ELECTROMAGNETIC HYPERSENSITIVITY EVALUATION IN PATIENTS WITH HYPERTHYROIDISM- NEUROHUMORAL EXAMPLE OF AUTONOMIC NERVOUS SYSTEM DISTURBANCES

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ABSTRACT

There are certain physiological changes which influence the electrical conductivity of the human skin and cause fluctuations in its electrical resistance, the results of which can be perceived as changes in the electro-photographic readings of the surface of the body. As characteristic and repetitive changes already occur in the pre-clinical stage of functional disturbances, the recordings of these disturbances could be used for additional diagnostic and epidemiological screening purposes in the case of certain diseases.
In order to use this method for diagnosis we must show in our experiment that a certain organic disturbance – hyperthyroidism in this case – is reflected by a change of electro-photographic emanations. Such pathological changes should occur regularly and be specific for the disease under investigation.
The aim of the research is to investigate, whether thyroid gland disease (hyperthyroidism) can be consistently detected with electro-photography. The main goal of the work is to assess the possibilities for early diagnosis of thyroid gland disease by the detection of the changes in the electrical resistance of the skin surface using a special form of electro-photography using the GDV-camera (Gas Discharge Visualization Camera).

1 THE WORKING HYPOTHESIS

The basic hypothesis is that people with hyperthyroidism have statistically significant differences in skin surface resistance patterns which can be measured by electro-photography compared to people with no such illnesses. Also that the changes can be consistently demonstrated using our analytical method.

2 THE PARTICIPANTS AND THE METHODOLOGY

We have compared sixty patients with hyperthyroidism to a control group of sixty healthy individuals (blood donors) corresponding in age, gender, and weight. We recorded the electro-photographic patterns around the fingers (called coronas), of both their hands. Electro-photographic patterns of coronas around the fingers were recorded using a GDV-camera modified for the electro-photographic recording of human fingers. The recordings followed a uniform protocol. Each person was recorded three times in a row spaced out by ten-minute intervals. The pictures were analysed using a computer program for electro-photographical analysis which divides the recordings into sections, gathers various numerical parameters, and makes their statistical analysis possible.

The expected results. On the basis of the data from literature and pilot experiments, we expect that electro-photographic recordings of the patients with diagnosed hyperthyroidism characteristically and consistently differ from recordings of healthy individuals with no such illnesses. We expect the differences in various algorithmically defined parameters of the recordings around thumbs (sectors 4L, 4D), and fourth fingers (8L, 7L, 1L, 1D, 2D, 8D) of both hands. If the recordings of the patients will characteristically and consistently differ from recordings of healthy individuals, it will be possible to use this method as an additional tool to diagnose patients with hyperthyroidism.

3 SUPPORTING ARGUMENTS

Is has been shown that certain physiological changes (hormonal disorders, stress, cardiovascular disturbances etc.) influence the electrical conductivity of the skin and cause fluctuations in its electrical resistance. Those fluctuations can be measured using different methods. The principle is commonly used in psychology and crime detection for verifying the authenticity of statements (1, 2, 3). Modern experiments show the connections between ***upper sympathetic cervical ganglions*** (USCG) and the medial basal regions of the hypothalamus, whereas an overview of older and recent experimental data show how peripheral autonomous nerves of the cervical region regulate the activity of endocrine organs (thyroid gland and parathyroid gland), showing also distinctive »endocrine dialogues« between humoral signals and the growth and secretion of those glands (5). Many endocrine or neuroendocrine structures found in this area signify the neuroendocrine importance of the USCG, including the pineal gland, thyroid gland, parathyroid gland, carotid artery, pituitary gland and median eminence. They differ from other sympathetic ganglions of the cervical region by having no rami communicants, meaning that preganglionic fibers reach the USCG from lower regions of the sympathetic chain (5). The growth and function of the thyroid gland is controlled by at least four mechanisms:

1. The hypothalamic-pituitary portal system: secretion of thyrotropin or Thyrotropin-releasing hormone (TRH) from the hypothalamus stimulates the synthesis and secretion of hormones from anterior pituitary lobe.
2. Thyreostimulating hormone (TSH), which stimulate the thyroid gland, causing growth and release of the thyroid hormones. Excessive release of thyroid hormones reduces the number of TRH receptors, therefore hindering TSH secretion.
3. The pituitary gland and outer-ring deiodinases modifying active form of free thyroid hormone (FT4 and FT3) effects,
4. The auto-regulation of thyroid hormone synthesis in connection to the thyroidal iodine store,
5. The stimulation and inhibition of thyroidal function by the activity of its own TSH receptor antibodies.

Excessive thyroid gland activity causes several clinical signs: vasodilatation, hyperthermia with cold intolerance, excessive sweating, increased appetite, weight loss, increased heart rate and palpitations, increased digestion, fatigue, unreasonable fear, the shaking of extremities, deformations of the fingertips, exophthalmia, swelling of lower extremities, muscular weakness, and irregularities in monthly hormonal cycles.

When measuring skin surface resistance it is especially important to consider the influence of thyroid hormones on the increase of body temperature and the activity of sweat glands as the excretion of sweat characteristically increases electrical conductivity and lowers the electrical resistance of the skin. The change is particularly noticeable on the palms.

Deviations in electrical resistance of the skin are also used for therapeutical and research purposes in electro-acupuncture (5, 6, 7). Fluctuations in the electrical resistance of the human skin are most noticeable on the tips of fingers and toes (5, 7).

Fluctuations of conductivity, which can be recorded by photography (the so-called electro-photographic effect), were first described by Semjon Kirlian, a Russian electro-technician. He noticed that the image of living creatures and objects in high-voltage electrical fields could be photo-documented (7, 8). A more recent method for recording the differences in skin resistance is electro-photography. This method also shows the structure and fluctuations in skin resistance on individual fingers (8).

Electro-photography detects and records fluctuations of skin resistance on the basis of the ionizing effect of radiation between the human body and an external electrical field (7, 8). The physical explanation of the ionizing effect on the image is relatively simple. An area of gaseous radiation is established around the object exposed to a high-voltage electrical field. Ionized gases radiate photons which can be photographed and analysed using suitable computer software. When a finger is exposed to a high-voltage electrical field, an area of gaseous radiation forms around it. Moving electrons collide with gas molecules taking another electron with them, therefore ionizing the molecules. The result of each collision is an ion, two electrons, and a slight photon emission. Radiating photons can be photographed. A change in the two-dimensional structure of skin conductivity can characteristically influence the electro-photographic image of an object in a high-voltage electrical field. It can be seen as consistent repeatable variation on a video-camera recording. The method is called Gas Discharge Visualization, or GDV (8, 9).

Computer processing of GDV images of ionizing radiation was developed by Konstantin Korotkov in the 1990s at the State Technical University in St. Petersburg (8). Special patterns, similar to tree branches and which are called coronas form around the finger. Apart from a strong electrical field and other physical conditions in the environment (relative humidity, air pressure and temperature), the shape of coronas is influenced mainly by the composition of the gas mixture around the finger and the conductive properties of the skin, the subcutaneous tissue, muscles, and bone (9). Some authors think that the method of measuring the coronas could be used for diagnostic purposes and that the electro-photographical changes occur already at the pre-clinical stage of functional disturbances. According to the authors of the method, the irregularities in the shapes of coronas are caused by illness and deviations in homeostasis (10, 11, 13).

So far the methods of measuring the characteristic changes in skin conductivity at certain specific points using electro-photography have not been systematically evaluated. Our pilot experiments indicate it has diagnostic potential.

4 PREVIOUS WORK CONNECTED WITH THIS RESEARCH

A scientific question, whether thyroid gland defect influences the electro-photographical recordings of the electrical resistance of the surface of skin, was raised in the pilot study where we examined the GDV recordings of patients treated with radioactive iodine^{131}. It showed that all of the patients before and after the I^{131} therapy had significantly different electro-photographic recordings on thumbs of both hands and some other statistically significant deviations in sectors, which, according to Korotkov (14), correlate with the hypothalamus, the pituitary gland and the endocrine system, occur on the fourth fingers of both hands. The measurement standardized error was less than 5%. On the basis of the pilot experiment the Institute for biomedical informatics of the Medical faculty of Ljubljana suggested research conducted on a sample population of 50 patients and 25 healthy control individuals. In order to minimize bias, we have taken bigger patterns.

The research design and a description of the methodology

a. Participants and methodology

We have examined sixty patients with confirmed hyperthyroidism and sixty two healthy blood donors aged between 18 to 65 who had no thyroid gland diseases in their anamnesis and who are therefore considered as part of the healthy control group. The research participants will be split into subgroups according to their age: each subgroup will span ten years. Diagnostic criteria for patient choice will be a clinically confirmed diagnosis of

hyperthyroidism and pathologically raised serum quantities of FT3, FT4 thyroid hormones, as well as a lowered quantity of TSH. All the participants will have voluntarily entered into the research program and will be fully informed. The recording of the electro-photographic coronas around the fingers will be done with a Crown-TV camera, modified for human finger electro-photography recordings (see further on for a description and specifications). The procedure had followed a detailed and specific protocol in order to make the recording conditions as uniform as possible.

b. Camera description

The Crown-TV camera (made by Kirlionics International, St. Petersburg), which were used for recording. This device consists of an electrode covered with dielectric, generator of electrical field of a suitable voltage and frequency, and a video camera.

Technical properties of the camera:

voltage U = up to 10 kV (3.2 kV are used for the recording of human subjects);
frequency **ν**= 1024 Hz;
electrical field duration (exposure time) t = 0.5 s (this time will be used for recording), it can also be 1, 2, or 3 s;
the electrical field is generated by 10 ms long electrical pulses;
measurement error: 3 – 5%

c. Protocol description

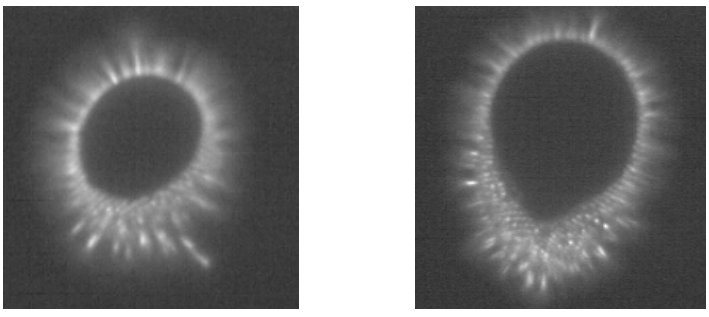
Separate fingers of the participant will be placed on a GDV camera inside software (GDV analysis and GDV Processor, made by Kirlionics International, St. Petersburg), which gathers various numerical parameters and makes their statistical analysis possible. Exposure time (t) was 0.5 s at voltage E=3,2 kV and frequency of **ν**=1024 Hz in a dark chamber.

d. The shape of electro-photographic coronas

Each finger's corona is divided into sectors (14).

The shape of coronas can be balanced, or regular, having a roughly symmetrical form. They can also be irregular. Three types of irregularities are distinguished:

- holes – empty areas on the recording;
- eruptions – isolated areas of the recording,
- connected to the main finger image, spark-like;
- separated particles – dots, circles, and areas,
- separated from the main finger image.



A B

Figure 1: An example of a normal corona of the first fnger (A) and typical irregularities corona in patients with hyperthyroidism (B).

Irregularities may be caused by:

- bad recording conditions (sweaty palms, dirt on the subject);
- transitional, meaning that they appear only on some recordings;
- consistent – those that appear on all recordings.

Changes in coronas can be transitional or permanent. Transitional changes are caused by transitional processes in the body and they rarely signify real medical problems. They can also be caused by inaccurate recording procedures. Consistent irregularities signify functional disturbances in the body part believed to be connected to the altered sector of a certain corona. This is why the irregularities in coronas can be split into sectors. According to founders of GDV, certain sectors of coronas are connected to certain internal organ (4, 6, 8).

The most biasing is the multiple relation of the single sector of the first finger (area from 5 to 7 o'clock), which also corresponds to other organs (throat, trachea, tonsils, lymph glands and soft tissue of cervical region), and not only to thyroid gland.

This causes some difficulties and potential biasing in proposing clinical state of the patient without thorough case history being taken in advance. Due to that limits, we have to consider more reflexion levels of the functional state of organ or the particular tissue. Those are blood, lymph and extra-cellular fluid flow, which is sustained by proper posture of the spine as a main neural network provider via visceral ganglia from and to the organs.

When applying knowledge of other medical thinking and existing theories about health issues, we may increase possibility of early prevention of the studied disease and widen the scope of understanding of clinical phenomena in pre-clinical stage.

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