Research Article/Araştırma Makalesi

NEURO PHYSICAL MECHANISM OF PARKINSON'S DISEASE LINKED WITH WEAK ELECTROMAGNETIC FIELD OF SUBTHALAMIC NUCLEUS INDUCED BY DECREASED CHARGING EFFECT OF NEURENTERIC COIL: PRELIMINARY EXPERIMENTAL STUDY

NÖRO-ENTERİK ŞELALENİN ŞARJ EDİCİ ETKİSİNİN AZALMASIYLA GELİŞEN ZAYIFLAMIŞ SUBTALAMİK ÇEKİRDEK ELEKTROMANYETİK ALAN ŞİDDETİNİN PARKİNSON HASTALIĞINDAKİ NÖRO FİZİKSEL ROLÜ: ÖNCÜ DENEYSEL ÇALIŞMA

Mehmet Dumlu AYDIN[1]✉, Mehmet Kürşat KARADAĞ[1], Mehmet Hakan ŞAHİN[1], Mete ZEYNAL[1], Ali AHISKALIOĞLU[2], Osman Nuri KELEŞ[3], Sevilay ÖZMEN[4]

1. Atatürk University,Medical Faculty, Department of Neurosurgery, Erzurum, TURKEY
2. Atatürk University,Medical Faculty, Department of Anesthesiology and Reanimation, Erzurum, TURKEY
3. Atatürk University,Medical Faculty, Department of Histology and Embryology , Erzurum, TURKEY
4. Atatürk University,Medical Faculty, Department of Pathology, Erzurum, TURKEY

ORCID: 0000-0002-0383-9739, 0000-0001-9123-0597, 0000-0002-5309-4165, 0000-0002-7398-443X, 0000-0002-8467-8171, 0000-0001-7740-8248, 0000-0002-1973-6101

Received/Geliş Tarihi	Accepted/Kabul Tarihi	Published/Yayın Tarihi
19.11.2022	12.12.2022	30.12.2022

To cite this article / Bu makaleye atıfta bulunmak için:

Aydin MD, Karadag MK, Sahin MH, Zeynal M, Ahiskalioglu A, Ozmen S. Neuro physical mechanism of parkinson disease linked with weak electromagnetic field of subthalamic nucleus induced by decreased charging effect of neurenteric coil: preliminary experimental study, Atatürk Üniversitesi Tıp Fakültesi Cerrahi Tıp Bilimleri Dergisi. 2022; 1(3): 80-88

Abstract

Objective: Although the neurophysical mechanism of subthalamic nucleus (STN) stimulation is still unclear, STN with decreasing electric field strength may be re-charged by battery. According to the law defined by Einstein, the unified electromagnetic field (UF) energy formed by the electrically charged Auerbach ganglia co-oscillating with bowel movements, can be transported by afferent nerves to charge the brain, like as battery. This study examines the rationality of this theory. **Methods:** In this study, 18 rats with 360±20 gr weighted were divided into 3 groups according to their intestinal pulsation ranges as: 10±3/GI; 7±2/GII and 3±1/GIII. Auerbach's ganglia density (n/AG/mm3), Auerbach ganglia neuron density (n/AGN/mm3) were estimated by taking 0.5 mm sections at 10 mm intervals from 5 different distances from the midline of the ascending colon; and STN neuron densities (n/STN/mm3) were estimated. The Auerbach ganglia neurons -accepted as vibrating particles- numbers (VPN/mm3) estimated with: VPN=nAxnAG;q the unified field strength (UFS) values formed by Auerbach's ganglia was estimated by UFS=fxVPN equation. UFS and n/STN values were compared Mann Whitney U test. **Results:** VPN/UFS/nSTN values were: (13.345±2.143)/(11.146±1.689)/132.863±12.654 in GI; (11.762±1.843)/(8.434±1.119)/121.371±9.872 in GII and (8.659±903)/(7.109±768) /118.127±6942 in GIII) Statistical results between UFS/nSTN were found as: $p<0.005$ of GI/GII; $p<0.0005$ of GII/GIII and $p<0.00001$ of GI/GIII. **Conclusion:** Electromagnetic energy emitted from the intestinal UFs which created by the Auerbach's ganglia have predestinative role on STN life with mechanisms such as batteries.

Keywords: Parkinson disease, subthalamic nucleus, unifield field, Auerbach ganglia, Neurenteric coil

Özet

Giriş: Subtalamik çekirdek stimülasyonunun (STN) nörofiziksel mekanizması hala belirsiz olsa da, azalan elektrik alan gücü ile STN pil ile yeniden şarj edilebilir. Einstein'ın tanımladığı yasaya göre, elektrik yüklü Auerbach gangliyonlarının bağırsak hareketleriyle birlikte titreşerek oluşturduğu birleşik elektromanyetik alan (UF) enerjisi, afferent sinirler tarafından pil gibi beyni şarj etmek üzere taşınabilir. Bu çalışma, mevcut teorinin rasyonelliğini incelemektedir. **Metot:** Bu çalışmada 360±20 gr ağırlığındaki 18 rat, intestinal pulsasyon aralıklarına göre 10±3/GI; 7±2/GII ve 3±1/GIII olmak üzere 3 gruba bölündü. Çıkan

kolon orta hattından 5 farklı mesafeden 10 mm aralıklarla 0,5 mm kesitler alınarak Auerbach ganglion yoğunluğu (n/AG/mm3), Auerbach ganglion nöron yoğunluğu (n/AGN/mm3) hesaplandı ve STN nöron yoğunlukları (n/STN/mm3) tahmin edildi. Titreşen parçacıklar olarak kabul edilen Auerbach ganglia nöronlarının sayıları (VPN/mm3), VPN=nAxnAG; Auerbach ganglionlarının oluşturduğu birleşik alan kuvveti (UFS) değerleri, UFS=fxVPN denklemi ile olacak şekilde tahmin edildi. UFS ve n/STN değerleri Mann Witney U testi ile karşılaştırıldı. **Bulgular:** VPN/UFS/nSTN değerleri: (13.345±2.143)/(11.146±1.689)/132.863±12.654 GI'de; GII'de (11.762±1.843)/(8.434±1.119)/121.371±9.872 ve GIII'de (8.659±903)/(7.109±768) /118.127±6942 olarak bulunmuştur. UFS/nSTN arasındaki istatistiksel sonuçlar: GI/GII'de $p<0.005$; GII/GIII'de $p<0,0005$ ve GI/GIII'de $p<0,00001$ olarak bulunmuştur. **Sonuç:** Auerbach ganglionları tarafından oluşturulan bağırsak birleşik alan kuvvetlerinden yayılan elektromanyetik enerji, pil gibi mekanizmalarla STN ömrü üzerinde belirleyici bir role sahiptir.
Anahtar Kelimeler: Parkinson hastalığı, subtalamik çekirdek, tek alanlı alan, Auerbach ganglionları, nöroenterik şelale

1. INTRODUCTION

Although the neurophysical mechanism of subthalamic nucleus (STN) stimulation is still unclear, STN with decreasing electric field strength may be re-charged by battery. Vibrating electrically charged masses create a magnetic field, and vibrating magnetic masses create an electric field; It is known that these two areas form a unified area. The combined field energy created by the vibrations of the myenteric ganglia in the vibrating intestines charges the neural tissues they reach with afferent signals and may be stored there for using when needed. The substantia nigra and subthalamic nucleus plays important roles in movement modulation (1). Parkinson's disease could begin at the bowel and spread to the basal ganglia and brain cortex secondary to abnormal brain-gut interactions (2-3). Iron deficiency anemia has also been responsible for STN degeneration in Parkinson's disease and deep brain stimulation may modulate iron metabolism in basal ganglia (4-5). The vibrating electric field also creates a magnetic field. And these two fields charge the brain by acting as Einstein mentioned in his unified field theory (6). We think that the electromagnetic field weakened as a result of neurodegeneration in the STN due to the decreasing charge effect of this neurophysical waterfall, which weakens the production power in iron deficiency anemia, may be responsible for the movement disorder, and STN stimulation also acts by increasing this power. For this reason, we say that Fe(III), which has a magnetic effect, may act like a dynamo magnet in the intestines and production of unified field area in intestines.

2. METHODS

The study protocols were approved by the Ethics Committee of Ataturk University, School of Veterinary Faculty, Erzurum-Turkey. In this study, 18 rats consisting of 6 members with an average weight of 360±20 gr were divided into 3 groups according to their intestinal pulsation frequencies as: 10±3/GI; 7±2/GII and 3±1/GIII. Auerbach's ganglia density (n/AG/mm3), Auerbach ganglia neuron density (n/AGN/mm3) were estimated by taking 0.5 mm sections at 10 mm intervals from 5 different distances from the midline of the ascending colon and STN neuron densities (n/STN/mm3) were estimated. The specimens were embedded in paraffin blocks and sections were stained with hematoxylin-eosin and GFAP immunohistochemistry. The physical dissector method was used to estimate the numbers of neurons in AG and degenerated neuron density of STN. Each neuron was accepted as a vibrating particle and the vibrating particles numbers (VPN/mm3) estimated with: VPN=nAxnAG; the unified field strength (UFS) values formed by Auerbach's ganglia was estimated by UFS=fxVPN equation. UFS and n/STN values were compared Mann Whitney U test.

2.1. Histological Procedure

The brain and intestinal tissues of all subjects were tenderly removed. After fixation in 10% neutral formalin solution, the tissues were passed in alcohol and xylol series and embedded in paraffin blocks. Firstly, tissues divided horizontally into 10 segments, and then about 20 sections were cut from each block 4-5 micrometer in thickness with a microtome (Leica RM2125RT, Leica Microsystems, Wetzlar, Germany). Some specimens were stained with hematoxylin-eosin (H&E) and GFAP immunohistochemistry.

2.2. Neuron Density Estimation Method of Auerbach Ganglia/STN by Stereology

To accurately estimate the number of Auerbach ganglia and STN, colon and brainstem tissues were vertically embedded in paraffin blocks and each of them sectioned 20 histological levels was measured and shown as ra, b,c,…,x. The mean external radius value of the colon was calculated as re = re1+….re20/20. Moreover, the mean internal radius of the colon was calculated as: ri = ri1 + ⋯ri20/20. In addition, the length of the colon was shown as h = h1 +⋯h20 = Σh and accepted as the total height of the cylinder-shaped channel. Next, Auerbach ganglia neuron density was calculated as: d = n/0.5mm segments. The total number of Auerbach ganglia-neurons per mm3 was estimated by using Physical dissector method as our previous studies.

2.3. Statistical Analysis.

Results analyzed by using SPSS 21.0 for Windows. Multiple comparisons among groups were done by Kruskal Wallis test. Using Mann-Whitney U test, binary comparisons between groups were assessed. Values are given as the mean±standard deviation. p-value <0.05 was accepted significant. SPSS version 15.0 was used. Since the data showed a normal distribution, intergroup differences were assessed using a one-way ANOVA. A P<0.05 was accepted as statistically significant.

3. RESULTS

3.1. Histological Results

Figure-1 shows ascending colon histomorphology and architectures of Auerbach's ganglia. Auerbach's ganglia are observed in the ascending colon of a rat. Estimations of Auerbach's ganglia and neuron densities of ganglia; Consecutive 5-micron sections of 0.5 mm sections taken at 0.5 mm intervals from the midline of the ascending colon from 5 different distances were stained with the GFAP immunohistochemistry, and stereological analysis was performed using a light microscope. Intra ganglion neurons and physical formulas are seen in figure-2. In the formula, each neuron is considered as an oscillating electrically charged particle, and the product of the neuron density and the number of ganglions is considered as the total number of particles. Since the cell voltages cannot be measured and it will not break the equality when it is on both sides, it will not affect the statistical results. Figure-3: Enlarged (d2) and narrowed (d1) lumen with colon wall (CW), lumen (L), Auerbach's ganglia (G) and intestinal pulsations in the ascending colon of a rat; and (d1-2-1) diagram (A) showing the oscillation amplitudes of ganglion (G) and neurons (n) in these contraction-expansion zones; A representative picture of the ganglion (Gn) (B) and neurons (C) in each ganglion, which we consider as charged particles, are seen in one section. In Formula I, the total number of particles considered as an oscillating electrically charged particle is; In formula II, the method of how to calculate the total combined area value is given simply. Figure-4 shows localization of subthalamic nuclei in the rat brain; normal neurons/glial cells (C) in animals with a normal oscillation frequency; Figure D shows partially reduced dendrites of glial cells and slightly deformed neurons in animals with moderate oscillation frequency; and in figure E, a large number of reduced dendrites and highly deformed neurons are observed in animals with low oscillation frequency. V3 indicates the third ventricle.

3.2. Numerical Results.

VPN/UFS/nSTN values were: (13.345±2.143) / (11.146±1.689) / 132.863±12.654 in GI; (11.762±1.843)/(8.434±1.119)/121.371±9.872 in GII and (8.659±903)/(7.109±768) /118.127±6942 in GIII)

3.3. Statistical Results

Statistical results between UFS/nSTN were found as: $p<0.005$ of GI/GII; $p<0.0005$ of GII/GIII and $p<0.00001$ of GI/GIII).

4. DISCUSSION

Electrically charged neurons vibrating throughout the body may be sending the combined electromagnetic field energy they create from the electrical energy arising from the vibrating magnetic energy they produce to the central nervous system to be stored and used when necessary, via afferent nerves. Vibrating electrically charged masses create a magnetic field, and vibrating magnetic masses create an electric field; It is known that these two areas form a unified area. Vibrating electrically charged masses create a magnetic field, and vibrating magnetic masses create an electric field; It is known that these two areas form a unified area. The combined field energy created by the vibrations of the myenteric ganglia in the vibrating intestines charges the neural tissues they reach with afferent signals and may be stored there for using when needed. The substantia nigra and subthalamic nucleus is an important modulator of the cortico-basal ganglia webs and the essential target of deep brain stimulation in Parkinson's disease (1). Recent studies have shown that Parkinson’s disease may begin at the bowel and spread to the central nervous system via the vagal nerve further spreading to the brain cortex (2). According to new literatures, the gut microbiota regulates the brain-gut axial interaction through neural mechanisms (3). Although the iron deficiency anemia has been accused of neurodegenerative events in Parkinson’s disease, the role of iron deficiency anemia has not been investigated in subthalamic nucleus degeneration (4). Iron absorption is a kinetic event which regulated by duodenum (7). A molecule called Hephaestin converts Fe(II) to Fe(III) during iron absorption in duodenal enterocytes (8). Subthalamic nucleus is deeply affected in iron metabolism disorders and associated with amyloid depositions in subthalamic nucleus with Parkinson’s diseases (9-10-11). Chronic striatal inflammation in the substantia nigra

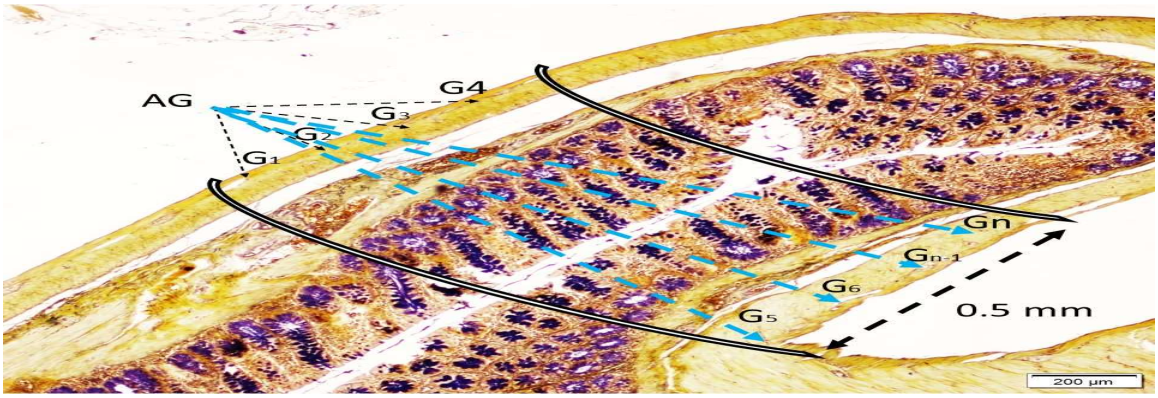

Figure-1: Auerbach's ganglia (AG) are observed in the ascending colon of a rat (LM, GFAP, x4). Estimations of Auerbach's ganglia and neuron densities of ganglia; Consecutive 5 micron sections of 0.5 mm sections taken at 0.5 mm intervals from the midline of the ascending colon from 5 different distances were stained with the GFAP method, and stereological analysis was performed using a light microscope..

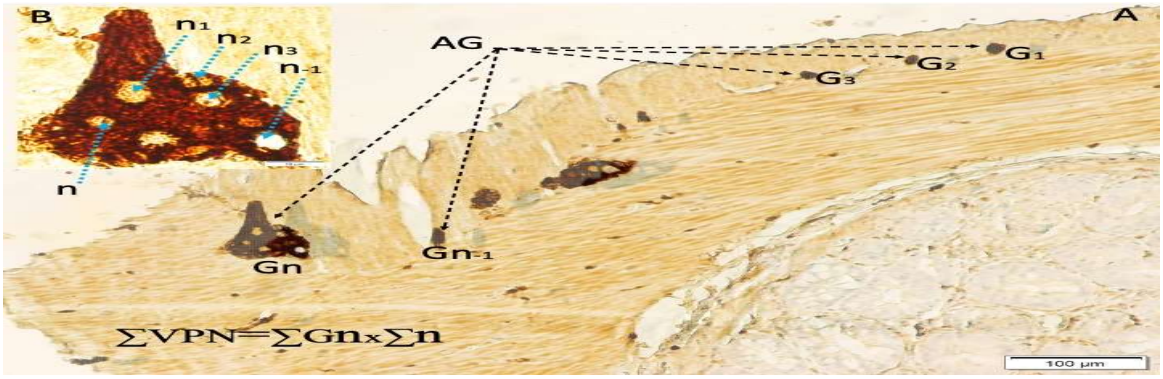

Figure-2: Auerbach's ganglia (AG/A) and neurons in the ganglion (B) are observed in the ascending colon of a rat. In the formula, each neuron is considered as an oscillating electrically charged particle, and the product of the neuron density and the number of ganglions is considered as the total number of particles. Since the cell voltages cannot be measured and it will not break the equality when it is on both sides, it will not affect the statistical results.

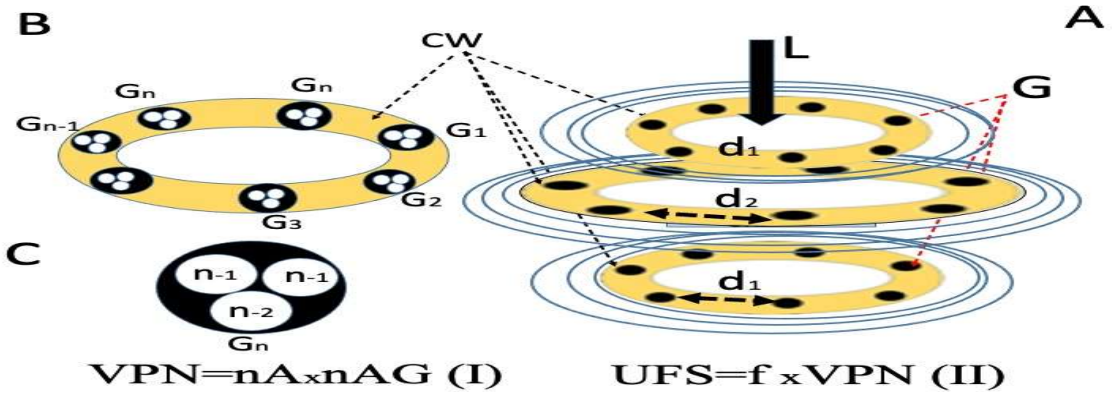

Figure-3: Enlarged (d2) and narrowed (d1) lumen with colon wall (CW), lumen (L), Auerbach's ganglia (G) and intestinal pulsations in the ascending colon of a rat; and (d1-2-1) diagram (A) showing the oscillation amplitudes of ganglion (G) and neurons (n) in these contraction-expansion zones; A representative picture of the ganglion (Gn) (B) and neurons (C) in each ganglion, which we consider as charged particles, are seen in one section. In Formula I, the total number of particles considered as an oscillating electrically charged particle is; In formula II, the method of how to calculate the total combined area value is given simply.

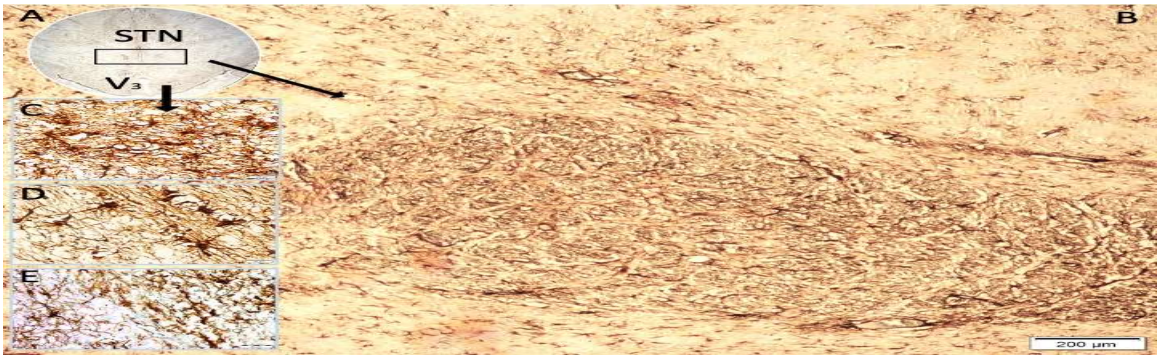

Figure-4: Localization of subthalamic nuclei (STN) in the rat brain; normal neurons/glial cells with a normal oscillation frequency owned animals (C); in figure D, partially reduced dendrites of glial cells and slightly deformed neurons in moderately oscillation frequency owned animals; and in figure E, many numbers of reduced dendrites and a highly deformed neurons in low oscillation frequency owned animals. V3 represents the third ventricle (LM, GFAP,x2/A; x4/B; x20/C-E).

causes iron deposition in subthalamic nucleus and deep brain stimulation may modulate iron metabolism in basal ganglia (12-5). The subthalamic nucleus has iron-rich subcortical structures in non-human primates (13). The working order of these myenteric energy generators, which we think is charging the brain with afferent signals, may be disrupted in iron deficiency and reduce energy production. In addition, while they were being stored in the basal ganglia, they created an electric field by vibrating due to brain pulsations. The vibrating electric field also creates a magnetic field. And these two fields charge the brain by acting as Einstein mentioned in his unified field theory (6). Since this mechanism is disrupted in iron deficiency anemia, electrical energy transfer to the brain, which is a treatment method, is considered necessary. Although STN stimulation is widely used in Parkinson's disease, its neurophysical mechanism is still unclear. We hypothesize that the stimulation process charges STN-connected network and the augmented STN network by uploaded electrical currency adequately modulates movement disorders. We think that the positively charged FE(III) ions, with the electrical energy that we think they produce as they flow through the coil-like narsaces surrounded by rich neural networks, energize the CNS, especially the basal ganglia. We think that the electromagnetic field has been weakened as a result of neurodegeneration in the STN. This result can be due to the decreasing charge effect of this neurophysical waterfall. As a result, iron deficiency anemia can occur, and this situation may be responsible for the movement disorder. STN stimulation may also act by increase this effect. For this reason, we say that Fe(III), which has a magnetic effect, may act like a dynamo magnet in the intestines and production of unified field area in intestines.

Considering in the light of current physical information, it is clear that the brain's ATP will not be sufficient on its own. We guess that the electric-magnetic and combined field energies produced by all vibrating cells due to the electric and magnetic charges they contain are used in the brain areas they reach with afferent signals and are stored for use when its necessary. The electromagnetic field is mainly formed as a result of harmonic motion of a charge in one direction. As a result, electric field lines of force propagate from a stationary or moving charge; An electric field force wave propagates from an oscillating charge. According to Faraday's electric field theory, electric field force points scatter from a stationary charge in all directions of space. Since these dots scatter sequentially from the same charge in certain directions, the combined electric field force dots become a straight line. The electric field is defined as the force per charge applied to a fixed point charge at a certain point in space: It is created by moving magnetic objects. There is a relation E=F/q between the electrical force felt by the F particle, q the charge of the particle, and the electric field at the position of the E particle. The magnetic or magnetic field is the area in which a magnet can exhibit its magnetic properties. The lines formed around the magnet are called magnetic field lines formed by the magnet in that region. The magnetic field is produced internally by moving electric charges, time-varying electric fields, or fundamental particles. It is generally produced by electrically charged objects in motion. Its unit is Tesla. The unit is Newtons per coulomb-meter/second. It is also referred to as T=N(Am)-1 since it is called one ampere in coulombs per second. In practice, gauss (G) is used, since Tesla is such a large unit for everyday events. 1 1T=104 G is Gauss. If the electric and magnetic fields are produced from the same center, the electric and magnetic fields intertwine and form a unified field within the frameworks

described by Albert Einstein (14). A tube-shaped and vibrating intestine can be thought of as a coil, with the electrically charged myenteric ganglia surrounding them. In this case, it is understood that both the electromagnetic field energy obtained from vibrating electrically charged neurons and the dynamo energy generated by Fe(III) ions flowing from the intestinal lumen are in enormous amounts. We imagine that this energy charges the peripheral, spinal cord and cerebral ganglia, where it goes with the afferent nerves, and is stored there for later use.

From a physical point of view, it can be thought that Parkinson's disease is caused by an electric-magnetic or electromagnetic field weakness that cannot occur or weaken within the nervous system. As a matter of fact, STN stimulation with electrical current is actually nothing but the act of electrically charging the brain. When Parkinson's disease is considered at the atomic and molecular level, it is revealed that a disease consists of metal metabolism disorders such as iron or conductive copper, which is a distorted ferromagnetic conductive metal, or cell losses that produce electrical energy in STN.

Parkinson's disease is characterized by progressive loss of dopaminergic neurons in the substantia nigra. Ferrum deficiency has been associated with neurodegenerative disorders. However, the role of iron in brain and bowel function is not well-known (15). Parkinson's disease is the second most frequent neurodegenerative disease of the central nervous system after Alzheimer's disease. The substantia nigra and subthalamic nucleus networks are important key structures in the treatment of movement disorders, particularly those associated with parkinsonism (1). Neurodegenerative disorders not only impair essential functions in the central nervous system, but also cause permanent intestinal dysfunctions through their action both in the central nervous system and in neurons that innervate the gut. (4). Iron is mostly absorbed from the duodenum (16). In our theory, the lack of iron atoms that play the role of magnet in the neuroenteric dynamo mechanism also leads to a decrease in the energy produced by the neuroenteric dynamo. The decrease in the energy produced in the intestines also leads to a decrease in the energy sent by the afferent nerves to support the neural circuits in the brain and the substantia nigra. This may mean denervation of the substantia nigra with the philosophy of neuropathology. And this event also leads to neurodegeneration due to denervation injury in the substantia nigra.

4.1. The Role of Iron in Biological Events

Weak magnetic fields created by bio magnets crystals (17). Animals are affected by the electromagnetic fields of the earth (18). Magnetite is produced by brain and intesinal cells (19). Increased magnetite levels were also observed in subjects with Huntington's and Parkinson's disease (20). The subthalamic nucleus is an important core of the cortico-basal ganglia network and the main target of deep brain stimulation in Parkinson's disease. Histological studies have revealed an inhomogeneous iron distribution within the STN, which has been related to putative subdivisions within this nucleus (21). The substantia nigra, the subthalamic nucleus, and the red nucleus are deeply affected in iron metabolism disorders (9). Iron accumulation induced neurodegeneration may be treated with bilateral subthalamic nucleus stimulation (22). Deep brain stimulation may modulate iron metabolism in basal ganglia (5). Paramagnetic substances principally iron delineate the caudate, putamen, globus pallidus, red nucleus, substantia nigra, and dentate nucleus (23). Iron deficiency is determined by hypointense signal intensity in the red nucleus. substantia nigra and subthalamic nucleus in Parkinson's disease (24).

Iron is an important modulator in brain energy metabolism. The iron concentration in the subthalamic nucleus has an important role in the formation of neuropsychological findings (25). Iron is very important in bowel dynamism. The decrease in iron absorption from the intestines with age may trigger Parkinson's disease (26). Iron accumulation in the hippocampus or basal ganglia creates black holes with very high gravitational fields, similar to those in space, leading to the deletion of the memory of the neurons in the vicinity and even the destruction of neurons (27).

4.2. Similar Physical/Biophysical Laws in the Working Order of Coils and Intestines

If we compare the intestines to the coil assembly in terms of their neuroenteric architecture, the coils used in the production of electric current can be replaced by the intestines, the coil windings by the myenteric neural network and the magnets by iron atoms circulating in the intestinal lumen.

4.3. Physical Laws Summarizing the Working Arrangement of Coils

In order to strengthen the magnetic field in the intestine and increase the inductance effect, myenteric networks consisting of somatic and autonomic nerves are wrapped together to form coils. Air or nutrients in the intestinal lumen can be compared to coil nuclei and the neuroenteric network to coil tubing. Magnetically effective iron atoms passing through the intestines also create a magnetic field by stimulating myenteric neurons. The currents of the intestinal loops lined up side by side also increase the field strength by affecting each

other. In this neuroenteric mechanism, if the neural network helix in the proximal segment of the intestine is high and the number of helices in the output segment is low, the high input voltage will be low at the output. If this situation is measured by electrophysiological tools, it manifests itself in the form of shrinking and shrinking sinusoidal waves. Since flux-current relations are linear in air coils, induction values are constant. This also applies to the intestines. Just like coils, the intestines convert the electrical energy they receive from the myenteric ganglia, which they stimulate through iron atoms, into magnetic fields and store energy in these magnetic fields. This energy is probably stored autonomously or in ganglia. In a gut where the total magnetic flux changes over time for some reason, a voltage known as electromagnetic induction occurs, just like in the coil. And this voltage creates an induction voltage. A different voltage known as electromotive induction, which occurs at varying intensities in the total magnetic flux of the coils, can also occur in the guts. The mechanism for this is that the autonomic and somatic nerves store energy (28).

Faraday's Law: When a coil placed in a constant magnetic field is moved, a voltage occurs between the two ends of this conductor as a result of the conductor cutting the magnetic field lines. With this voltage, mechanical energy is converted into electrical energy (28).

Lenz's Law: If the ends of a coil wire are joined on a load, which creates an induction voltage in a magnetic field, a current flow through the coil. The direction of the current passing through the coil is opposite to the direction of the magnetic field that creates it. When a coil placed in a fixed magnetic field is moved, a voltage occurs between the two ends of this conductor, depending on the coil's cutting of the magnetic field lines. This is the basic working principle of generators, in which electrical energy is provided and mechanical energy is converted into electrical energy (29).

The relationship between inductance value, magnetic permeability, number of turns, cross-sectional area of the core and length of the core can be summarized with the following equation.

$L=(\mu N2A)/l$

L:Inductans: μ: Magnetic permeability; N: Number of turns; A: Cross-sectional area of the core; l: Coil length

As the inductance value, magnetic permeability, number of turns and cross-sectional area of the core increase; The size of the core increases as it decreases (29).

4.4. The Use of Physical Laws That Summarize the Working Mechanism of The Coils to Explain the Working Order of The Intestines.

Iron absorption is a kinetic event that takes place in the duodenum (7). Because ultra-small superparamagnetic iron oxide nanoparticles are a new horizon in the treatment of Parkinson's disease (30). A molecule called Hephaestin converts Fe(II) to Fe(III) during iron absorption in duodenal enterocytes. Hephaestin is also localized to the enteric nervous system (8). We can easily use the physical laws that summarize the working mechanism of the coils to explain the working order of the intestines on a theoretical basis. The cylindrical structures of the intestines can be compared to the air core of the coil, and the myenteric ganglion networks on its wall can be compared to the coil windings. In this formula, L can be used as the intestinal inductance, μ the electrical permeability of the intestine, N the number of myenteric ganglia/network producing electrical current, A bowel section thickness and l the length of the bowel segment. As the intestine can be an air core model, cores with different conductivity values can be simulated when it is full of stool. In summary, we can consider the intestines as air cores, the myenteric neural network as windings, and iron atoms as free-moving cores with magnet effect. In addition, while they were being stored in the basal ganglia, they created an electric field by vibrating due to brain pulsations. The vibrating electric field also creates a magnetic field. And these two fields charge the brain by acting as Einstein mentioned in his unified field theory (6).

Limitation: Since this study is a histopathology-based theoretical physics study, clinical, electrophysiological and nanophysical data are not available.

5. CONCLUSION

According to our hypothesis, ferromagnetic iron atoms create an electric current as they pass through the coil-like intestines and cerebral arteries, and this current spreads through the enteric nervous system and charges the neural circuits. In addition, while they were being stored in the basal ganglia, they created an electric field by vibrating due to brain pulsations. The vibrating electric field also creates a magnetic field. And these two fields charge the brain by acting as Einstein mentioned in his unified field theory. Since this mechanism is disrupted in iron deficiency anemia, electrical energy transfers to the brain as a treatment method, is considered necessary. Although STN stimulation is widely used in Parkinson's disease, its neurophysical mechanism is still unclear. We hypothesize that the stimulation process charges STN-connected network and the

augmented STN network by uploaded electrical currency adequately modulates movement disorders. We think that the Fe(III) ions produce electrical energy flowing through the coil-like intestines surrounded by myenteric neural networks. Presumably, this energy is sent to the central nervous system through afferent nerves, especially the basal ganglia, to be stored and used when it is necessary. Because of the electromagnetic field strength weakened by neurodegeneration due to iron deficiency anemia, STN cannot modulate movements. Therefore, STN stimulation may be needed.

New Insights

We postulate that in the central nervous system, which has trillions of synaptic networks, ATP in the brain will be insufficient to operate these circuits, that the heat energy that will be released as the number of attached synapses increases may burn the brain, and that the main task of the cerebrospinal heat is to cool the brain. We think that the electromagnetic energy carried to the central nervous system by the afferent signals mentioned in the article charges the nervous system, is stored there as backup energy and can be used instead of ATP when it is necessary.

Future Insights: Neurocomputing interface methods that will increase iron absorption or inductance of the myenteric neural network will be used as a treatment method in the future.

Conflict of Interest: The authors declare that no conflict of interest.

Funding: None.

6. REFERENCES

1. Massey LA, Yousry TA. Anatomy of the substantia nigra and subthalamic nucleus on MR imaging. Neuroimaging Clin N Am. 2010 Feb;20(1):7–27.

2. Sato M, Miki S, Sakakibara R. (Parkinson's Disease, Dementia with Lewy Bodies and Brain-Gut Interactions). Brain Nerve. 2021 Aug;73(8):863–70.

3. Dong S, Sun M, He C, Cheng H. Brain-gut-microbiota axis in Parkinson's disease: A historical review and future perspective. Brain Res Bull. 2022 Jun;183:84–93.

4. Singh A, Dawson TM, Kulkarni S. Neurodegenerative disorders and gut-brain interactions. J Clin Invest. 2021 Jul;131(13).

5. de Hollander G, Keuken MC, van der Zwaag W, Forstmann BU, Trampel R. Comparing functional MRI protocols for small, iron-rich basal ganglia nuclei such as the subthalamic nucleus at 7 T and 3 T. Hum Brain Mapp. 2017 Jun;38(6):3226–48.

6. Goenner HFM. On the History of Unified Field Theories. Living Rev Relativ. 2004;7(1):2.

7. Thomson AB, Valberg LS. Passage of iron out of the intestinal mucosa of the rat. Can J Physiol Pharmacol. 1980 Feb;58(2):129–33.

8. Hudson DM, Curtis SB, Smith VC, Griffiths TAM, Wong AYK, Scudamore CH, et al. Human hephaestin expression is not limited to enterocytes of the gastrointestinal tract but is also found in the antrum, the enteric nervous system, and pancreatic {beta}-cells. Am J Physiol Gastrointest Liver Physiol. 2010 Mar;298(3):G425-32.

9. Garzón B, Sitnikov R, Bäckman L, Kalpouzos G. Automated segmentation of midbrain structures with high iron content. Neuroimage. 2018 Apr;170:199–209.

10. Cogswell PM, Wiste HJ, Senjem ML, Gunter JL, Weigand SD, Schwarz CG, et al. Associations of quantitative susceptibility mapping with Alzheimer's disease clinical and imaging markers. Neuroimage. 2021 Jan;224:117433.

11. Mazzucchi S, Frosini D, Costagli M, Del Prete E, Donatelli G, Cecchi P, et al. Quantitative susceptibility mapping in atypical Parkinsonisms. NeuroImage Clin. 2019;24:101999.

12. Thomsen MS, Andersen MV, Christoffersen PR, Jensen MD, Lichota J, Moos T. Neurodegeneration with inflammation is accompanied by accumulation of iron and ferritin in microglia and neurons. Neurobiol Dis. 2015 Sep;81:108–18.

13. Yoshida A, Ye FQ, Yu DK, Leopold DA, Hikosaka O. Visualization of iron-rich subcortical structures in non-human primates in vivo by quantitative susceptibility mapping at 3T MRI. Neuroimage. 2021 Nov;241:118429.

14. Wienner N VM, Unified Field Theory of Electricity and Gravitation. No Title. Nature. 1929;123:317–8.

15. Youdim MB, Ben-Shachar D, Riederer P. Iron in brain function and dysfunction with emphasis on Parkinson's disease. Eur Neurol. 1991;31 Suppl 1:34–40.

16. Asowata EO, Olusanya O, Abaakil K, Chichger H, Srai SKS, Unwin RJ, et al. Diet-induced iron deficiency in rats impacts small intestinal calcium and phosphate absorption. Acta Physiol (Oxf). 2021 Jun;232(2):e13650.

17. Nakajima K-I, Zhu K, Sun Y-H, Hegyi B, Zeng Q, Murphy CJ, et al. KCNJ15/Kir4.2 couples with polyamines to sense weak extracellular electric fields in galvanotaxis. Nat Commun. 2015 Oct;6:8532.

18. Bókkon I, Salari V. Information storing by biomagnetites. J Biol Phys. 2010 Jan;36(1):109–20.
19. Qin Y, Zhu W, Zhan C, Zhao L, Wang J, Tian Q, et al. Investigation on positive correlation of increased brain iron deposition with cognitive impairment in Alzheimer disease by using quantitative MR R2' mapping. J Huazhong Univ Sci Technol Med Sci = Hua zhong ke ji da xue xue bao Yi xue Ying wen ban = Huazhong keji daxue xuebao Yixue Yingdewen ban. 2011 Aug;31(4):578.
20. Beyhum W, Hautot D, Dobson J PQM biomineralisation in H disease transgenic mice. No Title. J Phys Conf Ser. 2015;17:50–3.
21. de Hollander G, Keuken MC, Bazin P-L, Weiss M, Neumann J, Reimann K, et al. A gradual increase of iron toward the medial-inferior tip of the subthalamic nucleus. Hum Brain Mapp. 2014 Sep;35(9):4440–9.
22. Ge M, Zhang K, Ma Y, Meng F, Hu W, Yang A, et al. Bilateral subthalamic nucleus stimulation in the treatment of neurodegeneration with brain iron accumulation type 1. Stereotact Funct Neurosurg. 2011;89(3):162–6.
23. Rutledge JN, Hilal SK, Silver AJ, Defendini R, Fahn S. Study of movement disorders and brain iron by MR. AJR Am J Roentgenol. 1987 Aug;149(2):365–79.
24. Dormont D, Ricciardi KG, Tandé D, Parain K, Menuel C, Galanaud D, et al. Is the subthalamic nucleus hypointense on T2-weighted images? A correlation study using MR imaging and stereotactic atlas data. AJNR Am J Neuroradiol. 2004 Oct;25(9):1516–23.
25. Brown G, Du G, Farace E, Lewis MM, Eslinger PJ, McInerney J, et al. Subcortical Iron Accumulation Pattern May Predict Neuropsychological Outcomes After Subthalamic Nucleus Deep Brain Stimulation: A Pilot Study. J Parkinsons Dis. 2022;12(3):851–63.
26. Levenson CW, Tassabehji NM. Iron and ageing: an introduction to iron regulatory mechanisms. Ageing Res Rev. 2004 Jul;3(3):251–63.
27. Aydin MD, Aydin A, Aydin A, Ahiskalioglu EO, Ahiskalioglu A, Ozmen S, et al. New Histophatological Finding About Data Destroying Amyloid Black Holes in Hippocampus Following Olfactory Bulb Lesion Like as the Universe. Arch Neurosci. 2022;9(4).
28. Igal Galili, Dov Kaplan YL, Teaching Faraday's law of electromagnetic induction in an introductory physics. No Title. Am J Phys. 2006;74:337.
29. F Behroozi. Electromagnetic Induction and Lenz's Law Revisited. No Title. Phys Teach. 2019;57(2):102–4.
30. An L, Tao Q, Wu Y, Wang N, Liu Y, Wang F, et al. Synthesis of SPIO Nanoparticles and the Subsequent Applications in Stem Cell Labeling for Parkinson's Disease. Nanoscale Res Lett. 2021 Jun;16(1):107.