**Original Research Article**

# Tesla's Secret Immunity and Well Being

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**Abstract:** The article discusses the effectiveness of inhalation of highly concentrated oxygen in patients with heart failure in large cities: quality of life, frequency of hospitalization and survival. *Matherials and methods of investigation:* In the study were included 100 people (age is from 50 to 74 years, mean age is $62.3\pm8.52$ years, 50 male and 50 female including) with the heart failure of II-III functional classes (NYHA) on the basis of ischemic heart disease. Examination of the patients included a 6-minute walk test, an assessment of the quality of life using the SF-36 and MLHFQ questionnaires. Endpoint frequency analysis (annual mortality and hospitalization rate analisys) has used. *The results of the study:* It was found that a year after the start of controlled monitoring, the quality of life of patients who daily, in combination with the main treatment used inhalations of highly concentrated oxygen (group 2), probably improved ($p<0.05$) due to all its parts of the physical component of health (PF, RP, BP, GH). The improvement in quality of life was also due to the refining of the parts of the emotional component of health (VT, SF, RE and MH, $p<0.05$). In both observation groups, the quality of life was improved according to the MLHFQ questionnaire - the total number of points ($p<0.05$), the number of points in the physical ($p<0.05$) and emotional spheres ($p<0.05$). It was proved that during the oneyear of observation in both groups there were significant changes and improvement in the test results with a 6-minute walk with increasing distance traveled (in group 1 - from $335.8\pm34.6$ to $378.2\pm25.4$ meters, $p<0.05$, in the second group - from $324.2\pm22.8$ to $412.7\pm35.1$ meters, $p<0.05$). A more significant increase was observed in group 2, $p<0.05$. According to the Kaplan-Meyer survival analysis of the cumulative frequency of endpoints (survival and hospitalization) of patients there was a significant discrepancy between the observation groups. The effectiveness of combination therapy with the inclusion of inhalations of highly concentrated oxygen in patients with heart failure to reduce the frequency of clinically important cardiovascular events was 10%, $p<0.05$.

**Keywords:** quality of life, physical activity, survival, hospitalization, heart failure, big cities environment.

## ACTUALITY

According to the World Health Organization (WHO), noncommunicable diseases (NCDs) are the leading cause of death in the world [19]. In Europe, CVD accounts for 45% of the death rate, while in 28 countries of the European Union (EU-28) it is 37% [8, 11].

This amounts to 2.14 million and 1.85 million deaths per year, respectively [19]. Well-known risk factors include tobacco smoking, unhealthy diets, lack of physical activity, overweight, raised blood pressure, fasting glucose and cholesterol, which can be either avoided or substantially reduced. It is estimated that 80% of premature heart disease, stroke, and diabetes can be prevented [19].

Environmental factors, in particular air pollution, pose additional risks with health consequences that have been underestimated in the Global Burden of Disease (GBD) [11].

Although air pollution is often ignored as a health risk factor, [8] the Lancet Commission on pollution and health recommends air quality action plans for the prevention and control of NCD [11].

According to the Commission, about nine million deaths worldwide are associated with environmental degradation, of which about half are air pollution, which is the main threat to environmental health. Previously it was estimated that the excess mortality rate from air pollution, related to CVD, amounts to 2.4 million per year, of which 269 000 in Europe [12]. Mechanistic factors include inflammation caused by pollutants, oxidative stress, and vascular (endothelial) dysfunction, which can contribute to the development of hypertension, diabetes, and atherosclerosis, which can have a much greater health effect than expected [6, 9, 13]. It is generally accepted that the chronic effects of air pollution on cardiovascular events are greater than the acute effects, and that older people and people with previous cardiovascular disease or associated factors are at higher risk [13].

An increase in the average annual value of pollutants by 10 $mg/m^2$ is associated with a significantly increased risk of hospitalization and mortality from heart failure [7, 14].

Numerous studies have established a strong association between air pollution and cardiovascular events, such as myocardial infarction, stroke, heart failure (including hospitalization for acute left heart decompensation), arrhythmia, and venous thromboembolism [12, 16].

As part of the ESCAPE project, a 13% increase in non-fatal acute coronary events was established as a result of prolonged exposure to pollutants with a content of more than 5 $mg/m^3$ [5]. In addition, a decrease in the oxygen content in polluted air leads to a change in the basal metabolic rate, increased catabolism and accelerated aging.

Similarly, aging-related cognitive decline is associated with impaired oxygen and glucose delivery through the vasculature of the brain.

Historically, there are two main approaches to the study of aging. In one case, primary importance is given to the search for mechanisms and molecular "substrates" of aging. This primarily concerns the accumulation of DNA damage caused by exogenous and endogenously generated radicals. The accumulation of DNA damage and a decrease in the ability of cells to repair and respond to these injuries with age should lead to a deterioration in the functioning of both individual cells, tissues and organs, and the whole organism (which leads to an increase in the likelihood of its death over time).

The body's ability to maintain anabolism is an important factor determining individual and species life expectancy. Thus, animals with a longer life duration should in any other equal conditions, have the best ability to respond to adverse environmental factors, air pollution and changes in metabolism caused by pollutants. This is confirmed, in particular, by the presence of a positive correlation between the activity of systems involved in DNA repair and the maximum pancreas of mammals.

Similarly, aging-related cognitive decline has been attributed to the compromised delivery of oxygen and glucose through the cerebral vasculature. It is known, that intense mental stress affects energy metabolism, and this one induces the formation of oxidative stress [10].

The usage of inhalations with high concentrated oxygen as effective way for improvement metabolism has shown in several studies [15]. In recent decades there are variable publications which confirm increased interest of scientists and many researches about role of reactive forms of oxygen in daily activity [1]. And nowadays in the literature are available many experimental and clinical data in this area, but these works are mainly related to various ways of application of high concentrated oxegen [3]. Therefore, the impact of high-concentrated oxygen inhalations in the form of breathing mixture, its safety and efficacy for life quality, level of hospitalization and mortality is an important issue of modern medicine.

The purpose is to study the efficacy of high concentrated oxygen administration for life quality, physical tolerance and level of hospitalization at the patients with ischemic heart disease.

## MATERIAL AND METHODS

In the study were included 100 people (with age from 50 to 74 years, mean age is $62.3\pm8,52$ years, 50 male, 50 female) with ischemic heart disease and heart failure II-III functional classes (NYHA). All persons subscribed informed agreement form before including in the study.

The study was conducted throughout the year. At the beginning and at the end of the observation period, the following examinations were performed on patients: 1) history data collection; 2) physical inspectin; 3) electrocardiography; 4) cardiac ultrasound examination; 5) laboratory tests. All was set according to the recommendations of the European Society of Cardiology (ESC).

Throughout the observation period, daily, by telemonitoring, blood pressure, heart rate (YR), respiration rate (RR) and pulse oximetry were monitored.

The groups were comparable by gender and age. Criteria for exclusion from the study were: unstable angina, myocardial infarction or stroke in the last two months, uncontrolled hypertension, brain tumors, severe concomitant pathology.

The study of quality of life was based on the analysis of patients' assessment of disease-related limitations using the MLHFQ questionnaire [2] and inquiry form SF-36. The MLHFQ questionnaire contains 21 questions. To answer each question, the patient was asked to use a scale that corresponds to the severity of certain disorders in ascending order. The maximum score of the questionnaire (105) corresponded to the worst, and 0 points - the best QOL.

The SF-36 questionnaire included 36 items spread over eight scales, each ranking from 0 to 100 points (100 - complete health), with the final score of each scale having its own value. The scales were grouped into two separate integrated indicators - the "physical component of health" (PhCH) and the "psychological component of health" (PsCH).

Examination of patients also included a 6-minute walk test. To assess exercise tolerance, a test with a 6-minute walk was performed. Testing was performed according to the protocol American Thoracic Society [4]. All patients performed the test in the morning, not earlier than 3 hours after a light meal use. Before the test, patients rested for at least 10 minutes. At this time, checked for contraindications to the test and conducted instruction. At the end of 10 minutes of rest, non-invasive blood pressure was measured with a manual mechanical tonometer Little Doctor LD 91 (Singapore) according to standard methods. Heart rate and pulse oximetry were determined using a fingerprint oximeter MD300 C1 (China). The test time was monitored with a stopwatch. Patients were divided into two groups by randomized method. In group 1 (n=50) were used standart therapy of ischemic heart disease, including statins and antiplatelets, ACE-inhibitors, ß-blockers and nitrates dependently to the clinical signs. In group 2 it was added inhalations with high concentrated oxygen (Tesla's Secret by Eco Medical Europe Ltd Oxygen Breathing Mixture, Natural, n=50). For oxygen inhalation it was used the spray can with 98% oxygen (Tesla's Secrets) and built-in a plastic mask for comfortable inspiration. Inhalation was conducted with 3 breathing per minute three time (totally - 3 minutes) three times per day during 1 year.

For statistical analysis we used Statistica for Windows Version 10.0 (Stat Soft inc., USA). The methods of descriptive statistics are the mean and standard error of the mean, the data are presented as $M\pm m$ for continuous variables, fractions for qualitative variables. To determine the differences between the studied groups by nominal variables, the $\chi2$ Pearson criterion was used. To analyze events taking into account the time before their occurrence, we used the Kaplan - Meyer survival analysis method (the difference between the groups is shown by the Gehan criterion), and to assess the influence of the parameter on the probability of an event occurring per unit time, the Cox regression proportional risks method was used. At the case of $p<0.05$, differences were statistically significant.

## THE RESULTS OF THE STUDY

As can be seen from Table-1, one year after the start of the controlled follow-up, the quality of life of patients who used inhalations of highly concentrated oxygen daily in combination with the main treatment (group 2) was likely to improve ($p<0.05$). Improving the quality of life of SF-36 was due to its components: PF, RP, BP and GH, PF. Improving PF after 3 months achieved by increasing exercise tolerance ($p<0.05$). Also, after a year of prospective observation, the RP indicator increased, which was due to an increase in tolerance to work and a decrease in difficulties in its implementation ($p<0.05$). One year after daily administration of inhalations of highly concentrated oxygen in addition to basic treatment, an increase in BP indicated a decrease in pain, which accompanied the daily activities of patients ($p<0,05$). There was also a probable improvement in GH, possibly due to some improvement in physical condition, a reduction in heart failure, and greater satisfaction with one's health, Table-1.

**Table-1: Quality of life of patients according to the SF-36 questionnaire in the dynamics of observation**

| Parameters | Basic treatment n=50 | | Basic treatment+ Oxygen inhalations n=50 | |
|---|---|---|---|---|
| | *Initial* | *After 1 year* | *Initial* | *After 1 year* |
| **PF** | 47,3±12,3 | 50,3±11,2 | 49,6±12,7 | 61,6±4,44[1,2] |
| **RP** | 27,0±7,98 | 30,25±8,94 p>0,05 | 25,4±7,57 | 40,8±7,63[1,2] |
| **BP** | 19,5±5,81 | 36,0±9,06[1] p<0,05 | 19,6±4,28 | 46,1±11,2[1,2] |
| **GH** | 40,5±13,5 | 43,2±8,30 | 40,4±9,1 | 56,0±7,83[1,2] |
| **RE** | 41,3±9,26 | 44,1±10,1 | 38,3±9,1 | 48,2±9,0[1,2] |
| **VE** | 40,8±8,62 | 57,1±11,0[1] | 42,7±7,65 | 61,1±11,5[1,2] |
| **MH** | 46,4±10,7 | 60,5±10,9[1] | 45,7±9,6 | 65,9±7,30[1,2] |
| **SF** | 36,9±7,39 | 51,7±9,71[1] | 44,9±12,3 | 56,0±10,6[1,2] |

*Note:*

(1) - The probability of the difference in the dynamics of treatment;

(2) - The probability of the difference between indicators between group 1 and group 2.

The improvement in quality of life was also due to improved components: VT, SF, RE and MH. The mean VT score of patients in group 2 was probably higher than in group 1 (p<0.05), and patients' own physical condition was subjectively perceived much better. Patients felt more energetic and reported a decrease in fatigue (p<0.05). There was also a subjective improvement in SF, RE and MH (p<0.05). As a result of subjective improvement of quality of life, increase of social activity of patients and significant refining of their physical and emotional state, amelioration of all psychological components of the SF-36 questionnaire was noted (p<0.05). A significant increase in RE probably meant that patients' emotional state improved so much that they were able to perform a significant part of their daily work, slightly limiting the time of its implementation and almost without changing the quality of performance (p<0.05). Thus, the results of QOL analysis in patients according to the SF-36 questionnaire proved the effectiveness of complex therapy with the addition to the main treatment of inhalations of highly concentrated oxygen (p<0,05), Table-1.

The improvement of quality of life according to the MLHFQ questionnaire was also found in the observation groups, Table-2.

**Table-2: Quality of life of patients according to the MLHFQ questionnaire in the dynamics of observation**

| Parameters | Basic treatment n=50 | | Basic treatment+ Oxygen inhalations n=50 | |
|---|---|---|---|---|
| | *Initial* | *After 1 year* | *Initial* | *After 1 year* |
| **Total number of points** | 66,2±6,16 | 61,4±4,12[1] | 65,8±6,56 | 44,5±4,61[1,2] |
| **Physical component of health, points** | 29,3±3,72 | 25,3±2,91[1] | 35,1±7,34 | 24,6±5,21[1,2] |
| **Psycological component of health (emotional), points** | 31,5±5,46 | 28,4±6,23 | 27,2±4,91 | 20,2±4,67[1,2] |

*Note:*

(1) - The probability of the difference in the dynamics of treatment;

(2) - The probability of the difference between indicators between group 1 and group 2.

The results of a 6-minute walk test are shown in Figure-2. During the year of observation, both groups showed significant changes and improved test results with an increase in the distance traveled (in group 1, from 335.8±34.6 to 378.2±25.4 meters, p<0.05, in the second group - from 324.2±22.8 to 412.7±35.1 meters, p<0.05). A more significant increase was observed in group 2, $p_1$<0.05, Fig-1.
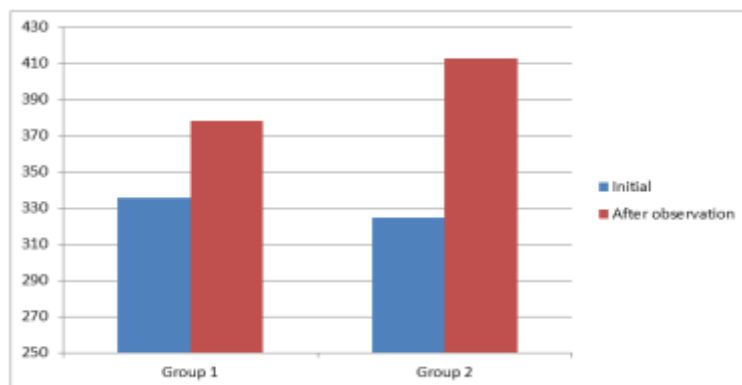


**Fig-1: The dynamics of the changes of the indexes of 6-minute walk test in observational groups.**

According to the Kaplan-Meyer survival comparative analysis of the cumulative frequency of the endpoints (survival and hospitalization) of patients in the groups, a significant discrepancy between the $1_{st}$ (blue curve) and $2_{nd}$ (red curve) observation groups can be noted, Fig-2.
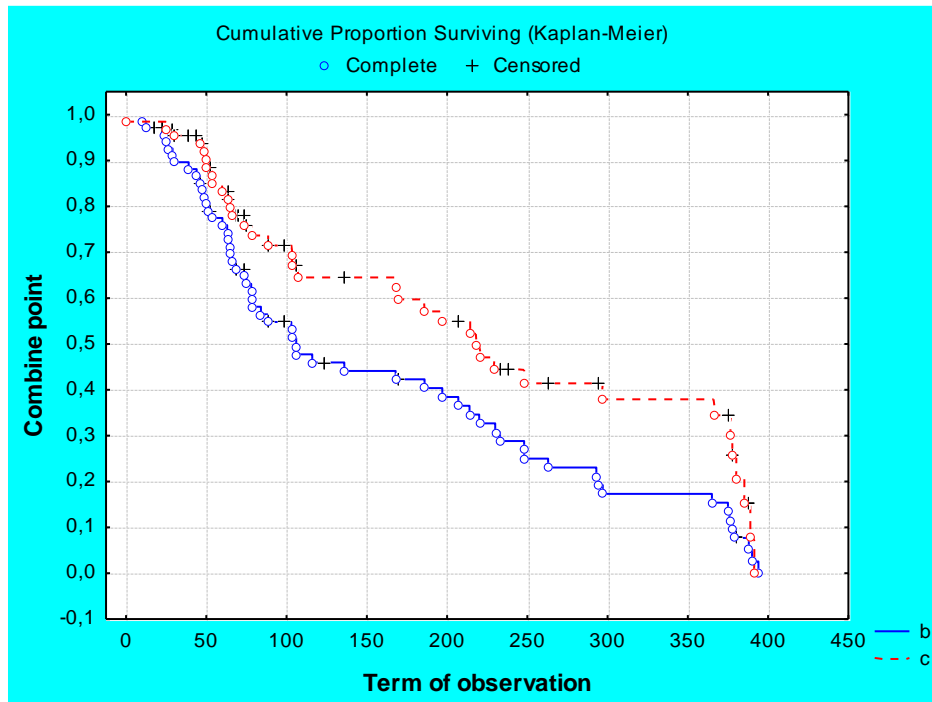


**Fig-2: Kaplan-Meyer curves with combined end points within 1 year after observation**

The numerical expression of the probability of cumulative frequency of endpoints in patients with heart failure within 1 year after the start of prospective observation in table 3.

**Table-3: Absolute and relative risk of re-hospitalization and mortality rate in patients with heart failure in the observation groups**

| Parameters | AR, % | RR [CI%95] | OR [CI%95] |
|---|---|---|---|
| Group 1 | 26,0 | 1,63 | 1,84 |
| Group 2 | 16,0 | [0,74-3,58] | [0,69-4,95] |

The absolute risk of the combined endpoint in the group where inhalation of highly concentrated oxygen was used was 16.0% versus 26.0% of the control group, i.e. the effectiveness of combined treatment with inhalation of highly concentrated oxygen in patients with heart failure to reduce the incidence of clinically important cardiovascular events is 10%, $p < 0.05$ (Table-3).

## CONCLUSIONS

1. One year after the start of controlled monitoring, the quality of life of patients who in combination with the main treatment used daily inhalations of highly concentrated oxygen, probably improved ($p < 0.05$) due to all its parts of the physical component of health, RP, BP, GH). The improvement in quality of life was also due to the refining of the parts of the emotional component of health (VT, SF, RE and MH, $p < 0.05$).
2. In both groups of observation, the quality of life was improved according to the MLHFQ questionnaire - the total number of points ($p < 0.05$), the number of points in the physical ($p < 0.05$) and emotional spheres ($p < 0.05$).
3. During the year of observation, in both groups, significant changes and improvement in the test results with a 6-minute walk were observed with an increase in the distance traveled (in group 1, from 335.8±34.6 to 378.2±25.4 meters, $p < 0.05$, in the second group - from 324.2±22.8 to 412.7±35.1 meters, $p < 0.05$). A more significant change was observed in group 2, $p_1 < 0.05$.
4. According to the Kaplan-Meyer survival analysis of the cumulative frequency of endpoints (survival and hospitalization) of patients, a significant discrepancy between the observation groups can be noted. The absolute risk of the combined endpoint in the group where high-concentration oxygen inhalations were used was 16.0% versus 26.0% of the group control. The effectiveness of combined treatment with the inclusion of inhalation of highly concentrated oxygen in patients with heart failure to reduce the incidence of clinically important cardiovascular events was 10%, $p < 0.05$.

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