Effect of Carbamazepine on Biochemical Parameters in Central Nervous System Patients

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Abstract

The response of serum glucose, Acetylcholinesterase, Haemoglobin and Urea to administration of carbamazepine drug was examined in Trigeminal neuraglia, Epilepsy, Brain tumour and various cases with short treatment. Carbamazepine in a dose of 80 mg / day given orally significantly inhibited the activity of AchE in the serum by (-57.5%) for a period of three years in trigeminal neuralgia patient in comparison with the control group. Also noted significantly an increased of the level of glucose by (66.3%) for a period of 12 months in Brain tumour patients. This drug increased the level of urea but decreased the level of Haemoglobin in Epilepsy patients.

The results indicate that carbamazepine changes AchE activity and possibly the central cholinergic neurotransmission.

الخلاصة

تم دراسة تأثير دواء الكاربامازيبين على مـستوى الكلوكـوز، انـزيم الاسـتيل كـولين اسـتريز، الهيموكلوبين واليوريا لمصل دم مرضى التهاب العصب القحفي الخامس والصرع وورم الـدماغ والحـالات أعلاه المعالجين لفترة قصيرة بالدواء المذكور.

أظهرت النتائج تثبيط لفعالية انزيم الاستيل كولين في المرضى الذين يتناولون الكاربامازيبين حيث أن الجرعة المساوية لـ 80 ملغم / يوم خفضت وبشكل معنوي فعالية انزيم الاستيل كـولين اسـتريز لمرضـى

التهاب العصب القحفي الخامس بواقع (57.5%) خلال فترة قد تصل ثلاث سنوات من بدء العلاج عند مقارنة مجمل النتائج مع مجموعة السيطرة.

كما لوحظ زيادة معنوية لمستوى كلوكوز الدم لمرضى ورم الدماغ بواقع (66.3%) خلال فتـرة قـد تصل إلى 12 شهراً.

كذلك لوحظ زيادة لمستوى يوريا الدم ونقصان لمستوى هيموكلوبين الدم لمرضى الصرع.

توحي هذه النتائج بأن الكاربامازيبين يغير من نشاط انزيم الاستيل كولين استريز ومن المحتمل الناقل العصبي الاستيل كولين في الدماغ.

Introduction

Actylcholinesterase (AchE) [Ec.3.1.1.7] is a membrane-bound enzyme found in all cholinergic neurons and plays essential roles in the regulation of most physiological events involving the turnover of acetylcholine [1, 2]. This has been regarded as the most important biochemical marker of cholinergic transmissio in the central nervous system [3]. The activity of blood or brain AchE have been found to be affected by a number of iminostibene compound and various psychotropic drugs [4]. Tegretol is a medication commonly used in the treatment of bipolar affective disorders, schizophrenia, Trigeminal neuraglia and other specific pain disorder like glossophryngeal neuralgia, peripheral neuralgia peripheral neuropathy and after surgical treatment (Brain tumour). The generic name of Tegretol is carbamazepine [5].

Trigeminal neurolgia (Trificial neuralgia) is a disorder characterized by brief attacks of severe pain within the distribution of one or more divisions of the trigeminal nerve [6]. The purpose of the present study was to examine the effect of carbamazepine upon serum actylcholinesterase activity in serum of patients suffering from Trigeminal neuraglia, Epilepsy and Brain tumour.

Experimental

Serum Collection:

Two ml of venous blood was collected from:

1. Control group:

   Six normal control, 3 males and 3 females aged 22-50 years (mean 36 years) randomly selected from University of Mosul students and lectures..

2. Patients:

   Four groups of patients who attending to sixth floor of the Ibn Senaa hospital in Mosul for the period from September to December 2003 were studied:

One. Trigeminal neuralgia group:

Twelfth patients were included in this group (8 males and 4 females) age 40-65 years with a mean of 52.5. Those patients were taking carbamazepine in a dose of 80 mg / day for a period from four months to three years.

b. Epilepsy group:

Sevene patients were included in this group (3 males and 4 females) age 30-46 years with a mean of 35.5. Those patients were taking the same dose of this drug for a period from one-five months.

c. Brain tumour group:

Ten patients were included in this group (6 males and 4 females) age 37-55 years with a mean of 46. Those patients were taking the same dose of this drug for a period from two-twelve months.

d. Variety group:

Elevene patients were included in this group (5 males and 6 females) suffering from previous cases. They had an age range of 20-62 years with a mean in 41 years and were taking the same dose of this drug for a period from one-seven days.

3. Assayes of parameters:

One. glucose: Blood glucose level was determined using Randox kit for glucose oxidase method [7].

Two. AchE Actylcholinesterase activity was assayed using acetylcholine iodide (7.5%) as a substrate [8].

Three. Hb: Haemoglobin concentration was measured using cyanomethemglobin method [9].

Four. Urea: Blood urea level was determined using urease-modified Berthelot reaction. [10].

Satistical significance of the differences between mean values was analyzed by students "t" test [11]. The level of significance was at $p<0.01$.

Result and Discussion

The mean values for glucose, AchE activity, haemoglobin concentration and urea of serum obtained from all groups are shown in Table 1. The results of the present study showed remarkable increasing effect on blood glucose level in Group 4 by (66.3%) in comparison to control group. This could be due to activation of glycogenolysis in liver and muscle, or / and inhibition of insulin secretion from B-cell in pancrease [12].

In this study, the activity of cholinergic neurotransmission following adiministration of carbamazepine was investigated by assaying serum AchE. The result showed that, Group 2 carbamazepine at

80 mg / day the activity was significantly redused in comparison with the control group. The effect of carbamazepine may be due to inhibition at the anionic site of AchE [13]. On the other hand, many reports suggested that such inhibition is due to a decrease in the internal microviscosity of phospholipids leading to changes in the fluidity of microsomal membranse of the brain [14, 15].

Examination of Table 1 indicated that carbamazepine at 80 mg / day has increase effect on blood urea level but decreased of Haemoglobin level by (25.7%) (-29.0%) respectively of Epilepsy patients (group 3).

The most acceptable illustretion for increasing in blood urea level may be due to the side effect of the (CBZ) drug on liver because hepatocytes were cosidered the main urea manufacture [16]. But, the decrease of haemoglobin level may be due to the abnormal haematological effects of (CBZ), which may causes Aplasic anemia (cagranulocytosis) in which the erythrocytes depressed in bone marrow [17].

Table 1: Effect of carbamazepine on glucose, Acetylcholinesterase, Haemoglobin and Urea level

Group No.	Carbamaz-epine 80mg/day	Period of treatment	Glucose mmol/L	Change %	AchE ΔpH/30min	Change %	Haemoglo-bin Hb g/dL	Change %	Urea mmol/L	Change %
1	Normal (control)	-	4.10±0.21	-	1.325±0.15	-	14.1±1.5	-	5.21±0.20	-
2	Trigeminal Neuraliga	4 months -3 years	4.91±0.21	19.7	0.565±0.82*	-57.5	12.8±1.6	-9.2	6.01±0.21	15.3
3	Epilepsy	1-5 months	3.92±0.56	-4.3	1.191±0.98	-9.8	10.0±2	-29.0	6.55±0.89	25.7
4	Brain tumour	2-12 months	6.82±0.81*	66.3	1.440±0.77	+9.0	11.5±1.2	-18.4	4.80±0.35	-7.6
5	Variety	1-7 days	4.20±0.71	1.4	1.402±0.22	+6.0	13.9±2	1.4	5.41±0.42	3.8

* Refers to significant at $p<0.01$ compared with the control group.

The values are mean ± ES.

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