

Arterial Dysfunction Affects the Function of Solitons in the Human Heart

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Abstract:

Arteries in the body have a transport function, and their degeneration occurs while performing this work. Blood distributed to all organs is rich in various types of nutrients that are deposited on the walls of arterial vessels. These include protein, calcium salts and fat, including the most well-known lipid for its role in the genesis of deposits – cholesterol. Deposits accumulating on the walls of vessels cause insufficient blood to flow through the arteries, which leads to hypoxia, dysfunction and even destruction of individual organs of the human body.

A decrease in the diameter of arterial vessels leads to disruption of quantum processes in the stretching and contraction of arterial walls. There is a significant change in the parameters of the electric field in biological piezoelectrics and pyroelectrics. An artery with atherosclerotic plaques shows different elasticity than an artery without deposits. There is a different electric field in the piezoelectric protein [6] located in the artery wall, which affects the proper functioning of the arteries. The electric field is a carrier of solitons, which play the most important role in the functioning of the heart. A heart without solitons was not able to function [1], [2], [3], [4], [5].

The human biological system is an integrated circuit made up of piezoelectric components, pyroelectric and protein semiconductors, nucleic acids, DNA, RNA and melanin. In this integrated biological system, there is a central system for generating energy solitons in the heart, which is responsible for the energy balance of life and the functioning of the entire biological system, as well as all kinds of emotional states and health of the Person. [1].

Keywords: atherosclerosis; arterial degeneration; non-linearity of heart rhythm and quantum processes – solitons; venous transport; coronary processes; healthy diet; healthy microbiome

Introduction

Cardiovascular diseases are associated with damage to organs and tissues that make up the cardiovascular system (heart, blood vessels – arteries, veins and capillaries). They are the most common cause of death, which is why they are a very serious problem of modern times, and for this reason they are called civilization diseases.

Disorders in the arteries depend on changes - metabolic, hormonal, inflammatory, neurological, and especially on quantum and information processes, in which solitons, spins and electric fields play an important role. Regardless of the etiology, the formation of pathological changes lead to various heart diseases. [5], [7], [19].

The most common dysfunctions of the circulatory system are:

- 1 Hypertension – is an increased blood pressure above 139/89 mm Hg.
- 2 Heart failure – occurs when the heart is unable to meet the body's need for oxygen and nutrients. The heart pumps less blood to the main vessels.
- 3 Ischemic heart disease – also known as coronary artery disease, is characterized by a reduced supply of oxygen to the coronary arteries, which is associated with severe chest pain and a feeling of crushing in the chest. The pain intensifies in a stressful situation, as well as during physical exertion.
- 4 Heart attack – as a result of hypoxia, necrosis of part of the heart muscle occurs. The most common cause of hypoxia is coronary

- artery occlusion. The main reason for the closure of coronary arteries is atherosclerotic plaque or their calcification.
- 5 Stroke – is a severe swelling and hypoxia leading to the death of part of the brain due to the cessation of blood supply to the cerebral vessels.
 - 6 Atherosclerosis – this is the deposition of lipid deposits in the walls of the arteries, which can lead to the gradual closure of the lumen of the vessels and, as a consequence, to hypoxia of the organs.
 - 7 Rheumatic of the heart – is an autoimmune disease that not only affects the joints, but also the heart, most often due to autoaggressive dysfunction of the immune system.
 - 8 Cardiac arrhythmias – this is a condition in which the heart rhythm is disturbed. These may be bradyarrhythmia (slow heart rate - 60 beats/min) or tachyarrhythmia (accelerated heart rate >100 beats/min).
 - 9 Varicose veins – excessive widening and twisting of the veins. Venous valve dysfunctions cause Blood flow to be impaired and much slower.
 - 10 Thrombophlebitis – due to impaired blood flow in venous vessels A clot (platelet aggregation) forms. Detachment of the clot leads to the formation of a dangerous embolism that can travel to the heart or lungs and cause a heart attack or lung infarction.
 - 11 Peripheral artery diseases – narrowing of the lumen of the artery except for the aorta, coronary arteries and brain arteries. It can be caused by atherosclerosis, blood clot, inflammation, or a defect in the anatomical
 - 12 An aneurysm is a local dilation of blood vessels (usually an artery), under the influence of blood pressure. Its rupture threatens severe hemorrhage and death [18]

In the human biological system, blood moves in ordered layers (laminar), which minimizes friction and energy losses. In large arteries (e.g. the aorta or femoral arteries), blood moves three-dimensionally, spinning clockwise, or vice versa. This phenomenon can be considered as the process of generating water solitons [4], [20], [21].

Traditionally, laminar blood flow is described by Poiseuille's law, where the velocity profile is parabolic (fastest in the center, slowest at the walls of blood vessels). The spiral motion is the result of the twisted anatomy of the heart (the left part of the heart) and the natural arches and branches of the vascular system. The spiral movement stabilizes the flow, preventing dangerous turbulence (blood turbulence) at the sites of vascular branching. Thanks to rotation, the blood evenly washes the walls of the vessels. This prevents the formation of areas of stasis and low shear stress, which are the main factor contributing to the deposition of atherosclerotic plaque. Irregular movement, "goating" of blood cells, mixing of layers and the formation of turbulence, this happens at higher blood flow velocities, narrowing of blood vessels (e.g. atherosclerosis), or in places of branching (e.g. arteries), which results in heart disease. Medical engineering designs vascular prostheses (stents, by-passes) that should force spiral blood flow [20-22] to improve their patency and durability [20,21,23].

Forcing the spiral blood flow is a thread other than generating water solitons, stable spiral motion conditions the energy and information balance of the biological system, turbulence again, disrupts this system. An important role in this process is played by the electric field formed

from biological piezoelectrics, pyroelectrics and ferroelectrics. The electric field is the carrier of solitons [5]

The action of solitons and spins in the human biological system provides the basis for seeing psychobiological processes in a different light than biology, psychology and medicine do today. Spin and soliton waves create a different picture of the world from the electromagnetic wave received by the receptor of sight. Solitons generated in the heart are responsible for the activity of heart rhythms, but also for emotional states in humans. They stabilize mental states and keep them in a certain balance. They shape our inner world [1], [3].

It can be concluded that we are dealing with a second center that creates a structure image of the world and is responsible for the psychophysical development of a person, health and disease. [1-5], [40]

Contemporary biosystems in science are considered at the level of corpuscular structures, omitting energetic and informational structures. Shifting the cognitive emphasis towards energy and information structures, the organism can be perceived as a quantum generator of electromagnetic, acoustic, soliton, spin and bioplasma information.

2. Quantum process in heart work

Scientists from the University of Washington investigated the ferroelectric properties of the tropoelastin protein [26]. Elastin, as a key protein found in connective tissues, is an important structural component of the lungs, heart and arteries, is ferroelectric [24], [25], performs important physiological functions in blood vessel morphogenesis, homeostasis and in the regulation of cell function [15].

It provides the necessary flexibility and resilience to the aorta, lungs, ligaments and skin subjected to repeated mechanical and physiological stresses [28], [29], [26],

Ferroelectric polarization of elastin has an effect on the proliferation and organization of smooth muscles, vessels and contributes to the morphogenesis of the arteries [30], [6]

Ferroelectric switching can help suppress increased pulse flow and blood pressure in the arteries to reduce distal pulse strain. Elastin polarization may also help regulate vascular smooth muscle proliferation and organization and contribute to arterial morphogenesis [30]. One of the nucleic bases, thymine, is ferroelectric and therefore piezoelectric in crystalline form [7]. There is a huge unknown field to explore in order to gain a basic understanding of biological ferroelectricity.

3. Soliton picture of functioning in the human biological system

Solitons are independent waves, they are a solitary moving impulse of high power, which is not blurred during contact with another particle, wave, or field. A soliton is an isolated running wave, the shape and speed of which do not change with the distance traveled and after collisions with other solitons. It can be formed in nonlinear dispersion media, in those where the phase velocity of the wave depends on its frequency. The phenomenon of dispersion causes the duration of the pulse to increase with the distance traveled [20,10,9].

Nonlinear dynamics are common in nature, hence nonlinear waves are ubiquitous. For the first time, in 1834, John Scott Russell observed a solitary wave in nature on the Union Canal. He called this wave the "great translational wave" and conducted extensive experiments to study its properties. However, this lone wave is considered a fundamental property

of nature that dates back to the beginning of the universe and can be as old as the inflationary age. A lone wave can be induced in a wide range of systems, such as aqueous medium, plasma, acoustic medium, magnetic medium, dielectric medium, biological systems, etc. [31].

Nonlinear waves, namely tsunamis, red waves, and solitary waves, are commonly observed in the aquatic medium. In biological systems, the occurrence of nonlinear waves has been observed in the propagation of nerve impulses, which play an important role in the transmission of genetic information [32].

There are solitons of light, water, and sound that can interact strongly with other solitons, but after this interaction, the form and structure remain unchanged. This means that they permeate each other without losing their identity [11], [13], [33].

An acoustic soliton is a non-linear sound wave that travels over long distances without changing its shape and speed. They are formed as a result of the final equilibrium between nonlinearity and wave dispersion, or specific conditions of the medium. It has been noticed that a soliton can generate an electromagnetic wave, or absorb it, which gives the creation of a continuous medium of conduction and transmission of information over a distance. Acoustic solitons - occur much less frequently than optical solitons, because they require specific conditions of nonlinearity of the medium (e.g. in crystals or plasma). [35],[36], [37], [16], [8].

These are pulses of light, or beams, that do not change their shape during propagation in nonlinear media, such as optical fibers or crystals.

They are formed by the equilibrium between group velocity dispersion (pulse blurring) and nonlinear phase automodulation (Kerr effect), which focuses the pulse. They are often described using the Korteweg-de Vries equation (KdV). In the biological system, they are generated by the heart valves.

4. Abnormal development of heart valves

Abnormal development of heart valves in the prenatal period leads to congenital heart defects

Valve regurgitation (regurgitation of the valves) is a condition in which the heart valve lobes do not close completely. It can affect any of the four valves in the heart: mitral, aortic, tricuspid, or pulmonary. Trace (small) regurgitation can be physiological and healthy, but a large defect puts a strain on the heart. Valve regurgitation occurs when the valve lobes do not contact properly. Blood flows back into the ventricle or atrium, leading to serious changes in the heartbeat. Excessive stretching of muscle fibers causes the heart to lose its contractility. Disorders that lead to dangerous arrhythmias, such as atrial fibrillation or ventricular tachycardia, appear. Around deformed valves and dilated atria, blood turbulence appears, which favors the exposure of thrombus. Deformed valves can lead to a detached clot being able to block an artery in the brain.

5. The process of calcification (calcification) is the loss of material nonlinearity.

When the valve lobes stiffen as a result of calcification, they stop opening properly and synchronously, reducing the valve exit field (EOA). Blood flow changes from a laminar (smooth) process to a turbulent (turbulent) process. Inside the flaccid earlier valve lobes, hard, crystalline hydroxyapatite nodules are formed. They become a durable, rigid and

isotropic material, which, as a result of stress, leads to the destruction of the valve, and:

1. Destruction of blood components (Hemolysis and Thrombosis): Turbulence resulting from changes in stress (Reynolds shear stresses) Nonlinear forces are produced that destroy red blood cells (hemolysis). These forces cause red blood cells to break, activate platelets (platelets) and damage the aortic endothelium, leading to harmful lesions.
2. Heart murmurs: The acoustic chaos caused by turbulence is transmitted to the chest. This turbulent movement of blood is heard by the doctor through a stethoscope as a characteristic jumping murmur (a symptom of narrowing of the aortic part).
3. Extinguishing of vortices (turbulence) is sometimes associated with the implantation of a new valve. In a new valve, the blood stream is considered smooth and layered (laminar). The nonlinear shear forces that previously destroyed red blood cells and aortic walls disappear.

Conclusion

The excitation of a soliton requires an abrupt change in any variable, these can be voltage pulses (commonly used in electrophysiology), mechanical stimulation, pH drops, temperature decreases [38], and other sudden stimuli that increase the phase transition temperature. [39]. Currently, none of these changes are taken into account in the process of heart functioning. Pyroelectric, ferroelectric, and piezoelectric processes play a significant role in the functioning of the heart, which are responsible for generating the electric field responsible for directing solitons. When the valve lobes become stiff and covered with hepatitis, they stop opening properly and synchronously, reducing the valve exit field (EOA). Blood flow changes from laminar (smooth) to turbulent (turbulent), which disrupts the proper functioning of the heart. There is a transition from hyperelasticity to linear stiffness. The valve loses its initial flabbiness phase.

The tissue becomes stiff even with blood pressure, which drastically increases the resistance that the heart and blood have to overcome through the valve. Excessive stretching of heart muscle fibers causes the heart to lose its contractility. Disorders that lead to dangerous arrhythmias, such as atrial fibrillation or ventricular tachycardia, appear. Around deformed valves and dilated atria, blood turbulence appears, which promotes the exposure of thrombi. Deformed valves can lead to a detached clot blocking an artery in the brain. The process of turbulence changes the function of solitons, which lead to heart disorders. This particular threat of sudden coronary death occurs in patients with metabolic diseases such as diabetes [27] and an overdown microbiota and not positive microbiota intestinal good species microflora level in gut's, which does not produce sufficient amounts of natural medium-saturated intermediate-chain fatty acids SCFA [34] and propionic and butyric acids and butyrates and vitamins, that have a positive effect on the heart and brain as the intestinal-brain-heart-vascular (axis) which is related to poor diet, including a small supply of adequate fiber as a eat prebiotic in diet or generally unbalanced human diet. [17].

Because the pulse is controlled by solitons, and electric and magnetic fields condition the functioning of solitons. [12], [3]. Arterial stiffness, or reduced elasticity of blood vessel walls due to metabolic diseases and poor supply of SCFAs, affects the ability to generate and maintain solitons

- as the basic carriers of heart rate, resulting in abnormal dynamics in the bloodstream in the human body. Such an interdisciplinary approach to the problem of cardiovascular diseases offers potential new possibilities for their treatment, starting from a simple diet affecting the microbiome and thus healthier blood vessels and the heart, to advanced vascular and cardiac interventions that should take into account the role of soliton quantum mechanics in cardiac surgery. In addition, the issues shown here should be applicable in the design of new implants such as cardio - valves or stents of the new generation...

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