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Evaluation of post-covid-19 pelvic hemodynamic and hormonal changes in women by bioelectrical resonance testing ("Parkes-D") during treatment with the "temp" galvanization and electrophoresis device and the "bioxyd-plasma-detox" electrophoresis solution

Abstract

This article reviews the indications for the use of therapeutic electrophoresis and galvanization with the **«Temp»** device in medical practice in combination with the author-developed electrophoresis solution **«Bioxyd-Plasma-Detox»** and physiotherapy sessions. The article also reviews current evidence supporting the concept of COVID-19 as a systemic panendothelial disease associated with persistent circulatory disturbances affecting multiple organs and systems, including the reproductive system. Particular attention is given to the relationship between virus-induced ACE2 depletion, immunothrombosis, vascular dysfunction, and the resulting hemodynamic and hormonal alterations. The role of hormonal mechanisms in maintaining respiratory function is analyzed, including their influence on ventilation, perfusion, lung function, airway smooth muscle tone, and modulation of the inflammatory response. Special emphasis is placed on cortisol as a marker of adaptive and functional changes associated with pathological conditions. A review of the literature demonstrates the important role of hormones in the growth, development, and maintenance of lung tissue throughout all stages of life, from the prenatal period to adulthood.

Keywords: electrotherapy, therapeutic electrophoresis, temp device, bioxyd-plasma-detox electrophoresis solution, galvanization, direct electric current, hemodynamics, cortisol, estrogens, progesterone, bioresonance testing (BRT), SARS-CoV-2, spirometry

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Relevance of the study

Disruption of the body's homeostasis following SARS-CoV-2 infection is accompanied by the development of systemic inflammatory,[1] vascular, and metabolic changes. According to current evidence, COVID-19 is regarded not only as a respiratory disease but also as a systemic panendothelial disorder characterized by endothelial dysfunction, immunothrombosis, and impaired microcirculation.[2] These alterations underlie the development of long-term post-infectious sequelae (Long COVID), which manifest as persistent functional impairments affecting multiple organs and systems.[3] The female reproductive system is among the organ systems most susceptible to post-COVID alterations. The pelvic vasculature is characterized by a complex anatomical structure, extensive vascularization, and continuous cyclic remodeling. Endothelial dysfunction, increased vascular resistance, microvascular thrombosis, and rheological abnormalities lead to alterations in pelvic organ hemodynamics, which can be detected using contemporary functional diagnostic methods, including spectral Doppler ultrasonography.[4–6] Alterations in regional hemodynamics are closely associated with changes in the hormonal profile. Regulation of reproductive function involves the coordinated activity of interconnected structures, including the cerebral cortex, hypothalamus, pituitary gland, ovaries, and uterus. Chronic stress, the inflammatory response, and vascular disturbances characteristic of post-COVID syndrome alter the interaction between the hypothalamic-pituitary-adrenal (HPA) axis and the hypothalamic-pituitary-ovarian (HPO) axis, which may lead to hormonal imbalance, menstrual disorders, and impaired reproductive function.[7,8] Given the mechanism of action of sex hormones, these alterations may affect not only the reproductive system but also the functional status of other organs, particularly the lungs.

Estrogens and progesterone exert pleiotropic effects not only on the reproductive system but also on vascular tone, metabolic processes, the immune response, and the functional status of other organs. The biological effects of estrogens are mediated through estrogen receptors ERα (ESR1), ERβ (ESR2), and GPER1 (GPR30), which are expressed in endothelial cells, vascular smooth muscle cells, and other tissues. Through these mechanisms, sex hormones participate in the regulation of vascular reactivity, tissue remodeling, and the inflammatory response, all of which play an important role in the development and progression of post-COVID complications.[9–12] Given the complexity of the pathogenic mechanisms underlying Long COVID, there is a need for methods that enable a comprehensive assessment of the body's functional status and facilitate the early detection of disturbances in regulatory processes. One such approach is bioresonance testing (BRT). In the present study, the **Parkes-D** bio resonance diagnostic device was used to functionally assess

the consequences of previous SARS-CoV-2 infection. The device was employed to evaluate the functional status of the body, assess hemodynamic changes in the pelvic organs, and analyze potential disturbances in the hormonal profile of women. Sex steroid hormones and their receptors are known to play an important role not only in the function of the endocrine and reproductive systems but also in maintaining the structural and functional integrity of the bronchopulmonary system. Findings from recent studies indicate that estrogens and progesterone are involved in lung development, maturation, and maintenance of pulmonary function. They regulate alveolar gas exchange, the expression of surfactant proteins and vascular endothelial growth factor (VEGF), and influence ventilatory function and airway reactivity.[13–18] Estrogen receptors and progesterone receptors are expressed in lung tissue and mediate the biological effects of sex hormones. Estrogens have been shown to promote alveolar formation, maintain pulmonary diffusing capacity, and regulate vascular tone, whereas progesterone is involved in the regulation of ventilation and the functional state of the respiratory tract smooth muscle. Thus, the hormonal imbalance associated with post-COVID disorders may affect not only the reproductive system but also the functional status of the respiratory system.[19–25]

Further studies indicate that SARS-CoV-2 may affect the endocrine system, particularly the functional state of the adrenal glands.[26–37] Proposed mechanisms of adrenal involvement include direct viral injury and adrenal vein thrombosis, which may lead to adrenal insufficiency or Cushing syndrome.[38] During the acute phase of COVID-19, activation of the hypothalamic-pituitary-adrenal (HPA) axis is accompanied by increased cortisol secretion, which exerts anti-inflammatory and immunosuppressive effects. In contrast, chronic dysregulation of cortisol secretion is associated with elevated levels of pro-inflammatory cytokines and the persistence of systemic inflammation, potentially contributing to the prolonged course of post-COVID syndrome.[39] Endocrine disturbances are also of considerable clinical importance in patients with chronic bronchopulmonary diseases, particularly chronic obstructive pulmonary disease (COPD), which is characterized by systemic alterations in hormonal status.[40–44] These findings further support the close relationship between endocrine regulation, inflammatory processes, and the functional state of multiple organs and systems. Given the systemic nature of post-COVID disorders, the use of comprehensive physiotherapeutic approaches aimed at improving microcirculation, normalizing hemodynamics, and restoring the functional status of the body is of particular interest. One such approach is the combination of galvanization and therapeutic drug electrophoresis. Electrophoresis provides the simultaneous action of direct electric current and a pharmacological agent, thereby creating the conditions necessary to achieve metabolic, vasoregulatory, trophic, and regenerative effects.[45] Therapeutic drug electrophoresis is a physiotherapeutic method and its therapeutic effect is based on the combined action of direct electric current and a medicinal agent. This combination promotes local accumulation of the drug within the tissues, prolongs its therapeutic effect, and creates a high drug concentration directly at the site of the pathological process. The advantages of therapeutic electrophoresis include the localized administration of small doses of medicinal agents, the combination of pharmacological and physiotherapeutic effects, improvement of metabolic processes, and reduction of the inflammatory response.[46–50]

Hydrophilic pads moistened with water or physiological saline are used to improve electrical contact between the electrodes and the skin. The use of hydrophilic pads reduces the electrical resistance of the skin, ensures uniform current distribution, and decreases the risk of local irritation associated with electrolysis products.[47,48] Changes in ion concentration within the tissues under the influence of direct electric current are accompanied by local physiological responses, including stimulation of blood circulation, lymphatic circulation, and cellular metabolism. In addition, galvanic current modulates the excitability of nerve and muscle cells, which underlies its application in physiotherapeutic practice.[46,47] Physiotherapeutic methods, particularly electrophoresis, contribute to improved blood circulation and the functional status of nerve fibers. In gynecological practice, electrophoresis is used to provide localized treatment of pathological lesions, reduce vascular spasm, relax smooth muscle, and improve blood circulation in the pelvic organs. The method is employed as part of the comprehensive treatment of inflammatory diseases, pelvic adhesions, and for the stimulation of ovarian hormonal function, thereby contributing to the reduction of pain and the improvement of the functional state of the reproductive system.[48,51] In view of the above, the present study employed bioresonance testing using the Parkes-D diagnostic device to assess the functional state of the body. To correct hemodynamic disturbances of the pelvic organs and hormonal profile alterations in women, a combined therapeutic approach consisting of electrophoresis and galvanization was applied using the Temp physiotherapy device in combination with the author-developed electrophoresis solution "Bioxyd-Plasma-Detox."

Aim of the study

The aim of this study was to evaluate the therapeutic efficacy of electrophoresis and galvanization using the **Temp** physiotherapy device in combination with the author-developed electrophoresis solution **"Bioxyd-Plasma-Detox"** for the correction of pelvic organ hemodynamic disturbances and hormonal profile alterations, including changes in cortisol levels as a marker of hormonal dysfunction, associated with alterations in ventilation, perfusion, and pulmonary function in patients with chronic bronchopulmonary disorders during the post-COVID period. The study also aimed to analyze and substantiate the feasibility of using bioresonance testing with the **Parkes-D** diagnostic device to assess these disturbances, determine cortisol levels, and evaluate the outcomes of the administered therapy.

Materials and methods

The study was conducted from September 2024 to May 2026. Over the 19-month study period, 97 women were examined after presenting with complaints of general weakness, dull lower abdominal pain, dyspnea during walking, a sensation of insufficient air indoors, excessive sweating, and depressive symptoms during the post-COVID period. All participants were evaluated between 6 months and 1.5 years after laboratory-confirmed COVID-19 infection, corresponding to the stage of persistent post-COVID complications. All patients underwent bioresonance testing using the Parkes-D diagnostic system to assess the functional state of organs and body systems. Before bioresonance testing, the results of diagnostic examinations previously performed prior to referral were reviewed and analyzed. An additional parallel assessment of cortisol levels in venous blood and urine was also performed. A comparative diagnostic assessment was performed before and after therapy using spirometry with the "SpiroCom" device (5.22.0224.53), manufactured by KhAI-Medica (info@x-medica.com; http://xai-medica.com).

The study was performed during quiet breathing, with the aim of recording the tidal volume (TV, %) in the sitting and supine positions, without the use of standard forced respiratory maneuvers (forced inspiration and expiration). This approach was used because the study participants struggled to perform three repeated forced inspiratory

and expiratory maneuvers. The selected approach was considered scientifically justified and supported by published data regarding the assessment of respiratory function in the supine position.[52] Galvanization and electrophoresis were used as therapeutic treatment. Galvanization was performed using low-voltage direct electric current (3 V), with the electrodes applied to the back at the level of the diaphragm and to both feet. Electrophoresis was performed using the author-developed "Bioxyd-Plasma-Detox" solution, providing the combined action of direct electric current and a pharmacological agent. Prior to electrophoresis, each patient underwent an examination to assess the condition of the skin at the intended electrode application sites. Hydrophilic pads were moistened with the author-developed "Bioxyd-Plasma-Detox" solution, after which electrodes of opposite polarity were attached. Each treatment session lasted 60 minutes, and the treatment course consisted of daily sessions for 60 days.[49,50]

One of the parameters evaluated in this study was the cortisol level as a marker of the functional state of the hypothalamic-pituitary-adrenal (HPA) axis and hormonal alterations associated with post-COVID disorders. Most currently available methods for cortisol assessment are based on laboratory testing, which reflects hormone concentrations only at the time of biological sample collection, whereas real-time point-of-care methods for cortisol assessment are currently very limited.[53,54] To evaluate cortisol, contemporary approaches to cortisol assessment were reviewed, and the selection of bioresonance testing using the Parkes-D diagnostic system was substantiated.[55] Bioresonance testing is based on the registration of electromagnetic oscillations. Assessment without a marker is used as a rapid screening method to evaluate the overall functional state of the body, whereas testing with a marker (selector) involves the use of electronic markers to assess specific parameters according to the capabilities of the diagnostic system.[55] The marker-based measurement was used to register an indicator of cortisol. The results were evaluated by comparing the measurements obtained with and without the marker. A difference of up to 7 units between the two measurements was interpreted as corresponding to a normal cortisol level, whereas a difference greater than 7 units was interpreted as indicating an elevated cortisol level.

Results

The results of the assessment of cortisol levels obtained by bioresonance testing (BRT) using the **Parkes-D** diagnostic system before the initiation of therapy and after completion of the treatment course with electrophoresis and galvanization are presented below. To assess the physiological cortisol indicator and its associated functional alterations, the marker-based diagnostic module of the Parkes-D system was used. Electrical resistance was recorded at the biologically active point (BAP) corresponding to the adrenal glands. As shown in Figure 1 & 2, before the initiation of therapy, the mean cortisol indicator in the study group was 22 units (blue line), corresponding to an elevated level. Following completion of the treatment course, the mean indicator decreased to 5 units. After therapy, none of the examined patients had a value exceeding 7 units, corresponding to normalization of the cortisol indicator according to the predefined assessment criteria. An additional parallel assessment of cortisol levels in venous blood and urine was also performed. Elevated cortisol levels were associated with chronic stress. The reported clinical manifestations included persistent fatigue, anxiety, insomnia, central obesity, elevated blood pressure, and muscle weakness. The results showed that the mean morning cortisol level in venous blood among the study participants was 750 nmol/L, which exceeded the reference range of 138–690 nmol/L. The 24-hour urinary free cortisol level was also above the reference value, exceeding 300–500 nmol/day, with a reference value of up to 214 nmol/day. After completion of therapy, the cortisol level in venous blood was within the reference range of 138–690 nmol/L, while the urinary cortisol level decreased to 214 nmol/day.

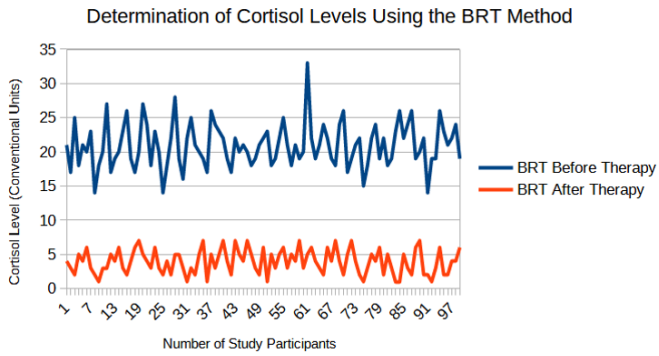

Figure 1 Difference in cortisol indicator before and after therapy.

The mean reduction in the cortisol indicator was 17 units. The obtained results demonstrate a positive change in the cortisol indicator following the course of the therapy.

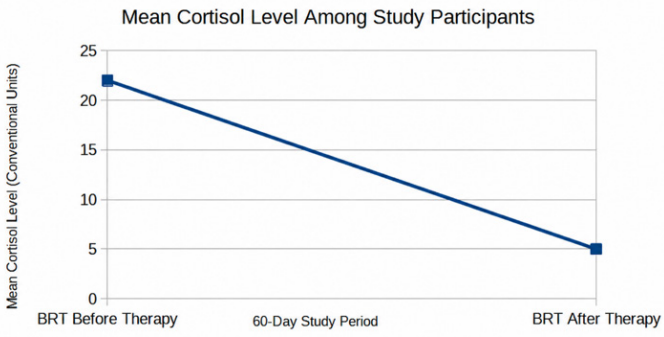

Figure 2 Changes in the cortisol indicator before and after a 60-day course of therapy with electrophoresis and galvanization (daily 60-minute treatment sessions).

Spirometry results: Figures 3 & 4 The observed dynamics were characterized by a mean difference of 108 percentage points between the pre-treatment and post-treatment values. Before therapy, the difference in tidal volume (TV, %) between the sitting and supine positions during quiet breathing was 120%. After completion of therapy with electrophoresis and galvanization using the "Temp" device, the corresponding difference decreased to 12%, indicating normalization of the assessed physiological functions. These findings demonstrate the effectiveness of electrophoresis and galvanization with the "Bioxyd-Plasma-Detox" solution in normalizing cortisol levels and physiological processes of the bronchopulmonary system during the post-COVID period. After therapy, complaints of difficulty breathing, weakness, excessive sweating, and chronic cough were no longer reported. For additional assessment, computed tomography (CT) of the lungs was also performed as a control diagnostic method. The findings demonstrated an increase in the total gas-exchange surface area, suggesting improved expansion of the lung tissue and alveolar air filling, as well as a reduction in inflammatory changes in the lung tissue, pneumosclerosis, and pulmonary fibrosis.

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Before Therapy (%)			After Therapy (%)			
Mean (Sitting)	Mean (Lying Down)	Difference	Mean (Sitting)	Mean (Lying Down)	Difference	Change
170	50	120	172	160	12	108

Figure 3 Spirometry results.

A difference in tidal volume (TV) of up to 20 % between the sitting and supine positions is considered normal.

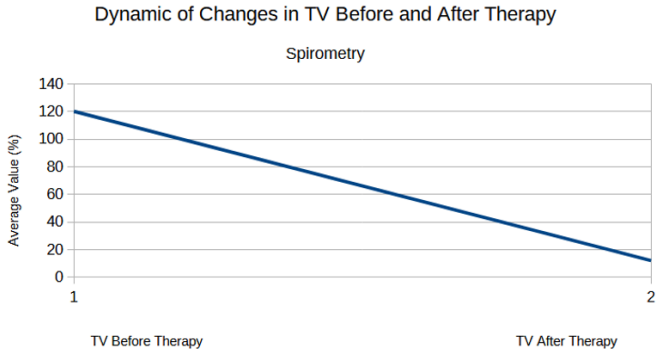

Figure 4 Dynamic of changes in TV before and after therapy.

Gynecological findings

The women who sought medical assistance reported a range of gynecological and psychosomatic complaints.

Menstrual cycle disturbances included:

i. irregular menstruation;

ii. excessively heavy or scant menstrual bleeding;

iii. menstrual cycles shorter than 21 days or longer than 35 days;

iv. absence of menstruation (amenorrhea);

v. severe menstrual pain;

vi. intermenstrual bleeding.

Emotional state and sleep disturbances included:

i. pronounced mood swings;

ii. irritability and tearfulness;

iii. anxiety and panic attacks;

iv. depressive symptoms;

v. insomnia or excessive sleepiness;

vi. reduced concentration and impaired memory.

Reproductive function

A decrease in libido was also reported among the participants. All patients underwent standard gynecological examinations prescribed by a gynecologist in accordance with the clinical protocol for the reported complaints. The primary diagnostic focus was the detection of human papillomavirus (HPV) infection and cervical dysplasia. The diagnostic assessment of cervical dysplasia included cytological examination (Pap test), colposcopy, and, where indicated, cervical biopsy for histological examination.

Among the 97 women included in the study, the following findings were identified:

I. **Cervical intraepithelial neoplasia grade I (CIN I):** 20 women had mild epithelial changes confined primarily to the basal layer. After therapy, no abnormalities were detected on repeat examination, and the patients reported no further complaints.

II. **Cervical intraepithelial neoplasia grade II (CIN II):** 10 women had involvement of approximately one-half to two-thirds of the epithelial thickness. After therapy, CIN II was no longer detected in 4 patients. The remaining 6 patients demonstrated positive dynamics, with a 30% reduction in the extent of epithelial involvement and an 80% reduction in symptom severity.

III. **Restoration of the menstrual cycle after menopause:** In 10 women aged 50 years who had experienced menopause for 2 years, the menstrual cycle resumed after therapy.

IV. **Amenorrhea:** 17 women aged 40–45 years reported absence of menstruation; after therapy, the menstrual cycle was restored in all 17 patients.

V. **Menstrual and associated symptoms:** 40 women reported irregular menstruation, excessively heavy or scant menstrual bleeding, menstrual cycles shorter than 21 days or longer than 35 days, pronounced mood swings, irritability, tearfulness, anxiety, panic attacks, depressive symptoms, and insomnia or excessive sleepiness. After therapy, these complaints completely resolved in 33 patients, while 7 patients reported only minor residual symptoms.

In gynecological practice, human papillomavirus (HPV) infection is considered a major risk factor for the development of cervical diseases. HPV infection can cause changes in epithelial cells that may subsequently lead to cervical dysplasia or cancer. HPV infection is often asymptomatic in women during its early stages, which may delay its timely detection. However, certain signs may warrant further evaluation, including:

i. unusual vaginal discharge;

ii. bleeding between menstrual periods or after sexual intercourse;

iii. lower abdominal pain or discomfort during sexual intercourse.

Discussion

The present study demonstrated a positive improvement in the clinical condition of the patients following completion of the treatment course. According to the clinical observations, most patients experienced complete resolution or a marked reduction in complaints of dyspnea, general weakness, excessive sweating, and chronic cough. A decrease in depressive symptoms, anxiety, fear, and discomfort in the reproductive organs was also observed. A positive clinical response to the administered therapy was recorded in all examined patients. These findings suggest the potential value of the combined use of electrophoresis, galvanization, and bioresonance testing in the assessment of the functional state of patients during the post-COVID period. Nevertheless, the clinical utility of this approach requires further investigation in larger patient cohorts. The author-developed electrophoresis solution "Bioxyd-Plasma-Detox" contains choline, an essential nutrient involved in numerous physiological processes. Its metabolite, phosphatidylcholine, is a major component of cell membranes, lipoproteins, bile, and pulmonary surfactant, and

is also required for the synthesis of acetylcholine, one of the principal neurotransmitters. In addition, choline is involved in lipid transport, methyl-group metabolism, and the regulation of homocysteine levels, while its metabolite betaine supports methylation reactions and contributes to normal kidney and mitochondrial function.[56,57]

Choline also plays an important role in the functioning of the nervous system by promoting the synthesis and release of acetylcholine, thereby supporting cholinergic neurotransmission. Acetylcholine is one of the key neurotransmitters involved in memory, learning, and cognitive function. Reduced activity of the cholinergic system has been associated with age-related cognitive impairment and decreased acetylcholine synthesis.[58] The present study traced and diagnostically substantiated a sequential cascade of homeostatic disturbances occurring during the post-COVID period. The first stage is the evolving understanding of COVID-19, from a primarily respiratory disease to a systemic panendothelial disorder associated with the development of persistent vascular complications. Among the most severe consequences of severe COVID-19 are thrombosis and systemic inflammation, which, according to current evidence, may be associated with persistent functional alterations of erythrocytes following SARS-CoV-2 infection.[58,59] The subsequent stage involves the development of hemodynamic disturbances, particularly within the vascular bed of the pelvic organs. Inflammatory processes, virus-induced depletion of ACE2, immunothrombosis, and endothelial dysfunction contribute to increased vascular resistance, chronic ischemia, endotheliitis, and microvascular thrombosis, ultimately leading to persistent impairment of blood flow.[4–6] Hemodynamic disturbances affecting the reproductive system are accompanied by alterations in the hormonal profile. Estrogens and progesterone are known to exert distinct effects on the bronchopulmonary system, particularly on ventilation, perfusion, and the functional state of lung tissue, highlighting the relationship between vascular, endocrine, and respiratory changes during the post-COVID period.[7] A subsequent stage in the pathogenic cascade is the disruption of neuroendocrine regulation of the reproductive system. Regulation of the menstrual cycle is mediated through the coordinated interaction of the cerebral cortex, hypothalamus, pituitary gland, ovaries, and uterus. Severe stress induced by SARS-CoV-2 infection and the psychosocial consequences of the pandemic disrupts the interaction between the hypothalamic-pituitary-adrenal (HPA) axis and the hypothalamic-pituitary-ovarian (HPO) axis. Activation of the stress response is accompanied by suppression of the reproductive axis, leading to reduced estrogen and norepinephrine production, menstrual cycle disturbances, and the development of anovulatory cycles.[8]

Cortisol plays an important role in these processes. Direct involvement of the adrenal glands by SARS-CoV-2, as well as adrenal vein thrombosis, may lead to adrenal dysfunction or the development of Cushing syndrome.[38] During severe COVID-19, activation of the hypothalamic-pituitary-adrenal (HPA) axis is accompanied by increased cortisol release, which exerts anti-inflammatory and immunosuppressive effects during the acute phase of the disease.[39] However, prolonged dysregulation of cortisol secretion has been associated with elevated levels of pro-inflammatory cytokines, the development of systemic inflammation, and disruption of hormonal homeostasis. The findings of the present study suggest that alterations in the cortisol indicator may represent one of the key factors contributing to systemic hormonal disturbances in women during the post-COVID period.[60–64]

Conclusions

The present analysis demonstrated the potential of electrophoresis and galvanization using the Temp physiotherapy device in combination with the author-developed electrophoresis solution "Bioxyd-Plasma-Detox" for the comprehensive correction of pelvic organ hemodynamic disturbances and hormonal alterations associated with the consequences of COVID-19. Given the relationship between hormonal regulation and the functional state of the respiratory system, this approach may contribute to improvements in ventilation, perfusion, and pulmonary function, as well as to the normalization of vascular tone, nerve conduction, and metabolic processes.[65] The study demonstrated a positive improvement in the clinical condition of the patients, accompanied by a decrease in the cortisol indicator according to bioresonance testing. The obtained findings suggest a possible relationship between post-COVID hemodynamic disturbances, alterations in the hormonal profile, and the functional state of the bronchopulmonary system.[66] This may be associated with the restoration of neuroendocrine regulatory function.

Based on the analysis of the comparative diagnostic assessments performed in the study, including the measurement of cortisol levels in venous blood and urine, spirometric evaluation of bronchopulmonary function, and conventional gynecological examinations, bioresonance testing (BRT) using the Parkes-D diagnostic complex was evaluated as a potential screening method for assessing functional changes and monitoring cortisol-related parameters in women.

In patients with gynecological complaints, comparative assessments using the Parkes-D system and conventional clinical diagnostic methods, including examinations for human papillomavirus infection and cervical dysplasia, demonstrated concordant changes in the parameters assessed.[67] These findings suggest that BRT may have potential as a complementary screening and functional assessment method. However, diagnostic accuracy and clinical validity of the Parkes-D system require further investigation using standardized diagnostic methods, larger patient cohorts, and appropriate statistical validation. Results of the therapy have practical significance for treating a wide range of pathological processes in the human body. Therefore, they warrant further investigation and broader dissemination in scientific literature. Further clinical studies should incorporate contemporary approaches in medical physics, physiology, organic and medical chemistry, and medical biology to clarify the mechanisms of action, diagnostic value, and clinical applicability of these technologies Appendix A.

Acknowledgments

None.

Conflicts of interest

The author declares that there are no conflicts of interest.

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