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Dermatoglyphics: A Plausible Risk Indicator

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Abstract

Introduction: Dermatoglyphics is the study of epidermal ridges on the planter & palmer surface of human skin. These patterns are genetically inherited by polygenic system with individual genes which can serve as a diagnostic tool to determine various systemic problems like diabetes, hypertension, schizophrenia, etc and even malignant lesions.

Aims: To study various dermatoglyphic patterns in diabetes mellitus & chronic periodontitis & whether it can be used as possible risk indicator in periodontitis patients for the future predilection of diabetes mellitus.

Study Design: Finger-prints of total 75 patients divided in 3 groups were recorded using ink stamp method, ie healthy group (CGG), periodontitis group (CGP) and periodontitis with diabetes mellitus group (CGP+DM). The prints of all 10 fingers of each patient were taken and were analyzed with the help of 2X-3X magnifying glass. The collected data was subjected to statistical tests.

Results: Overall (CGP+DM) showed to have more number of loops. (CGP+DM) have more number of whorls when compared to CGP group. CGG has more arches when compared to the other two groups. CGP group has more loops compared to CGG group.

Conclusion: Chronic periodontitis patients with more number of whorls are at a higher risk of having diabetes mellitus.

Keywords: Periodontitis; Dermatoglyphics; Diabetes Mellitus; Finger Pattern.

Introduction

Dermatoglyphics is the study of palmer and plantar dermal ridge carvings on hands and feet (Derma: Skin, Glyph: Carving). The terminology was coined by Cummins and Midlo in 1926 and Cummins is regarded as the "Father of Dermatoglyphics [1]." In ancient India, ridge pattern study was known as "Samudra Shastra." The epidermal ridge patterns were classified into "Chakra, Shankya and Padma" which corresponds with the whorl, loop, and Arch system of modern classification. Fingerprints are unique to all individuals and remain unchanged over the lifetime. Multiple genes determine the fingerprint configuration and the study of fingerprints reveal vital genetic and medical information about an individual [2].

Abnormal dermatoglyphic patterns have been observed in several nonchromosomal genetic disorders and other diseases whose etiology may be influenced directly or indirectly by genetic inheritance [3]. Dermatoglyphics are assumed to be genetically controlled although the exact mechanism of inheritance is still unknown. In dentistry, the significance of dermatoglyphics has been investigated by several investigators. The study of the ridged skin can be used in predicting the genetic susceptibility of diseases through a cost effective means which can be used in field studies [4].

Periodontal disease is characterized by loss of supporting tissues of the teeth. This loss often compromises function and esthetics and may also be

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associated with pain and discomfort. Prevention of this needless loss of supporting tissue of the teeth can occur by a complete understanding of the etiologic factors involved. Bacterial plaque is generally accepted as the primary etiological agent in gingivitis and periodontitis. Many studies have demonstrated immunological responses to putative pathogenic strains within the oral flora. However, it is established that the mere presence of bacterial plaque, even in large amounts, does not invariably induce periodontal attachment loss. Thus other host factors may well be required for periodontitis to occur in the individual who is exposed to the appropriate environmental challenge [5]. Studies of twins and epidemiological investigations on the natural history of periodontitis have suggested that the genetic factors, in addition to dental plaque, play a major role in determining the actual clinical presentation of periodontitis [6].

Dermatoglyphic features are inherited by polygenic system with individual gene contributing a small additive effect. This has been reflected in number of diseases and can be used as a diagnostic aid in screening of genetically transmitted diseases. Prevalence and incidence of Maturity onset diabetes mellitus has increased globally, especially in newly industrialized and developing countries. Diabetic patients, if undiagnosed or inadequately treated, develop multiple chronic complications leading to irreversible disability and death [7]. Maternal insulin dependent diabetes mellitus is associated with two to threefold increase in the incidence of congenital anomalies in offsprings, like congenital heart disease, neural tube defects, sacral agenesis and femoral hypoplasia [8]. Maturity onset diabetes mellitus has a strong hereditary background, and certain dermatoglyphic variations are expected in maturity onset diabetes mellitus.

Both periodontal disease and diabetes mellitus are multifactorial conditions which present a strong genetic predeliction. Diabetic individuals are susceptible to periodontal breakdown considering that periodontitis is now the recognized '**sixth**' complication of diabetes. And so are the periodontitis patients who can also be affected by diabetes. Therefore the present study aims to use dermatoglyphics patterms as a risk indicator in periodontitis patients for the future determination of diabetes mellitus.

Materials and Methods

The study samples were collected from the patients visiting the OPD of Department of Periodontics. 3 groups were made - healthy group(CGG), periodontitis group(CGP) and periodontitis with diabetes mellitus group (CGP+DM). 25 samples were allotted to each group and their finger-prints were recorded by ink-stamp method. The prints of all 10 fingers of each patient were taken with written consent explaining the objective of the study.

Palms and fingers were cleaned with soap and water to remove oily dirt, sweat and other dirt from palm and fingers. Spirit was used to remove remaining oil and other dirt and keep the hand clean and dry. Same procedure was repeated after taking prints. A dab of 'Kores' duplicating ink was applied on the slab and spread on slab evenly by rolling the roller over the ink on the slab so that a thin layer of ink is formed on the slab surface. Ink was used and an ink-roller was employed to spread ink on the palm and fingers evenly.

The prints were taken on white sheets; one sheet was used for one hand i.e. for palm and fingers of one hand. Finger prints are taken by rolled prints with the help of roller, which was already covered by a layer of ink, was rolled on the finger. It requires rotation of finger for inking as well as for printing to get complete pattern of balls of fingers. After taking the rolled prints of all 5 fingers in the space specified for each finger, palmar print was taken. After this, same procedure was repeated for other hand on a separate paper (Figure 1). The prints were then manually analyzed with the help of 2X-3X magnifying glass. The main patterns were taken for the study: Arch, Loop, Whorl (Figure 2). The obtained data were subjected to statistical analysis. For qualitative analysis Chi Square test was used.

Results

A total of 75 samples were analysed in this 1 month study period.

Pattern	CGG		CGP		CGP+DM		X2	P value
	No.	%	No.	%	No.	%		
Arch	21	8.40	13	5.20	4	1.53	17.07	0.0018
Whorl	118	47.20	99	39.60	117	45		
Loop	111	44.44	138	55.20	139	53.46		

The distribution of Arch pattern was seen as 8.40% in CGG group, 5.20% in CGP group and 1.53% in CGP+DM group.

Whorl pattern was distributed as 47.20% in CGG group, 39.60% in CGP group and 45% in CGP+DM group.

The Loop pattern was distributed as 44.44% in CGG group, 33.20% in CGP group and 53.40% in CGP+DM group.

The chi-square test for the test of interdependence was 17.07 and the p value was 0.0018(highly significant).

The CGG group showed highest number of Whorl patterns, CGP and CGP+DM had highest number of Loop patterns.

The least number of Arch patterns were seen in GCP+DM group.

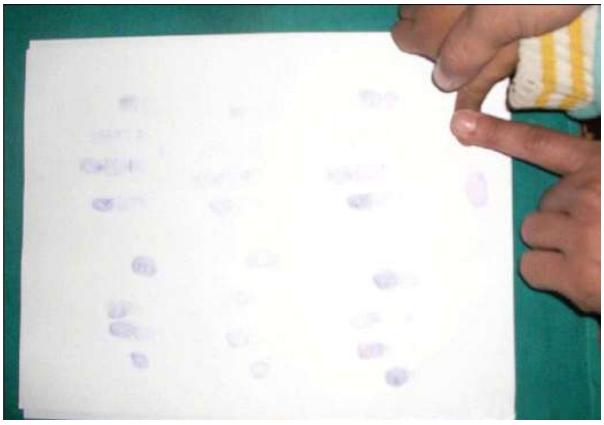

Fig. 1: Collection of sample finger prints

Fig. 2: Arch, whorl and loop pattern

Discussion

The term dermatoglyphics was given by Cummins and Midlo in 1926 to describe what until then had been referred to as epidermal ridge configurations [9].

Over the last thirty years or so, more than four thousand papers have been published on the significance of skin-ridge patterns. Whilst many of these have been restricted to the study of genetic or congenital disorders, not all of them have been related solely with chromosomal disorders. Significant investigations have also been carried out into the dermatoglyphic indicators of Congenital heart disease, Leukemia, Cancer, Coeliac disease, Intestinal disorders, Rubella embryopathy, Alzheimer's disease, Schizophrenia as well as other forms of mental illness [5]. The current state of medical dermatoglyphics is such that the diagnosis of some illnesses can now be done on the basis of dermatoglyphic analysis alone and currently, several dermatoglyphic researchers claim a very high degree of accuracy in their prognostic ability from the hand's features [4].

Dermatoglyphic features are inherited by polygenic system with individual gene contributing a small additive effect. Being susceptible to chronic periodontitis and diabetes mellitus are controlled by various immunological as well as environmental factors; genetic predisposition due to gene polymorphism being the major reason.

Apart from this, Diabetes and Periodontitis has a birectional relationship where the Diabetes is considered to be a major risk factor for periodontal disease [10]. Loe H in 1993 considered periodontitis to be the "sixth complication" of diabetes mellitus which has been widely accepted throughout the world [11]. Since genetics influence the patterns of dermatoglyphics and the vulnerability to chronic periodontitis and diabetes mellitus in an individual, we took dermatoglyphics patterns to predict the future risk of susceptibility to these two diseases.

As per our knowledge, the present study is the first of its kind to use dermatoglyphics as a risk indicator for periodontitis and periodontitis patients with diabetes mellitus. Burute and Kazi studied the role of finger patterns and predilection of Type 2 Diabetes and found that higher frequency of arches and lower of whorls in diabetic population [12].

Nayak conducted a study using dermatoglyphics pattern for prediction of Diabetes Mellitus and found that the pattern showed fluctuating asymmetry and not useful for the prediction [13].

Ashtekar et al evaluated the dermatoglyphics pattern periodontal patients and controls and found high numbers of whorl pattern in the study group and loop pattern in the control group [14].

Devishree and Gujjari studied the dermatoglyphic patterns in aggressive periodontitis individuals and

found increased numbers of ulnar loops compared to healthy individuals [15].

Though literature reviews are strongly suggesting possible links of dermatoglyphics with diabetes mellitus and periodontal disease, more research is required to confirm it. Since there is no previous literature found on dermatoglyphic patterns on periodontal patients with diabetes mellitus, we could not compare our present findings. Our study is a preliminary one which has been conducted on a small scale population where we did not include gender, race and other dermatoglyphics pattern. This may be the limitations of the present study.

Conclusion

Dermatoglyphics is a very cost effect and easy method which can be used to predict the future of a possible disease. Within the limitations of the present study we found that individuals with periodontitis and diabetes mellitus have more number of loop patterns compared to others. Healthy individuals showed a higher number of whorl patterns. Therefore dermatoglyphics can be used as a plausible risk indicator for the prediction of diabetes mellitus in periodontal patients though futher studies with larger sample size is required to confirm the findings.

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