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Fingerprints: A simple method for Screening Hemophilic Patients

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Abstract

Background: The present study aims to compare hemophilic patients' fingerprint types with the normal people to help diagnose the disease, particularly new occurrences of the disease. Method: This case-control study was conducted in 2012. Sixty two patients with hemophilia type A and 62 normal healthy people were selected. The type of fingerprint was determined by a forensic specialist who was kept unaware of the participants' group. Using advanced Henry method, the main types of fingerprints were classified as arch, loop, whorl, as well as other types. Results: In the control group, loop type (65%) and in the case group the whorl type (34%) were the most frequent fingerprint type ($p<0.001$) and there was a significant difference of fingerprint in each finger between two groups. In addition, the average number of whorl type in the patients with mild disease was significantly higher and the average number of arch and other types of fingerprints was significantly lower than patients with moderate or severe disease. Conclusion: The findings of the present study indicated that not only are the fingerprints of normal and hemophilic people different, but also a difference was observed between hemophilic patients with the mild factor level and patients with moderate or severe one.

Introduction

Hemophilia, the most common inherited chronic bleeding disorder, is an X-linked recessive disorder with the prevalence approximately 1 in 5000 newborn boys (10 in 100,000 people) around the world.[1] Normally, men get afflicted with hemophilia through receiving a defective gene from their mother, whereas women will be the carrier of the disease through receiving a defective gene from either of their parents. Although hemophilia is usually diagnosed based on family history, it is created without any family history and through spontaneous gene mutation in 30% of the cases.[2] Hence, the diagnosis of these cases is delayed until clinical symptoms such as bleeding in various organs appear which may lead to irreversible damage to the patient. Therefore, finding inexpensive methods to screen hemophilic cases would be of great importance.

Considering the fact that dermatoglyphics or fingerprints, appear between 12 to 16 weeks of intrauterine life and its formation is completed by 24 weeks and remain unchanged, through the life and they are unique for every person,[3] fingerprinting has been used to determine its relationship with different diseases. Some relationships have been reported between diseases such as Down syndrome, mental retardation, multiple sclerosis, thalassemia and types of fingerprints.[4-15] In our previous study,[16] we showed that there were differences between fingerprint types of women who were carriers of hemophilia and normal, healthy women. Therefore, in the present study we have compared the fingerprint types of the hemophilic patients and the healthy people.

Materials and Methods

This case-control study was conducted in 2012. Sixty two patients with hemophilia type A referring to Arak Hemophilia Center were selected as case group and the level of their blood factor VIII level was determined. Sixty two healthy people with normal MCV and MCH in their CBC were randomly selected to be the control group. Having healthy fingertips, not being afflicted with any skin disorder, or burns leading to distorted fingerprints, and not having fingers cut were the inclusion criteria. The study was approved by the Ethical Committee of Arak University of Medical Sciences and consent forms were obtained from all participants prior to the study.

Fingerprinting was conducted by a skilled and professional person and all fingers of both hands were printed. To do that, at first, the finger tips were completely cleaned off any type of dirt or

pollution. Each finger was rolled from right to left on the specific fingerprinting ink, and then the fingerprint was laid on the paper in the same way. On the fingerprinting form, the demographic information was registered including the full name, age, and gender. The types of fingerprints were determined by a forensic specialist who was unaware of the groups to which the individuals belonged. For the fingerprinting, advanced Henry Method was used. However, only the main types of fingerprints including arch, loop, whorl types, as well as other types were determined (figure 1). The last group included three subcategories of the main loop group including twin loop, random loop, and lateral pocket loop because of low frequency. In addition, fingerprints which were not able to be determined due to technical errors were considered as unknown group in this category.

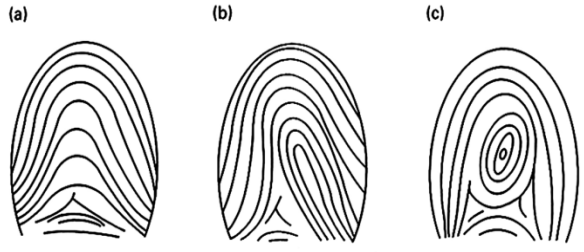

Fig.-1: Main fingerprint types: a) Arch, b) Loop and c) whorl

The statistical analyses were conducted by SPSS 13.0 for windows. The total number of each fingerprint type, also, fingerprint types of each finger separately were described by frequency and percentage. In order to investigate the differences between fingerprint types between groups Chi square test was used. In addition, an independent t-test was used to compare the mean number of fingerprint types among the ten fingers between two groups. $P<0.05$ considered as level of significance.

Results

54 hemophilic patients (87%) and 31 healthy people (50%) were men. The factor VIII level was mild in half of the hemophilic patients and in the other half, the factor level was moderate to severe. Table I illustrates the frequency of all types of fingerprints among the all fingers of participants in both groups. In the control group, the loop type was the most common (65%), while whorl type was the most common in hemophilic patients (34%) ($P<0.05$). Table II shows the average number of each fingerprint type among all fingers of participants of both groups. The average number of the arch type was not significantly different between the two groups. The average number of loop type was significantly higher whereas the whorl type and other types were significantly lower in the control group than hemophilic patients.

Table I also indicates the frequency of each fingerprint type among ten fingers separately between the groups. As it can be observed, there are statistically significant differences among all fingers between groups. In general, the frequency of loop fingerprint is higher in the control group, while in the hemophilic patients the frequency of whorl and other types of fingerprints (rare or unknown types) is higher. Table II also indicates the average number of different types of fingerprints among ten fingers among hemophilic patients compared to factor level. The average number of loop fingerprint was not statistically different between patients with mild level of factor VIII and patients with moderate or severe factor levels. However, the average number of whorl type in the mild level group was significantly higher and the average number of arch and other types of fingerprints was significantly lower than other group.

Table -I: Frequency of fingerprint types

		Arch	Loop	Whorl	Others	P value*
Hemophilic patients		24(4%)	181(29%)	210(34%)	205(33%)	<0.001
Control		38(6%)	405(65%)	142(23%)	35(6%)	
Right hand finger						
Thumb	Hemophilic patients	0(0%)	21(34%)	25(40%)	16(26%)	0.001
	Control	2(3%)	41(67%)	12(19%)	7(11%)	
Index	Hemophilic patients	6(10%)	12(19%)	38(61%)	6(10%)	0.004
	Control	11(18%)	26(42%)	24(39%)	1(1%)	
Middle	Hemophilic patients	6(10%)	37(60%)	3(5%)	16(25%)	0.003
	Control	4(7%)	51(82%)	5(8%)	2(3%)	
Ring	Hemophilic patients	6(10%)	6(10%)	19(30%)	3(50%)	<0.001
	Control	0(0%)	33(53%)	26(42%)	3(5%)	
Small	Hemophilic patients	0(0%)	31(50%)	6(10%)	25(40%)	<0.001
	Control	1(2%)	50(80%)	9(15%)	2(3%)	
Left hand finger						
Thumb	Hemophilic patients	0(0%)	12(19%)	19(31%)	31(50%)	0.001
	Control	1(2%)	33(53%)	13(21%)	15(24%)	
Index	Hemophilic patients	0(0%)	25(40%)	31(50%)	6(10%)	<0.001
	Control	10(16%)	36(58%)	16(26%)	0 (0%)	
Middle	Hemophilic patients	0(0%)	6(10%)	25(40%)	31(50%)	<0.001
	Control	7(11%)	46(75%)	7(11%)	2(3%)	
Ring	Hemophilic patients	6(10%)	12(19%)	38 (61%)	6(10%)	<0.001
	Control	2(3%)	36(58%)	23 (37)	1(2%)	
Small	Hemophilic patients	0(0%)	19(31%)	6(10%)	37(59%)	<0.001
	Control	0(0%)	53(86%)	7(11%)	2(3%)	

* Chi square test

Table II: Mean of frequency of fingerprint types

	Arch	Loop	Whorl	Others
Groups				
Hemophilic patients	0.4	2.9	3.4	3.3
Control	0.6	6.5	2.3	0.6
P value*	0.123	<0.001	0.010	<0.001
Factor level				
Mild	0.2	2.9	5.0	2.0
Moderate or severe	0.6	2.9	1.8	4.7
P value*	<0.001	0.938	<0.001	<0.001

* Independent sample t test

Discussion

The results of the present study indicated that compared to normal people, the frequency of loop fingerprints is lower in hemophilic patients, and the frequency of whorl and other types of fingerprints is higher. The arch type fingerprint had not any difference. In addition, the fingerprints of patients with the mild levels of factor VIII have some differences with patients with moderate or severe factor levels.

Based on the investigation conducted by the authors, the present study is the only study conducted on the issue of fingerprints in hemophilic patients. Nowadays, fingerprinting science is utilized in medical sciences in order to distinguish diseases from one another. Fingerprint is shaped during fetal life and remains constant throughout life; therefore, studying fingerprints is a simple, accessible tool in genetic diseases studies particularly in detecting and diagnosing abnormal chromosomes.[15] Abnormality of fingerprints has been investigated in relation with diseases such as Down Syndrome, Mental diseases, Glaucoma, Multiple Scoliosis, Alzheimer, uterine cancer, Wilson disease, psoriasis, Vitiligo, brachial plexus paralysis, congenital cardiovascular diseases, borderline personality disorder, schizophrenia, autism, thalassemia, and carriers of hemophilia.[4-16] Our study indicated that the fingerprints of the hemophilic has some differences with normal people, in a way that the most frequent fingerprint type among normal people is loop fingerprint while this is the whorl type among the hemophilic patients. In addition, the factor level creates differences in fingerprints of these patients. While the frequency of loop fingerprint is almost similar in patients with mild factor level and with moderate or severe levels, the whorl fingerprint frequency is higher in patients with mild factor level. Conversely, in the moderate or severe factor levels, the arch type and other types were more frequent. In other words, in the hemophilic patients compared to the normal people, fingerprints are mostly among less frequent or unknown types. Among hemophilic patients, the more severe the level of the disease is, the higher the frequency of less frequent or unknown fingerprint types are. Hence, it can be said that single-gene disorders such as hemophilia are not limited to a single aspect, but they create other disorders as well.

Although morphologic and clinical studies have noted that environmental, genetic, and even geographical factors influence the dermatoglyphic patterns,[17-20] using the present simple method, along with other methods, can greatly contribute to early screening of the disease particularly in cases of spontaneous gene mutation. However, further studies focusing on the wrinkle between hand fingers, and lines on the bottom of the feet, through larger samples, and in different geographical areas might pave the way for further contribution of this method in detecting hemophilic patients.

Conclusion: The results of the present study indicated that compared to normal people, the frequency of loop fingerprints is lower in hemophilic patients, and the frequency of whorl and other types of fingerprints is higher. The arch type fingerprint had not any difference. In addition, the fingerprints of patients with the mild levels of factor VIII have some differences with patients with moderate or severe factor levels. Hence, fingerprint, as a simple, inexpensive, and accurate screening method may be considered as a simple method for screening hemophilic patients and their severity of disease, particularly cases with spontaneous gene mutation, and also in resource-poor facilities.

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