QUALITATIVE ANALYSIS OF DIGITAL DERMATOGLYPHICS IN A SMALL PATIENTS GROUP IN BOSNIA AND HERZEGOVINA

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ABSTRACT

BACKGROUND

Dermatoglyphics refers to epidermal ridges that typically form under genetic control in the early stage of development. The aforesaid skin ridges are very likely to be influenced by various external, i.e. environmental circumstances in the course of the first trimester of pregnancy. In other words, it implies that the genetics message contained in the normal or abnormal genome is decoded throughout this particular period and likewise, reflected by dermatoglyphics. Dermatoglyphic pattern has been studied in various diseases. The main idea of this paper was to determine differences of fingerprints patterns in breast cancer patients and healthy women.

METHODS

The study was conducted on 50 histopathologically confirmed breast cancer women and 50 healthy women without family history of diagnosed breast cancer. The prints were analyzed by qualitative methods like arches, loops, whorls. The differences of qualitative dermatoglyphic patterns were tested for their significance using the Chi-square test and Fisher's exact test. A p-value of < 0.05 was considered statistically significant.

RESULTS

It was observed that six or more loops in the fingerprint pattern were statistically significant among the control group as compared to women with breast cancer. A pattern of six or more loops can be used as an indicator during calculation of the risk of the breast cancer. The difference between other parameters was not statistically significant.

CONCLUSIONS

It can be concluded in qualitative dermatoglyphic analysis that women with reduced number of digital loops tend to develop breast cancer. Therefore, the occurrence of breast cancer can be predicted and dermatoglyphics can be used as a non-invasive, anatomical marker and prediction tool to detect women with increased risk for breast cancer, who then can be subjected to timely mammography.

BACKGROUND

Dermatoglyphics refers to epidermal ridges that typically form under genetic control in the early stage of development. The aforesaid skin ridges are very likely to be influenced by various external, i.e. environmental circumstances in the course of the first trimester of pregnancy. In other words, it implies that the genetics message contained in the normal or abnormal genome is decoded throughout this particular period and likewise, reflected by dermatoglyphics.[1] It is believed that they may represent different genetically determined congenital abnormalities. Several genes are involved in the inheritance of the dermal traits.[2]

The correspondence between predilection of cancer and dermatoglyphics patterns has been recorded in previously conducted studies.[3] Breast cancer is the most common malignant tumor in women around the world and makes more than 20% of all malignant diseases in female population. In the Federation of Bosnia and Herzegovina, breast cancer is the most common cancer. Two tumor suppressor genes BRCA1 and BRCA2 are linked to the occurrence of family breast cancer. The main role of these genes is repairing DNA damage and maintaining the genome integrity. Loss of their function contributes to genomic instability. Women with BRCA1 and BRCA2 mutations have a poorer prognosis and shorter survival than those without mutations on these genes.[4] Inherited breast cancers form the total of 5-10% of all breast tumor cases within which around 90% of inherited breast tumors include mutation of the BRCA1/2 genes.[5]

The study of dermatoglyphics can serve as a non-invasive, anatomical marker and a predictor tool to determine the individuals with breast cancer.[6]

The main aim of this paper was to determine the differences in dermatoglyphic patterns in women with breast cancer and healthy women.

Aims and Objectives

1. To determine qualitative differences in digital dermatoglyphic patterns in women with breast cancer compared to normal women.
2. To use the results of this study as one of the diagnostic parameters for early detection of breast cancer development.

METHODS
Sample Size
The convenience sampling size was determined according to the world's similar studies. Bosnia and Herzegovina do not have statistic evidence about the total number of women with breast cancer. That is why our sample is made up by convenience, made up of Bosnian Herzegovinian population and according to very low statistical and data base evidence. All examinees were provided with appropriate information about aims, methods and purpose of this research. Ethical anonymity was provided by filling in the questionnaire form. After obtaining permission from the Ethics Committee, inform consent form was taken from the patients. This case control study included total 100 patients, 50 histopathologically confirmed breast cancer women and 50 healthy women who were informed about the procedure in detail and data comprising of age and address were taken in Bosnia and Herzegovina in 3 cities (Kakanj, Zenica, Visoko). Those cities were not included in our previous studies[6] and had no complete statistical evidence. All samples are the result of volunteer participation.

Case group
In the patients (Case) group were 50 women in the age group of 18-80, with histopathologically confirmed breast cancer. All women were breast cancer association members from those cites.

All examinees had no history of any other disease or disorders especially genetically based.

Patients in the terminal phase were not estimate.

Control group
The control group were consisted of 50 healthy women randomly selected volunteers age ranged from 18-80, selected by the Department of Biology and Human Genetics, Medical School, University of Sarajevo. All women had no familiar history of any other disease or disorders especially genetically based.

Inclusion and exclusion criteria were followed for this group as well.

Inclusion Criteria
1. 50 histopathologically confirmed female breast cancer patients aged 18 years and over.
2. 50 female control group individuals with no history of cancer or any other genetic disorders.
3. Citizenship of Bosnia and Herzegovina.
4. Signed informed consent.

Exclusion Criteria
1. Diagnosis of other type of cancers - medically confirmed
2. Disability linked to the fingers of both hands.
3. Disability linked to the palm of both hands.
4. The presence of genetically based disorders or diseases. Collecting the fingerprints of both hands (Right and Left) was done by staining them (Printake). Taking a fingerprint is done by pressing all the areas of fingers in sequence on a white piece of paper sheet. The cases were labeled on the sheets with all their relevant data.

Statistical Analyses
Statistical analysis was performed using IBM SPSS Statistics version 21.0. Data are presented as absolute numbers and as percentages as well as odds ratios (ORs) and marginal effects with 95% CI. In the analysis of the dependence between categorical variables, chi-square test and Fisher's exact test were performed. Finally, logistic regression analysis was used to assess the predictors of the disease. A p-value of < 0.05 was considered statistically significant.

Study was done for Qualitative Analysis of Digital Dermatoglyphics

Dermatoglyphics: Qualitative Analyses of Fingers-

Arch
Labelled as an area without drawings.

Tented Loop
Labelled as T formation with triradius in the center of the drawing classified as half of ulnar and half of radial loop.

The Ulnar Loop
Labelled as U pattern runs in the direction of radius, the central part and triradius are on the radial side; topologically is classified as the presence of radial component (value 2) and absence of ulnar (value 0), and traditionally is labelled by U.

The Radial Loop
Labelled as R pattern runs in the direction of ulna, and the triradius and the central part are located on the ulnar side. Topologically is classified as the presence of an ulnar component (value 2) and the absence of radial (value 0).
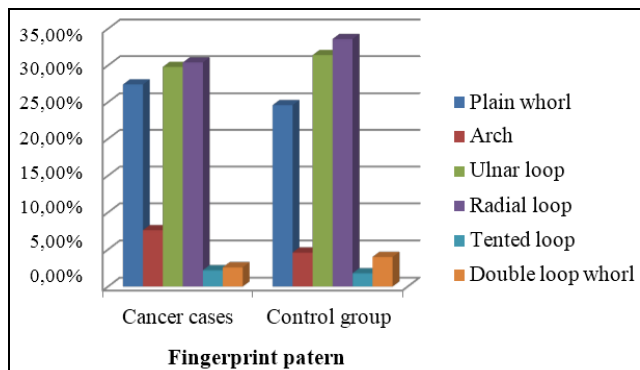
Whorl
Labelled as W is a concentric or spiral drawing followed by two triradii. Topologically: as the presence of ulnar and radial loops. This category of drawings also belongs to the double loops, as they are always accompanied by two triradii.[6]

RESULTS
From the statistical analysis the following results were obtained. Results of the research of qualitative analysis of dermatoglyphics breast carcinoma patients were compared with the results obtained in the control group.

Out of the 1000 fingerprints studied, the cancer breast patients had 30% whorls, 62.4% loops and 7.6% arches whereas the control group had 28.6% whorls, 66.8% loops and 4.6% arches (Fig. 1). We found that the arches were least represented. There was not any statistically

significant difference between these two groups regarding the fingerprint patterns.

Figure 1. Multiple Diagram Showing Percentage of Whorls, Loops, Arches and Mixed Patterns in The Fingerprints of Cancer Cases and Control Group

Analysis indicated there was no statistically significant difference in the presence of six or more whorls between the breast cancer patients and control group (Fisher's exact test: $\chi 2=0.78$, $p=0.500$; $p>0.05$) (Table 1).

It was observed that six or more loops in the finger print pattern were statistically significant among the controls as compared to breast cancer patients (Fisher's exact test: $\chi 2=3.934$, $p=0.038$; $p< 0.05$) (Table 2). Pattern of 6 or more loops is the indicator in calculating the risk of breast cancer.

In the study group, the frequency of arches was 15%, while 35% had no arches. In the control group, frequency of arches was 10%, while 40% women had no arches. There was no statistically significant difference in the frequency of arches between the control and the study group (Fisher's exact test: $p = 0.173$; $p>0.05$) (Table 3).

In study group, the frequency of mixed patterns was 6%, while 44% women had no mixed patterns. In the control group, which consisted of 50 women, the frequency of mixed patterns was 11%, while remaining 39% women did not have any mixed patterns. There was no statistically significant difference in the frequency of mixed patterns between the control and the study group (Fisher's exact test: $p= 0.143$, $p> 0.05$) (Table 4).

Fingerprint Pattern	Cancer Cases	Control Group	Total	χ2	p Value
Whorls ≥ 6	7	8	15		
Whorls < 6	43	42	85	0.78	p> 0.05
Total	50	50	100		

Table 1. Association Between Presence of More Than Six Whorls and Carcinoma of Breast

Fingerprint Pattern	Cancer Cases	Control Group	Total	χ2	p Value
Loops ≥ 6	31	40	71		
Loops < 6	19	10	29	3.934	p< 0.05
Total	50	50	100		

Table 2. Association Between Presence of More Than Six Loops and Carcinoma of Breast

Fingerprint Pattern	Cancer Cases	Control Group	Total	χ2	p Value
Arches	15	10	15		
No Arches	35	40	85	1.33	p> 0.05
Total	50	50	100		

Table 3. Frequency of Arches in The Control and Breast Cancer Group

Fingerprint Pattern	Cancer Cases	Control Group	Total	χ2	p Value
Mixed	6	11	15		
No Mixed	44	39	85	1.772	p> 0.05
Total	50	50	100		

Table 4. Frequency of Mixed Patterns in The Control and Breast Cancer Group

From the observed qualitative parameters, it was found that only whorls are a significant negative predictor of the disease 0.37 (0.15-0.89), while the number of loops; 0.18 (0.89-3.96) and arches, 1.04 (0.47-2.29) were not significant predictors of the disease.

DISCUSSION

Breast cancer is one of the most common malignant diseases among women in the world. According to NCRR (National cancer registry program) in 2008, about 25% of all cancer cases were breast cancer. With increasing natality, it is important to develop methods for identifying individuals who are at risk or already have a certain disease. The use of dermatoglyphics, as presented in this paper, represents a unique and inexpensive approach of identification of such individuals.

In this paper, it is found that there is no significant difference between control and breast cancer group regarding fingerprint patterns (whorl, arch, loops and mixed figures). The highest frequency was observed for loops, then for whorls, and the least for arches, which was supported by Al.Araji 2003[7] who found the highest percentage of loops, then whorls and arches. Sariri et al 2012[8] found that the pattern of loops was most common in both examined groups, followed by whorls.

Statistically significant difference was not observed in the pattern of 6 or more whorls between these two groups, correlating with the results of the research by Natekar et al 2006[9], who found that the presence of more than 6 whorls is significantly negatively associated with carcinoma of breast. It appears that >6 whorls have a protective effect for breast cancer. This finding was in contrast to Lavanya et al 2012[10] study which reported significant difference regarding pattern of 6 or more whorls. Therefore, the percentage of whorls is higher in breast cancer group compared to the control. Chintamani et al 2007[11] also found that a pattern of 6 or more whorls was statistically significant among breast cancer patients compared to controls, which correlates with the results of research carried out by Seltezer 1982,[12] who observed that women with 6 or more whorls, have 95% chance to have a cancer or are at high risk of getting it. King Mc et al 1980[13], Huang and Mi 1987[14] and Sukre et al 2012[15] observed that the pattern of whorls is more common in breast cancer patients compared to controls. Abbasi et al 2006[16] found more whorls (6 out of 10) in breast cancer

patients compared to controls. However, between study group and highly risk group there was not any statistical significance for more than 6 whorls. These results are consistent with the results of Chintamani et al 2007[11] and Fulari et al 2012,[17] who also showed an increase in the number of whorls in breast cancer patients.

Statistically significant difference was observed in pattern of 6 or more loops in control group compared to women with breast cancer, which was in contrast to Huang and Mi 1987[14] who found more loops in breast cancer patients compared to controls, which is consistent with the results of Chintamani et al 2007,[11] who also observed more loops in the patients. Natekar et al 2006[9] also concluded that females whose fingerprint patterns had more than six loops, had 46 times higher risk of developing breast cancer when compared to controls. Bierman et al 1988[18] and Sridevi 2010[19] observed that ulnar loops were significantly associated with breast cancer. On the other hand, Fulari et al 2012[17] found a lower percentage of ulnar loops in breast cancer patients compared to controls, which is consistent with the results obtained by Sukre et al 2012.[15]

Significant statistical difference was not observed in the frequency of arches between the control and the study group, which is not corresponding to the results of Ajeena 2015[20] whose results showed the following. Increased number of arches was observed in both hands in breast cancer patients, these results were supported by Raizada et al 2013[21] who found an increasing number of arch patterns in both hand in breast cancer patients in comparison with the control.

CONCLUSIONS

It can be concluded in qualitative dermatoglyphic analysis that women with reduced number of digital loops tend to develop breast cancer. Therefore, the occurrence of breast cancer can be predicted and dermatoglyphics can be used as a non-invasive, anatomical marker and prediction tool to detect women with increased risk for breast cancer, who then can be subjected to timely mammography.

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