Original Article

Dermatoglyphics: A Tool for Dental Caries Prediction

Devang Agravat, Nishtha Agarwal, Parva Patel

Ahmedabad Dental College and Hospital, Ahmedabad, Gujarat, India.

Corresponding Author:

Dr. Parva Patel

Ahmedabad Dental College & Hospital, Ahmedabad,

Gujarat,

India.

E mail: parvapatel@gmail.com

Received: 22-06-2014

Revised: 12-07-2014

Accepted: 16-07-2014

Abstract:

Background: Dermatoglyphics has been a useful tool in understanding basic questions in biology, medicine, genetics and evolution, in addition to being the best and most widely used method for personal identification. Dermatoglyphic analysis is now beginning to prove itself as an extremely useful tool in identification of people at risk of developing dental caries. **Aim:** To analyze the relation between dermatoglyphic pattern variations and dental caries in school children of Ahmedabad. **Materials and Methods:** The study sample included 200 school children of Ahmedabad with age ranging between 5-12 years. Dental caries and fingerprints were recorded. **Results:** Variations in the frequency of fingerprint patterns were seen among the samples. Also a significant relationship between whorl pattern and dental caries was noticed, however, a negative correlation was observed for ulnar loops, radial loops and dental caries. **Conclusion:** Dermatoglyphic pattern variation can serve to strengthen the diagnostic impression of the disease right from an early age.

Key Words: Dermatoglyphics; dental caries; fingerprints

This article may be cited as: Agravat D, Agarwal N, Patel P. Dermatoglyphics: A Tool for Dental Caries Prediction. J Adv Med Dent Scie Res 2014;2(3):66-69.

Introduction

Fingerprints are unique to all individuals and remain unchanged over the lifetime. For centuries the features of the hands have fascinated scholars, sages, theologians, doctors and layman alike. Rather through decades of scientific research, the hands have come to be recognized as a powerful tool in the diagnosis of psychological, medical and genetic conditions. It was in the 1926 that Cummins introduced the term 'dermatoglyphics'.[1] The word "Dermatoglyphics" is originated from two greek words "Dermato" means skin and "Glyphics" meaning carving. The term "dermatoglyphics" was proposed by Harold Cummins in the year 1926. 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.[2],[3]

Sir Francis Galton, in 1892, gave the basic nomenclature of the types of fingerprint patterns. They are grouped as loops, whorls and arches. The loops can be further subdivided into ulnar loops and radial loops. The identification of these dermatoglyphic patterns can be done after knowing the basic dermatoglyphic landmarks, which are core and triradii. Ideally, a triradii is the point marked by the confluence of three ridges that form angles of approximately 120° with one another. If these ridges fail to meet, triradial point is

represented by a very short, dot-like ridge called as “Island”. A loop is recognized as a series of ridges that enter the pattern area on one side of digit, recurves abruptly and leaves the pattern area on the same side. A whorl differs from the loop in the aspect of concentric arrangement of ridges, with two or more triradii in the latter.[4]

Significant investigations have been carried out into the dermatoglyphic indicators of congenital heart disease, leukemia, cancer, celiac disease, intestinal disorders, rubella, embryopathy, schizophrenia as well as other forms of mental illness. Dermatoglyphic analysis is now beginning to prove itself as an extremely useful tool for preliminary investigations into conditions with a suspected genetic basis. On the other hand, modes of the inheritance patterns of dermatoglyphics traits and characters are hereditary.[1] Thus the present study was undertaken to analyze the relation between dermatoglyphic pattern variations and dental caries in school children of Ahmedabad, which will enable an early detection of the diseases and thus helps in prevention of dental caries.

Materials and Methods

The study was conducted on 200 school children of Ahmedabad. The age of the subjects ranged between 5-12 years. The materials used in the study included basic diagnostic instruments needed for recording caries index and the materials needed for recording fingerprints. These included basic diagnostic instruments, duplicating printing ink, pressure pad, cotton, light source, glazed paper, magnifying glass, and pointer. The samples (carious group) were divided into boys (75) and girls (75). The control group included caries free chidren (50). Children with special health care needs (e.g. cleft lip and palate syndromes, medically and physically challenged), history of maxillofacialtrauma/pathology/developmental defects, and with previous orthodontic treatment of any kind were excluded from the study. In the present study, data were collected in accordance with the method used by Bazmi et al.[3] and Madan et al.[4] Dental caries were detected clinically, using mouth mirror and probe in daylight. Caries status was recorded using the df index given by Grubbel AO. Considering the ethical issue and confidentiality of fingerprints of patients, the procedure was explained to the parents of the subjects and permission was obtained through written consent forms before recording the fingerprints. The fingertip patterns (according to Cummins and Middlo, 1943): Whorls, Radial loop, Ulnar loop, and Arch were recorded for the study and control group. The children were motivated to remain calm, relaxed, and passive, and the methodology of taking handprints was explained to the children. The hands of the patient were scrubbed thoroughly and blot dried. The duplicating ink was dispensed in a pea-sized amount for each hand and spread to the entire area of palm and fingers with the help of a gauze pack. Rolled prints of finger were taken by rolling the fingers over the glazed paper, which was first placed on the glass slab. Prints were dried and studied using a magnifying lens to identify the finger patterns. After taking the imprints of all fingers, ink was removed by using oil, soap and water. The data was subjected to appropriate statistical analysis.

Results

Descriptive statistics and correlation test was performed for the data obtained. Fingerprints of caries-free children, especially females, showed maximum whorls, followed by ulnar loops, radial loops and arches (Figure 1). Caries-free males showed more occurrences of ulnar loops. The caries group showed maximum occurrence of ulnar loops than caries-free group and they were found to be more prevalent in females. The results are in contrast to the results obtained in the study done by Bazmi et al., who observed significantly higher whorls in female affected with caries. The correlation test revealed that there is a significant relationship between whorl pattern and dental caries (r=0 .70). However, a negative

correlation was observed for ulnar loops (r= -0.60), radial loops (r= -0.65) and dental caries (Table 1).

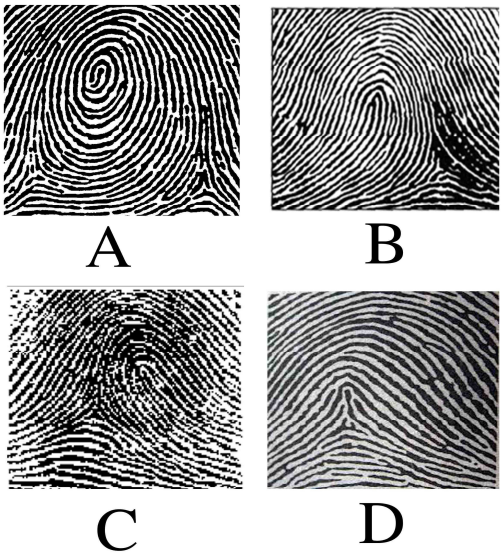

Figure 1: Picture depicting the various fingerprint patterns assessed in the study: A: Whorls, B: Radial Loops, C: Ulnar Loops, and D: Arches.

the surface of the skin in the 24th week of gestation.[5-9] From this stage onwards, they are unaffected by the environment, and this explains their unique role, as an ideal marker for individual identification and the study of populations, as well as detection of defects due to intra-uterine irregularities in the early weeks of pregnancy. Begin to develop in the 6th-7th week of gestation and are complete by the 20th -24th week of gestation. Genetics &environmental forces, play an important role in the development of an individual's fingerprints.[9],[10] The dermal ridges develop in relation to the volar pads, which are formed by the 6th week of gestation and reach maximum size between 12th and 13th weeks. This means that the genetic message contained in the genome -normal or abnormal is deciphered during this period and is also reflected by dermatoglyphics.[11]

Table 1: Table depicting the correlation coefficients obtained for various parameters assessed in the study

Parameters correlated	Correlation coefficient (r)	Interpretation	Inference
Whorl pattern and dental caries	0 .70	Positive correlation	With an increase in the whorl pattern, the patient has an increased susceptibility to dental caries.
Ulnar loops and dental caries	-0.60	Negative correlation	With an increase in the ulnar loop pattern, the patient has a decreased susceptibility to dental caries.
Radial loops and dental caries	-0.65	Negative correlation	With an increase in the radial loop pattern, the patient has a decreased susceptibility to dental caries.

Discussion

A fingerprint is an individual characteristic, no two have yet been found to possess identical ridge characteristics. Fingerprints are a reproduction of friction skin ridges found on the palm of the fingers and thumbs. Dermatoglyphics deals with the study of the epidermal ridges and their configurations on the fingers, palms and soles. The development of dermatoglyphic patterns begins with the appearance of fetal pads in the 6th week of gestation and ends with the appearance of finished patterns on

The ectoderm, from which the epidermis is derived from, has a role in the formation of many specialized structures such as the teeth. When an intrauterine dermal damage occurs, naturally a tooth anomaly should be expected.[12] The dermatoglyphic patterns have been used as an oral health marker, which can determine the genetic predisposition of children to dental caries. The children and their parents are observed to show similar pattern of occurrence of dental caries. This can be attributed to the

genetic inheritance of salivary pH, enzymes, salivary flow and tooth morphology.[9] In the present study, caries-free children, especially females, showed maximum whorls, followed by ulnar loops, radial loops and arches and. Caries-free males showed more occurrences of ulnar loops. The caries group showed maximum occurrence of ulnar loops than caries-free group and they were found to be more prevalent in females. The results are in contrast to the results obtained in the study done by Bazmi et al.[3], who observed significantly higher whorls in female affected with caries. The correlation test revealed that there is a significant relationship between whorl pattern and dental caries (r=0.70). Thus, the two variables whorl and dental caries was positively correlated. Thus, with an increase in the whorl pattern, the patient has an increased susceptibility to dental caries. However, a negative correlation was observed for ulnar loops (r=-0.60), radial loops (r=-0.65) and dental caries. Thus, with an increase in the loop pattern, the patient has a decreased susceptibility to dental caries. The results obtained are similar to the study conducted by Abhilash et al.[1]

Conclusion: Dermatoglyphic pattern variation may be an important tool in identification of people at risk of developing dental caries, which will enable an early detection and prevention of the disease.[3] It can serve to strengthen the diagnostic impression of the disease right from an early age and preventive oral health measures can be obtained. Although dermatoglyphic examination is technique sensitive, but once applied, can give new dimension and reliable parameter to dental science.[9]

References

1. Abhilash PR, Divyashree R, Patil SG, Gupta M, Chandrasekar T, Karthikeyan R. Dermatoglyphics in Patients with Dental Caries: A Study on 1250 Individuals. J Contemp Dent Pract 2012;13:266-274.
2. Mukherjee DP. How Scientists read palms. Sci Today 1980:15-21.
3. Bazmi BA, Ghosh C, Kar S , Mubtasum H, Sarkar S , Sengupta AB. A cross sectional study of dermatoglyphics and dental caries in Bengalee children. J Indian Soc Pedod Prev Dent 2013;31:245-248.
4. Madan N, Rathnam A, Bajaj N. Palmistry: A tool for dental caries prediction!. Indian J Dent Res 2011;22:213-218.
5. Mulvihill JJ and Smith DW. The genesis of dermatoglyphics. J Pediatr 1969;75:579-589.
6. Babler W.J. Prenatal selection and dermatoglyphic patterns. Am J Phys Anthrop 1978;48:21-28.
7. Babler WJ. Quantitative differences in morphogenesis of human epidermal ridges. In: “Dermatoglyphics: fifty years later”. W. Wertelecki and C. Plato(eds.). Birth Defects Original Article Series. 1979;15(6): 199–208. New York: Ala R. Liss.
8. Babler WJ. Embryologic development of epidermal ridges and their configurations. Birth defects: Original article series. 1991;27(2):95–112.
9. Latti BR, Kalburge JV. Palmistry in Dentistry. J Adv Med Dent Scie 2013;1(2):25-33.
10. Kobyliansky E, Bejerano M, Katznelson MB, Malkin I. Relationship between genetic anomalies of different levels and deviations in dermatoglyphic traits. Studies in Historical Anthropology 2004;4:61–121.
11. Mathew L, Hegde AM, Rai K. Dermatoglyphic peculiarities in children with oral clefts. J Indian Soc Pedod Prev Dent 2005;23(4):179-82.
12. Metin Atasu, Scrap Akyuz. Congenital hypodontia: A pedigree & dermatoglyphic study. J Clin Pediatr Dent. 1995 Spring 19(3):215-24.

Source of support: Nil

Conflict of interest: None declared