



Nahirniak V.M.

ESTIMATE OF THE EFFECT PRODUCED BY THE AUTOMATIC VIBRATORY MASSAGE ON THE FUNCTION OF CARDIOVASCULAR SYSTEM

*Department of Biological Physics and Medical Informatics
Higher state educational establishment of Ukraine
“Bukovinian State Medical University”*

The results of our previous studies demonstrated the substantial increase of the arterial blood pressure in patient who underwent the session of a low frequency vibrational massage. We were wondering how it may affect the observed positive therapeutic results from the massage.

It is well known that the blood pressure is affected by several factors including peripheral resistance and elasticity of vessels, blood volume in circulatory system, and cardiac output of a heart.

Firstly, blood volume affects blood pressure. When there is a greater volume of fluid, more fluid presses against the walls of the arteries resulting in a greater pressure. When there is less volume, there is less pressure.

Secondly, anything that decreases cardiac output, also decreases blood pressure, because there is less pressure on the vessel walls. An increase in cardiac output results in increased blood pressure. Anything that affects heart rate or stroke volume affects cardiac output and thus blood pressure.

Mathematically, it can be demonstrated in the following way. We used the Hagen–Poiseuille equation to model the blood flow in arterial portion of circulatory system:

$$p = \frac{8\eta \cdot L \cdot Q}{\pi R^4} \quad (1)$$

where p – is a blood pressure, Q – is a cardiac output (CO), η – is a viscosity of blood, L – is a blood vessels' length, and R – is an effective radius of blood vessels. Cardiac output is a product of a stroke volume (SV) and the heart rate (HR):

$$CO = SV \times HR \quad (2)$$

In our experiments we observed the increase in blood pressure and the following increase in stroke volume as it follows the equation (1). The change in heart rate was marginal and we neglected its change.

The resulting increase in volumetric rate Q of the circulating blood provides necessary nutrients and oxygen for tissues and cells. In our opinion, this short-term intense functioning of a cardio-vascular system explains the invigorating and therapeutic actions of low frequency automatic vibratory massage of a whole body.

Olar O.I.

THE HAZARDS OF 5G TECHNOLOGIES TO HEALTH

*Department of Biological Physics and Medical Informatics
Higher state educational establishment of Ukraine
“Bukovinian State Medical University”*

Mobile communication is becoming the basis of economy and social life, and requires new standards that can provide virtual reality, the Internet of Things, intellectual medicine (e.g. the possibility of patients' physiological indicators monitoring, the health status of cancer patients monitoring, etc.).

It is a well-established practice in the world every 10 years to provide a new generation of cellular communications. The first generation was emerged in the early 1980s, and in 2009 world gained access to 4G Internet. The generation of 5G can become a reality in 2020 in Ukraine too. The necessary Presidential Decree on the Fifth Generation Mobile Communications Conditions in Ukraine has been signed and the Ministry of Infrastructure started testing 5G in April, 2019.



Since April 2019, South Korea has been created the first in the world a new-generation national network. 5G is already operational in the USA, Japan, China and Switzerland, and next year 5G will receive 35 European cities.

Experience shows that both low and high frequencies are required to provide the coverage and high speed and network capacity, respectively. Previous generations of communication standards use frequencies of 1-5 GHz and 5G towers operate in the 24-90 GHz range.

Today, electromagnetic pollution of the environment is an objective reality and it increases in magnitude. The mechanisms of its influence, including those from mobile communication stations, have not been completely understood yet. In 2014, the World Health Organization stated that "no adverse health effects caused by the use of mobile phones have been identified." However, in 2011, WHO, together with the International Agency for Research on Cancer, classified all radio frequency radiation (part of which is mobile signals) as "possibly carcinogenic". The spread of cancer and cardiovascular diseases including fatal results are wide observed in high-technologic countries. This is a result of the negative influence of different factors, including the electromagnetic pollution, which manifests itself at the cellular and at the level of the human body as a whole.

Sanitary standards are the maximum permissible exposure levels of the power flow. Appearance of the latest technologies has necessitated a revision of standards for pollution in many countries. For instance, permissible radiation levels of mobile base stations in Ukraine in 2016 were the most stringent in Europe - $2.5 \mu\text{W} / \text{cm}^2$, today - $10 \mu\text{W} / \text{cm}^2$, in Russia until 2009 - $2.0 \mu\text{W} / \text{cm}^2$, today - $10 \mu\text{W} / \text{cm}^2$, Hungary - $10 \mu\text{W} / \text{cm}^2$, USA, Scandinavian countries - $100 \mu\text{W} / \text{cm}^2$.

The repatriation of 5G networks will seriously increase the already high level of maximum permissible levels. The hazards of 5G to our health are that the antenna network will be very dense both outside and inside of buildings. This setting is necessary for signal distribution since 5G waves are short in length and cannot propagate through buildings and other obstacles.

Increased levels of EM pollution will be manifested in the occurrence of problems with infertility, nervous disorders, decreased immunity and general well-being, impaired DNA structure, etc.

There is not enough research to estimate the damage of 5G networks because it takes time. Today's life requires high-speed technologies, and humanity seeks to have them, even at the cost of their own health. Therefore, the exhaustive work of physicians and physicists is exhausting.

Бірюкова Т.В.

ЛАЗЕРНА КОРЕКЦІЯ ЗОРУ

Кафедра біологічної фізики та медичної інформатики

Вищий державний навчальний заклад України

«Буковинський державний медичний університет»

Зір для людини є ланцюжком, який з'єднує нас із навколишнім світом, допомагає мозку отримувати візуальну інформацію (90% від усієї інформації) для орієнтації в просторі, дозволяє одержати характеристики предметного світу, такі як форма, колір, розмір, отримати яскраві враження про весь світ. З підвищеним ритмом життя в сучасному суспільстві багато людей страждають вадами, втратою зорової функції, тому їх відновлення є актуальним. Існують різні методики корекції зору, які мають недоліки та переваги: носіння окулярів: переваги – доступність, відсутність подальшого прогресу хвороби; недоліки – запотівання скла очок, спадання, обмеженість можливості ведення активного способу життя; контактна корекція (лінзи): переваги – можливість використовувати вироби планової заміни, одноденні варіанти, ведення активного способу життя; підвищення якості зображення на відміну від окулярів; підвищення гостроти зору без спотворення картинки; недоліки – алергічні прояви, порушення надходження кисню до рогівці, сухість очей, ризик травмування при надяганні та знятті, вартість послуги, наявність протипоказань; оперативне втручання: переваги – повне відновлення зору після проведення операції; недоліки – імовірні ускладнення в післяопераційний період.