Original Article

To Evaluate the Neurotropic Effects of Methylcobalamin on Atrophied Cerebellar Granular Cell Layer in Albino Rats

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ABSTRACT

Objective: As there is scanty research literature on the neurotropic effects of Methylcobalamin on the Cerebellar Granular cell layer of cerebellum, our present study was carried out to evaluate the neurogenetic effects of methylcobalamin on Cerebellar granular cell layer.

Study Design: Observational, Experimental study

Place and Duration of Study: This study was conducted at the Animal House of Basic Medical Sciences Institute (BMSI) JPMC, Karachi from 30 June and ended at 30 July 2013.

Materials and Methods: We selected 18 albino rats weighing 140-185 animals and each group contained six animals. In Group A there were six, animals which were fed Lab diet and water, Group B contained six albinos which were given Lithium carbonate at a dose of 20 mg/g OD for four weeks and Group C received Lithium carbonate at a dose of 20 mg/kg OD in flour pellets along with Injection 500 microgram of Methylcobalamin.

Results: The results showed regeneration and improved thickness of Granular layer due to vitamin b12.

Conclusion: The strength of this study proved that the use of vitamin b12 is resulted in restoring the cerebellar Granular cell layer of cerebellar gray matter.

Key Words: Cerebellar Granular layer, Degeneration, Regeneration

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INTRODUCTION

Cerebellum a part of hindbrain is present posterior to the brainstem and fourth ventricle,[1] it consists of two cerebellar hemispheres[2] which comprises of Gray and White matter.

The cerebellar cortex consists of three layers, the outer is the low cell or Molecular layer, the interface or middle is the Purkinje cell layer and the innermost Cells rich layer is called the Granular cells layer[3]. The innermost layer is easy target for deleterious Opoid agents such as Morphine[4], metals like Zinc[5] and Lithium.[6]

Lithium carbonate is frequently prescribed in Pakistan in Bipolar affective disorders.[7]

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Lithium ingestion causes neurological signs in patients[8] these neurological deficits[9]were found to be reversed by use of Methylcobalamin as documented by Kaji, et al 2019[10].

We found that there is insufficient data on the Neuroprotective role of Methylcoba- lamin on cerebellar cortex including Granular Cerebellar layer ,therefore this study was carried out to collect further observed data on the beneficial effects of Vitamin B 12 on Granular layer in Albino rats.

MATERIALS AND METHODS

The Animal House of Basic Medical Sciences Institute, JPMC, Karachi affiliated with the Anatomy department of Basic Medical sciences Institute is the place where our research was conducted, for four weeks. For this study eighteen adult albino rats weighing almost 140 to 185 grams were selected. The animals were divided in three groups, each group comprised of six rodents. Six in Control Group A were given Lab diet and Six Group B rodents ingested Lithium Caronate at a dose of 60 mg /kg OD[11] in flour pellets for four weeks and Group C albinos who were six in number were given Methylcobalamin 500mcg for four weeks along with Lithium carbonate 60 mg /kg OD for above time period in flour pellets.

At completion of four weeks the animals were sacrificed, brain was removed; the cerebellum was separated from the rest of the brain and fixed in Formaldehyde[12] 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.[13]

The changes of the thickness of Granular layer were observed under light microscope in all groups. Observations were recorded at the end of four weeks. Measurement of thickness of Granular 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 Granular cell layer was documented in major group-A (Lab diet group) shows a highly significant increased thickness of inner layer at 4 weeks' time interval as compared to the major group-B (Lithium treated) but a highly significantly increased thickness of Granular cell layer was visualized and recorded in Group C (Methylcobalamin) compared to Group B animals.

RESULTS

Group-A (lab diet) which was 178 ±0.89 microns at 4 weeks was observed and showed normal histology and thickness of Granular layer Table: 1

Observations showed a highly increased thickness of Granular 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 or of Granular layer was observed in group B (90.1±0.34 µm)

Group-C shows highly significant P value <(.001) increase in thickness of molecular cell l ayer172.5±1.96 microns.

Results proved that Methylcobalamin restored thickness of molecular layer.

Table No.1: Measurement of granular cell layer in microns at 4 weeks in Group A, B and C

Groups	No. of Subjects	4th Week	
		Mean	SEM
A Normal Diet	6	178.6µm	0.89
B Normal Diet + Lithium Carbonate	6	90.1µm	0.34
C Normal Diet + Lithium Carbonate+ Inj. Methylcobalamin	6	172.5µm	1.96

Table No.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 the vitamin B12 play a vital role in neuronal DNA synthesis[14] in degenerated neuronal tissue and leads to proliferation of neurons as seen by Idiris and Belge[15]. The same results of Neuroregeneration by Methylcobalamin were found in our study and we documented that Methylcobalamin treatment in group C animals alleviated the damage of alkali metal on Cerebellar granular cell layer. Methylcobalamin restored the thickness of granular cell layer. This may be due to the fact that Methylcobalamin causes Antioxidative effects and decreases neuronal Apoptosis.

The same results of regenerated Granular cell neurons and Granular layer were observed by Okada, et al 2010[16] their Research documented that Methylcobalamin ameliorated the damage to the Granular layer and increased the thickness of Granule cells layer. This may be due to the fact that methylcobalamin enhances the methylation cycle in neurons and increases the neuronal protein kinases and DNA methylation. Our research is in accordance with their results.

CONCLUSION

Our population suffering from neuronal damage should be prescribed Methylcobalamin.

Author's Contribution:

Concept & Design of Study:	Tazeen Kohari
Drafting:	Faryal Azhar, Meshaal Azhar
Data Analysis:	Faryal Azhar, Usama Faruqui
Revisiting Critically:	Tazeen Kohari
Final Approval of version:	Tazeen Kohari

Conflict of Interest: The study has no conflict of interest to declare by any author.

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