Cureus

Open Access Case Report

DOI: 10.7759/cureus.28245

Regenerative Radio Electric Asymmetric Conveyer Treatment in Generalized Cerebral and Cerebellar Atrophy to Improve Motor Control: A Case Report

Salvatore Rinaldi [1, 2] , Chiara Rinaldi [3] , Vania Fontani [1, 2]

1. Department of Research, Rinaldi Fontani Foundation, Florence, ITA 2. Department of Regenerative Medicine, Rinaldi Fontani Institute, Florence, ITA 3. Department of Neuroscience, Psychology, Drug Area and Child Health (NEUROFARBA), University of Florence, Florence, ITA

Corresponding author: Salvatore Rinaldi, srinaldi@irf.it

Review began 08/08/2022
Review ended 08/15/2022
Published 08/21/2022

Abstract

This report presents a case with a diagnosis rarely described in the literature, that is generalized cerebral-cerebellar atrophy. The patient showed a rapid decline with general cognitive deterioration, memory loss, temporal and spatial disorientation, and ataxic manifestations in voluntary movements. The loss of neurons and synaptic connections can be explained by an alteration of the correct endogenous bioelectrical activity (EBA), the phenomenon which allows all the processes of cellular life, such as differentiation, proliferation, migration, morphogenesis, apoptosis, and neurotransmission. The patient was treated with a specific regenerative neurobiological stimulation treatment applied with the radio electric asymmetric conveyer (REAC) technology, which was designed to recover the correct EBA. The tissue optimization regenerative (TO RGN) treatments used in this case report have already demonstrated the ability to induce neuroregenerative processes. At the follow-up, the patient showed a reduction in ataxia both in walking and running. This case report allows us to learn that the manipulation of the EBA can induce improvements even in clinical cases in which the scientific literature leaves no room for improvement.

Categories: Neurology, Physical Medicine & Rehabilitation, Healthcare Technology
Keywords: reac, neurobiological stimulation, neuromodulation, neurostimulation, endogenous bioelectrical fields, endogenous bioelectrical activity, cerebellar atrophy, cerebral atrophy

Introduction

Cerebral atrophy is a progressive and permanent reduction of brain tissue, and it can be focal when the damage affects a specific area of the brain [1]. Sometimes, atrophy can involve one or more brain structures, such as the cerebellum. In this case, we have generalized cerebral-cerebellar atrophy, rarely described in the literature, so much so that it does not have its own International Classification of Diseases 10th Revision (ICD-10) code. Cerebral atrophy is characterized by both the loss of neurons and their synaptic connections (SCs). The SCs constitute the bioelectrochemical connectors between neurons, consequently, the progressive loss of the SCs determines the decay of neurotransmission and therefore decay of neuronal functionality and vitality. The basis of neurotransmission is endogenous bioelectrical activity (EBA). In addition to allowing all the processes of cellular life, such as differentiation, proliferation, migration, morphogenesis, and apoptosis, the EBA also allows the processes of neurotransmission [2-6]. The loss of the correct EBA could therefore be the initial cause that would determine the loss of synapses and neurons [7]. To recover EBA, a neurobiological stimulation technology called radio electric asymmetric conveyer (REAC) was studied, which is administered through specific treatment protocols in relation to the pathology to be treated [8,9]. In the case presented here, the tissue optimization regenerative (TO RGN) treatments were used, which demonstrated the ability to induce neuroregenerative processes [10-13], even in the case of chemical destruction of specific neurons such as those of the substantia nigra [14]. The REAC medical device used in this study was the BENE 110 (Florence, Italy: ASMED SRL).

Case Presentation

The patient was a 79-year-old university-educated man who has always held senior management roles throughout his career. He was a long-time sufferer of type II diabetes and hypertension, in pharmacological treatment with oral hypoglycemic and antihypertensive drugs. The patient had not performed genetic testing, and the wife denied familiarity. Since the patient came to us with a complete medical record, completed the previous week, we did not consider it appropriate to repeat psychometric tests or reassess the ataxia with specific scales.

Over the past three years, the patient has shown rapid decline with general cognitive deterioration, memory loss, and temporal and spatial disorientation. In the last year, the decline has increasingly involved the neuromotor component with ataxic manifestations. A magnetic resonance examination showed significant cerebral and cerebellar atrophy, drawing a picture of generalized cerebral-cerebellar atrophy. On the recommendation of medical relatives, the patient was sent to our institute, where we were able to ascertain

the evident overall neurocognitive decay and the neuromotor ataxic component. Ataxia was evident in various voluntary movements, such as carrying food to the mouth but also in walking (Video *1*) and even more in attempting to run (Video *2*).

VIDEO 1: Patient walking before REAC treatments.

REAC: radio electric asymmetric conveyer

View video here: https://vimeo.com/735058662

VIDEO 2: Patient attempting to run before REAC treatments.

REAC: radio electric asymmetric conveyer

View video here: https://vimeo.com/735162632

During the first visit, the patient underwent a preliminary REAC neurobiological modulation treatment called Neuro Postural Optimization (NPO), aimed at inducing an initial brain remodulation and treating functional dysmetria [15-17]. The REAC NPO is a preprogrammed single-session treatment of a few milliseconds. It is administered by applying the tip of the metallic REAC asymmetric conveyer probe (ACP) to a specific area of the ear pavilion.

Subsequently, the patient underwent REAC TO RGN type N treatment for a total of 25 hours, administered five hours a day for five consecutive days [14]. The REAC TO RGN type N is a preprogrammed treatment, that the operator cannot modify in any parameter. The treatment is administered by placing an ACP along the spine holding it in place with a tubular elastic net. At the follow-up performed after about 30 days, the patient showed an initial improvement in interpersonal skills, but above all a clear reduction in ataxia both in walking (Video *3*) and running (Video *4*).

VIDEO 3: Patient walking after REAC treatments.

REAC: radio electric asymmetric conveyer

View video here: https://vimeo.com/735162743

VIDEO 4: Patient running after REAC treatments.

REAC: radio electric asymmetric conveyer

View video here: https://vimeo.com/735169786

Discussion

Neurodegenerative diseases, linked to senescence, are a constantly growing phenomenon linked above all to the increase in life expectancy. Unfortunately, there are no effective pharmacological treatments for these pathologies. For this reason, research in the various sectors of regenerative medicine is trying to find effective and safe solutions. In addition to genetic engineering, other methodologies are opening up new therapeutic perspectives for neurodegenerative diseases. Among these, the electroceutical [18] with various types of approaches and technologies seems to demonstrate a potential efficacy in countering neurodegenerative decay [7]. REAC technology represents one of these electroceutical technologies.

The ability to manipulate EBA in order to promote reparative and regenerative effects has long been considered essential [7]. Thanks to the continuous progress of technological research, it has only recently been possible to face this challenge positively. REAC technology has been designed for this purpose, demonstrating to be able to directly reprogram cell fate also towards neuronal differentiation [10-13], and at the same time fighting inflammatory phenomena that can aggravate neurodegenerative processes [14,19]. These results are clinically evident in the improvements observed in this case report.

Of course, these results, although positive, are the result of only one very short cycle of REAC RGN type N treatment. In fact, the expected duration of the treatment is at least 200 hours. This duration was inferred from previous animal model studies, in which neuronal death of specific parts of the brain was chemically produced [14]. Naturally, given the variability of the causes that can induce neurodegenerative phenomena such as generalized cerebral-cerebellar atrophy, further studies will be needed to establish the treatment

duration protocols.

The fact that the REAC TO RGN treatments are non-invasive, painless, and easy to administer represents certainly an element of strength. The weaknesses of this study are those that all the case reports have in common. Unfortunately, due to family problems, the patient was unable to continue the treatments and consequently, our follow-up stops at 30 days. Although this period is very short, this initial significant improvement encourages us to continue to spread this new therapeutic possibility to patients who otherwise would have no other therapeutic perspectives.

Conclusions

Regenerative medicine is an interesting field of medicine and is rapidly evolving. Since some genetic engineering and stem cell implantation techniques have shown little or no efficacy compared to expectations or side effects, research is looking for more effective and safer techniques. REAC RGN treatments have been designed to achieve these goals in regenerative medicine. Of course, further studies will be needed.

Additional Information

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Intellectual property info:** Salvatore Rinaldi and Vania Fontani are the authors of REAC patent. Chiara Rinaldi is daughter of Salvatore Rinaldi and Vania Fontani. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Acknowledgements

The authors would like to thank Dr. Alessandra Cappelli for her precious general support.

References

1. Blundo C, Gerace C, Ricci M: An overview on vitamin B12 and dementia with behavioral and executive disturbances. Diet and Nutrition in Dementia and Cognitive Decline. Martin CR, Preedy VR (ed): Academic Press, San Diego, CA; 2015. 649-62. 10.1016/B978-0-12-407824-6.00060-4
2. Levin M, Pezzulo G, Finkelstein JM: Endogenous bioelectric signaling networks: exploiting voltage gradients for control of growth and form. Annu Rev Biomed Eng. 2017, 19:353-87. 10.1146/annurev-bioeng-071114-040647
3. Levin M: Endogenous bioelectrical networks store non-genetic patterning information during development and regeneration. J Physiol. 2014, 592:2295-305. 10.1113/jphysiol.2014.271940
4. Pai VP, Lemire JM, Paré JF, Lin G, Chen Y, Levin M: Endogenous gradients of resting potential instructively pattern embryonic neural tissue via Notch signaling and regulation of proliferation. J Neurosci. 2015, 35:4366-85. 10.1523/JNEUROSCI.1877-14.2015
5. Chen J, Lv Y, Wang Y, Ren Y, Li X, Wang X: Endogenous inorganic carbon buffers accumulation and self-buffering capacity enhancement of air-cathode microbial fuel cells through anolyte recycling. Sci Total Environ. 2019, 676:11-7. 10.1016/j.scitotenv.2019.04.282
6. Adams DS, Levin M: Endogenous voltage gradients as mediators of cell-cell communication: strategies for investigating bioelectrical signals during pattern formation. Cell Tissue Res. 2013, 352:95-122. 10.1007/s00441-012-1329-4
7. Baer ML, Colello RJ: Endogenous bioelectric fields: a putative regulator of wound repair and regeneration in the central nervous system. Neural Regen Res. 2016, 11:861-4. 10.4103/1673-5374.184446
8. Maioli M, Rinaldi S, Cruciani S, et al.: Antisenescence effect of REAC biomodulation to counteract the evolution of myelodysplastic syndrome. [In press]. Physiol Res. 2022,
9. Rinaldi A, Maioli M, Martins MC, et al.: REAC non-invasive neurobiological stimulation for mitigating the impact of internalizing disorders in autism spectrum disorder. Adv Neurodev Disord. 2021, 5:446-56. 10.1007/s41252-021-00217-7
10. Maioli M, Rinaldi S, Migheli R, et al.: Neurological morphofunctional differentiation induced by REAC technology in PC12. A neuro protective model for Parkinson's disease. Sci Rep. 2015, 5:10.1038/srep10439
11. Maioli M, Rinaldi S, Santaniello S, et al.: Radioelectric asymmetric conveyed fields and human adipose-derived stem cells obtained with a nonenzymatic method and device: a novel approach to multipotency. Cell Transplant. 2014, 23:1489-500. 10.3727/096368913X672037
12. Maioli M, Rinaldi S, Santaniello S, et al.: Radio electric conveyed fields directly reprogram human dermal skin fibroblasts toward cardiac, neuronal, and skeletal muscle-like lineages. Cell Transplant. 2013, 22:1227-35. 10.3727/096368912X657297
13. Maioli M, Rinaldi S, Santaniello S, et al.: Radiofrequency energy loop primes cardiac, neuronal, and skeletal muscle differentiation in mouse embryonic stem cells: a new tool for improving tissue regeneration. Cell Transplant. 2012, 21:1225-33. 10.3727/096368911X600966

14. Panaro MA, Aloisi A, Nicolardi G, et al.: Radio electric asymmetric conveyer technology modulates neuroinflammation in a mouse model of neurodegeneration. Neurosci Bull. 2018, 34:270-82. 10.1007/s12264-017-0188-0
15. Mura M, Castagna A, Fontani V, Rinaldi S: Preliminary pilot fMRI study of neuropostural optimization with a noninvasive asymmetric radioelectric brain stimulation protocol in functional dysmetria. Neuropsychiatr Dis Treat. 2012, 8:149-54. 10.2147/NDT.S29971
16. Rinaldi S, Fontani V, Castagna A: Brain activity modification produced by a single radioelectric asymmetric brain stimulation pulse: a new tool for neuropsychiatric treatments. Preliminary fMRI study. Neuropsychiatr Dis Treat. 2011, 7:649-54. 10.2147/NDT.S26123
17. Rinaldi S, Mura M, Castagna A, Fontani V: Long-lasting changes in brain activation induced by a single REAC technology pulse in Wi-Fi bands. Randomized double-blind fMRI qualitative study. Sci Rep. 2014, 4:10.1038/srep05668
18. García-Alías G, del Valle J, Delgado-Martínez I, Navarro X: Electroceutical therapies for injuries of the nervous system. Handbook of Innovations in Central Nervous System Regenerative Medicine. Salgado AJ (ed): Elsevier, Amsterdam, Netherlands; 2020. 511-37. 10.1016/B978-0-12-818084-6.00014-3
19. Lorenzini L, Giuliani A, Sivilia S, et al.: REAC technology modifies pathological neuroinflammation and motor behaviour in an Alzheimer's disease mouse model. Sci Rep. 2016, 6:10.1038/srep35719