PART II

STUDIES IN BIOENERGETIC CORRELATIONS

Study on Bioenergy in Diabetes Mellitus Patients

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Abstract: The purpose of this article is to demonstrate two differences between diabetes mellitus patients and healthy subjects: 1)The bioenergetic measurement of electroacupuncture points and 2) the energy changes in diseased organs. In this phase of study, the authors chose diabetes mellitus because of the accuracy of diagnosing established diabetic patients. The data was analyzed by discriminant analysis which showed a 95 to 97.5% correct classification rate by test.

TSUEI et al.[1] studied sex and age variations in the bioelectric activities of 483 healthy subjects based on whole-body as well as specific-point measurements. In this investigation the bioenergetic measurements were compared between diabetic patients and healthy subjects to depict bioenergy patterns, if any, between the two groups and to test the usefulness of these measurements for discrimination.

The measurement of electric potentials, perception threshold, and conduction velocity of the peripheral nerve, spinal cord, and supraspinal segment of the somatosensory pathway has been used to make electro-physiological assessment of nerve function in diabetic patients with or without neuropathy.[2-6] Ionescu-Tirgoiste et al.[7,8] studied the electric potentials of the acupuncture points in diabetics with and without clinical symptoms of neuropathy at acupuncture points.

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This investigation was designed to statistically compare diabetic patients with healthy subjects in various bioenergetic measurements made at whole-body and specific point locations and to critically evaluate these measurements to discriminate between the two groups.

Two specific acupoints are important for the study of diabetic patients. The first is the Pancreas Measurement Point Number 3 as described by Voll[9] which corresponds to Sp-3 (Taibai) in Chinese medicine. It represents the measurement point for carbohydrate metabolism and the formation of pancreatic amylase and maltase. The second is the insulin point, which is located on the Triple Warmer meridian (TW1dI) and related to the pancreatic function of controlling carbohydrate metabolism. The measurement of bioenergy at these two points in diabetic patients was expected to show a marked drop.

Materials and Methods

Fifty-five established diabetic patients, diagnosed by conventional methods based on blood-sugar test and medical history, were recruited from a private family practice in Honolulu. These patients were first diagnosed during the period 1950 to 1987. At the time of recruitment they were under different treatment plans: Nine were on a diabetic diet, 22 received oral hypoglycemic medication, and 19 received daily insulin injections. The remaining five had developed diabetic complications under various treatment modalities. After overnight fasting, blood and urine sugar tests were conducted on these patients. For comparison a total of 95 known non-diabetics were recruited as controls from two sources: 36 subjects were from the same clinic; the others were senior citizens and church members from the community. In this control group, diabetes mellitus was ruled out for each subject by negative blood and urine tests.

The bioenergy in all subjects was measured by two participating physicians using a Dermatron (Pitterling Electronics, GmbH). As the first instrument available on the market for measuring EAV (Electroacupuncture according to Voll), the Dermatron is basically an impedance measurement device, which has a Volt-ohm metering circuit in the range of 0-1.2 volts and which delivers 12 microamperes of direct current at a full-scale reading of 100.

Four whole-body measurements were recorded. These were Hand-to-Hand (HH), Foot-to-Foot (FF), Left-Hand-to-Foot (LHF), and Right-Hand-to-Foot (RHF) as described in a previous study.[1] Ten specific points were also measured: The Left and Right Allergy control measuring points (LAcmp, RAcmp), the Left Skin point (LScmp), and the Right Pancreas point (RPcmp).[1] The six additional points measured were: The Right and Left Triple Warmer of Insulin points (RTW1dI and LTW2dI), the Right Spleen-Pancreas number three point (RSP3), the Right and Left Organ Degeneration control measuring points (RODcmp, LODcmp), and the Right Spleen-Pancreas number 2 point (RSP2). These hand and foot points are illustrated in Figures 1 & 2.

Each measurement provided two readings: The initial value and the indicator drop. The initial value was the reading taken at the highest point as indicated on the meter when the electrode was in contact, and the second reading was recorded as any subsequent drop to a lower value.

Because the two participating physicians found no consistent difference in the measurement of whole-body and specific points on the same subjects, this possible source of variation was not considered in any subsequent analysis. The chi-square test was performed on the data for sex, age, blood sugar, and urine sugar test results. For continuous data on all bioenergy measurements, the comparison of two groups was based on the *t*-test.

The method of discriminant analysis was used to distinguish the diabetic group from the control group based on a minimal set of bioenergetic measurements. Data was randomly divided into two subsamples with approximately the same number of patients and healthy subjects in each subsample. The discriminant function constructed in each subsample was applied to the other subsample to determine the usefulness of these measurements for classification.

Results

The diabetic group consisted of 33 males and 22 females while the control group had 43 male and 52 female subjects. The distribution of male and female subjects was not found to be statistically different between the patient group and the control group (Table 1). Subjects were further classified into three age groups: Young (30 years of age or younger), middle (31 to 60 years), and old (over 60 years). Although no patient was under 30 years of age and only 4 subjects were in the control group, the age distribution was not found to be statistically different between the two groups (Table 2). Approximately 40 percent of the subjects were of middle age and the remainder were of old age. The average age was 63.2 years with a standard deviation of 11.8 years for the patient group. The mean and standard deviations for the controls were 61.0 and 15.1 years, respectively.

The comparison of the fasting blood sugar level is given in Table 3. The blood sugar was under 120 mg/ml for the majority of subjects in the control group (96.3%). Only three subjects had a slightly higher level of blood sugar, but it was under 140 mg/ml. The mean blood sugar for the control group was 88.4 mg/ml with a standard deviation of 21.9 mg/ml. Fifty-seven percent of the patients had a level of blood sugar greater than 140 mg/ml. The patient group had a mean of 154.7 mg/ml and a standard deviation of 42.5 mg/ml. The difference in the fasting blood sugar test between the two groups was highly significant ($P<0.01$). None of the control subjects had a positive urine sugar test while 37 percent of the known diabetics had a positive result (Table 4).

The mean and standard deviations of the initial reading and drop reading for each bioenergy measurement are given in Table 5. A marked difference occurred between the diabetic patients and the controls in various measurements. The patients had a lower value for the Hand-to-Foot measurement on the left side (LHF) and right side (RHF) than did the controls, the difference being statistically significant ($P<0.01$). For the most specific point measurements the initial reading did not vary markedly between the two groups. With only two exceptions, one at the Right Spleen-Pancreas Number 2 point (RSP2) and the other at the Left Skin point (LScmp), the diabetic patients had a significantly lower initial value ($P<0.05$). However, the diabetic patients had a drop reading much greater than that of the controls at all specific points, the difference being highly statistically significant ($P<0.01$). The mean difference ranged from 0.8 units for the Left Skin point (LScmp) to 20.6 units for the Right Spleen-Pancreas Number 3(RSP3).

Because the diabetic patients did display a bioenergy pattern distinct from that of the controls, it became feasible to assess whether these measurements would have clinical importance for the diagnosis of diabetes, as well as to determine the relative usefulness of various measurements for such a discrimination. Only the ten specific point measurements were considered for this purpose. The initial and the drop readings at each point were treated as two independent variables. Nine variables were finally selected based on the magnitude of the difference between the patients and the controls. These variables included RSP3 drop, RSP3, RODcmp drop, LODcmp drop, Pcmp drop, LTW1dI drop, RTW1dI drop, RSP2 and RSP2 drop for discriminant analysis.

To test the applicability of the discriminant function, all patients were subdivided at random into two subsamples of approximately equal size. The healthy subjects were similarly grouped. The resulting Subsample A consisted of 28 patients and 47 controls, and 27 patients and 48 controls were in the Subsample B. No significant difference occurred between the diabetic patients in the two subsamples for each discriminating variable. Similarly, the controls in the two subsamples did not differ. For the Subsample A the discriminant function based on the nine selected variables misclassified only one patient and one control, giving a rate of misclassification of 2.5 percent. In Subsample B the discriminant function also misclassified one patient and three controls, giving an error rate of 5.3 percent. Subsequently, the discriminant function derived from Subsample A was used on Subsample B. One patient and four controls were erroneously classified, the misclassification rate being 6.7 percent. When the discriminant function derived from Subsample B was used on Subsample A, one patient and one control were misclassified, giving an error rate of 2.5 percent. The sampling variation and the small size of subsamples could be expected to cause the two discriminant functions to be different, and the use of either one on the other subsample could easily result in a slightly higher rate of misclassification.

Discussion

The findings of this investigation—that is, the diabetic patients measured by the EAV technique—showed a measurement drop significantly greater at all specific points than that of the controls, strongly suggesting that these measurements can be used to effectively diagnose diabetes. The RSP3 drop, which was the most significant among all the specific point measurements, was identified by Voll[10] as the carbohydrate metabolism point of the body.

The second reading of the RSP3 point was below 40 units in 85 percent of the patient group, and none of the control group's second reading of that point was below 40. This result confirmed Voll's observation that diabetic

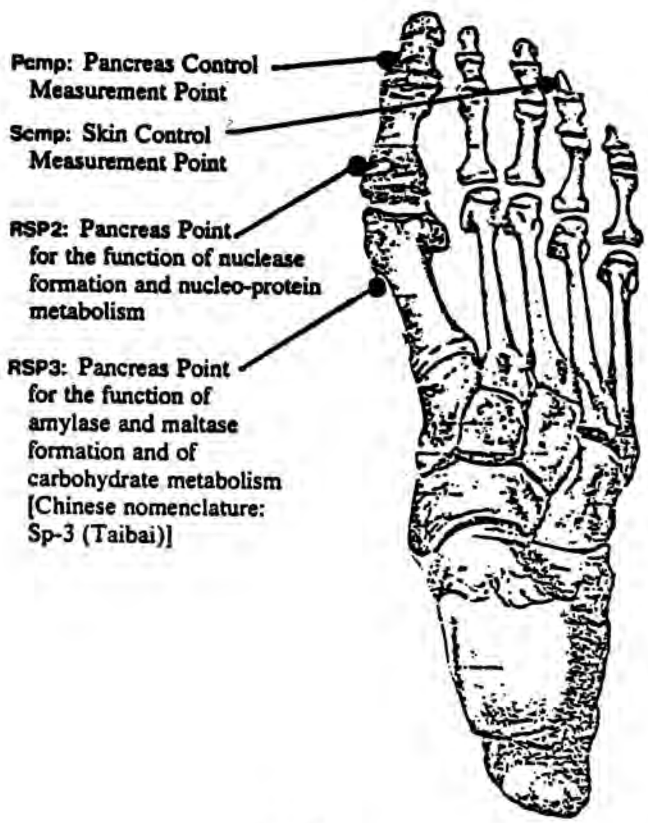

Figure 1.
Location and summary of measurement points on foot

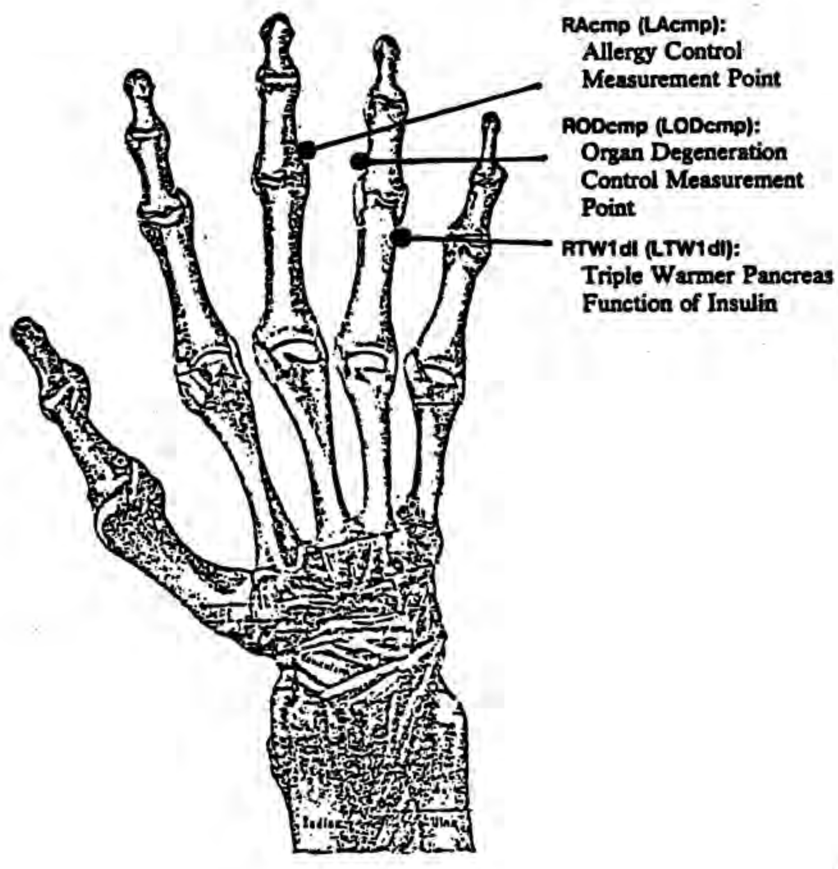

Figure 2.
Location and summary of measurement points on the hand

Table 1.
Sex distribution.

Sex	Patient	Control
Males	33	43
Females	22	52
Total	55	95

Table 2.
Age distribution.

Age class	Patient	Control
<30	0	4
31-60	22	34
>60	33	57
Total	55	95

Table 3.
Fasting blood test.

Sugar, mg%	Patient	Control
<120	10	92
121-140	13	3
>140	31	0
Total	54	95

Table 4.
Urine sugar test.

Urine sugar	Patient	Control
Negative	34	95
Positive	20	0
Total	54	95

Table 5.

Mean values of bioenergy measurements[1]

Measurement	Patient	Control	Difference[2]
Whole body[3]			
HH	80.6 (9.5)	82.9 (6.5)	-2.3
LHF	78.8 (11.5)	83.0 (7.8)	-5.2**
RHF	78.8 (12.1)	82.6 (7.5)	-3.8**
FF	82.4 (12.0)	82.8 (9.1)	-0.4
Specific point:			
RODcmp	57.9 (7.9)	57.0 (8.9)	0.9
RODcmp drop	5.8 (6.3)	1.3 (2.8)	4.5**
LODcmp	55.1 (7.5)	55.6 (8.3)	-0.5
LODcmp drop	6.0 (6.9)	1.1 (3.0)	4.9**
RTW1dI	57.5 (9.0)	56.0 (8.4)	1.5
RTW1dI drop	9.0 (5.8)	1.1 (2.5)	7.9**
LTW1dI	55.2 (8.0)	57.3 (9.6)	-2.1
LTW1dI drop	8.1 (5.7)	1.1 (2.4)	7.0**
Pcmp	56.6 (8.4)	59.3 (9.9)	-2.7
Pcmp drop	13.8 (8.1)	2.0 (4.4)	11.8**
RSP3	62.5 (10.6)	59.5 (9.1)	3.0
RSP3 drop	22.6 (8.2)	2.0 (4.3)	20.6**
RSP2	57.2 (9.2)	61.7 (9.3)	-4.5*
RSP2 drop	3.6 (5.3)	0.9 (2.5)	2.7**
RAcmp	59.7 (9.3)	57.6 (8.1)	2.1
RAcmp drop	4.6 (5.9)	2.4 (4.3)	2.2**
LAcmp	56.9 (8.6)	55.9 (10.4)	1.0
LAcmp drop	3.7 (5.1)	1.6 (4.3)	2.1**
LScmp	54.7 (7.8)	57.5 (11.4)	-2.8*
LScmp drop	1.5 (4.2)	0.7 (0.4)	0.8**

1. All standard deviations are given in parenthesis.
2. *Statistically significant ($P<0.05$); **Highly significant ($P<0.01$).
3. The drop for each whole body measurement was omitted because the magnitude of drop was neg.ibible.

patients should have a second RSP3 reading of below 42.

An interesting observation is that the other points that showed indicator drops were the LTW1dI-D and RTW1dI-D, which showed 7.4 and 8.2 times over the control group, respectively. These were identified by Voll as the endocrine points representing the pancreatic function of insulin secretions. The next most significant finding was on the pancreas control measurement point (RPcmp), which showed a drop reading of 6.9 times over the controls. This finding demonstrated the role of the pancreas in diabetis mellitus that matches the conventional medical teachings. The only other point measured that showed a large indicator drop were the left and right organ degeneration points. These were identified by Voll as nonspecific indicators for degeneration or tissue damage, which may or may not be present in early diabetes. The level of the indicator drops was smaller, but still four or five times over that of the control group. No significant drops were recorded from other acupuncture points measured such as Left Skin (LScmp) or the allergy points of both sides. One interesting point attracted attention. The Spleen-Pancreas Number 2 point (SP2) had an indicator drop of over four times that of the control group. This point was identified as the measurement point for the functions of nuclease formation and nucleo-protein metabolism, both of which may detect the presence of gout. Because the point is located on the same meridian as the pancreas, it may co-exist with diabetes.

Conclusion

The discriminant analysis showed that points RSP3-D and RSP3 were the most important discriminators that represented the initial value reading and the indicator drop reading of the Spleen-Pancreas Number 3 point (SP3). These two discriminators were three to five times more important than the other discriminators. This finding again re-enforced the efficacy of the EAV measurement system. The test of the discriminant analysis for Subsample A and Subsample B showed a 97.5 percent and 95 percent correct classification rate, respectively, which supports the validity of this method of evaluation. This accuracy was further confirmed by cross-examination between the two subsamples.

This investigation showed that bioenergetic measurements such as EAV can be effective in the diagnosis of diabetes. Because of its sensitivity, reliability, specificity, EAV can serve as an extremely valuable new diagnostic tool in medical practice.

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