

Autonomic Nervous System Disorder Due to Exposure RF Jamming

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Abstract

Background: The study of Heart rate is very important the body heart is directly related to heart rate ,the autonomic cardiovascular examination provides necessary information about function of the autonomic nervous system as well functional capacities of effectors heart and vessels and other associated part with radiation .

Objective: To study the effect of jammer on autonomic nervous system as measured by heart rate.

Patients and Methods: Heart rates of 10 males (age 21-51 years), and 10 females (age 20-54 years) were measured and recorded before, during using jammer for 15 minutes, 30 minutes, and 45 minutes, and one hour after shutting down the device .

Results: The results clearly indicate that jammer radiation induced high fluctuations in heart rate variability of recovery period (after15 minutes using jammer) and show that the change of heart rate variability signal during jammer exposure is not permanent. There was no statistically significant difference observed in heart rate.

Conclusion: The heart rate flection resulting from exposure to radiofrequencies of jammer are depending on the orientation of both electric &magnetic field of the electromagnetic radiation, the greater increase in heart rate that occurred during E orientation irradiation.

Keywords: heart rate variability, radio frequency radiation, RF jammer, autonomic nervous system.

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Introduction

The study of Heart rate is very important the body heart is directly related to heart rate. The heart rate changes for the purpose of maintaining balance, where the S-A node and spontaneous excitation of the S-A node are stimulated by autonomic nervous system[1]. The heart rate is controlled by contradictory work of the sympathetic nervous system and

parasympathetic nervous system [2]. Mobile jamming devices in the RF field for the purpose of blocking mobile communications (transmission, receiving).Mobile jammers are used in universities during exam periods to prevent students from cheating. The study proved that exposure to radio waves caused a change in the automatic balance and affect

the heart rate [3]. The autonomic cardiovascular examination provides necessary information about function of the autonomic nervous system as well functional capacities of effectors heart and vessels and other associated part [4]. And it can use for cardiovascular system observation investigation in healthy citizen, adult patients with different diseases and for the diagnosis of autonomic dysfunction. One generally cardiovascular test in clinical practice used is the postural change manage, which is founded on the mensuration of heart rate reflex changes in response to suitable stimuli [5].

Where heart rate variability was refer to indicator of autonomic nervous system activity, backup this idea. At 50 Hz, 28 μ T Electric Motive Force exposure, its observed a decrease in the low-frequency band that inspire an increase in sympathetic nervous system activity. we proposed that the increase in sympathetic nervous system activity recompense for the decrease in heart rate regarding to the EMF exposure. we attempted to induce more substantial alterations in the Electro Cardio Gram using passive case to generate increased sympathetic neural control with minimized physiological trouble, but we observe indications of autonomic compensation using this mode [6]. Heart rate variability is a conventionally accepted term to dispatch the inconstancy in the intervals between consecutive heartbeats, which are related to effected of the autonomic nervous system on the (SN) [7], [8]. Cut-price heart rate

variability, a sing of poor persons cardiac autonomic function, its associated with air pollution, especially fine particulate. [9]. The study showed a little increase in heart rate and irregularity during exposure to radio waves due to modification in the response of the sympathetic nervous system and the parasympathetic autonomic nervous system [10]. A study stated that the sympathetic tenor was lowered, while parasympathetic tone was optional to be increased in persons during cell mobile call, thus adapting the operative of circulatory system. High focus of renin-angiotensin was described to lead to important baroreceptor-mediated Brady cardiac [11].

A study reported that rats uncovered to radio frequency for 2hrs or 3hour s/day for 4 and 8 weeks displayed that the heart rate was significantly reduced. Reduction in the heart rate maybe is explained by an increase in plasma renin activity and parasympathetic tone in these animals [12], [13]. A reading observed that exposure of humanoid and experimental animals to Electric Motive Forces has a negative effect on the heart and blood vessels by make happen a histopathological changes and disturbances in the functions of the organs of the (CS)[14]. The temperature of the human body is elevating during exposure to electromagnetic radiation [15]. Heat provides relaxation in the autonomic nervous system [16]. The studies found that the high and uncomfortable temperatures increase the activity of the nervous system and lead to fluctuations in the heart rate, manifested as changes in heart rate

variability. Diastolic blood pressure leads to rise during the winter season compared to summer [17], [18]. Study results shows that the sympathetic activity increase in summer weather (High ambient temperature) in healthy subjects.[19]. May be exposure increased sympathetic activity, which was dampen after cold acclimation. Parasympathetic activity presented a minor increase in cold, which was improved after cold acclimation. In supposition cold habituation lowers sympathetic activation and a reason a shift to increased parasympathetic activity [20]. Results of a study propose that heat and massage applications provide relaxation to the autonomic nervous system wanting serious adverse events [21].

The orientations of the human body will affect the maximum magnitude of the made electric field and its supply in human body [22]. Effect of radio frequencies on heart

rate fluctuation depend on positions of the body respect to orientation of electromagnetic radiation (in the case of lying on the back and standing) it was not to be affected when standing and found to be lower in heart rate when lying on the back. This indicates increased activity of the sympathetic nerve when lying on the back [23].

Patients and Methods

The mobile jammer 3G, CDMA , GS (made by china) used in this study, this study was performed in Department of Physiology College of Medicine, Diyala University, in Iraq. Twenty volunteers, 10 males (age 21-51 years), and 10 females between the ages of 20 and 54 were measured and recorded before, during using jammer for 15 minutes, 30 minutes, and 45 minutes, and after one hour of shutting down the device . The mobile jammer device was at a distance of 1m from the volunteers.



Figure (1):Mobile jammer device

Heart rate measurements were performed in five stages:

First: the measurement of the heart rate of the volunteer without exposure to radiation from

the device clamps of communication. Second: Recording heart rate during exposure, and within 15 minutes of exposure. Third: Recording the heart rate during

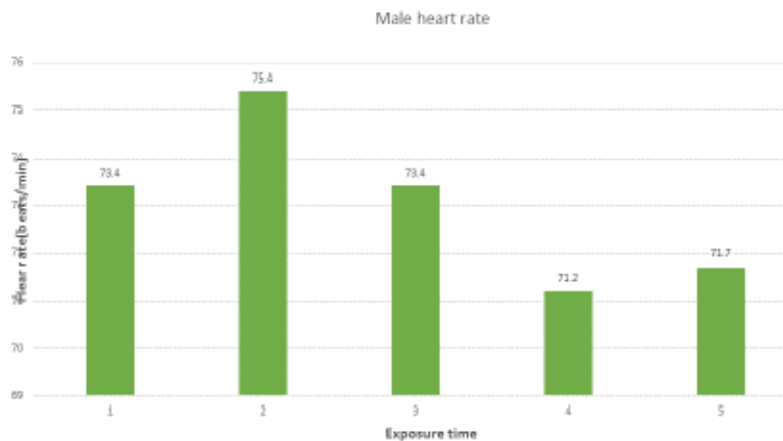
exposure, and within 30 minutes of exposure. Fourthly: Recording the heart rate during exposure, and within 45 minutes of exposure. Fifth: Recording pulse rates after one hour of shutting down the device.

Results

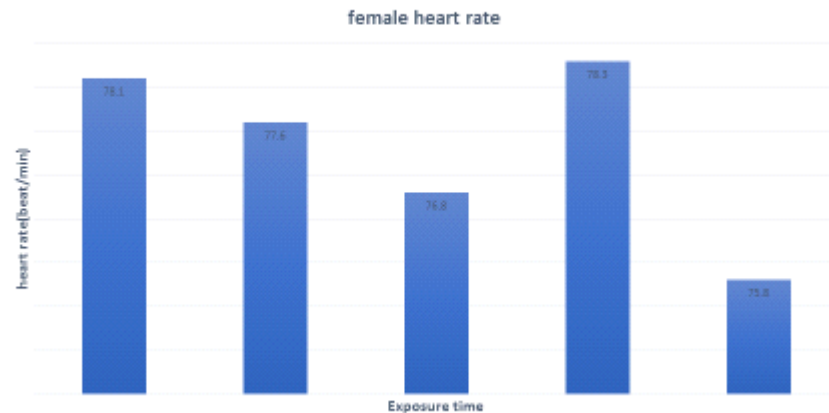
There were no significant differences between heart rate for male before exposure to radio frequency (10 to 20 meter) emitted from jammer and heart rates during exposure (15, 30, and 45) minutes and after one hour without exposure, however, a significant increase on heart rate was observed at 15 minute, decrease heart rats at 30 minutes, and decrease at 45 minute. Also the heart rate

decreases after one hour without exposure to jammer Figure(2).

There were no significant differences between heart rate for female before exposure to radio frequency emitted from jammer and heart rates during exposure (15, 30, and 45) minutes and after one hour without exposure, Figure(3) showed a significant decrease of heart rate at 15 minute, but no differences were found at 30 minute, and decrease at 45 minute. Also the heart rate decreases after one hour without exposure to jammer. There were no significant differences, in total.



Figure(2):Mean heart rate for conditions,before irradiation,during irradiation at 15,30,45 minutes and without exposure after one hour



Figure(2):Mean heart rate for conditions,before irradiation,during irradiation at 15,30,45 minutes and without exposure after one hour

The results show: fluctuations in heart rate during periods of exposure to jammers for both genders, and decreases in heart rate after one hour without exposure as in Figure(1), and in Figure(2).

Discussion

The result of this study showed statistically insignificant difference in heart rate between male and female before exposure to jammer radiation and during irradiation for the period of (15, 30, 45) minutes, and after one hour post irradiation, Results presented in this study clearly prove that irregular rate when exposed to jammer radio frequency radiation.

Exposure to radio frequency radiation may be effect on heart rate variability and change the autonomic equilibrium. The increase in the sympathetic tenor with associated decrease in the parasympathetic tenor measured incidentally by examination of heart rate variability was observed during exposure to radio frequency radiation

especially in female. Parasympathetic tone may be reduced in male subjects while exposing to radio frequency radiation [24].

Our results are in agreement with previous studies. Exposed to radio frequency for the period of 35 min leads to decrease in heart rate [25]. Also reported that radio frequency exposure does not acutely change heart rate [26]. Exposure to radio frequency before bedtime leads to lower heart rate [27]. Results of analysis of the effect of RF exposure on heart rate fluctuations showed no statistical significance of the effect [25]. The exposure to radiofrequency can cause irregular heart rhythms in male gender because of prolongs the QT interval [28]. Heart rate dynamically responds to interior and exterior worries on a beat-by-beat foundation [29]. The activity of the autonomic nervous system is influenced by changes in the activity of the earth's magnetic field [30]. Changes in geomagnetic and solar

magnetic activity affect the autonomic nervous system, as the heart rate increases with an increase in the solar wind, which increases with the radio flow causing a physiological stress reaction, which in turn increases the activity of the parasympathetic and increase the pulse rate [31]. In this study, it was shown that the exposure to radio frequency radiations emitted from mobile jammers affect the autonomic balance subjects. The electromagnetic field formed by jammer induces heart rate variability changes and disorders in the functions of the organs of the cardiovascular system due to magnetic fields relate with moving charges in cells [32]. Electromagnetic radiation has two components electric and magnetic field, which oscillate in phase perpendicular to each other and perpendicular to the direction of energy propagation and has three possible orientations. (E) the electric field is parallel to the human body, cross-section of human body perpendicular to the incident magnetic field. (H) the electric field is perpendicular to the human body, the magnetic field vector is parallel to cross section. (E) Orientation produces the highest energy absorption for frequencies up to and slightly outside the resonance region. This is because coupling between the human body and the electric field is maximized in that orientation [33]. The greater intense in the heart rate that occurred during E orientation irradiation [34]. Increases in heart rate were related to the rate of temperature change. Increases at most sites measured were significantly faster in E than in H orientation exposure. This

difference in rate of temperature change may partially explain the greater increase in heart rate that occurred during E orientation irradiation.

Conclusions

It can be concluded that exposure to RF jammer changes the autonomic balance and causes the heart rate fluctuations due to the change in the direction of electric field and magnetic field.

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