

EFFECTS OF SACRAL PHOTOBIO-MODULATION ON THE AUTONOMIC NERVOUS SYSTEM IN PATIENTS WITH COLONIC DYSMOTILITY

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Background: Patients with chronic refractory constipation show colon dysmotility, including impaired coordination of descending colon-sigmoid colon-rectum-anal sphincter motor functions; this may involve slow colonic transit and colo-anal dyssynergia. Impaired neuronal communication between the sacral defecation center and the distal colon may be causative. In addition, patients with lumbosacral neurological conditions (with lower back pain) may not be able to evoke an effective defecation reflex.

Aims: To evaluate if a single therapeutic session of sacral low-level laser therapy (LLLT) would affect the autonomic activity in patients with chronic constipation as revealed by changes in heart rate variability, and to report a multi-session treatment case study.

Methods: In 41 patients with chronic constipation, one session of LLLT was executed, using red LED light at a wavelength of 660 nm for 10 minutes and infrared LED light at wavelength of 840 nm for 10 minutes followed by infrared laser light with wavelength of 825 nm for 20 minutes, while measuring the electrocardiogram. One patient received this treatment 8x over 3 weeks.

Results: The lumbar-sacral light array treatment showed a significant decrease in parasympathetic activity (RSA & RMSSD) whereas pure sacral laser light treatment showed a significant increase in parasympathetic activity (RSA & RMSSD) as well as a reduction in sympathetic activity (Baevsky's stress index: SI) (table). A single session of LLLT was also executed during HRCM in 8 patients with some but not all showing evoked colonic motility. Before COVID-19 shutdown, one patient was successfully treated. With a history of chronic constipation without ability to have spontaneous bowel movements for 5 years, symptoms improved from 13 to 8 (on a 20 scale) and quality of life improved from 1.5 to 2.5 (on a 0-4 scale) after 8 sessions. Sympathetic reactivity from supine to standing markedly reduced, from highly elevated measured as the Baevsky index from 55 to 153 s⁻² it improved from 42 to 75 s⁻² upon standing after 4 sessions. Parasympathetic reactivity did not change.

Conclusions: A single session of sacral LLLT markedly affected autonomic nervous

activity reflected in changes in HRV. The LLLT is likely affecting the sacral defecation center through peripheral nerves entering and exiting the spinal cord including the dorsal root ganglia. LLLT treatment of a patient with inability to generate spontaneous bowel movements, resulted in ability to have complete evacuations associated with marked reduction in sympathetic reactivity during the supine-standing test, after 4 LLLT sessions.

Change in HRV parameters during one session of sacral Low-Level Laser Therapy; (mean -SEM); n=41

| | Baseline (B) | LLLT Array | LLLT Probe | Recovery | P-value B-array | P-value array to probe | P-value B- probe | P-value probe to recovery |
|-----------------------|--------------|------------|------------|------------|-----------------|------------------------|------------------|---------------------------|
| RSA (ln(ms)) | 6.0 ± 0.2 | 5.8 ± 0.2 | 6.2 ± 0.2 | 6.0 ± 0.2 | *0.0449 | **0.0011 | *0.0478 | *0.0449 |
| RMSSD (ms) | 47.0 ± 5.1 | 40.5 ± 4.2 | 49.2 ± 5.1 | 45.7 ± 5.4 | **0.0032 | ***0.0001 | >0.9999 | >0.9999 |
| SD1 (ms) | 47.3 ± 3.3 | 44.2 ± 3.0 | 54.5 ± 3.7 | 46.2 ± 3.2 | 0.3459 | ***0.0002 | 0.0683 | *0.0292 |
| SI (s ⁻²) | 38.7 ± 3.8 | 41.6 ± 4.1 | 32.0 ± 4.1 | 34.2 ± 3.7 | 0.6269 | ***0.0003 | *0.0363 | >0.9999 |
| PEP (ms) | 111.1±2.5 | 111.1±2.7 | 111.2±2.7 | 111.9±3.0 | 0.5744 | >0.9999 | >0.9999 | >0.9999 |
| HR (bpm) | 68.0 ± 1.3 | 66.9 ± 1.5 | 65.2 ± 1.4 | 67.3 ± 1.4 | 0.2201 | ***0.0005 | **0.0029 | ***0.0005 |

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