ISSN: 2717-8161 RESEARCH ARTICLE

New Trend Med Sci 2024; 5(1):14-20. https://dergipark.org.tr/tr/pub/ntms

A Newly Defined Electromagnetic Dural Armor Functioned as a Brain Protecting Cerebrosphere: A Preliminary Theoretical Analysis

Mehmet Dumlu Aydin[1*], Mustafa Can Guler[2], Mehmet Hakan Sahin[1], Erkan Cem Celik[3], Osman Nuri Keles[4]

[1]Department of Neurosurgery, Faculty of Medicine, Atatürk University, Erzurum, Turkey
[2]Department of Physiology, Faculty of Medicine, Atatürk University, Erzurum, Turkey
[3]Department of Anesthesia, Faculty of Medicine, Atatürk University, Erzurum, Turkey
[4]Department of Histology, Faculty of Medicine, Atatürk University, Erzurum, Turkey

Article History
Received 20 Dec 2023
Accepted 25 Jan 2024
Published Online 30 Jan 2024

[*]***Corresponding Author***
Mehmet Dumlu Aydin
Department of Neurosurgery
Faculty of Medicine
Ataturk University
Erzurum, Turkey
Phone:+90 5323228389
E-mail: nmda11@hotmail.com

Doi:*10.56766/ntms.1419119*

Authors' ORCIDs
Mehmet Dumlu Aydin
http://orcid.org/0000-0002-0383-9739
Mustafa Can Güler
http://orcid.org/0000-0002-0383-9739
Mehmet Hakan Sahin
http://orcid.org/0000-0002-5309-4165
Erkan Cem Celik
http://orcid.org/0000-0002-7773-9562
Osman Nuri Keles
http://orcid.org/0000-0001-7740-8248

Abstract: Electric and magnetic field-generating systems must be insulated in order to maintain their balance. It is certain that the brain, which has a very intense electric and magnetic field, is insulated by the dura mater and cerebrospinal fluid (CSF) that surround it. In this article, the electrophysical properties of these structures will be postulated in accordance with the laws of mathematics and physics. In human samples, on the other hand, the morphological features of EEG waves were examined with parameters such as the number of scalp hairs and scalp thickness, conductivity, skull thickness, ratios between cra nnial and brain volumes, and the thickness of the subarachnoid space where CSF circulates, and ventricular volumes. Since this study is postulative, the data were not detailed by statistical evaluation. With the geometric shapes of EEG waves; scalp thickness and number of hairs, skull thickness, depth of subarachnoid space, ventricular volumes, thickness of dura mater. EEG artifacts were excessive in pediatric cases with closed fontanelles or in adults with bone defects. There were statistically varying safety limits between $0.05<p<0.0001$ values between neuron density in the sensory ganglion of the trigeminal nerve, which innervates the dura mater intensely, especially.
The morphological structure of the skull and brain is fundamental in determining the nature of the EEG waves. The artifact of EEG waves in infants with open fontanelles and individuals with cranial bone defects may result from the rupture of the cerebrospheric armor formed by the dura. ©2024 NTMS.

Keywords: Cerebrospher; Durospher; Electroencephalography; Wave Interferences.

1. Introduction

The anterior cranial dura is innervated by trigeminal nerves [1]. Upper cervical dorsal root ganglions, superior cervical ganglions, facial, trigeminal, hypoglossal, glossopharyngeal, and vagus nerves innervate the medial and posterior cranial fossa dura mater [2]. Intracranial nociceptive innervation is managed by trigeminal system [3]. Dura mater has an excellent magnetic field generating power because it has good electrical conductivity [4]. Along with the dura mater, the scalp, bones, cerecrospinal fluid (CSF), and cranial

Cite this article as: Aydin MD, Güler MC, Sahin MH, Celik EC and Keles ON. A Newly Defined Electromagnetic Dural Armor Functioned as a Brain Protecting Cerebrosphere: A Preliminary Theoretical Analysis. New Trend Med Sci. 2024; 5(1):14-20. Doi:10.56766/ntms.1419119.

vessels [5], create an electrical field [6]. Neurons are also electrically charged bodies [7]. Their vibrations create a magnetic field [8], and a vibrating electric field creates a magnetic field around them [9]. As a result, a unified electromagnetic field occurs [10] as described by Einstein. The brain resembles two parallel electric-loaded plates and the corpus callosum is an interconnection band between these two plates and equalizes the capacitance of the two cerebral hemispheres [7]. According to the moment, these electromagnetic fields charge the brain. Otherwise, the brain will not find enough ATP to ignite many synaptic circuits. Suppose the dura mater loses its electromagnetic properties. In that case, the brain is deprived of this electromagnetic shield, and its surroundings may suffer severe damage that has not yet been described. Here, we have defined the layers that protect the brain as the cerebrosphere, just like the Earth. We have denoted its layers from outside to inside: vibrisosphere, scalposphere, ososphere, durosphere, vesselospher, and hydrosphere. The durosphere will be discussed in this article.

2. Material and Methods

The data used in this study were obtained from a large number of rabbits subjected to the subarachnoid hemorrhage experiment. Atatürk University Local Ethics Council of Animal Experiments approved the study (25.06.2010/22). The EEG findings of the subjects who had seizures after subarachnoid hemorrhage and the neuro-degeneration relationships determined in the local hemispheres causing these EEG disorders formed the basis of the research.

3. Results

The epileptiform feature of EEG waves was found to be proportional to the number of ischemic neurons exploding like mines in the brain. Again, the ischemia of the cervical dorsal root ganglia, nodose-petrous and otic ganglia innervating the dura mater, probably caused dural innervation weakness and changed the EEG patterns by causing a decrease in magnetic power in the durosphere.

In the light of these data, the EEGs of babies whose fontanelles are not closed, adults with cranial surgical bone defects, people with different sizes of cranium and dura thickness, those with a wide subarachnoid distance, those with large ventricles, and those with hair loss or thick hair were evaluated quantitatively. Statistical analysis has confirmed that our thinking may be correct to varying degrees.

Especially in patients with subarachnoid hemorrhage, if there is ischemic damage to the neural structures that we think innervate the dura, the durospheric weakness is also more pronounced.

Ferromagnetic minerals in the blood flowing through the blood vessels can also act as coils and form a separate magnetosphere.

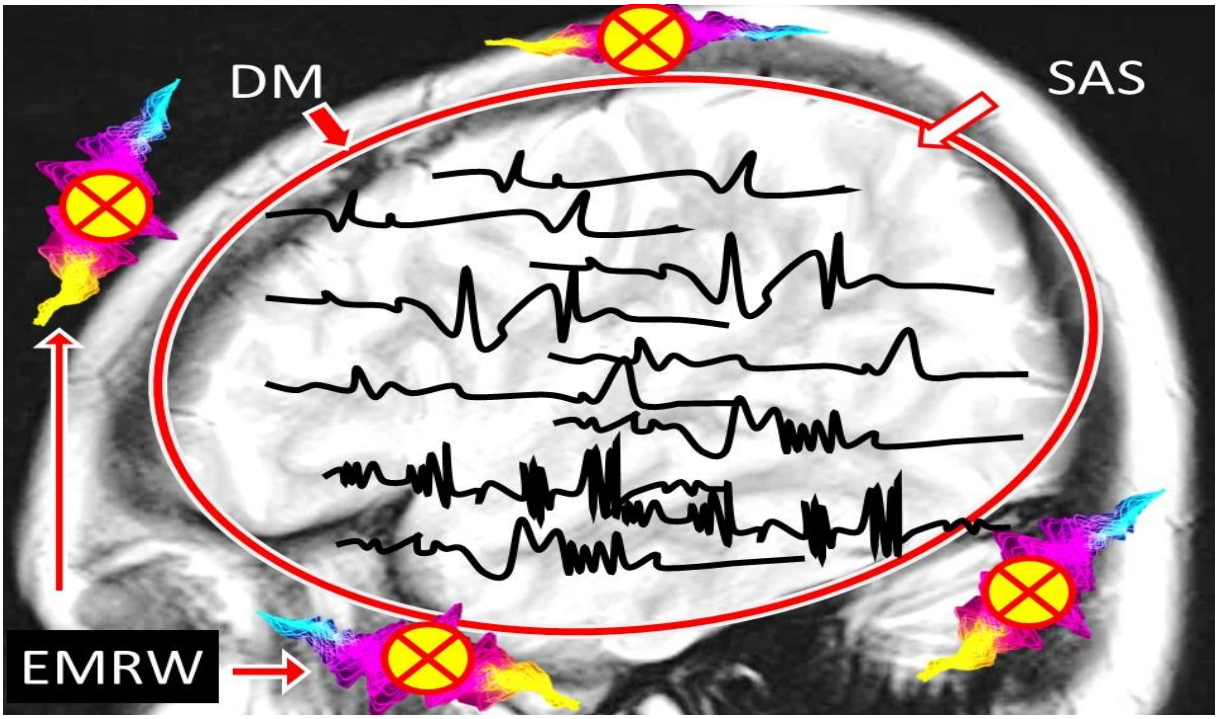

Figure 1: Dura mater is an electromagnetic shield, acting like the ionosphere with the CSF, protecting the brain. Due to these two strong armors (red-white ellipse), the electrical, magnetic and thermodynamic balances of the brain are preserved. These armors prohibit external magnetic resonance waves (EMRW) transmitted to brain.

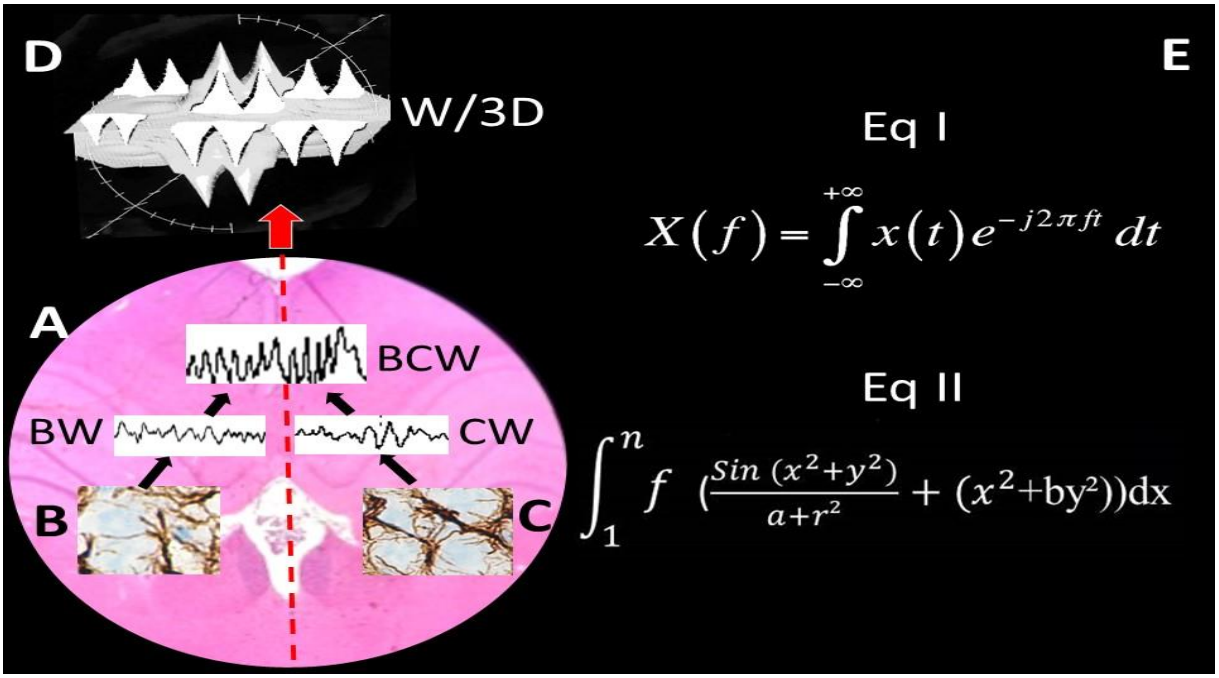

Figure 2: In a normal subject brain (A), neurons producing electroencephalography (EEG) waves and surrounding glia cells are observed (B) d (LM, H&E, x4/A; GFAP, x20/B, C). Integral formulas for how these cell groups produce EEG waves and how the waves interfere to produce resultant waves are given in EI and EII, respectively (Grapher Program of Apple Computer makes Figure D).

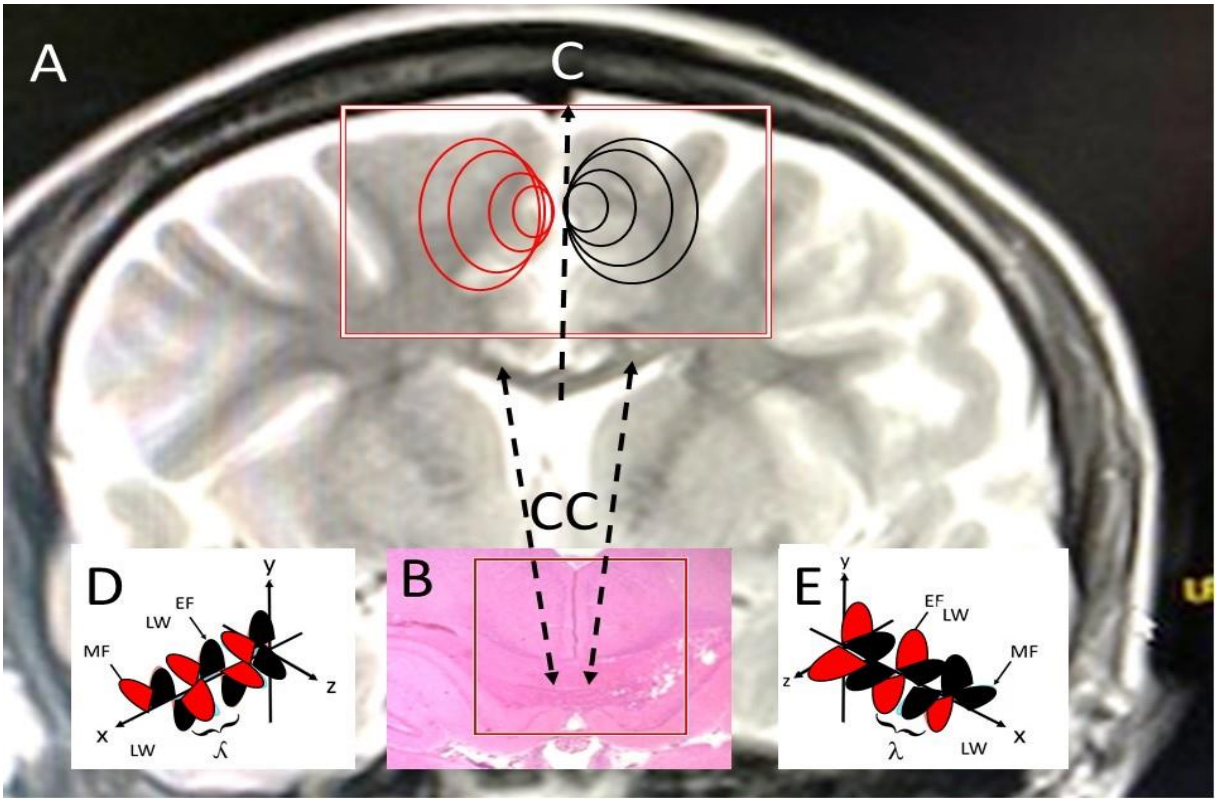

Figure 3: Regarding electrical engineering, the brain is two parallel plates that generate and charge energy. The corpus callosum (CC) is an intermediate link that balances the load between these two plates. Since both brain hemispheres are designed like the north-south hemispheres, their electromagnetic fields are in opposite directions and have different intensities according to the brain time.

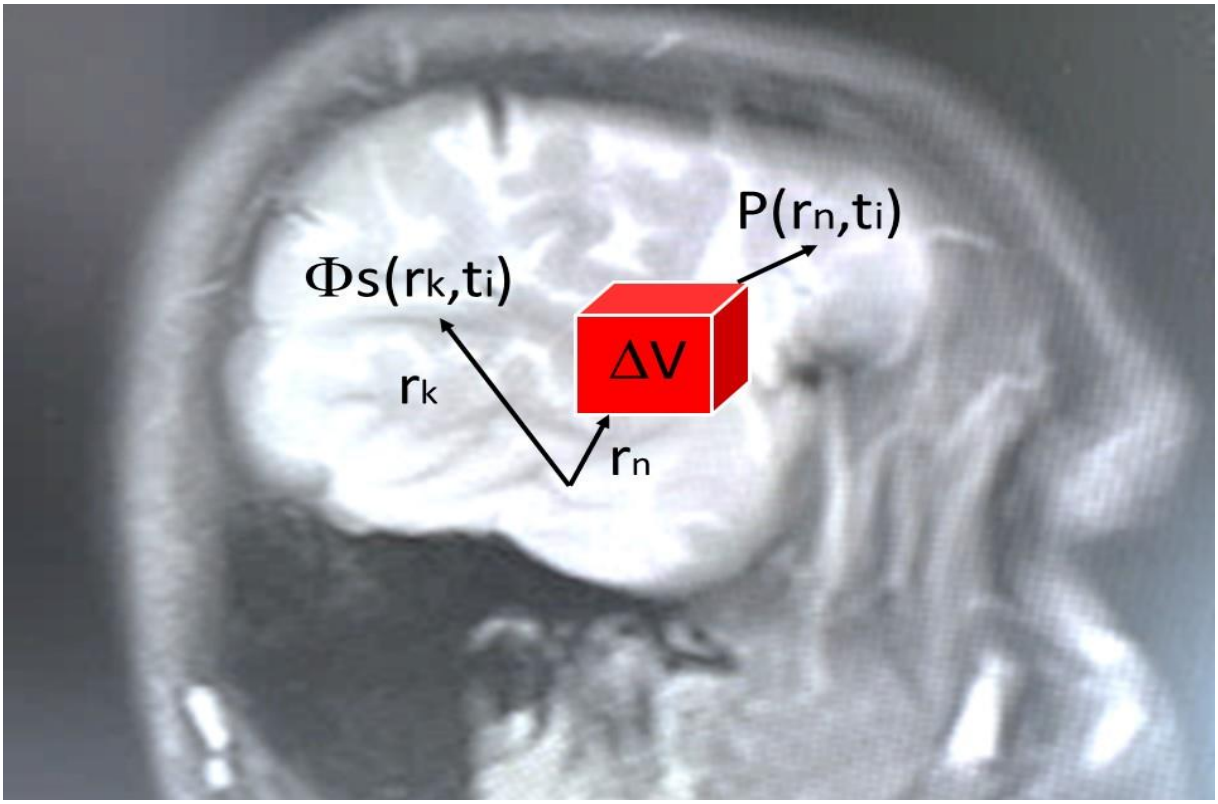

Figure 4: Brain volume conductor is indicated in which surface potentials Φs (rk, ti) are recorded at discrete surface lokations rk and time ti. The surface potentials are generated by dipole moments p (rn, ti) in tissue masses (voxels) ΔV located at rn. All volume conductor properties are included in the Green function G (rk, rn). Resources are defined as dipole moments per unit volume p (rn, ti) / ΔV. $\Phi(r,t) = \iiint_{Brain} G(r,r').P(r',t)dV(r')$.

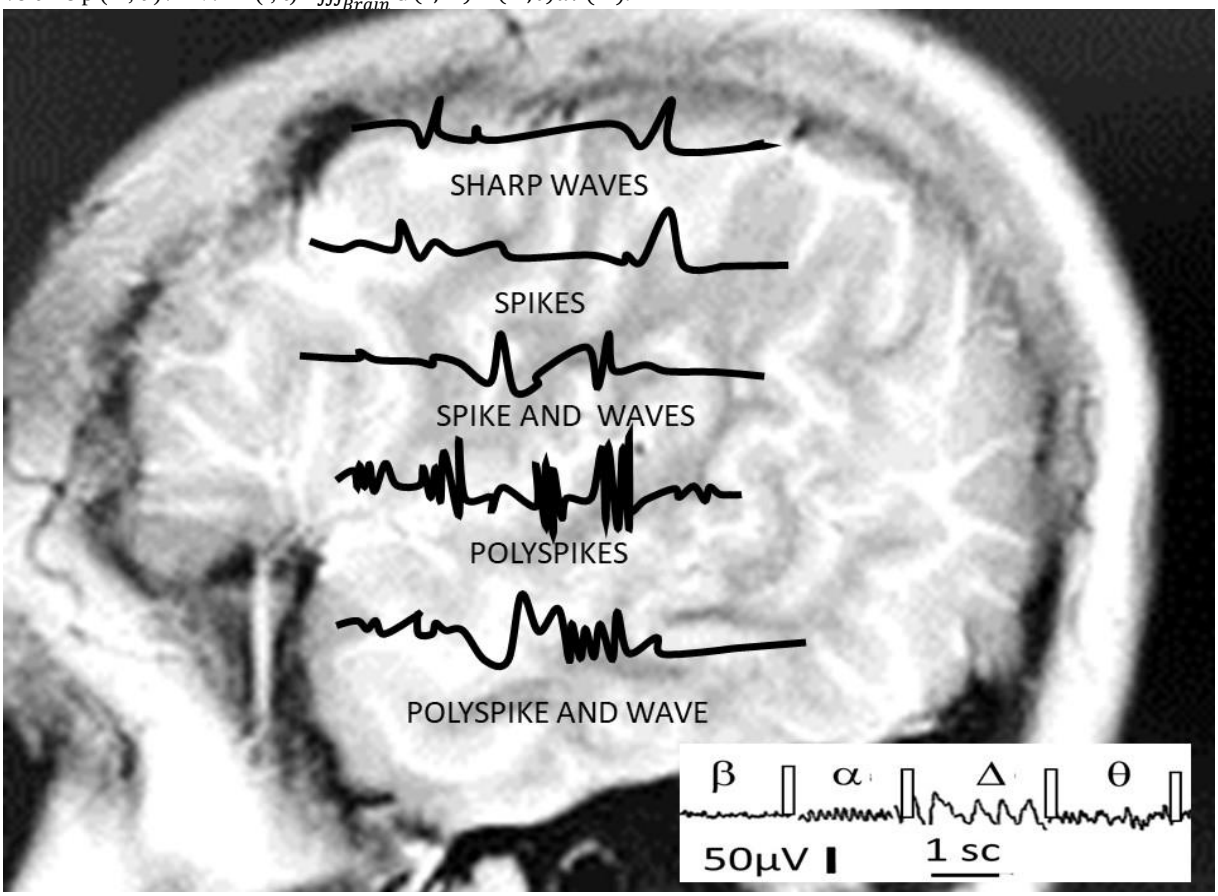

Figure 5: Cortical surface regions where alpha rhythms were recorded in a large population of epilepsy surgery patients are indicated by abnormal waves. Dotted regions near the central motor strip exhibited beta activity. ECoG activity was

characterized by counting zero crossing s before Fourier transforms were used in EEG 15. In the picture, normal EEG waves are in A; abnormal EEG waves are also observed in B-F.

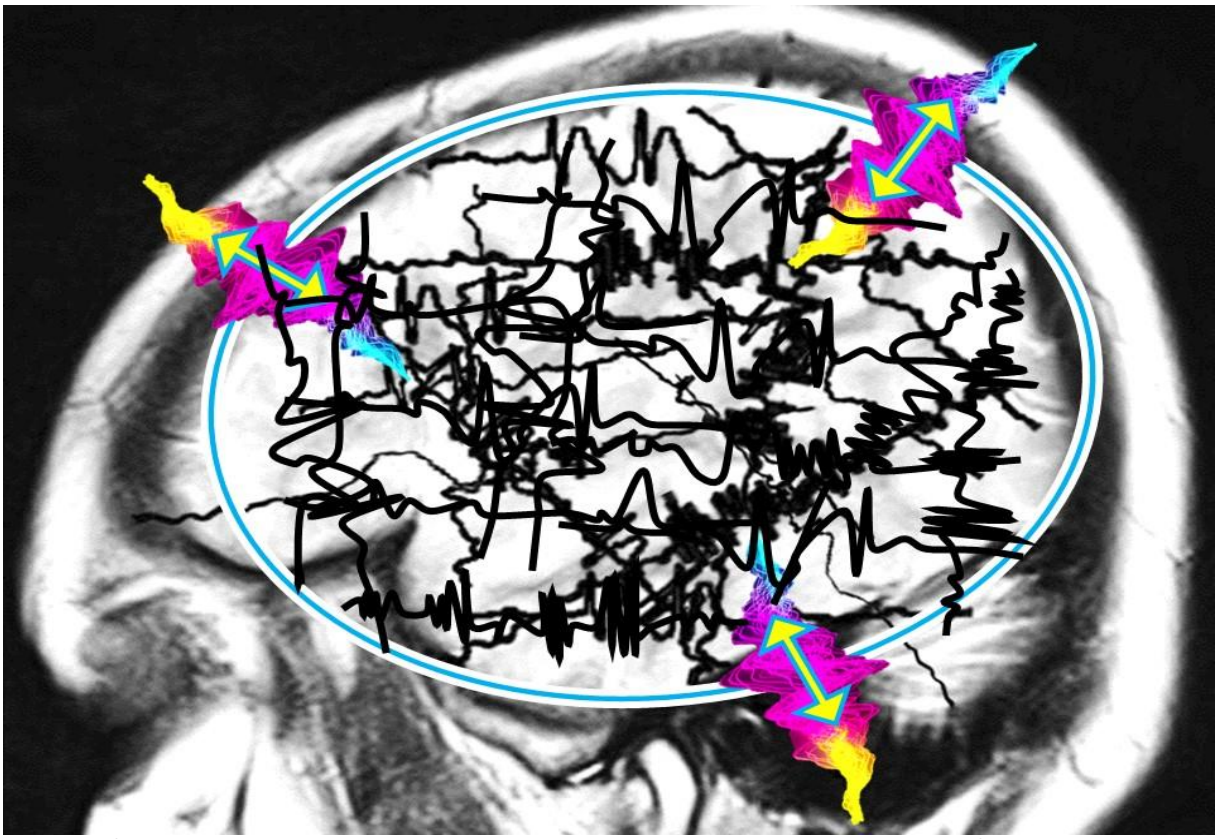

Figure 6: If the dura mater surrounding the brain cannot be adequately innervated by the trigeminal, facial, glossopharyngeal, vagal, and upper cervical nerves, and if the brain is deprived of this electromagnetic shield, both itself and its surroundings may suffer severe damage that has not yet been described. If the dura mater and CSF, which are the armors of the brain, cannot function, the electromagnetic, thermodynamic, and many other unknown functions of the brain will be disrupted. Due to these two weak armors (blue-white ellipse), the electrical, magnetic, and thermodynamic balances of the brain are not preserved. These armors do not prohibit external magnetic resonance waves (EMRW) from transmitting to the brain. In that situation, chaotic interferences occur among EEG waves, and various neuropsychiatrimlems can be developed.

4. Discussion

Just like the layers of the atmosphere surrounding the galaxies, the solar system, the planets, and the Earth. It is not against the laws of physics and reason to have an armor that covers the brain, which we can call the cerebrosphere.

4.1. Innervations of Cranial Dura Mater

Since the dura mater has a vibrant neural network, is conductive, and is vibrating, it can be predicted that it will create a magnetic field, an electric field, and ultimately an electromagnetic field, which will insulate the brain, thanks to the charged neuroparticles it contains (Figure 1). The temporomedial dura is innervated by trigeminal nerve fibers [1]. The posterior cranial fossa dura mater is innervated by upper cervical dorsal root ganglions, superior cervical ganglion, vagus nerve, trigeminal nerve, hypoglossal nerve, and glossopharyngeal nerve [2]. Intracranial nociceptive innervation is managed by trigeminal system [3]. The dura mater, which surrounds the brain and is intensely innervated by the trigeminal, facial, glossopharyngeal, vagal, and upper cervical nerves, forms a strong electromagnetic shield. While this armor protects me from external factors, it also protects the brain, electrically charged objects, and even other environmental organs from the dangers of this intense and dangerous electromagnetic field. The cerebrospinal fluid also acts as the ionosphere, protecting the brain with the same activities. Spherical shell is formed by the Earth's surface and the inner surface of the ionosphere. Due to these mechanisms, the brain's static and kinetic, electromagnetic, and thermodynamic balances are preserved.

4.2. The Electrophysical Properties of the Dura Mater and its Mysterious Role in the Formation of Electromagnetic Armor that We Think it Makes Around the Brain

Transcranial electrical stimulation and transcranial magnetic stimulation suggest that the dura mater may also have good magnetic field-generating power since it has good electrical conductivity. Because the dura mater, which has numerous electrically charged and conductive cells, is also in vibration, it can create a hemispherical magnetic field in terms of its shape and

a combined electromagnetic field with the electric field [4]. Head tissues have a measurable electrical impedance that mathematical methods can express. Every cranial tissue exhibits dielectric properties. The dura mater can be excited with inductive currents with frequencies greater than 200 Hz. The internal current source density for currents is negligible.

Along with the dura mater, the scalp, bones, CSF, and cranial vessels are also sensitive to electric current [5]. Cranial skin, bones, and dural layers create an electrical field with the placement of electrodes [6]. Since the dura mater conducts electrical current well, it can also damage the distant nerves and organs to which it is connected [11].

4.3. Biophysical Properties of Neurons

Neurons are -70mV electrically charged bodies [7]. When neurons vibrate like electrically charged bodies, they create a magnetic field around them [8]. While neurons vibrate synchronously with the brain, creating a magnetic field around them, this vibrating magnetic field creates an electric field [9]. Vibrating electrically charged objects create a magnetic field around them, an electric field around them when magnetic masses vibrate, and an intertwined common electromagnetic field if the two vibrate simultaneously [10].

Electromagnetic waves created by multiple ongoing lighting strikes cause waves traveling away from each epicenter with the velocity of light v=c, like earthquake waves or thunderstorms. Wave interference and periodic boundary conditions in the shell result in discrete preferred frequencies of field oscillations, the Schwann resonances, given by the expression of the wave energy of the total brain. The brain-like structures result from mentally inflating the folded cortical surface of one hemisphere. The characteristic velocity corresponds to the peak in the velocity distribution function for corticocortical transmission, roughly 6-9 m/s [12].

4.4. Neurophysical Properties of Neurons and Their Role in the Design of Differential-Integral Equations of EEG Waves

Regarding electrical engineering, the brain is two parallel plates that generate and load energy, and the corpus callosum is an interconnection that balances the load between these two plates. At large distances, the field is that of a monopole because the total local charge or current does not add to zero. If the current is a conductor, it must flow to distant sinks. Billions of neurons in the brain charged with -70 mV electrical current generate electrical current [7]. Since the brain is in a state of vibration, these neurons vibrate simultaneously with the brain, creating a magnetic field around them. As this magnetic field vibrates, it creates an electric field around it [9]. Thus, these two fields combine to form a unified electromagnetic field. In Figures C and D, combined electromagnetic fields running in opposite directions in both cerebral hemispheres are representatively drawn (Figure 2). According to the moment, these electromagnetic fields charge the brain. Otherwise, the brain will not find enough ATP to ignite so many synaptic circuits, and even if it does, the heat released turns the brain into ashes.

Regarding electrical engineering, the brain is two parallel plates that generate and load energy, and the corpus callosum is an interconnection that balances the load between these two plates (Figure 3). At large distances, the field is that of a monopole because the total local charge or current does not add to zero.

In the Figure 4, brain volume conductor is indicated in which surface potentials Φs (r_k, t_i) are recorded at discrete surface locations rk and time ti. The surface potentials are generated by dipole moments p (rn, ti) in tissue masses (voxels) ΔV located at rn. All volume conductor properties are included in the Green function G (rk, rn). Resources are defined as dipole moments per unit volume p (rn, ti) / ΔV. Φ (r, t) $=\iiint_{Brain} G(r,r').P(r',t)dV(r')$ [8, 13, 14].

Here, P (r, t) is the tissue dipole moment per unit volume, that is, resource strenght at location r and time t. Resource strenght in terms of the membrane current sources. The integral is weighted by the Green's function G (r, r'), which accounts for all geometric and conductive properties of the volume conductor. Generally, G (r, r') is large when the ''electrical distance'' between recording location r and source location r' is small. In an infinite, homogenous and isotropic medium, the electrical distance equals the actual distance, this idealisation is not accurate for the head volume conductor [14].

In the Figure 5, the cortical surface regions where alpha rhythms were recorded in a large population of epilepsy surgery patients are indicated by abnormal waves. Dotted regions near the central motor strip exihbited beta activity. ECoG activity was characterized by counting zero crossing s before Fourier transforms used in EEG [8, 13, 14]. If the dura mater surrounding the brain cannot be adequately innervated by the trigeminal, facial, glossopharyngeal, vagal and upper cervical nerves, and if the brain is deprived of this electromagnetic shield, both itself and its surroundings may suffer serious damage that has not yet been described (Figure 6).

5. Conclusion

Insufficient dura mater activity may cause many neuropsychiatric diseases of unknown origin, which result from congenital or acquired causes that damage these circuits. The same results are inevitable if the cerebrospinal fluid cannot function as the ionosphere for similar reasons.

Limitations of the Study

This theoretical study is devoid of rational data.

Acknowledgement

None.

Conflict of Interests

The authors declare no competing interests.

Financial Support
None.

Author Contributions
MDA and AA designed the study. MDA, MCG, AA, MHŞ, ECÇ, and ONK contributed to data collection and data analysis. MDA, MCG, AA, MHŞ, ECÇ, and ONK read the draft and approved the final scenario.

Ethical Approval
Atatürk University Local Ethics Council of Animal Experiments approved the study (25.06.2010/22).

Data sharing statement
None.

Consent to participate
None.

Informed Statement
None.

References

1. Sloekers JCT, Herrler A, Hoogland G, et al. Nerve fiber density differences in the temporal dura mater: An explanation for headache after temporal lobectomy? An anatomical study. *J Chem Neuroanat*. 2022; 121:102082.
2. Hage D, Mathkour M, Iwanaga J, Dumont AS, Tubbs RS. The posterior cranial fossa's dura mater innervation and its clinical implication in headache: a comprehensive review. *Folia Morphol (Warsz)*. 2022; 81(4):843-50.
3. Terrier LM, Fontaine D. Intracranial nociception. *Rev Neurol (Paris)*. 2021; 177(7):765-72.
4. Weise K, Wartman WA, Knösche TR, Nummenmaa AR, Makarov SN. The effect of meninges on the electric fields in TES and TMS. Numerical modeling with adaptive mesh refinement. *Brain Stimul*. 2022; 15(3):654-63.
5. Williams T, Bouazza-Marouf K, Zecca M, Green AL. Analysis of the validity of the mathematical assumptions of electrical impedance tomography for human head tissues. *Biomed Phys Eng Express*. Feb 8 2021;7(2): 025011.
6. Asan AS, Gok S, Sahin M. Electrical fields induced inside the rat brain with skin, skull, and dural placements of the current injection electrode. *PLoS One*. 2019; 14(1):e0203727.
7. Scaglioni G, Narici MV, Maffiuletti NA, Pensini M, Martin A. Effect of ageing on the electrical and mechanical properties of human soleus motor units activated by the H reflex and M wave. *J Physiol*. 2003; 548(Pt 2):649-61.
8. Khrennikov A. Quantum-like model of processing of information in the brain based on classical electromagnetic field. *Biosystems*. 2011; 105(3):250-62.
9. Stern S, Rotem A, Burnishev Y, Weinreb E, Moses E. External Excitation of Neurons Using Electric and Magnetic Fields in One- and Two-dimensional Cultures. *J Vis Exp*. 2017;(123): 54357.
10. Hales CG, Ericson M. Electromagnetism's Bridge Across the Explanatory Gap: How a Neuroscience/Physics Collaboration Delivers Explanation Into All Theories of Consciousness. *Front Hum Neurosci*. 2022;16:836046. doi:10.3389/fnhum.2022.836046
11. Zhang Z, Zhang L, Zhu J, Dong J, Liu H. Effect of electrical impedance-guided PEEP in reducing pulmonary complications after craniotomy: study protocol for a randomized controlled trial. *Trials*. 2022; 23(1):837.
12. Nunez PL, Westdorp AF. The surface Laplacian, high resolution EEG and controversies. *Brain Topogr*. 1994; 6(3):221-26.
13. Kreezer GL, Smith FW. The relation of the alpha rhythm of the electroencephalogram and intelligence level in the non-differentiated familial type of mental deficiency. *J Psychol*. 1950; 29(1):48-51.
14. Nunez PL. *Electric Fields of the Brain: The neurophysics of EEG*. 2nd ed. Oxford University Press; 2006.
15. Jasper H, Penfield W. Electrocorticograms in man: Effect of voluntary movement upon the electrical activity of the precentral gyrus. *Archiv für Psychiatrie und Nervenkrankheiten*. 1949/01/01 1949; 183(1):163-74.

NTMS New Trends in Medicine Sciences
https://dergipark.org.tr/tr/pub/ntms