A Pilot Study of the Effectiveness of 'Butterfly Technique' of SCENAR Therapy on Heart Rate Variability

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Background The modern physiological investigations of the impact of somatosensory input on autonomic functions have been reviewed in a very comprehensive monograph. Somatic stimulation has been shown to modulate such aspects of cardiovascular function as heart rate (HR), blood pressure, and regional blood flow. Heart rate variability (HRV) representthe beat to beat fluctuations in the rhythm of the heart. This is also an indirect method measuring of autonomicnervous system function. SCENAR (Self-Controlled Energy Neuro Adaptive Regulator) is a reflex biofeedback device and one method of energy medicine. Thus, the pilot study was undertaken to measure the effect of SCENAR therapy on autonomic nervous system.

Methods: The HRV analysis was performed for five minutes before and after SCENAR therapy on 30 healthy subjects (23 men and 7 women) ranging in age from 23 to 31 years.

Results: HR declined from the first to second 5-minute intervals (P<0.05, two-tailed paired t test). The power of SDNN component increased from 46.63±19.49 to 54.34±24.97 (P=0.01, paired t test). The power of RMSSD component from 40.18+28.75 to 45.48±33.44 (P=0.004, Wilcoxon signed rank test). In addition, the mean of Log (RMSSD) increased from 1.520±0.627 to 1.568±0.277 (P=0.041). However, there was no statistically significant change in the TP or others HRV parameters (LF, HF, VLF, LF/HF, LFn, HFn, LFn/HFn) component of the power spectrum.

Conclusion: SCENAR therapy called butterfly technique appears to be able to influence autonomic nervous system in ways that raised high frequency components of the HRV RMSSD, and overall HRV powder component; SDNN at the same time vagal output to the heart; HR.

Key Words: SCENAE therapy, Butterfly technique, HRV, Autonomic nervous system

INTRODUCTION

The modern physiological investigations of the impact of somatosensory input on autonomic functions have been reviewed in a very comprehensive monograph.[0] Somatic stimulation have been shown to modulate such aspects of cardiovascular function as heart rate (HR), blood pressure, and regional blood flow. In some instances, these effects are accompanied by, and perhaps attributable to, alterations in autonomic output to the cardiovascular system. Heart rate variability (HRV) represents continuous fluctuations inheart rate. R-to-R interval variations on electrocardiograms represent beat-to-beat control mechanisms. Efferent sympathetic and parasympathetic activities directed to the sinus node characterized by each cardiac cycle can be modulated by central and peripheral stimulators. These stimulations generate rhythmic fluctuations in efferent neural discharge that ma-nifest as oscillations in the heart beat period.

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SCENAR is an acronym for Self Controlled Energy Neuro Adaptive Regulator.[4)] It is a reflex biofeedback device and one method of energy medicine. It originated in research in the Soviet Union. A secret pro-jectinvolved 40 scientists for 20 years working on a type of medicine to treat astronauts in space vehicles. It was not practical to send a doctor into space to treat astronauts. A device with the size of a TV remote control was developed. In the late 1970s the Russian Space Program established a special division to research and provide a resolution for this dilemma. This group was under the direction of electronics experts Alexander Karasev and Alexander Nechushkin as well as medical doctor and neurologist Alexander Revenko. They were headquartered at Sochi University and worked to develop an energetic medical device that could meet very exacting specifications. In 1986 the SCENAR was permitted by the USSR Medical Council for release to the general public and hospitals. After the Soviet Union collapsed in 1989 the device was patented. The device is used widely in Russia. SCENAR impulse therapy produces an electrical tidal wave of neurological energy that activates a pathology into a neurovegetative as well as immune response.[5,6]* In SCENAR therapy there are the Little Wings technique that developed by the Russians helps tone down the sympathetics by using electrical power at the belly of the upper trapezius to affect the upper cervical ganglion. This in turn releases endorphins that calm the sympathetic nervous system.

In general, most of the functions of the head and neck are directly influenced by the brain and transmitted to the parasympathetic nerve systemvia the cranial nerves and spinal nerves of the cervical portion of the spine. In other words somatic nerve system is associated with the voluntary control of body movements through the action of skeletal muscles, and also reception of external stimuli. Thus, the present study was undertaken to measure the effect of SCENAR therapy on autonomic nervous system.

METHODS

1. Subject & Procedure

The subjects were 30 healthy persons (23 men and 7 women) ranging in age from 23 to 31 years. They had had a general health check up less than 12 months before the test. All had normal fasting blood glucose (126 mg/dL) and were normotensive (140/90 mmHg). None of the subjects was taking medication that might affect the autonomic nervous system. The active ECG unit connects to the subject through 3 electrodes that attached to left arm, right arm and left leg. And initial HRV was recorded before treatment was given. The HRV recording was taken in the sitting position for 5 minutes. After completion of SCENAER treatment, they then had another 5 minutes of HRV recording made. The SCENAR therapy was applied to the belly of the upper trapezius for maximum contraction of the trapezius with frequency 120 Hz and amplitude mode 3 : 1, that impulse time is three second and pause time, one second. The energy raised to the above threshold level that sensed as comfortable electro-action with current density 25 mA/cm. The technique is called Little Wings or butterfly because the SCENAR signal uses variable power resulting in the shoulders involuntarily moving up and down like wings.

2. Apparatus for Measuring HRV and Treatment

The analysis of HRV was performed with the use of a device (SA-3000; Medicore, Seoul, Korea) that satisfies the standards of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology. And treatment apparatus was SCENAR-NT (RTM, Russia).

3. HRV Assessment

HRV measurement was carried outfor five minutes *m* accordance with current standards, and is described in detail elsewhere. HRV was analyzed both in the time domain (SD of all intervals between R waves with normal-to-normal conduction [SDNN]) and in the frequency domain with the autoregressive method. Frequency domain components were computed by integrating the power spectrum within 2 frequency bands: low frequency (LF), 0.04 to 0.15 Hz (in ms"), and high frequency (HF), 0.15to 0.4 Hz (in ms~). The LF power reflects both parasympathetic and sympathetic modulations; the HF component is a function of the variation in parasympathetic tone.[2)] Heart rate was estimated from standard resting ECG.

4. Statistical Analyses

The HRV distribution was tested for normality. If necessary, the values were log transformed to produce normalized distribution. Pre-treatment and post-treatment values were compared by the paired t test, in which data were distributed normally, and by the Wilcoxon signed rank test in which data were not normally distributed. P value of 0.05 was used as the threshold for statistical significance. All data were analyzed using SPSS version 11.0 (SPSS Inc. USA).

RESULTS

General characteristics indices are presented in Table 1. Of the 30 subjects, 7 were women and 23 were men. They ranged in age from 23 to 31 years, with an average age of 25 years. The mean weight was 68.7 kg (SD 17.1), the mean height 173.2 cm (SD 7.8).

Premanipulation values of HR and HRV were examined for skewness and kurtosis (Table 2) as indicators of normally distributed data. The z scores for skewness and kurtosis were calculated by dividing the calculated values of skewness and kurtosis by the standard error of the mean for the respective data set, with an acceptable measure of normality set between + 1.96 and -1.96. In addition, the Kolmogorov-Smirnov test and the Shapiro-Wilk test were applied to the data sets to test for normal distribution. As indicated in Table 2, 3 of the initial data departed markedly from a normal distribution. These were as follows: (1) RMSSD, the square root of the mean of the sum of the squares of differences between adjacent NN intervals, (2) VLF, very low frequency, (3) HF high-frequency component. Consequently, two-column statistical comparisons involving these parameters were performed using the Wilcoxon signed rank test. Where data were normally distributed, based on skewness and kurtosis, the data were initially analyzed using a t test, with $P<0.05$ considered to be significant. In as much as normality, based on skewness and kurtosis, was not always confirmed by the Kolmogorov-Smirnov test and Shapiro-Wilk test, where either of these tests suggested a non-normal distribution, it was decided to also perform a second comparison of prestimulation and poststimulation measures using the Wilcoxon signed rank test.

Table 1. Characteristics of participants (n=30, male=27, female=3)

	Mean	SD	Median	Range
Age (year)	25	2.06	25	23~31
Weight (kg)	68.7	17.1	64.0	49~106
Height (cm)	173.2	7.8	173.5	159~188

Table 2. Measure of normal distribution of data

Parameter	Skewness	Kurtosis	Kolmogorov-smimow test			Shapiro-wilk test		
			Statistics	Df		Statistic	Df	
HR	-0.140	0.170	0.085	30	0.200	0.989	30	0.982
SDNN	0.964	1.109	0.142	30	0.125	0.937	30	0.077
RMSSD	**2.163**	**6.050**	0.185	30	**0.010**	0.795	30	**0.000**
Log (RMSSD)	0.427	0.833	0.07	30	0.200	0.976	30	0.722
TP	1.403	1.727	0.158	30	0.054	0.850	30	**0.001**
VLF	**2.923**	**11.642**	0.197	30	**0.004**	0.699	30	**0.000**
LF	1.145	0.764	0.174	30	**0.021**	0.881	30	**0.003**
HF	**3.232**	**13.113**	0.259	30	**0.000**	0.622	30	**0.000**
LF/HF	1.081	0.590	0.174	30	**0.021**	0.896	30	**0.007**
LFn	-0.611	-0.261	0.106	30	0.200	0.949	30	0.157
HFn	0.611	-0.261	0.106	30	0.200	0.949	30	0.157

For skewness and kurtosis, the z scores are shown. Values between +1.96 and -1.96 were considered to be indicative of a normal distribution. All values printed in boldface suggest nonnormal distribution of data. Values before SCENAR therapy HR, heart rate; SDNN, standard deviation of all NN intervals RMSSD, the square root of the mean of the sum of the squares of differences between adjacent NN intervals; TP, total powder; VLF, very low frequency; LF, low frequency; HF, high-frequency component; LF/HF, the ratio of high-frequency component to low-frequency component; LFn, normalized low-frequency component; HFn, normalized high-frequency component.

As shown in Table 3, in the SCENAR therapy, HR (bpm) declined from the first to second 5-minute intervals (P<0.05, two-tailed paired t test). Pre-SCENAR and post-SCENAR measures of HRV were compared by first using either the paired two-tailed t test or the Wilcoxon signed rank test as described; subsequently, parameters with skewness and kurtosis within normal limits but significant P values as per the Kolmogorov-Smirnov test or the Shapiro-Wilk test were reassessed using the Wilcoxon signed rank test. Using a cutoff point of P=0.05, in no instance did this second analysis change the decision about whether responses were statistically significant. As shown in Table 3, in subjects undergoing SCENAR therapy, there were significant increases in SDNN and RMSSD as well as log (RMSSD).

The power of SDNN component increased from 46.63+19.49 to 54.34±24.97 (P=0.01, paired t test). The power of RMSSD component from 40.18+28.75 to 45.48+33.44 (P=0.004, Wilcoxon signed rank test). In addition, the mean of Log (RMSSD) increased from 1.520+0.627 to 1.568+0.277 (P=0.041). However, there was no statistically significant change in the TP or others HRV parameters (LF, HF, VLF, LF/HF, LFn, HFn, LFn/HFn) component of the power spectrum; neither was there any whether the comparison was made using the paired t test or the Wilcoxon signed rank test.

Table 3. Pre-SCENAR therapy and post-SCENAR therapy HR and measures of HRV

Parameter	Pre-SCENAR		Post-SCENAR		P
	Mean	SD	Mean	SD	
HR(bpm)	73.80	10.89	71.33	10.88	0.006[a]*
SDNN	48.63	19.49	54.34	24.97	0.010[a]*
RMSSD	40.18	28.75	45.48	33.44	0.004[b]*
Log (RMSSD)	1.520	0.267	1.568	0.277	0.04 l[a]*
TP	2179.4	1689.2	2088.5	1665.4	0.686[a]/0.894[b]
VLF	813.1	768.3	787.4	780.0	0.959[b]
LF	640.4	460.5	570.9	412.2	0.432[a]/0.360[b]
HF	719.0	1027.3	750.2	1114.4	0.468[b]
LF/HF	1.989	1.5664	2.217	1.9283	0.343[a]/0.644[b]
LFn	57.69	20.07	56.77	23.67	0.715[a]
HFn	42.30	20.07	43.22	23.67	0.715[a]

[a]obtained via two-tailed t test, [b]obtained via Wilcoxon signed rank test for the null hypothesis that there was no difference between pre-SCENAR and post-SCENAR values. HR, heart rate; SDNN, standard deviation of all NN intervals RMSSD, the square root of the mean of the sum of the squares of differences between adjacent NN intervals; TP, total powder; VLF, very low frequency; LF, low frequency; HF, high-frequency component; LF/HF, the ratio of high-frequency component to low-frequency component; LFn, normalized low-firequency component; HFn, normalized high-frequency component. *P<0.05; n=30.

DISCUSSION

With SCENAR therapy, there was a statistically significant (P<0.05) decline in HR when comparing the average values for the 5-minute periods immediately before and after the intervention. The decline was approximately 2.467±4.577 bpm for SCENAR therapy.
There are several studies human physiologic experiments of somatoautonomic reflexes. One study on conventional acupuncture, using a different forearm insertion point, showed decreased HR.[10)] In the study, modulation of cardiovascular responses by atropine and propranolol suggested that the effects of acupuncture were achieved by facilitation of cardiac vagal activity and suppression of cardiac sympathetic activity. Myofascial trigger-point massage to the head, neck, and shoulder has been shown to decrease HR, systolic blood pressure, and diastolic blood pressure while augmenting HRV measures of parasympathetic tone. A study on the effects of shoulder and back massage on elderly patients hospitalized for stroke revealed decreases in HR, systolic blood pressure, and diastolic blood pressure as well as decreases in levels of anxiety and pain.[12)] Collectively, these studies show that innocuous somatic stimulation is most often associated with changes in HR, HRV, and blood pressure that are strongly suggestive of augmentation of vagal output to the heart or attenuation of sympathetic output. These are quite consistent with the effects that we observed with SCENAR therapy. Thus, in seeking to explain the results, one is necessarily drawn to the consideration of the effects of that unique SCENAR impulse similar to the body nerve impulse, action potential. The Little Wing or called butterfly technique of SCENAR stimulate the accessory nerve that control the sternocleidomastoid muscle and the trapezius muscle. In general, most of the functions of the head and neck are directly influenced by the brain and transmitted to the para-sympathetic nerve systemvia the cranial nerves and spinal nerves of the cervical portion of the spine. In other words somatic nerve system is associated with the voluntary control of body movements through the action of skeletal muscles, and also reception of external stimuli. The cervical muscles are invested with high density of muscle spindle-Golgi tendon organ complexes.[13,14*] If these muscle do have a particularly important role in signaling muscle tone or

position, then from an adaptive point of view, it is reasonable that they would also have some input into reflex regulation of cardiac function.
So our result support a previous study suggesting that muscle spindles in cervical paraspinal muscles may in fact be capable of eliciting somatoautonomic reflexes.[15]* Additionally, there is another report from studies in conscious humans that innocuous somatic stimulation of the neck may influence cardiovascular function.[16)] In addition, despite the significant reduction in HR after SCENAR treatment, it was noted that the reduction in HR was within just a few heart beats and did not seem to have any clinical significance to an individual patients. However, if this reduction is true, it will provide long-term benefit to the patients. Because this study used just 1 therapy, it is possible that longer-term treatment period may produce greater HR diminishment.
Several studies of HRV in heart failure from the late 1990s showed that low SDNN is associated with increased mortality, and one study demonstrated an increase in sudden death with lower SDNN.[I7)] Mean SDNN and SDANN, which reflect the longest term heart rate variability trends, are consequently increased. Low values for SDNN and SDANN have been associated with an increased risk for death after myocardial infarction, and low values for these indexes reflect the failure of heart rate to decrease substantially. SDNN reflects all the cyclic components responsible for variability in the periods of recording, and RMSSD mainly reflects parasym-pathetic nervous activity. Progressive increase in the high-frequency spectral power or the corresponding time domain parameters generally indicated the restoration of the parasympathetic nervous regulation of the heart rate.[2,19)]
In the study, SCENAR therapy called butterfly technique appears to be able to influence autonomic nervous system in ways that raised high frequency components of the HRV RMSSD, and overall **HRV** powder component; SDNN at the same time vagal output to the heart; HR. However our results were inconsistent with two domain of HRV time domain, frequency domain because the effects of SCENAR therapy on the components; TP, LF, HF of frequency domain were insignificant. Therefore further study is need in the future.
Limitations of the study include a small sample size, absence of a control group and possible placebo effect. It is necessary to undergo comparative studies such as transcutaneous nerve stimulation to evaluate directly, effect 'Butterfly Technique' of SCENAR therapy on HRV.

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