DOI: https://doi.org/10.53350/pjmhs211571567

ORIGINAL ARTICLE

Ameliorarting Action of Methylcaobalamin on Degenerated Cerebellar Molecular Cell Layer

TAZEEN KOHARI[1], ZAHEER AMJAD[2], ZAFFAR MALICK
[1]*Associate Professor of Anatomy, Islam Medical and Dental College, Pasrur, Sialkot*
[2]*Assistant Professor of Anatomy, Dow International Medical College, Dow University of Health Sciences, Karachi*
[3]*Assistant Professor Sahara Medical College, Narowal*
Correspondance to Dr. Tazeen Kohari, E-mail: tazeenk67@gmail.com. Phone: 0323-2967849

ABSTRACT

Background: Cerebellum the hindbrain is located in the posterior cranial fossa.The cerebellar cortex consists, of a gray matter and a white matter and the gray matter comprises of outer molecular layer, middle purkinje cell layer and inner most is the granule cell layer. The antimaniac drug lithium caused distortion to the outer molecular cell layer which was repaired and the damage was lessened by injecting the albino rats with Methylcobalamin.
Aim: To observe and document the data of the restored thickness of molecular cell layer after Methylcobalamin administration.
Methods: Eighteen albino rats were selected and were treated with lithium and Methylcobalamin for a period of 4 weeks.
Results: The results showed regeneration and improved thickness of molecular cell layer stressing the need for educating our masses in dietary use of vitamin b12 and the consultants to prescribe Methylcobalamin in neuronal injuries.
Conclusion: My study proved that the use of vitamin b12 is mandatory in strengthening and restoring the cerebellar molecular gray matter.
Keywords: Cerebellar molecular cell layer,Degeneration, Regeneration

INTRODUCTION

Clinical Research of cerebellar toxicity favors the use of Methylcobalamin as it inhibits cerebellar degeneration.[1]
Cerebellum plays a pivotal role in coordination[2]and motor skills[3,4]. The little brain has folias.[5]It's cortex consists of gray and white matter. Gray matter comprises of outer Molecular middle Purkinje cell layer and innermost granule cell layer. The molecular layer has stellate basket cells and Purkinje cell dendrites[6]. Neurosciences has proved that cerebellar lesions lead to impairment of muscle tone and balance[7].

The aim of the study was to observe and document the data of the restored thickness of molecular cell layer after Methylcobalamin administration.

METHODS

My present experimental study was carried out in the anatomy department and Animal House of Basic Medical Sciences Institute, JPMC, Karachi for four weeks. I selected 18 animals. Six in control group A2, on lab diet, to Group B rodents lithium at a dose of 20mg/kg OD[8] in flour pellets and Croup C albinos were given injection Methylcobalamin 500mcg[9] thrice daily for four weeks along with lithium carbonate 20mg /kg OD for above time period in flour pellets. On twenty eight day the animals were sacrificed, brain was removed; the cerebellum was separated from the rest of the brain and fixed in formaldehyde[10] for 24 hours. The cerebellar tissue was dehydrated by passing through ascending grades of alcohol cleared by xylene and infiltrated by paraffin. The fixed tissue blocks were sectioned and obtained on glass slides four micron thick sections were collected for staining with Haematoxylin and Eosin[11].

The changes of the thickness of molecular cell layer were observed under light microscope in all groups. Observations were recorded at the end of four weeks. Measurement of thickness of molecular layer was recorded under 40 x objectives in selected fields of the tissue. The data was subjected to statistical analysis by using software SPSS (Statistical Program for Social Sciences) 2007 version-16. A statistical difference between means and experimental data was carried out by student 'T' test.
Statistical Analysis: Statistical analysis of the thickness of molecular cell layer was documented in major group-B (Lithium carbonate treated) shows a highly significant decrease of the thickness of outer layer at 4 weeks' timeinterval as compared to the major group-A (control) but a highly significantly increased thickness of molecular cell layer was visualized and recorded in Group C as compared to Group B animals.

RESULTS

Group-A (lab diet) which was 236.6 ±7.59 micronsat4 weeks was observed and showed normalhistology and thickness of molecular cell layer Table: 1. Observations showed a highly increased thickness of molecular cell layer P value <.001 Table 2 in Group Animals. Group- B (Lithium treated Group at 4 weeks). A highly significantly (P<0.001) decreased in the mean values of thickness of molecular layer was observed in group B (131±5.47) microns. Group-C shows highly significant Value<(.001) increase in thickness of molecular cell layer168.5±8.92 microns. Results proved that Methylcobalamin restored thickness of molecular layer

Received on 14-02-2021
Accepted on 24-06-2021

Table 1: Measurement of molecular cell layer in microns at 4 weeks in group A, B, C

Groups	n	4th Week	
		Mean	SEM
A Normal Diet	18	236.6µm	7.59
B Normal Diet+Lithium Carbonate	18	131.1µm	5.47
C Normal Diet+Lithium Carbonate+Inj. Methylcobalamin	18	168.5µm	8.92

Table 2: P value in group A, B and C

Groups	Weeks	P value
A	4th Week	P<0.001
B	4th Week	P<0.001
C	4th Week	P<0.001

DISCUSSION

Methylcobalamin play a focal role in normal functioning of brainand nervous system as it causes DNA synthesis[12]. Literature has proved that Cerebellar molecular cell layer`injury by lithium[13] is reversible and these findings are in agreement with Netto and Phutane[14].·This may be due to fact that Methylcobalamin causes cell division and neurogenesis[15,16].

The above beneficial effects of Methylcobalamin were observed in our research on damaged molecular cell layer and it concluded that Methylcobalamin at a dose of 500 micro grams /three times by intramuscular injection for 4 weeks causes restoration of the histology and thickness of molecular cell layer; this may be due to the fact that Mecobal causes proliferation of cerebellar tissue.

CONCLUSION

Methylcobalamin causes restoration of nervous tissue and should be prescribed by clinicians in nerve tissue damage.
Conflict of interest: Nil

REFERENCES

1. Chakrabarty B, Dubey R, Gulati S, Yoganathan S, Kumar A, Kumar A. Isolated cerebellar involvement in vitamin B12 deficiency: a case report. J Child Neurol. 2014 Nov;29(11):NP161-3. doi: 10.1177/0883073813513498. Epub 2013 Dec 16. PMID: 24346315.
2. Ataullah AHM, Naqvi IA. Cerebellar Dysfunction. 2020 Sep 1. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan–. PMID: 32965988.
3. Jimsheleishvili S, Dididze M. Neuroanatomy, Cerebellum. [Updated 2020 Jul 31]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538167/
4. Unverdi M, Alsayouri K. Neuroanatomy, Cerebellar Dysfunction. [Updated 2020 Aug 10]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK545251/
5. Serino MI,Diedrichsea J,Tachrout M,Testasilva G,D'Arcenil H, De Zeeuw CI ,in "The human cerebellum has almost 80% of the surface area of the neocortex" Proceedings of the National Academy of Sciences Aug 2020, 117 (32) 19538-195 OI: 10.1073/pnas.2002896117
6. De Zeeuw CI, Lisberger SG, Raymond JL.: Diversity and dynamism in" the cerebellum". Nat Neurosci. 2021 Mar;2 (3):450. doi: 10.1038/s41593-020-00782-5. . MID: 33398139.
7. Iremscu I,Bolfa P,Crisan M,Dezdrobitu C,Damian A,In "Macroscopical and Histological aspects in Chinchillas.Agriculture and agriculture proceedings",(2015)350-35913.
8. Kumar, S.B., Kamal, R., Khan, A. *et al.* Dose optimization of lithium to increase the uptake and retention of I-131 in rat thyroid. *Radiat Environ Biophys* **58,** 257–262 (2019).
9. Han X., Wang L., Shi H., Zheng G., He J., Wu W., Shi J., Wei G., Zheng W., Sun J., et al. Acupuncture combined with methylcobalamin for the treatment of chemotherapy-induced peripheral neuropathy in patients with multiple myeloma. [(accessed on 19 June 2020)];BMC Cancer. 2017 17:40. doi: 10.1186/s12885-016-3037-z. Available online: http://bmccancer.biomedcentral.com/articles/10.1186/s12885-016-3037-z
10. Gupta JK; Sana S Q; in Potential benefits of Methylcobalamin: Review https;//www.researchgate.net/publication/339412930
11. Mussi AC, Rhoton AL Jr. Telovelar approach to the fourth ventricle: microsurgical anatomy. J Neurosurg. 2000 May;92(5):812-23. doi: 10.3171/jns.2000.92.5.0812. PMID: 10794296.
12. Zhang M,H wenjuan,H Sanjue,X Hui in Hindawi Publishing Corporation Neural Plasticity Volume 2013, Article ID 424651, 6 pages http://dx.doi.org/10.1155/2013/42465133
13. Yuan m, Wong b,tan shijjin in Mecobalamin and early functional outcomes of ischemic stroke patients with H-type hypertension.http//dxdoi.org/10.1590/18062
14. Netto I, Phutane VH. Reversible lithium neurotoxicity: review of the literature. Prim Care Companion CNS Disord. 2012;14(1):PCC.11r01197. doi: 10.4088/PCC.11r01197. PMID: 22690368; PMCID: PMC3357580.11.
15. Rathod R, Kale A, Joshi S. Novel insights into the effect of vitamin B_{12} and omega-3 fatty acids on brain function. J Biomed Sci. 2016 Jan 25; 23:17. doi: 10.1186/s12929-016-0241-8. PMID: 26809263; PMCID: PMC4727338.
16. Strand TA, Ulak M, Chandyo RK, Kvestad I, Hysing M, Shrestha M, Basnet S, Ranjitkar S, Shrestha L, Shrestha PS. The effect of vitamin B_{12} supplementation in Nepalese infants on growth and development: study protocol for a randomized controlled trial. Trials. 2017.