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Digito-Palmar Complex in Non-Insulin Dependent Diabetes Mellitus

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Background: It is only recently that the knowledge of dermatoglyphics has been applied to the field of medical and genetic diagnosis.

Aim: The aim of the present study was to compare and evaluate the dermatoglyphic pattern in individuals with non-insulin dependent diabetes mellitus (NIDDM) with a normal adult population.

Materials and Methods: Both quantitative as well as qualitative parameters were analyzed in 112 (63 male and 49 female) subjects and compared with the data from 142 (65 male and 77 female) healthy controls. Modified Purvis-Smith ink method was used for obtaining the prints, and statistical analyses were done using Student's unpaired t test and chi-square test.

Results: A statistically significant increase in the 'atd' angle was noted on both hands of both sexes in diabetics when compared to the controls, who showed narrower angles. The presence of an additional axial triradii (t'/t") in diabetic patients was also significant.

Conclusions: With the available data, although other parameters were not statistically significant, the current work emphasizes that a wider 'atd' angle and the additional axial triradii were seen as reliable indicators helpful in scientific screening of populations prone to diabetes mellitus.

Key Words: Dermatoglyphics, atd angle, axial triradii, diabetes

İnsülin Bağımsız Diyabette Digito-Palmar Kompleks

Giriş: Dermatoglifiklerle ilgili bilgilerin medikal ve genetik tanı alanına girişi yakın geçmişe dayanır.

Amaç: Normal ve insülinden bağımsız diyabeti olan kişilerin dermatoglifik özelliklerinin araştırılması amaçlandı.

Yöntem ve Gereç: İnsülin bağımsız diyabeti olan 112(49K) hasta ve 142(77K) normal sağlıklı kontrole ait veriler karşılaştırıldı. Modifiye Purvis-Smith mürekkep yöntemi kullanılarak baskılar elde edildi ve veriler t-test ve ki-kare testleri kullanılarak karşılaştırıldı.

Bulgular: Kontrollerin daha dar açılarına karşın, diyabeti olan hastalarda cinsiyete bakılmaksızın 'atd' açısında istatistiksel olarak anlamlı bir artış olduğu gözlendi. Diyabetik hastalarda ilave aksiyel triradii(t'/t") varlığı da anlamlı idi.

Sonuç: Diğer parametreler anlamlı olarak bulunmasa da daha geniş 'atd' açısı ve ilave aksiyel triradii gibi veriler özellikle diyabete eğilimi olan kişilerin taramasında güvenilir göstergeler olarak bulunmuştur.

Anahtar Sözcükler: Dermatoglifik, atd açısı, aksiyel triradii, diyabet

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Introduction

The peculiar patterns of the epidermal ridges serve as a diagnostic tool in a number of diseases that have a strong hereditary background; diabetes mellitus is one such disease with a strong genetic basis. The importance of dermatoglyphic studies in clinical medicine is that, during development, ridge formation is affected by maternal environment, gene deviants, and chromosomal aberrations. Once formed, they are age and environment stable, becoming a reliable indicator of genetic damage. Dermatoglyphic investigation is absolutely cost effective and requires no hospitalization, and it can help in predicting the phenotype of a possible future illness. The present study was undertaken to ascertain the reliability of dermatoglyphics as a predictive diagnostic tool for diabetes.

Materials and Methods

In the present study, 112 non-insulin dependent diabetes mellitus (NIDDM) patients (63 males and 49 females) and 142 (65 males and 77 females) healthy controls belonging to the same demographic profile were included. The individuals in the control group were above the age of 40 years and had no significant personal or family history of DM. Possibilities of other hereditary diseases were also ruled out. Informed consent was obtained. Modified Purvis-Smith ink method (1) was applied to record the finger and palm prints. The prints so obtained were analyzed and tabulated for certain quantitative and qualitative parameters. Statistical analyses were done by applying the Student's unpaired t test and chi-square test.

Results

Certain variables (total finger ridge count-TFRC, absolute finger ridge count-AFRC, a-b ridge count, "atd' angle, additional axial triradii, pattern intensity of fingers and principal digital pattern frequency) were compared. Statistically significant parameters ($P < 0.001$) were noted and tabulated (Tables 1- 4).

Table 1. Comparison of 'atd' angle in control (c) and diabetic (d) groups.

	N	Mean+Standard Deviation	
		Right hand	Left hand
'atd' angle	c-142	44.73 ± 5.09	44.70 ± 5.57
	d-112	53.85 ± 10.54	54.73 ± 12.15
		(P value-0.00)	(P value-0.00)

Table 3. Comparison of additional axial triradii (t') in control (c) and diabetic (d) groups.

	c	d
t' (Rh)	08	42 (P value-0.00)
t' (Lh)	06	43 (P value-0.00)

Rh: Right hand, Lh: Left hand

Table 4. Comparison of additional axial triradii (t') in both sexes of control (c) and diabetic (d) groups.

	Male		Female	
	c	d	c	d
t' Rh	03	29 (P value-0.00)	05	13 (P value-0.002)
t' Lh	01	23 (P value-0.00)	05	20 (P value-0.00)

Rh: Right hand. Lh: Left hand.

Contrary to previously reported differences, parameters such as TFRC, AFRC, a-b ridge count, pattern intensity of fingers and principal digital pattern frequency were statistically insignificant; and as such, the wider 'atd' angle and the presence of additional axial triradii became reliable indicators of diabetes.

The epidermal ridges run in different directions and meet to form the triradius. In the distal palm there are four triradii, one proximal to each finger except the thumb, named 'a, b, c and d', from index to little finger, respectively. At the proximal end of the palm in line with the middle finger, there is normally another triradius - the axial triradius 't'. Additional axial triradius is

Table 2. Comparison of 'atd' angle in both sexes of control and diabetic groups.

	Mean+Standard Deviation					
	Male			Female		
	N	Right hand	Left hand	N	Right hand	Left hand
'atd' angle	Cm- 65	44.26 ± 5.16	43.60 ± 4.98	Cf-77	45.12 ± 5.04	45.64 ± 5.89
	Dm-63	52.51 ± 9.68	52.13 ± 10.69	Df-49	55.57 ± 11.42	58.08 ± 13.16
		P value-0.00	P value-0.00		P value-0.00	P value-0.00

Cm: Control male, Cf: Control female, Dm: Diabetic male, Df: Diabetic female

designated t'' and it is customary to record the widest 'atd' angle from the distal triradius. The 'atd' angle is measured by joining the digital triradius 'a' to axial triradius 't' and to the digital triradius 'd'. The present study emphasizes the importance of these parameters in diabetic patients.

Discussion

Dermal ridge differentiations are genetically determined and influenced by environmental forces, the process being completed by the sixth prenatal month.

Sant et al. (2) reported a significant increase in the frequency of whorls and decrease in ulnar loops in diabetics of both sexes. They also pointed out a significant increase in the arch pattern in female diabetics only. Vera et al. (3) and Verbov (4) also revealed similar findings regarding the arch pattern. However, an increase in ulnar and radial loops and decrease in whorls in diabetics of both sexes was observed by Ravindranath and Thomas (5). In the present study, pattern frequency was not statistically significant in the diabetic group, similar to that reported by Mandasescu et al. (6).

Several authors in their studies have found a higher TFRC in diabetics (7,8). The difference in mean TFRC and AFRC in the present study, at $P > 0.05$, was not statistically significant.

Verbov (4) pointed out a decrease in a-b ridge count in female IDDM patients. Similar findings were also reported by Zieglar et al. (9). However, this parameter was not determined to be significant in either the present study or in that done by Shield et al. (10).

In a study by Mandasescu et al. (6), right hand 'atd' angle was significantly lower in male diabetics only. The present study showed a statistically significant increase in the 'atd' angle in diabetics of both sexes when compared with controls who showed acute angles.

A statistically significant increase ($P < 0.001$) in the frequency of palmar additional axial triradii was seen in the present study as well as in a study done by Zieglar et al. (9). Mandasescu et al. (6) in their computer study considered the position of axial triradii as a diagnostic tool.

There appears to be little agreement between the findings of various authors. Possible reasons are due to the small sample sizes chosen, incomplete diagnoses, control group inadequacy, statistical errors, and lack of open-mindedness in subjects. To conclude, though dermatoglyphics generally do not play any major role in clinical diagnosis, it can serve as a ready screener to select individuals from a larger population for further investigations to confirm or rule out diabetes mellitus.

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