hyperactivity which can be evaluated by suitable electromyographic techniques. Our data suggest that surface electrodes allow better sampling than Teflon coated needles..." and that "...integration procedures (surface EMG) allow better quantification than does the visual evaluation of a (needle) EMG..."

Surface electrode electromyography with attached electrodes exhibits very good to excellent test-retest reliability.

Reliability is a measure of the ability to reproduce a measurement, which is expressed as a coefficient ranging from 0.00 to 1.00. Perfect reliability results in a coefficient of 1.00, while chance agreement would be 0.0. As presented below, research data indicates that the reliability of sEMG is clearly superior to palpation for muscle tension. Spector (3) reported a surface EMG study performed at New York Chiropractic College which yielded correlation coefficients ranging from 0.73 and 0.97. Komi and Buskirk (4) compared the test-retest reliability of surface electrodes vs. needle electrodes in the deltoid muscle. The test-retest reliability for surface electrodes was 0.88 compared to 0.62 for inserted electrodes. Giroux and Lamontagne (5) compared the reliability of surface vs. intramuscular wire EMG of the trapezius and deltoid muscles during isometric and dynamic contractions. The statistical analysis on the integrated EMG was a factorial analysis model with repeated measures. They found that surface EMG was more reliable than inserted wire EMG on day-to-day investigations.

Andersson et al (6) compared the electrical activity in lumbar erector spinae muscles using inserted electrodes and surface electrodes. They found that the standard deviations and coefficients of variation for wire electrodes was greater than those for surface electrodes. They concluded, "Wire electrodes are more sensitive to electrode location and give estimates with less precision than surface electrodes." Thompson et al (7) found that the scanning electrode technique correlated well with the "gold standard" of attached electrode technique (The Insight sEMG has both static and attached electrode techniques).

Cram et al (8) evaluated the reliability of surface EMG scanning in 102 subjects in the sitting and standing positions. sEMG scans were performed on three occasions approximately one hour apart on the same day. The median correlation between hand-held and patch electrodes was high, with a correlation coefficient of 0.64. The authors concluded, "With

adequate attention given to skin preparation, EMG sensors held in place by hand with a light pressure provide reliable results.”

3 – SURFACE EMG REFERENCES

1. Price JP, Clare MH, Ewerhardt RH. Studies in low backache with persistent muscle spasm. *Journal Phys Med Rehabil* 1948; 19:703.
2. Cobb CR, DeVries HA, Urban RT, et al. Electrical activity in muscle pain. *Am J Phys Med* 1975; 54(2):80.
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4. Andersson G, Jonsson B, Ortengren R. Myoelectric activity in individual lumbar erector spinae muscles in sitting. A study with surface and wire electrodes. *Sc and J Rehab Med* 1974 Suppl; 3:91.
5. Giroux B, Lamontagne M. Comparisons between surface electrodes and intramuscular wire electrodes in isometric and dynamic conditions. *Electromyography Clin Neurophysiol* 1990; 30:397.
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8. Cram JR, Lloyd J, Cahn TS. The reliability of EMG muscle scanning. *Int J Psychosomatics* 1994; 41:41.