

DİABETES MELLİTUS' TA HİPORENİNEMİK HİPOALDOSTERONİZM

HYPORENINEMIC HYPOALDOSTERONISM IN DIABETES MELLITUS.*

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Özet

Diabetik hastaların büyük kısmında böbrek hastalığı ve düşük renin aktivitesi gösterilmiştir. Diabetes mellitus ile hipoadosteronizm sıklıkla bir arada bulunmaktadır. Bu sendromun patogenezi açıklanamamıştır. Yaptığımız çalışmada diabetes mellitusu olan hastalarda plazma aldosteron düzeylerini ve renin aktivitesini inceleyerek, sağlıklı kontrol vakaları ile karşılaştırdık. Çalışmamıza 72 diabetes mellitus hastası ve 10 sağlıklı kontrol vakası dahil edildi. Diabetes mellitus grubunda plazma aldosteron düzeyleri ve renin aktivitesi, kontrol grubuna göre önemli oranda düşük bulduk. Bu parametreler plazma glukoz düzeyleri, glikolize hemoglobin düzeyleri, BUN, endojen kreatinin klirensi ve potasyum düzeyleri ile korelasyon göstermiyordu. Özetle, diabetes mellitus olan hastalarımızda hiporeninematik hipoadosteronizm tesbit ettik, ancak bu sendromun patogenezi izah edemedik.

Anahtar kelimeler : *Diabetes Mellitus, Hiporeninematik Hipoadosteronizm.*

Summary

Renal disease and low renin activity have been demonstrated in the majority of diabetic patients. There is a frequent association between diabetes mellitus and hypoadosteronism. The pathogenesis of this syndrome remains unclear. We investigated plasma levels of aldosterone and renin activity in the diabetic patients and compared with those of healthy control subjects. Seventytwo patients and ten healthy control subjects were examined. Plasma levels of aldosterone and renin activity were significantly lower than those of control group. There was no correlation among plasma levels of glucose, glycolysed hemoglobin (Hb A1c), blood urea nitrogen, endogenous creatinine clearance rate, potassium and plasma levels of aldosterone and renin activity. In summary, we detected hyporeninemic hypoadosteronism in the patients with diabetes mellitus, but could not explain the pathogenesis of this situation.

Key words : *Diabetes Mellitus, Hyporeninemic Hypoadosteronism.*

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Introduction

The occurrence of intermittent hyperkalemia associated with insulin-dependent diabetics has attracted recent attention. In addition, it has been attributed to a combination of insulin deficiency and hyporeninemic hypoadosteronism (1,2,11,12). The important clinical features of this syndrome have now been identified as hyporeninemia, hypoadosteronism, and hyperkalemia. In addition, most patients have metabolic acidosis, diabetes mellitus (especially NIDDM) and at least a mild reduction in renal function as documented by an increase in blood urea nitrogen and creatinine (3, 4). In diabetes mellitus, reduced renin secretion may be due to small vessel disease in the kidney, autonomic neuropathy or the production of an inactive form of renin (5). We aimed to investigate the plasma levels of renin, aldosterone, glucose, glycolysed hemoglobin (Hb A1c), blood urea nitrogen, creatinine, endogenous creatinine clearance, potassium, sodium, uric acid, creatinine clearance

and the correlation among above mentioned parameters the diabetes mellitus.

Materials and Methods

Seventytwo (55 females, 17 males) patients with diabetes mellitus and ten (3 females, 7 males) healthy control subjects were examined. All of the patients with diabetes mellitus were insulin-dependent. In the patient and control groups, plasma blood urea nitrogen, creatinine, glucose, sodium, potassium and uric acid were examined by routine biochemical techniques (Hitachi 750 Autoanalyser). Plasma levels of Hb A1c were examined by using chromatography method (Glyc-Affin GHb, cat. no: SG-6200, Isolab Inc., USA). Student's t-test was used for evaluation of the difference among biochemical parameters in the patient and control group. Linear correlation was used for evaluation of the relationship among biochemical parameters in the patient group. All of calculation were applied on IBM computer by GB-STAT, Version 3.0 programme (13). Endogenous

Table 1. Comparison of Plasma Levels of BUN, Creatinine, Uric acid, Glucose, Glycolysed Hemoglobin, and Creatinine Clearance Between Diabetes Group and Control Group.

	Patients group	Control group	p values
BUN (mmol / L)	9.10 ± 5.39	3.42 ± 0.46	p < 0.005
Creatinine (µmol / L)	159.42 ± 115.14	70.85 ± 8.85	p > 0.5
Creatinine clearance rates (mL/s/m ²)	0.43 ± 0.05	1.10 ± 0.14	p < 0.0001
Uric acid (mmol / L)	0.31 ± 0.10	0.22 ± 0.01	p > 0.5
Glucose (mmol / L)	19.18 ± 9.58	5.11 ± 0.37	p < 0.0001
Hb A1c (%)	13.1 ± 3.8	5.6 ± 1.8	p < 0.0001

creatinine clearance rate was calculated by a rectangular hyperbola (11) and by a tables of creatinine clearance rates (10). Plasma renin activity and plasma aldosterone levels were examined by radioimmunoassay (Angiotensin I, catalog number : NEA-104, RIANEN, USA and Aldosterone, catalog number : TKAL 1, DPC, USA, respectively).

Results

Seventy two (55 females, 12 males) patients with diabetes mellitus and ten (3 females, 7 males) healthy control subjects were examined. In the patient and control groups, average of age was 54.02±10.7 year-old and 30.1±9.4 year-old, respectively. In the patient group, plasma levels of blood urea nitrogen, creatinine, glucose, Hb A1c, sodium, potassium, uric acid and endogenous creatinine clearance rate were 9.10 ±5.39 mmol/L, 159.42±115.14 µmol / L, 19.18±9.58 mmol/L, 13.1±3.8 per cent, 139.8 ±6.2 mmol/L, 4.7±0.5 mmol/L, 0.31±0.10 mmol /L and 0.43±0.05mL/s/m², respectively. Plasma renin activity and aldosterone levels were 0.39±0.37 µg/L and 0.26±0.20 nmol / L in the patient group (Table-1, and 2).

Table 2. Comparison of Plasma Levels of Sodium, Potassium, Aldosterone and Renin Activity Between Diabetes Group and Control Group.

	Patients group	Control group	p values
Sodium (mmol / L)	139.8±6.2	142.8± 1.7	p>0.5
Potassium (mmol / L)	4.7±0.5	4.1 ± 0.2	p>0.5
Renin activity (µg / L)	0.39±0.37	1.5 ± 0.2	p<0.0001
Aldosterone (nmol / L)	0.26±0.20	1.73 ± 0.52	p<0.0001

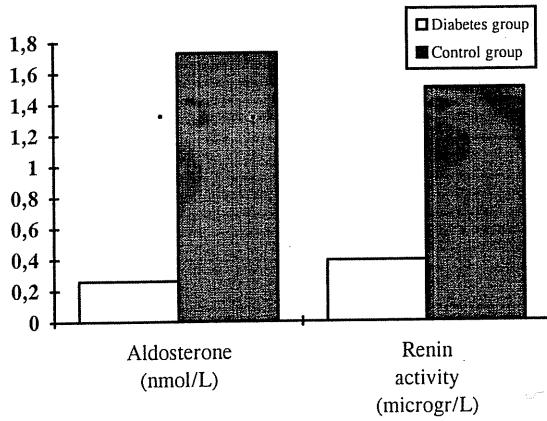
In the control group, plasma levels of blood urea nitrogen, creatinine, glucose, Hb A1c, sodium, potassium, uric acid, endogenous creatinine clearance rate, aldosterone and renin activity were 3.42 ± 0.46 mmol / L, 70.85± 8.85 µmol / L, 5.11±0.37 mmol/L, 5.6±1.8 per cent,

142.8±1.7 mmol/L, 4.1±0.2 mmol / L, 3.8 ± 0.3 mg/dL, 1.10±0.14 mL/s/ m², 1.73±0.52 nmol / L and 1.5 ± 0.2 µg / L, respectively (Table-1, and 2). In the patient group, plasma levels of glucose, Hb A1c, blood urea nitrogen and endogenous creatinine clearance rate were higher than those of control group, in addition, plasma levels of aldosterone and renin activity were lower than those of control group (t = 4.85, p < 0.0001, t =4.21, p < 0.0001, t = 3.29, p < 0.005, t =6.54, p < 0.0001, t = -14.8, p < 0.0001, t =-8.66 , p < 0.0001) (Figure-1). Plasma levels of creatinine, sodium, potassium and uric acid were not significantly different from those of the patient and control groups (p > 0.05). There was no correlation between plasma levels of glucose, blood urea nitrogen, sodium and plasma levels of aldosterone and renin activity.

Discussion

The frequent association of selective hypoaldosteronism with diabetes mellitus is known. Renin activity in these patients is usually low or subnormal. The aldosterone deficiency has been explained by low renin activity, circulating angiotensin II and combined defects in both renin and aldosterone biosynthesis (6, 7). In the present study, we investigated plasma levels of aldosterone and renin activity in the patients with diabetes mellitus. We saw that above mentioned parameters decrease in these patients. Renal disease and low plasma renin activity can be demonstrated in the majority of diabetic patients (8,11,12). We detected moderate highly renal function tests, low plasma renin activity and aldosterone levels in this study. Large et al. (5) described that in diabetic patients hyperkalemia occurred as a result of insulin deficiency and hyporeninemic hypoaldosteronism. We detected low renin activity and low aldosterone levels, but did not detect hyperkalemia, in addition, did not examine insulin levels in the diabetic patients. It was attributed that hyporeninemic hypoaldosteronism were usually seen in the elderly patients with mild renal insufficiency, often due to diabetes or chronic interstitial nephritis (4). Average of age of our patients was 54.02 ± 10.7 year, and

Figure 1. Comparison of plasma Levels of Aldosterone and Renin Activity in Both Group.



we detected a moderate renal insufficiency. In summary, the pathogenesis of this syndrome remains unclear. However, the defects in both renin and aldosterone biosynthesis, association with renin-angiotensin-aldosterone system and kallirein-kinin system and prostaglandin system are accused of this syndrome in the diabetic patients (4,8).

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