Dermatoglyphic Study on Patients with Dental Caries Who Wearing Dental Fillings and its Correlation to Apoptosis that Induced by Using Dental Fillings

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Abstract: Background and Objective: There is a definite correlation between the dermatoglyphic patterns and the oral cleft deformity. So the aim of this study was to detect the correlation between dermatoglyphics and the number of apoptotic cells that induced by dental fillings. Materials and Methods: Finger and palm prints were collected from 32 patients with dental caries who replaced it with amalgam and composite fillings then compared with 15 normal persons. Results: The patients with lower number of apoptotic cells were characterized by increasing whorl patterns on the finger-tips. Meanwhile, the ulnar loop pattern was the dominant pattern in the patients with moderate and higher number of apoptotic cells. Conclusion: The variation in the dermatoglyphic patterns according to the number of apoptotic cells in one week group indicates genetically susceptible and resistant patients to filling toxicity. [Nature and Science 2010;8(10):54-57]. (ISSN: 1545-0740).

Key words: dermatoglyphic and oral disorders, dermal patterns.

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1. Introduction

Dermatoglyphics is considered as a window of congenital abnormalities and is a sensitive indicator of intrauterine anomalies. Dermatoglyphics is known to be one of the best available diagnostic tools in genetic disorders [11]. Dermatoglyphics refers to the friction ridge formations which appear on the palms of the hands and soles of the feet. The ridge formations of the skin of an individual begin to appear during the third and fourth month of foetal development. Dermal palmar and plantar ridges are highly useful in biological studies. Their variable characteristics are not duplicated in other people, even in monozygotic twins or even in the same person, from location to location. Thus, dermatoglyphics may be in a position to become the primary means of assessing complex genetic traits, and also useful for the evaluation of children with suspected genetic disorders [6]. Dermatoglyphic patterns are broadly classified into three major types: whorl, loops, and arches which have been subdivided into various subtypes. These patterns are present on finger tips/buds, whereas whole of human palm show certain other features such as atd angle, H-loop, IV loop, and t-triradius [12].

2. Materials and Methods

According to the percentage of apoptotic cells, the patient group that used an amalgam and composite fillings for one week was divided into three groups. Low toxicity group; with lower number of apoptotic cells (≤20%), moderate toxicity group; with moderate number of apoptotic cells (>20-50%) and high toxicity group; with higher number of apoptotic cells (>50%).

The dermatoglyphic study included:

1-Full history taking:

Family pedigree for patients of both sexes to reveal consanguinity, similar conditions in the sibs or other relatives, also exposure to radiation was known by questionnaire.

2- Dermatoglyphic collection:

Identification of the dermal ridge patterns was carried out according to the original classification described by Cummins and midlo [5] and Mathew et al [8].

Dermatoglyphic analysis was carried out using a simple magnifying lens with a light source. Dermatoglyphic analysis included the following:

A-Qualitative analysis that includes finger-tip patterns, palmar patterns and simian crease.

B-Quantitative analysis that includes finger ridge count, total finger ridge count (TFRC) and distal

deviation of axial triradius or ATD angle (Figure 1).

3. Results

Dermatoglyphic analysis revealed that, the control group has more loop patterns on all fingers of the right and left hands and it was only ulnar loops. Meanwhile, the patient group has more whorl patterns and it was mainly spiral whorls. Some patterns such as double loops, central pocket whorls and radial loops noticed only in patient group. TFRC was higher in patient group (139.06 ± 22.3) than in control group (125.88 ± 20.7) and the finger ridge count was higher in the right hand than in the left hand in both groups. The patterns in the thenar and I-interdigital area were only arches in control group while in patient group were arches and radial loops. Moreover, in the IV-interdigital area, a higher number of distal loops found in control group while the patient group has a higher frequency of arch patterns. In the hypothenar area, some whorl patterns appeared only in the patient group. Also, the simian line appeared only in two cases of patient group. The ATD angle was more than 56 degrees in the control group while in the patient group, was between 45-56 degrees. In addition, when the patient group was divided into low (≤20%), moderate (>20-50%) and high toxicity group (>50%) according to the percentage of apoptotic cells caused by dental fillings, it was found that, the moderate and high toxicity groups were characterized by increasing loop patterns on all fingers. The moderate toxicity group is the only group characterized by having arch patterns and increased number of central pocket whorls. Meanwhile, the low toxicity group was characterized by increasing whorl patterns on all fingers. Also, the high toxicity group has a higher TFRC and the moderate toxicity group has lower TFRC. In the III-interdigital area, the low toxicity group has more loop patterns while the moderate and high toxicity groups have more arch patterns. Meanwhile, in the IV-interdigital area, the moderate and high toxicity groups have more loop patterns while the low toxicity group has more arch patterns. Simian line appeared only in two cases of low toxicity group while in moderate and high toxicity groups it was absent. The axial t triradius in all groups was mainly between 45-56 degrees.

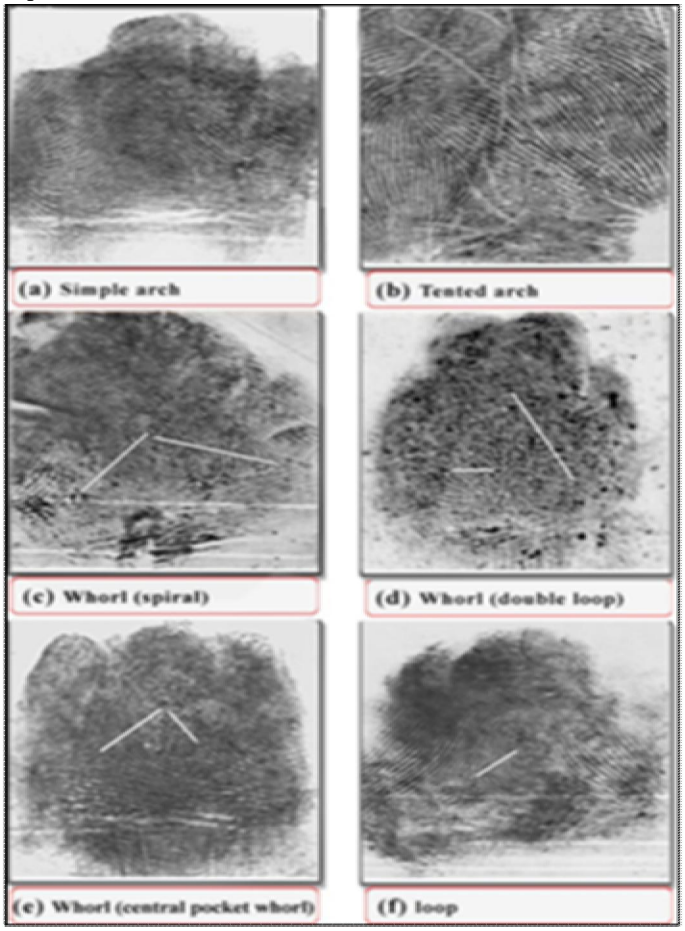

Fig.1: The finger tip patterns and finger ridge count (FRC). The counting is done along the straight lines

connecting the core (c) and the triradius (t). a & b arch, c, d & e whorl spiral, double loop and central pocket whorl respectively, f loop.

4. Discussion

Widespread interest in epidermal ridges developed only in the last several decades when it became apparent that many patients with chromosomal aberrations had unusual ridge formations [14]. It is known that the finger and palm prints are formed during the 1st 6-7 weeks of the embryonic period and are completed after 10-20 weeks of gestation [8]. Abnormalities in these areas are influenced by a combination of hereditary and environmental factors, but only when the combined factors exceed a certain level, can these abnormalities be expected to appear [3, 7, 9, and 12]. The study of ridged skin is considered as a window of congenital abnormalities and is a sensitive indicator of intrauterine dental anomalies. Indeed, the ridged skin and the teeth originate from the same layer, ectoderm during embryogenesis. When an intra-uterine dermal damage occurs, naturally a tooth anomaly should be expected [2]. The present work found that, the control group (without dental caries) characterized by increasing the number of ulnar loops on all fingers of both hands. While, the patients with dental caries characterized by increasing the number of whorl patterns on all fingers of both hands and this in agreement with Atasu [1] and Sharma and Somani [12] who found that, the caries-free children showed an increased frequency of ulnar loops on the finger-tips. In contrast, the children with dental caries had more whorls on the finger-tips. The present work also found that, all whorl patterns in the control group were spiral while in the patients were spiral, central pocket and double loop. Also the radial loop patterns appeared only on the 2nd, 4th and 5th fingers of both hands of the patients with dental caries. In contrast, Atasu [1] found these radial loops in the caries-free children on the left 2nd, right 2nd, 3rd and 4th fingers. Furthermore, the means of TFRC of patients (mostly females) was higher than that of control group and the TFRC in the right hand is more than that in the left hand, which indicates a strong development of embryonic fingers [13]. In addition, Atasu [1] found that, males (with extensive caries and free caries) had more TFRC than females. On the other hand, the patient group was characterized by having radial loops in the I-interdigital area of the left hand and increasing the arch patterns in the IV-interdigital area of both hands. Meanwhile, the control group was characterized by increasing the distal loops in the IV-interdigital area of both hands and this is in agreement with Atasu [1] who showed that, the caries-free children had more IV loops than that of the children with extensive caries. The present study also revealed that, the control group was characterized by increasing arch patterns in the hypothenar area and this in agreement with Atasu [1] who found that, the caries-free children had less H loops. In the present work, the axial t triradius was wider in the control group (more than 56 degrees) than in patient group (between 45-56 degrees); this is in agreement with Atasu [1] where, the caries-free children had more t triradii than that of the children with extensive caries. As the dermatoglyphics are genetically controlled characteristics, any deviation in the dermatoglyphic features indicates a genetic difference between the controls and the abnormal population [8]. Also, the present work was attempted to study the dermal ridges of genetically resistant and susceptible patients who wearing dental fillings for one week by linking their dermatoglyphics to the percentage of apoptotic cells that induced by amalgam and composite fillings. It was known that programmed cell death is an essential event during mammalian morphogenesis which eliminates unnecessary cells to accomplish histogenesis and organogenesis. Cell death in interdigital spaces of the developing limb is a classical example of morphogenetic cell death. Also, cytological apoptotic alterations and fragmentation of nuclear DNA occur in the interdigital tissue and presumptive joint areas of fetal mouse limbs, appear to play a significant role in the separation of digits as well as the formation of joint cavities [10]. In normal development as programmed cell death, this controlled process determines the size, pattering, and function of many tissues. The importance of its proper genetic regulation is demonstrated by the discovery of cell death-specific genes and the several disorders including cancer and teratogensis that result from repression or enhancement of cell death [16]. Genetically determined differences among these individuals would explain the susceptibility [4] where, in response to environmental exposures, genetic damage accumulates more quickly in individuals with genetic susceptibility to DNA damage. Consequently, those individuals might be at a greater risk for developing lesions.

5. Conclusion

There were different characteristic patterns between low, moderate and high toxicity groups. Therefore the dermatoglyphic study considered as a simple and inexpensive technique that can use to differentiate between resistance (with low number of apoptotic cells) and susceptible (with moderate and high number of apoptotic cells) individuals to filling

toxicity, and enables the early diagnosis and protection from dental caries in susceptible persons who rabidly influenced by components of dental fillings.

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5. References

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