Artigo Original

Effects of microkinesitherapie on heart rate variability.

Afonso Shiguemi Inoue Salgado[1], Rodolfo Borges Parreira[1], Israel Reis dos Santos[2], Jessica Julioti Urbano[2], Nina Teixeira Fonsêca[3], Patrice Bénini[4], Daniel Grosjean[5].

Faculty of Biomedical Engineering, Camilo Castelo Branco University, Sao Paulo (SP), Brazil.

Abstract

Introduction: Microkinesitherapie technique was developed in France. This word comes from Greek, which means ("micro": small and "kinesi": movement and "therapie": treatment), being literally "treatment by small movements". The objective of this study is to analyze the autonomic nervous system behavior in healthy subjects undergone microkinesitherapie technique through the heart rate variability (HRV) analysis. Method: Sixteen Caucasian (11 women) healthy subjects were voluntarily recruited to participate of this study who have never been undergone any manual therapy treatment. All patients who attended the inclusion criteria were evaluated according to anthropometric data, and after this, they underwent a 45 minutes session of microkinesitherapie technique. Orthostatic test was performed by all participants before and right after the treatment, using the Nerve-Express System software to data acquisition and the Kubios HRV to data analysis. We analyzed the HRV according to time domain and frequency domain parameters. Result: We could observe a statistically significant difference in the mean RR intervals, with the subjects becoming closer to the normal values ($p \leq 0.05$). There was also a significant difference in the high frequency domain (HF) after the treatment, which corresponds to an increase of parasympathetic nervous system activity ($p \leq 0.05$). Conclusion: We have concluded that this technique has contributed to the sympathetic and parasympathetic balance.

Keywords: Autonomic nervous system, manual therapy, microkinesitherapie.

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1. Physiotherapist Master in Experimental Surgery, Universidade Estadual Paulista (UNESP), Botucatu (SP), Brazil; Stricto Sensu Postgraduation Program in Biomedical Engineering of Camilo Castelo Branco University, Sao Paulo (SP), Brazil.
2. Rehabilitation Sciences Master's and PhD Degree Program, Nove de Julho University (UNINOVE), Sao Paulo (SP), Brazil.
3. Physical Therapy School, Universidade Estadual de Ciências da Saúde de Alagoas (UNCISAL), Maceió (AL), Brasil.
4. Co-founder of Microkinesitherapy, Montigny les Metz, France.
5. Professor and founder of Microkinesitherapy, Nilvange, France.

Correspondence to:
Afonso Shigguemi Inoue Salgado - e-mail: afonsosisalgado@yahoo.com.br

INTRODUCTION

Emotions have diverse effects on autonomic nervous function.[1] According to the World Health Organization[2], several mental health-related conditions fall within the most important causes of disability and mortality, including violence, road traffic accidents, cirrhosis of the liver, and self-inflicted injuries.[3] During the 1990s, the WHO published the Global Burden of Disease, a comprehensive assessment of the burden of mortality and disability from diseases, injuries, and risk factors, taking into account the number of years of life lost due to premature mortality and years of healthy life lost as a result of disability, as well as the combined measure of disability-adjusted life years.[2] Unveiling the disability associated with several health conditions, the Global Burden Disease has thrown light on the huge impact of mental disorders in the public health scenario, as psychiatric morbidity is a major source of disability, both in developed and developing regions.[4]

The clinical importance of HRV became apparent in the late1980s when it was confirmed that HRV was a strong and independent predictor of mortality following an acute myocardial infarction [5]. It is well documented that emotional processes result in changes in heart rate (HR), heart rate variability (HRV) and contractility. HRV and complexity are useful non-invasive techniques to assess the vagal component of cardiac autonomic function in response to emotional changes.[6] It describes the variations between consecutive heartbeats. The regulation mechanisms of HRV originate from the sympathetic and parasympathetic nervous systems and, thus, HRV can be used as a quantitative marker of the autonomic nervous system.[7]

It is know that several treatments interfere on the ANS function. Microkinesitherapie is a technique that works directly in some layers of the body surface with global results, then, we hypothesize that it can also interfere on the ANS activity. Microkinesitherapie technique was developed in France. This word comes from Greek, which means ("micro": small and "kinesi": movement and "therapie": treatment), being literally "treatment by small movements". The base of this technique is embryology, when the whole structure of the human body is originate from 3 embryonary stems. The structures formed by a same stem are considered from a same "embryologic family", thus they are considered interlinked each other. [8] This treatment is a manual therapy technique-based which principles are similar to the homeopathy – both follow two laws: the cure by the infinitive (diluted medicament – minimal palpation) and similarity (similar cures the similar). It consists in identifying the primary cause of a disease and/or symptom and to stimulate the organism's "self-cure", so that the body could recognize the aggressor (antigen) and initiate the elimination process through a tissue and cellular reprogramming.[9] This primary aggression leaves traces (scars) which disturb the cells and tissues behaviour, these traces remain stored in tissue/cell memory (loss of vitality) by a body and mind elimination deficiency regarded to the aggressor. [10]

This is justified because during the second to third period of the foetus formation, the skin and the nervous system are originated from the ectoderm. Thus, there is a projection from the nervous system disturbances to the skin. This technique is applicable in all ages with a therapeutic or preventive objective. With the hands, the therapist mobilizes and stimulates the different tissues, with the objective of find cell/tissue memories (scars), through selective micro palpation in pre-determined points of the body.[8] The objective of this study was to analyse the autonomic nervous system behaviour in healthy subjects undergone microkinesitherapie technique through the analysis of the heart rate variability.

MATERIAL AND METHOD

Subjects

This is an experimental prospective descriptive study, which followed the International Norms of Human Rights and the Helsinki Declaration. Sixteen Caucasian (11 women) healthy subjects were voluntarily recruited to participate of this study.

The inclusion criteria were healthy subjects between 20 to 65 years (table 1), who have never been undergone any manual therapy treatment and that have accepted to participate of the study. Were excluded all the subjects with cardiac or any other illness that could affect autonomic nervous system activity, moreover, were also excluded subjects who regularly taking prescription medication and had a history of current drug or alcohol abuse. All volunteers were fully informed about the program and gave their formal signed consent before participate of the study in agreement with the terms of Resolution 196/196, October of 1996, of the national Council of Health of the Ministry of Health (Protocol Reference Number: 390/2).

Procedure and data collection

All participants underwent an interview to provide some personal data and to confirm the inclusion and ex-

Table 1. Subjects' anthropometrical characteristics

Characteristics (n = 16)	Values (mean ± SD)
Age (years)	41,88 ± 11,27
Sex (male:female)	5 : 11
Weight (Kg)	69,62 ± 13,25
Height (meters)	1,65 ± 0,96
Body mass index (Kg/cm^2)	25,52 ± 3,56

clusion criteria. Then, the volunteers who attended the inclusion criteria were evaluated according to anthropometric data (table 1). Only after this they underwent a 45 minutes session of microkinesitherapie technique.

To assess the effects of microkinesitherapie technique on HRV, an orthostatic test was performed by all participants before and right after the treatment, according to the previous study of Kerppers et al.[11] In this procedure the volunteers was informed about the test and was required to lie down in supine position, with eyes opened and relaxed, without talking or moving exceedingly. The examiner can follow the test by a rhythmogram which shows the length of RR intervals for the heart beats. After 192 RR intervals, the patient is asked to stand up looking to the wall and to remain in this position for a few minutes until the end of the test, which is at the 448 RR intervals points, which represents approximately five minutes. Recording of approximately 1 min is needed to assess the HF components of HRV while approximately 2 min are needed to address the LF component. In order to standardize the procedure, 5 min recordings was performed according to standards measurement of heart rate variability of the European Society of Cardiology and The North American Society of Pacing and Electrophysiology.[7] All assessments took place in a controlled environment (i. e. light, temperature, and sound).

All the RR intervals acquisition was done by a frequency meter (Nerve-Express System; v. 2.9; Heart Rhythm Instruments Inc., USA). HRV signals was compiled with MATLAB routines (The Mathworks, Natick, MA) and analysed in both time and frequency domain by the software Kubios HRV version 1.1 (Biosignal Analysis and Medical Imaging Group; Kuopio, Finland).[12] The frequency bands analysed in this study were in accordance with previous guideline published by American Heart Association which state the recommendations for HRV measurement and interpretations.[7] The variables used in this study were for the time domain (obtained by determination of correspondent RR intervals in any point in the time),[7,13] was mean RR (mean values of N-N intervals from a period of time), HR intervals (beats/min), SDNN (standard deviation of the N-N intervals – an estimate of total HRV), rMSSD (square root of the mean squared difference of the successive N-N intervals – a parasympathetic marker), these variables are routinely measured during the supine position; and for the frequency domain (contributed to understanding of the autonomic background of RR intervals fluctuations in the heart rate record) were measured in both supine and orthostatic positions, and the variables analysed was, the power of low frequency (LF – is modulated by both parasympathetic and sympathetic activities) and high frequency (HF – modulated exclusively by the parasympathetic activities).The LF/HF ratio was considered as a marker of the sympathovagal balance. The Orthotest (orthostatic test from Nerve-Express) is a very popular method of ANS provocation, which is a simply transition from a supine to a standing position.[14]

Statistical Analysis

Data of heart rate variability signals are presented as means and standard deviations (SD). The parametric *t*-paired test was used to compare the difference of the heart rate variability signals between pre and post microkinesitherapie treatment. In this exploratory study, the level of significance of each comparison was set to $p < 0.05$. The entire analysis was conducted using the software SPSS □ (Version 16.0).

RESULTS

The data values of the heart rate variability components before and after the microkinesitherapy are shown in figures 1 and 2. The HR and RR intervals in the time domain parameter showed statistic differences, where RR interval increased from 0.797 ± 0.071 ms pre-treatment to 0.837 ± 0.094 ms post-treatment ($p < 0.01$), and the HR interval showed a decrease after microkinesitherapy from 79.97 ± 6.28 bpm to 77.42 ± 8.05 bpm ($p < 0.05$). The other component in the time domain were not statistically significant pre and post-treatment, being the SDNN was 0.129 ± 0.057 ms to 0.142 ± 0.045 ms ($p = 0.13$) and the rMSSD component de-

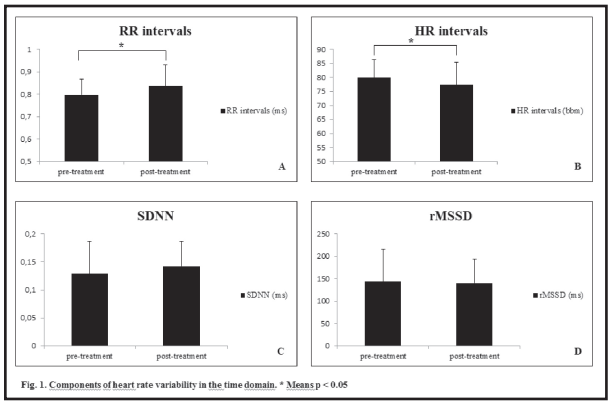

Fig. 1. Components of heart rate variability in the time domain. * Means $p < 0.05$

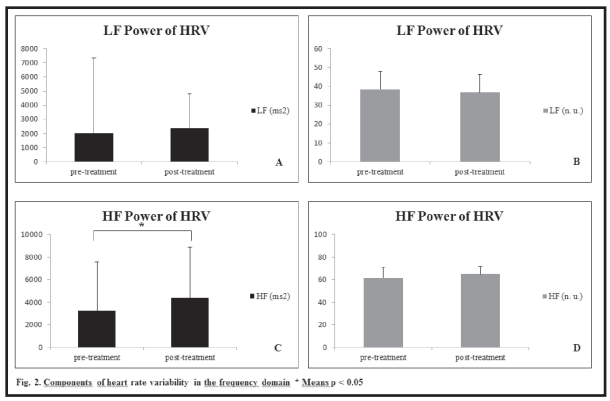

Fig. 2. Components of heart rate variability in the frequency domain * Means $p < 0.05$

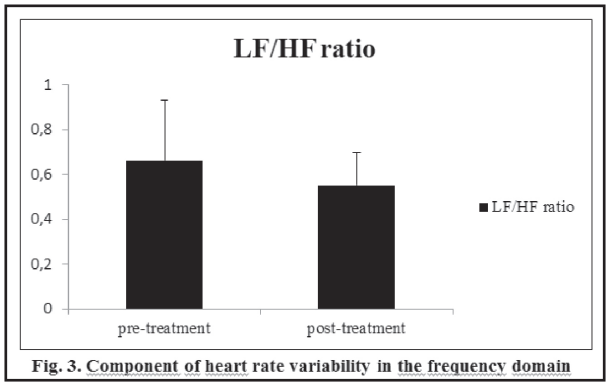

Fig. 3. Component of heart rate variability in the frequency domain

creased from 143.64 ± 71.96 ms to 139.64 ± 54.33 ms (p = 0.43). Concerning to frequency domain components (fig. 2), only the HF component showed statistical difference, where pre-treatment value was 3217.69 ± 4372.43 ms^2 and post-treatment 4351.81 ± 4536.32 ms^2 (p < 0.04), but when the values were normalized, these statistical difference disappeared (p = 0.14). The other component in the frequency domain LF the values pre and post-treatment was from 2007.06 ± 5350.26 ms^2 to 2387.97 ± 2431.97 (p = 0.37), and LF / HF ratio component (fig. 3) was from 0.663 ± 0.27 ms^2 pre-treatment to 0.552 ± 0.145 ms^2 post-treatment (p = 0.09).

DISCUSSION

To our knowledge, this is the first study bout this manual therapy-based technique, called microkinesitherapy on the heart rate variability. The objective of microkinesitherapie according to Grosjean and Benini[8], is to inform again the body of the attacks suffered and not rejected, so that it can be possible to start a self-cure mechanism. This information is filed by the slow stretching of the skin structures performed by light touch on the altered tissue's areas. It can be applied an immunology law, which says that for an organism create an antibody; it has to recognize the antigen.[8] There are strong evidence of records of the autonomic effector responses from spinal autonomic nerves[15], cardiac nerve[16], and from clinical observational results in which there are autonomic spinal reflexes circuits associated with the sympathetic systems from the viscera, deep somatic tissues or skin and spinal parasympathetic systems. These circuits may also have functional specificity with respect to afferent input, for example, the skin[17], so functional changes of organs or deep somatic tissues can cause changes in the corresponding dermatomes, myotomes and sclerotomes (e. g., trophic changes of skin tissue and its appendages, joint capsule, fascia, etc.)(17). The present study showed that the microkinesitherapy change some componentes of the HRV, thus indicating that there is na autonomic system modulation with increased RR intervals and decreased of heart rate. Despite the widespread use of HRV analysis in understanding the phenomena involved with the SNA in normal and pathological conditions are poor in number of publications related to its use in clinical practice.

The time domain analisys of the HRF contributes to the understanding of the knowledge of the RR intervals fluctuations; [18,19] these variations present during resting conditions represents best beat-to-beat control mechanisms.[20] These mechanisms is mediated by vagal afferent stimulation which leads to reflex excitation of vagal afferent activity and inhibition of sympathetic efferent activity.[21] Efferent sympathetic and vagal activities directed to the sinus node are characterized by discharge largely synchronous with each cardiac cycle which can be modulated by central (e.g. vasomotor and respiratory centers) and peripheral (e.g. oscillation in arterial pressure and respiratory movements) oscillators.[5] These oscillators generate rhythmic fluctuations in efferent neural discharge which manifest as short and long--term oscillation in the heart period, and the analysis of these rhythms may permit inferences on the state and function of, for example, the central oscillators, sympathetic and vagal efferent activity, humoral factors, and the sinus node.[7] In our study we could see that in the RR intervals, this fluctuation after the microkinesitherapy, remain in a better state than before the treatment and the t-test showed significant increased values (see fig. 1A). The HRV reduction (i. e. RR intervals) has been shown as a strong indicator to adverse events related illness such as arterial hypertension[22,23], myocardial infarction,[24] diabetic neuropathy[25] and others, which reflect a vital role that the ANS performs in maintaining a good health[26]. For example, a study by Menezes et al.[23] showed that subjects with arterial hypertension when compared with normotension subjects, they founded a reduced indices such as RR interval, HF, LF, LF/HF ratio, probably due a sympathetic activity[23]. This was showed too by Pecyna et al.[27]in a systematic review, where patients post-acute myocardial infarction their HRV parameters was lower. It was also reported differences in HRV in trained and non-trained subjects.[28,29] Trained subjects had both time and frequency domain higher values than non-trained people, indicating a good status of the ANS. It is important to mention here that during sympathetic activation the resultant is tachycardia, expressed by HR component, whereas the reverse occurs during vagal activation[7]. In our study we could see that after microkinesitherapy there was a heart rate reduction (see fig. 1B) reflecting a vagal tonus predominance in the cardiac system.

The efferent vagal activity is a major contributor to the HF component of HRV. Various studies in clinical and experimental observations has shown this phenomenon throughout of autonomic manoeuvers such as electrical vagal stimulation, muscarinic receptor blockade, and vagotomy[18,30]. Our results has showed, as seen in fig 2C,

that absolute values (ms²) from HF component reached statistical difference, which values of this variable before and after microkinesitherapy had an increased, but when expressed in normalized units (n. u.) there wasn't statistical difference (fig 2D). We state here the significant difference found in our results (as seen in absolute values) because when the spectral components are expressed in absolute units, the changes in total power influence LF and HF components in the same direction and prevent the appreciation of the fractional distribution of the energy,[18] thus, indicating a good vagal activity where is induced among others by controlled respiration.[13,30,31] This result suggest according to Pomeranz et al.[18] that autonomic control of the heart in response to postural movements strikes a balance between the activities of the parasympathetic and sympathetic nervous systems provide a quantitative measure of this balance. The other component from frequency domain analyzed was LF and as showed in our results (fig. 2A,B), this component did not reached statistical significance neither in absolute units (ms²) nor in normalized units (n. u.). LF component is considered as a marker as sympathetic modulation (mainly expressed in normalized units)[30-32], but other researches has stated that LH component includes both sympathetic and vagal influences[33,34] being difficult and controversial its interpretation. This discrepancy is due to the fact that in some conditions, associated with sympathetic excitation, a decrease in the absolute power of the LF component is observed[7]. Consequently, LF/HF ratio component of HRV (fig. 3) is considered the same of sympatho-vagal balance or to reflect sympathetic modulations[7].

There are some limitation of this study, first is the fact of the patients were not analysed after more time of the treatment, then the time of paradoxical effects would be passed and it could exist different results. Also, it could have been done more treatment sessions and then perform new analysis, and finally this procedure was conducted only in healthy subjects, making necessary a comparison with a specific population.

CONCLUSION

We concluded that this technique has contributed to the sympathetic and parasympathetic balance as seen in parameters such as RR intervals and HR in time domain and HF component in frequency domain. Further studies with more subjects, more sessions and a control group are needed for bringing results to specific populations.

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