MEASURMENT OF C-PEPTIDE IN BLOOD AND SALIVA IN CHILDREN WITH TYPE 1 DIABETES MELLETIS

Nashiet A. Nashiet* *CABP,* **A.W.R. Hamad**** *B.Sc., Ph.D.,* **W.K. Jawad****

Abstract

Background: C-Peptide is a polypeptide hormone (31 amino acid residues) with molecular weight of 3.018 Dalton. It is a part of the pro-insulin molecule. Determination of C-peptide is useful in all cases in which the insulin assay would normally be used; antibodies and exogenous insulin therapy interfere with the insulin immunoassay.

Aim: To determine the relation between the level of C-peptide in blood and saliva in children with Type 1 Diabetes Mellitus.

Material & Method: Our study conducted in the Pediatric Diabetic Clinic of Al-Kadhimiya Teaching Hospital, Baghdad, Iraq, between March 2000 to April 2001. Fifty patients were involved in the study, blood aspiration and saliva samples were taken at morning from fasting known diabetic patients registered in diabetic clinic for measuring C-peptide level by using radio immunoassay kit (Cis, France), also serum glucose was measured.

Results: The level of C- peptide in serum was about 6-7 times higher than saliva.

Conclusion: The measurement of C-peptide in saliva is easy and reliable, with no disturbance or panic in pediatric age group.

Keywords: C-peptide, Diabetes Mellitus, Saliva, Serum.

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Introduction

C-peptide is a polypeptide hormone (31 amino acid residues) with molecular weight of 3,081 Dalton. It is a part of the pro-insulin molecule, the connecting peptide splits out, leaving two amino acids chains of 21 and 30 AAS (A-and β-chains, respectively) connected by sulphur bridges. This splitting out of C-peptide occurs as the pro-insulin is packed into vesicles in the Golgi apparatus when the beta cell is stimulated to release insulin and secretary granules are brought to its surface for discharge, the hormonally inert connecting peptide passes together with insulin into the adjacent capillary.

In the pancreatic β-cells, pro-insulin is enzymatically cleaved into insulin (A chain and β chain) and the C-peptide molecule. Both are simultaneously secreted in equimoalar concentrations into blood, insulin have rather a short half-life of approximately 5 minutes, while the half life of C-peptide is approx. 30 minutes. Therefore, the molar ratio between C-peptide and insulin in the peripheral blood ranges between approximately 3:1 and 5:1[1,2].

The main degradation site for C-peptide is the kidney. Therefore patients with renal dysfunction exhibit a longer life and elevated basal values[3]. Determination of C-peptide is useful in all cases in which the insulin assay would normally be used, in which, however, the presence of circulating insulin antibodies and exogenous insulin therapy interfere with the immunoassay[4].

The C-peptide has no known biological activity. It is a distinct molecule from an antigenic stand point. Thus C-peptide immunoassay can distinguish insulin secreted endogenously from insulin administrated exogenously and can quantities the former when anti-insulin antibodies preclude the direct measurement of insulin[5,6].

The C-peptide of different species have a high rate of amino acid substitution and observation which under scores the statement that this fragment probably has no biological activity[5,6,7].

Material & Methods

The study included fifty patients with type 1 Diabetes Mellitus attending Pediatric Diabetic Clinic in Al-Kadhimiya Teaching Hospital, during the period from March 2000 to April 2001, their ages were between 5-26 years. Two milliliters of fasting blood and about 2 milliliters of saliva were taken for the measurements of C-

* Dept. Pediatirics, ** Research Center, College of Medicine, Al-Nahrain University.

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Address Correspondence to Dr. Nashiet A. Nashiet,
E-mail naazna2003@yahoo.com.

peptide and blood glucose .C-peptide was measured by radioimmunoassay.

The collection of saliva was done by washing the mouth with distilled water twice and then the saliva was collected by disposable pipette. The method used to determine the level of C- peptide in blood and saliva was by taking patient sample add to it C- peptide antiserum + I 125- C-peptide +1 bead and then incubated at room temperature for 3 hours and then washing and measure the level and C-peptide in Gamma counter.

Statistical analysis: Students (t)-test was used to estimate the significance of the variations in the results obtained for the test two groups.

Results

The total number of samples collected for one year (March 2000-April 2001) was 50 samples of serum and saliva for determination of the level of C-peptide and fasting serum glucose.

Table 1 shows the level of C-peptide in serum, saliva and mean fasting serum glucose. In the first group (age 5-6 years), the number of patients were 10, serum level of C-peptide 1.376 with standard deviation ± 0.201 while that of saliva was 0.234 with standard deviation ± 0.034 and fasting blood sugar 94 mg/dl. The second group (age 7-8 years) (n=8), the mean value of C-peptide in serum was 0.659 with standard deviation $\pm$ 0.096 and that in saliva was 0.106 ± 0.017 and fasting blood sugar 91 mg/dl. The third group (age 9-10 years), (n=10) and serum level of C- peptide in serum 0.498 with standard deviation $\pm$ 0.080 and that of saliva was 0.081 $\pm$ 0.13 and fasting blood sugar 89 mg/ dl. The forth (age 11-12y), (n=6). The level of C-peptide in serum 0.868 ± 0.127 while in saliva was 0.139 ± 0.022 and fasting blood sugar 84 mg/dl.

The fifth group (age 13-14y), (n=10). The level of C-peptide in serum 0.934 ± 0.137 with that in saliva 0.138 ± 0.022 and fasting blood sugar 95 mg/dl. The last group (age 15-16y), (n=6). The level of C= peptide in serum 1.632 ± 0.24 with that of saliva 0.223 ± 0.35 and fasting blood sugar 99 mg /dl.

The conclusion from the table 1, and Figure 1, it appeared that the concentration of C-peptide in blood was 6-7 times higher than that of saliva and there was no significant difference between age groups in both C-peptide levels in serum and saliva.

Table 1: Serum and salivary C- peptide and serum glucose in different age groups of children with type I DM

Age (years)	No. of samples	Serum C-peptide	Saliva C-peptide	Serum fasting glucose
5-6	10	1.376±0.201	0.234±0.034	94
7-8	8	0.659±0.096	0.106±0.017	91
9-10	10	0.498±0.08	0.081±0.031	89
11-12	6	0.868±0.127	0.139±0.022	84
13-14	10	0.934±0.137	0.138±0.022	95
15-16	6	1.632±0.24	0.0223±0.035	99

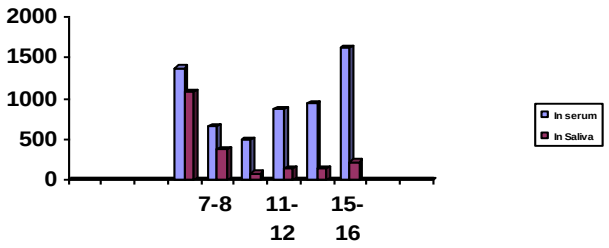

Figure 1: Level of C-peptide in serum and saliva

Discussion

Determination of C-peptide is useful in all cases in which the insulin assay would normally be used in which, however, the presence of circulating insulin antibodies and exogenous insulin therapy interfere with the immunoassay[1,4]. Moreover C-peptide is used in classification of diabetes and can be measured in other body fluids[7,8].

In this study the samples were taken from children early diagnosed with type 1 diabetes mellitus and some of them were in the honeymoon period. Patients with uncontrolled D.M or had acidosis, dehydration and febrile illness were excluded.

The radioimmunoassay method used for assessment of C-peptide in serum and saliva of children with type 1 D.M is one of the most sensitive methods available for the analysis of various types of organic compounds from complex biological fluids. Following a rapid development of RIA procedures in clinical chemistry, the method has been introduced during the last few years into the analysis of plant assay of serum insulin in diabetic patients[9,10].

In this study the measurement of C-peptide level in serum was about 6-7 times that of saliva in different age groups and there was no significant difference between ages in both C-peptide levels in serum and saliva.

Measurement of C-peptide exhibits a number of advantages over insulin measurement. Because hepatic metabolism is negligible, C-peptide levels are better indicators of β-cell function than perhaps insulin concentration. Furthermore, C-peptide assays do not measure exogenous insulin and do not cross-react with insulin antibodies, which interfere with insulin immunoassay[1,11,12].

So we can conclude that measurement of C-peptide in saliva is reliable, easy, accurate and cheap in pediatric age group, for the … etc.

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