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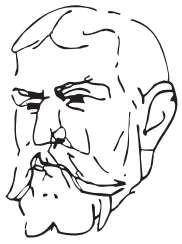
Official journal of the Polish Medical Association



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VOLUME LXXIV, ISSUE 6, JUNE 2021

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Wiadomości Lekarskie

Distribution and Subscriptions:
Bartosz Guterman prenumerata@wydawnictwo-aluna.pl
Graphic design / production:
Grzegorz Sztank www.red-studio.eu

Publisher:
ALUNA Publishing House
ul. Przesmyckiego 29,
05-510 Konstancin – Jeziorna
www.wydawnictwo-aluna.pl
www.wiadomoscilekarskie.pl
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ORIGINAL ARTICLE

ELECTRO-PHOTONIC EMISSION ANALYSIS IN FUNCTIONALLY HEALTH RESPONDENTS AND PATIENTS WITH NON-COMMUNICABLE DISEASES

DOI: 10.36740/WLek202106128

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ABSTRACT

The aim: Of this publication is to evaluate the results of EPEA in functionally healthy respondents and patients with NCDs to deepen fundamental knowledge of Systemic Medicine, increase the effectiveness of measures to prevent and treat NCDs by improving their diagnosis and prevention through the introduction of modern science-intensive technologies.
Materials and methods: 114 respondents were included in an open non-randomized controlled study. 66 ccomorbid patients (71% - men; median age - 61(43; 80) years) with verified Ischemic Heart Disease: functional class II-III angina pectoris were included in the Main Group. 78 functionally healthy young people (23% - men; median age - 23(20; 30) years) who did not play sports regularly were a Control Group. EPEA was made on a digital software hardware device Bio-Well 2.0 (Bio-Well 2.0, Russia-USA).
Results: Significant differences in AEFE indicators in functionally healthy individuals and patients with NCDs were established. Qualitative indicators of AEFE (indicators of area, intensity, energy of emission) were significantly higher in functionally healthy individuals compared to patients with NCDs. Geometric indicators of AEFE (indicators of length of contours and radii of luminescence) were significantly higher in patients with NCDs than in healthy individuals, which confirmed the visually uneven and more complex contour of luminescence of the fingers in them.
Conclusions: AEFE parameters have significant differences in functionally healthy individuals and patients with NCDs. AEFE is a fundamentally new promising approach to assessing the level of activity of metabolic processes at the tissue level in living biological systems, including in the normal human body and in patients with NCDs.

KEY WORDS: Non-Communicable Diseases, Ultra-Weak Photon Emission, Electro-Photonic Emission Analysis

Wiad Lek. 2021;74(6):1439-1444

INTRODUCTION

Non-Communicable Diseases (NCDs) cause the deaths of 41 million people, including 15 million people who have not reached old age. This is a significant medical and social problem of the world. Therefore, further search for new approaches to the diagnosis and treatment of NCDs and improving understanding of the fundamental issues of metabolism remain relevant. [1-3].

It is well known that pathological changes in metabolism form the basis of the pathogenesis of NCDs. Until now, the consideration of metabolic reactions has been limited to the study of the shape and chemical interaction of molecules in the human body. Improving scientific knowledge about the nature of metabolic phenomena at the micro level of biological tissues is the next step in understanding the functioning of the human body. This may be a new way to address NCDs as well. Analysis and globalization of modern scientific knowledge from the standpoint of Systems Medicine make it possible to theoretically describe the metabolism of substances at the subatomic level now.

Basic Research has proved that all matter consists of atoms. An Atom is formed from Fermions and Bosons according to Quantum Field Theory and the Standard Model. Fermions are electromagnetic fields and they are united by the fundamental field forces of electromagnetic, strong, weak nuclear interactions, which are carried by Bosons. Therefore, all matter consists of quantum fields, ie energy. Since Biological Molecules are formed from Atoms, they are Quantum Fields as well, and their properties are due to the electronic structure and wave functions of the state of Electrons in their Atoms. It turns out that Chemistry is a secondary phenomenon of Electromagnetism. Therefore, Electromagnetic Phenomena are the fundamental basis of intermolecular processes in Living Systems [2-5].

Ultra-Weak Photon Emission (UPE) is one of the promising physical phenomena for studying the systemic energy processes of the micro-level of functioning of human tissues. It is proved that UPE occurs due to the emission of photons by living molecules and human tissues during metabolic reactions at the micro level of the human body. Metabolic disorders are one of the decisive pathogenetic factors of NCDs. Therefore, the study of Photon Emission can be considered as a potential tool for assessing the functioning of tissues and organs to reflect the activity of metabolic processes at the cellular level. Today, the spectrum and intensity of UPE are considered to be recognized,

and the main source, statistical distribution, fractality of UPE are considered to be partially understood by the Basic Research. UPE registration is technically complex and requires the use of ultra-sensitive digital equipment. The UPE registration process can be simplified by increasing the apparent emission of photons by additional electromagnetic stimulation of tissue radiation. This approach uses the Electro-Photonic Emission Analysis (EPEA) method. EPEA is implemented in the certified hardware and software complex Bio-Well (Russia-USA). The use of a certified Bio-Well measuring instrument makes it widely available to scientifically study the UPE phenomenon, which can make the assessment of systemic energy processes in tissues possible for a significant number of scientists today. The EPEA method of registration of the device is based on the physical phenomenon of Electro-Photonic Emission from the surface of the skin of the fingers, which is amplified under the influence of high-frequency electromagnetic pulse of high intensity. This creates visible emission (glow) in the air that is captured by a digital camera [2, 5-9].

THE AIM

The aim of this publication is to evaluate the results of EPEA in functionally healthy respondents and patients with NCDs to deepen fundamental knowledge of Systemic Medicine, increase the effectiveness of measures to prevent and treat NCDs by improving their diagnosis and prevention through the introduction of modern science-intensive technologies.

MATERIALS AND METHODS

Scientific work is carried out in conjunction with Shupyk National Healthcare University of Ukraine, the cooperation coordinator is the Head of the Department of Medical Informatics, prof., DM Mintser O.P. 114 respondents were included in an open non-randomized controlled study on the basis of the Educational and Practical Center of Biophotonics and Valeology of the Department of Internal Medicine and Emergency Medicine of the Educational and Scientific Institute of Postgraduate Education Ukrainian Medical Stomatological Academy (UMSA) and Physiotherapy Department of the municipal enterprise "Regional Clinical Hospital. M.V. Sklifosovsky of the Poltava Regional Council". Presence of verified Ischemic Heart Disease: functional class II-III angina pectoris according to the classification of the Canadian Cardiovascular Society was a criterion for inclusion in the Main Group. The diagnosis was considered verified by a proven history of Myocardial Infarction, or a positive result of coronary angiography, or delayed revascularization, or the presence of a positive stress test (for men) and a positive visualized test - scintigraphy with exercise or stress echocardiography. Comorbid patients (n=66 people; 47(71%) men; median age - 61(43; 80) years) who received treatment in the specialized cardiology department of the municipal enterprise "Poltava Regional Clinical Medical Cardiovascular Center of Poltava Regional Council" were included in the Main Group (MG).

The presence of mental illness, severe somatic pathology in the decompensation stage, drug use, postoperative condition, terminal cancer, diffuse connective tissue disease, infectious disease, including CoronaVirus Disease-2019 infection, Post-COVID-19 syndrome, pregnancy were exclusion criteria. Functionally healthy young people (n=78 people; 18(23%) men; median age - 23(20; 30) years) who did not play sports regularly (students, interns, clinical residents of UMSA) were a Control Group (CG).

EPEA was made on a digital software hardware device Bio-Well 2.0 (Bio-Well 2.0, Russia-USA). Bio-Well 2.0 is a certified measuring device for use in a wide range of scientific and practical research. Bio-Well 2.0 is registered in 70 countries and has CE, EU and FDA certificates. Full Scan mode was used for alternate photo-registration of each finger with the Bio-Well 2.0 device: Left thumb (Lt), Right thumb (Rt), Left fore (Lf), Right fore (Rf), Left middle (Lm), Right middle (Rm), Left ring (Lr), Right ring (Rr), Left little (Ll), Right little (Rl). The following direct parameters were evaluated in this fragment of the study: Image size was size of the whole image in pixels (pel) (always is equal to 370*285 pel); Ellipse dimensions was the X and Y dimensions of the inscribed ellipse in pixels; Inner circle radius was the radius of the inscribed circle in pixels.

Individual mathematically calculated parameters were also evaluated: Area (A) was the number of the Glow Image (GI); Calibrated Area (AC) was the ratio of Area of the finger glow to the Area of glow of calibration cylinder (for sector or whole image); Normalized Area (NA) was the ratio of GI Area to the area of the inner oval; Intensity (I) was the average intensity of all the pixels from the GI; Inner Area (IA) was the overall number of pixels in the inner oval; Inner Noise (IN) was the number of noise (colored) pixels in the inner oval; Inner Noise (IN, %) was the ratio of inner noise and inner area in percents; Energy (E) - energy of Glow in $*10^{-2}$ Joules (J); Corrected Energy (CE) was the energy corrected to sector's angular size; Form Coefficient (FC) is calculated according to the formula: FC=L2/S, where L is the length of the GI external contour and S is the GI Area; Entropy Coefficient (EC) was the ratio of outer contour to the inner contour lengths; Inner contour length (Icl) was the length in pixels of the inner contour of the GI; Inner contour radius (Icr) was the radius in pixels of the inner contour of the G; Outer contour length (Ocl) was the length in pixels of the outer contour of the GI; Outer contour radius (Ocr) was the radius in pixels of the outer contour of the GI. Integral parameters of the functional state of the organism were calculated from the parameters of all ten fingers. The following parameters were evaluated by us in this fragment of the study: General Energy (GE, J) was an integral indicator of the functional state, which was software parameter derived as numeric evaluation of the energy of the Glow captured by the Bio-Well GDV Camera device and calculated by multiplication of Area on Average Intensity on correction coefficient; Stress test

Table I. EPEA indicators of the fingers of the left hand of functionally healthy respondents and patients with NCDs

Groups	CG	MG	CG	MG	CG
Indicator	Lt	Lt	Lf	Lf	Lm
A, pel	11587±1034	10935±1020*	10988±949	10209±1013*	11063±872
AC	0.13±0.28	-0.10±0.28*	0.20±0.29	0.03±0.31*	0.15±0.28
NA	1.77±056	1,2±0.42*	2.59±0.93	1.65±0.52*	2.42±0.80
I, pel	98.75±4.45	87.01±5.38*	101.1±4.1	91.55±4.69*	101.1±4.3
IA	7338±2830	10190±3535*	4803±1771	6790±2145*	5109±1820
IN, pel	1660±296	1405±256*	1742±308	1429±356*	1764±274
E, J	4.89±0.52	4.23±0.59*	4.75±0.50	4.16±0.61*	4.79±0.50
CE, J	4.89±0.2	2.68±0.47*	4.75±0.50	2.66±0.51*	4.79±0.50
FC	2.64±0.55	2.08±0.2*	2.87±0.62	2.19±0.27*	2.67±0.38
EC	2.24±0.33	2.08±0.20*	2.56±0.45	2.19±0.27	2.41±0.32
Icl, pel	339.2±53.27	391.7±59.53*	282.9±45.82	329.7±43.59*	292±43.91
Icr, pel	47.56±8.73	56.1±9.76*	38.57±6.94	46±7.15*	39.82±6.91
Ocl, pel	747.3±76.2	809.7±111*	707.9±79.51	716.4±82.62*	692.4±59.99
Ocr, pel	73.08±6.86	78.14±7.63*	66.16±5.09	69.42±5.44*	66.98±5.04
Groups	**MG**	**CG**	**MG**	**CG**	**MG**
Indicator	**Lm**	**Lr**	**Lr**	**Ll**	**Ll**
A, pel	10592±1011*	10795±835	10197±1290*	10592±821	10267±1067
AC	0.04±0.30*	0.002±0.246	-0.13±0.37*	-0.12±0.23	-0.23±0.28*
NA	1.62±0.50*	2.64±0.79	1.97±0.60*	3.94±1.30	2.48±0.95
I, pel	91.93±4.05*	102.9±3.9	98.2±4.8*	105.8±4.2	95.57±4.52
IA	7070±2029*	4451±1326	5727±2088*	3033±1138	4826±2129*
IN, pel	1554±469*	1729±240	1549±480*	1769±247	1625±427*
E, J	4.33±0.55*	4.75±0.45	4.24±0.68*	4.79±0.42	4.36±0.60*
CE, J	2.64±0.51*	4.75±0.45	2.75±0.39*	4.79±0.42	2.76±0.47*
FC	2.18±0.26*	2.79±0.43	2.32±0.25*	3.07±0,60	2.46±0.35*
EC	2.18±0.26*	2.52±0.34	2.32±0.25*	3.02±0.54	2.46±0.35*
Icl, pel	336.3±41.09*	276.1±37.22	306.2±46.06*	230±39.44	282.1±51.82*
Icr, pel	47.02±6.73*	37.29±5.65	42.12±7.38*	30.65±5.69	38.4±8.1*
Ocl, pel	728±88.42*	684.6±54.49	700.7±77.21*	677.99±80.39	679.8±82.25*
Ocr, pel	70.79±5.27*	64.91±4.25	66.74±6.40*	60.93±4.03	64.55±6.65*

Note * - the difference Mann-Whitney test is reliable at $p<0.05$ between the characteristics Control Group (CG) and Main Group (MG).

(ST, cu) was an integral parameter of a person's functional state, which was regime or mode of capturing images of human fingers (left and right ring fingers) in the Bio-Well Software, that allows to assess Stress, Energy and Balance parameters; Balance (B, %) was an integral parameter of the functional state, which was Bio-Well Software parameter derived as ratio of Energy parameter values of GI between the left and right hands; Balance on the left (Balance left - Bl,%) and the balance on the right (Balance right - Br,%) were the presence or absence of asymmetry (lateralization syndrome) [8-10].

The study was conducted in compliance with all the requirements of the World Medical Association's Declaration of Helsinki and it was approved by the Ethics Commission of UMSA. Statistical analysis was performed using the Prism 5.0 software package. The data obtained are presented as mean values with their mean error (M±m). Mann-Whitney test were used to determine the statistical significance of differences between groups. Differences were considered significant at $p<0.05$.

RESULTS

Significant differences in all direct and mathematically calculated evaluation parameters were found in the analysis of results between the main group and the control group (Table I-II).

Quantitative indicators of AEFE (indicators of area, intensity, emission energy) were significantly higher in the control group compared to the main group ($p<0.002$-0.0001). The

Table II. EPEA indicators of the fingers of the right hand of functionally healthy respondents and patients with NCDs

Groups	CG	MG	CG	MG	CG
Indicator	**Rt**	**Rt**	**Rf**	**Rf**	**Rm**
A, pel	11289±1130	10763±1333*	10876±909	9987±995*	10967±804
AC	0.05±0.28	-0.16 ±0.38*	0.16±0.27	-0.08±0.30*	0.13±0.25
NA	1.86±0.56	1.22±0.49*	2.47±0.74	1.71±1.24*	2.31±0.66
I, pel	97.29±4.42	85.57±5.66*	101.3±4.2	90.9±5.1*	101.1±3.7
IA	7500±2704	9939±3331*	4836±1659	6813±2162*	5139±1486
IN, pel	1638±281	1450±443*	1738±284	1384±437*	1745±242
E, J	4.70±0.56	4.11±0.72*	4.71±0.48	4.03±0.56*	4.74±0.43
CE, J	4.70±0.56	2.89±0.72*	4.71±0.48	2.83±1.26*	4.74±0.43
FC	2.63±0.43	2.16±0.27*	2.81±0.58	2.24±0.58*	2.78±0.46
EC	2.20±0.25	2.16±0,27	2.5±0,40	2.24±0.58*	2.43±0.32
Icl, pel	343.3±51.94	388.5±55.85*	284.5±41.47	330.3±46.74*	293.6±37.3
Icr, pel	48.17±8.49	55.5±9.16*	38.81±6.40	46±7.77*	40.12±5.82
Ocl, pel	744.9±74.53	833±134.7*	699.2±71.06	719.9±83.62*	704.8±69.59
Ocr, pel	72.81±6.83	77.46±6.50*	65.99±5.16	68.76±6.49*	66.92±4.57
Groups	**MG**	**CG**	**MG**	**CG**	**MG**
Indicator	**Rm**	**Rr**	**Rr**	**Rl**	**Rl**
A, pel	10552±1389*	10843±886	10427±1274*	10546±954	10101±1146*
AC	0.01±0.37*	0.02±0.23	-0.04±0.4*	-0.13±0.22	-0.26±0.29
NA	1.74±0.88*	2.68±0.83	2.03±0.63*	3.85±1.30	2.57±0.90*
I, pel	91.8±5.0*	102.3±4.0	93.64±4.44*	105.5±4.0	95.13±4.2*
IA	6879±2118*	4437±1383	5718±2095*	3075±1105	4487±1826*
IN, pel	1520±518*	1763±234	1670±492*	1754±237	1669±412*
E, J	4.31±0.75*	4.75±0.47	4.35±0.69*	4.76±0.48	4.27±0.64*
CE, J	2.89±0.81*	4.75±0.47	2.82±0.77*	4.76±0.48	2.81±0.61*
FC	2.30±0.39*	2.84±0.49	2.33±0.28*	2.94±0.56	2.49±0.36*
EC	2.30±0.39*	2.54±0.34	2.33±0.28*	2.92±0.49	2.49±0.36*
Icl, pel	331.9±43.18*	276.38±38.6	306.9±45.19*	231±37.88	273.8±48.2*
Icr, pel	46.3±7.32*	37.2±5.85	42.07±7.38*	30.9±5.50	37.14±7.30
Ocl, pel	755.6±109*	692.5±76.38	709±94.41*	661.5±85.21	669.5±888.92*
Ocr, pel	70.43±4.88*	64.95±4.52	66.99±5.72*	60.76±4.29	63.17±5.92*

Note * - the difference Mann-Whitney test is reliable at $p<0.05$ between the characteristics Control Group (CG) and Main Group (MG).

rate of AC is clinically clear at the same time. The indicator AC reflects the comparison of the registered Area of the glow to the established standard norm, which is recognized as the Area of the calibration cylinder. The Area of the glow should match or be close to the Area of the calibration cylinder if the indicator is within the normal range. The indicator slightly exaggerated the Area of the calibration cylinder in the Control Group and this was an indicator of the norm. The recorded glow area of the Main Group was smaller than the size of the calibration cylinder, so they had a negative indicator AC, in contrast to the Control Group (Table 1-2). It was found to be true for left and right hand readings, respectively (Table 1-2). All this indicates that the emission of photons is higher in the group of functionally healthy individuals than in patients with NCDs.

The difference between the geometric parameters of the glow between the comparison groups was also established. The glow contours were smoother and more uniform in the visual analysis in the Control Group. The contours of the glow had a larger edge roughness in the Main Group (the contour was sawtooth). This was confirmed by the analysis of geometric parameters of EPEA. The geometric parameters of the contour length (FC, Icl, Icr, Ocl, Ocr) were significantly larger in the Main Group than in the Control Group ($p<0.0001$). This confirmed the greater length of the complex perimeter of the geometric contour in the Main Group compared to the Control Group and it indicated the presence of a different qualitative nature of Photon Emission in patients with NCDs.

Integral functional parameters probably differed in the Control Group from the Main Group as well (Table III).

Table III. Integral EPEA indicators of functionally healthy respondents and patients with NCDs

Indicator	GE, J	B, %	Bl,%	Br,%
CG	52.87±3.72	96.84±2.89	88.73 ±8.12	91.89 ±5.91
MG	48.12±5.11* p<0.0001	95.78±3.46* p<0.02	84.01 ±9.88* p<0.0085	86.72 ±7.76* p<0.0002

Note * - the difference Mann-Whitney test is reliable at p<0.05 between the characteristics Control Group (CG) and Main Group (MG).

The GE indicator differed significantly between the comparison groups and it showed a significantly lower level of emissions in the main group compared to the control group (Table III). Comparison of the parameters of the balances of the fingers of the right and left hand found that in the main group the balance indicators (B, Bl, Br) were significantly lower than in the control group (Table III). This may indicate a greater balance of metabolic processes in the body of functionally healthy respondents compared with patients with NCDs.

DISCUSSION

Since free photons are formed in living tissues during metabolic reactions according to existing ideas, accordingly, the more photons are registered, the more intense the metabolic processes [2, 8, 9]. Thus, the probable negatives of all quantitative parameters reflecting the area of emission (A, AC, NA) and qualitative parameters reflecting the intensity (I) and energy (E, CE) between the control group and the main group can be explained by the presence more active tissue metabolism in young healthy individuals. Geometric differences and a more uneven glow contour in patients with NCDs may be related to changes in the activity of the autonomic nervous system during NCDs. Changes in autonomic innervation can change the initial electrical parameters of the skin of the fingers and the parameters of the gas discharge. All this leads to the appearance of a different distribution of photons during a gas discharge in an electromagnetic field. That is why the changed geometric shape of the glow may be a possible diagnostic symptom in the practical use of the EPEA method.

The difference in the balance of indicators in functionally healthy individuals and patients with NCDs can be explained by the greater degree of asymmetry of the autonomic nervous system in NCDs as well.

The results obtained by us coincide with the conclusions of the author of the method K.G. Korotkov and other researchers that the EPEA method makes it possible to obtain valuable diagnostic information about the functional state of patients. Our results confirm the opinion of the authors, whose works were included in the review of publications for 2008-2018, that the EPEA method is simple and convenient to use in screening examinations, which theoretically allows its use in various medical fields. [8, 9].

CONCLUSIONS

AEFE parameters have significant differences in functionally healthy individuals and patients with NCDs.

AEFE is a fundamentally new promising approach to assessing the level of activity of metabolic processes at the tissue level in living biological systems, including in the normal human body and in patients with NCDs.

The AEFE method deserves further study and evaluation of opportunities for future prospective application in the Objective Structured Clinical Examination of patients as a method of screening to assess functional status and quantify objectively the level of health.

Further research and formation of the methodology of application of the AEFE method in various patients with NCDs is a promising area for future further research.

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This research work is a fragment of the initiative research project "Development of algorithms and technology for introducing a healthy lifestyle in patients with non-com-

municable diseases based on the study of psycho-emotional status" (State registration No. 0116U007798, UDC 613:616-052:159.942:616-03).

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Conflict of interest:
The Authors declare no conflict of interest.

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Received: 29.10.2020
Accepted: 13.04.2021

A - Work concept and design, **B** – Data collection and analysis, **C** – Responsibility for statistical analysis, **D** – Writing the article, **E** – Critical review, **F** – Final approval of the article