

Original Article

An Assessment of Relationship between Dermatoglyphics and Tooth Loss

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ABSTRACT

Background: Dermatoglyphics are the patterns of the skin ridges on pads of fingers which constitute a person's fingerprints. Several studies have shown that there exists a relationship between dermatoglyphics and dental diseases and conditions such as dental caries, periodontal disease, and malocclusion. The study aimed to determine the relationship between dermatoglyphics and tooth loss.

Materials and Methods: The study comprised 100 patients, including fifty dentulous and fifty edentulous participants. The fingerprint patterns of the participants were recorded by a single investigator with a rolling impression technique using duplicating ink on an executive bond paper. Dermatoglyphic patterns of all ten palmar digits were recorded using Cummins and Midlo method. The level of significance was set as $P < 0.05$.

Results: The study showed that in dentulous patients, there was a highest prevalence of whorl pattern (50.8%), followed by ulnar loop (45.2%), radial loop (3.2%), and arch (0.8%) patterns. The prevalence of pattern was similar for edentulous patients; however, the prevalence of whorls reduced to 49.8%, ulnar loops to 37.4%, and radial loops to 2.8% whereas the prevalence of arch patterns increased to 10%.

Conclusion: The whorl pattern was the most prevalent pattern among both dentulous and edentulous patients followed by ulnar loop pattern. The present study showed that ulnar loop pattern was most prevalent in the fifth digit of both right and left hands of edentulous patients whereas the ulnar loop was prevalent in the third digit of both right and left hands of dentulous patients.

KEY WORDS: *Dermatoglyphics, fingerprint pattern, tooth loss*

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INTRODUCTION

Human skin, the largest organ of the human body, performs various vital functions in life. The palms of hand and soles of the feet are covered with two totally distinct classes of marks. The most conspicuous are the creases or folds of the skin which interest the followers of palmistry.^[1] Dermatoglyphics are the patterns of the skin ridges on pads of fingers which constitute a person's fingerprints.^[2] The term was coined in 1926 by Cummins and Midlo, although Cummins is considered to be the father of dermatoglyphics.^[3] Toward the end of the 19th century, Galton put forth a rule called "proof of no change," which states that an individual's dermatoglyphics remain unchanged throughout his or her lifetime.^[4] Due to their unique nature, studying them can determine a number of parameters, which could be helpful in diagnosing and treatment of examined individuals.^[5] Thus, it is considered to be an important tool in assessing the genetic trait, evaluation of children with suspected genetic disorders, and also forensics.^[6,7] The ridged skin is considered to be a sensitive indicator of intrauterine dental anomalies as it originates from fetal volar pads similar to the teeth which also

originates from the same ectodermal layer in the 6th-7th week of embryonic life.^[8] Hence, when an intrauterine dermal change occurs, a tooth anomaly can be expected.^[9] The basic patterns are whorls, arches, and loops; however, the size, spacing, and shape give them their distinct personality.^[10]

In the recent past, a number of investigators have focused their attention in finding out an association of morphological and genetic characteristics with a number of pathological conditions. In a study conducted by Sharma and Somani, patients with dental caries had a positive correlation with the loops (decreased frequency of loops) and growth of *Streptococcus mutans*.^[11] In a study conducted by Saxena *et al.*, 48 cleft participants and 50 healthy controls with both their parents were evaluated and they found increased frequency of loops and arches and low mean total ridge count in cleft participants. They also found increased frequency of loops and arches with decreased frequency of whorls and mean total ridge count.^[12]

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Although edentulism has been described to be on the decline in many developed countries, tooth loss continues to be a major public health problem globally, and causes of tooth extractions had large geographical and cultural differences among various regions in a country and from one country to another.^[13] The research regarding dermatoglyphics and tooth loss is still in its early stages. Hence, if such a relationship is established between dermatoglyphics and tooth loss, early detection can aid the clinician to anticipate health problems in adults and initiate preventive and protective measures at the earliest. Until now, there exists no literature pertaining to the relationship between dermatoglyphics and tooth loss. Hence, the current study was conducted to assess the relationship between dermatoglyphics and tooth loss.

MATERIALS AND METHODS

The present study was conducted during the period of January–March 2018. The study comprised 100 patients who visited Pushpagiri College of Dental Sciences, Thiruvalla. Of the total participants, 50 dentulous and 50 edentulous participants were included. The participants were in the age group of 30–50 years. The exclusion criteria were as follows:

1. The absence of any digits
2. Patients with conditions which did not permit accurate recording of fingerprints
3. Pregnant females
4. Patients with orthodontic appliances and fixed partial denture
5. Third molars were excluded.

Before the start of the study, approval was obtained from the institutional ethics committee. Written informed consent was obtained from all the participants. Before the start of the procedure, the hands of the participants were cleaned using antiseptic lotion and water to remove sweat, oil, or dirt from the palmar surface and allowed to dry. The fingerprint patterns of the participants were recorded by a single investigator with a rolling impression technique using duplicating ink on an executive bond paper. The investigator was trained in recording the fingerprints before the start of the study at the department of public health dentistry under the guidance of an

expert. Dermatoglyphic patterns of all ten palmar digits were recorded using Cummins and Midlo method.^[14] All ten fingers of a single participant were studied under adequate light and magnification using a $\times 10$ magnifying glass and classified into three basic types according to shape, whorls, loops, and arches. Loop pattern was subdivided into ulnar loop and radial loops. Ulnar loop pattern composed of ridges which open to the ulnar side and radial loop pattern composed of ridges which open to the radial side [Figure 1].

The data were entered into Microsoft Excel spreadsheet. Statistical analysis was done by SPSS software, 18 version (IBM, Chicago, Illinois, USA). The intergroup data were analyzed using the Chi-square test and the level of significance was set as $P < 0.05$ with a confidence level of 95%.

RESULTS

A total of 50 dentulous and 50 edentulous patients participated in the study. The frequency distribution of all pattern types on fingertips of dentulous and edentulous patients was assessed [Table 1]. It was found that in dentulous patients, there was a highest prevalence of whorl pattern (50.8%), followed by ulnar loop (45.2%), radial loop (3.2%), and arch (0.8%) patterns. The prevalence of pattern was similar for edentulous patients; however, the prevalence of whorls reduced to 49.8%, ulnar loops to 37.4%, and radial loops to 2.8% whereas the prevalence of arch pattern increased to 10%.

The frequency distribution of all pattern types on individual fingertips of dentulous and edentulous patients was assessed [Table 2]. The ulnar loop pattern was highest in the fifth digit of both right and left hands of edentulous patients, whereas in dentulous patients, the ulnar loop pattern was highest in the third digit of both right and left hands. The difference was found to be statistically not significant. The whorl pattern was highest among both edentulous and dentulous patients in the first digit of both right and left hands. The difference observed was not statistically significant. It was noted that the highest prevalence of arch pattern was found on the third digit of the right hand among dentulous patients which was similar to that of dentulous patients.

DISCUSSION

Dermatoglyphics refers to the frictional ridge formation which appears on the palms of hand and soles of feet. The development of primary palate and lip is completed by the 7th week of intrauterine life and that of secondary palate by 12th week. The dermal ridges develop in relation to volar pads,

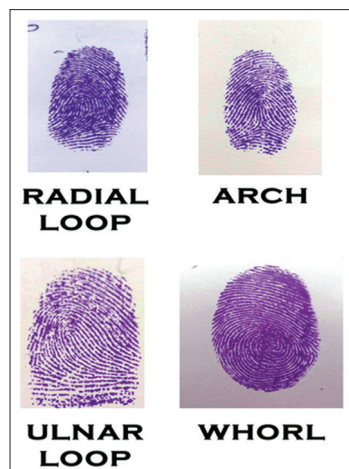


Figure 1: Fingerprint patterns

Table 1: Frequency distribution of fingerprint patterns among study participants

Patterns	Dentulous, <i>n</i> (%)	Edentulous, <i>n</i> (%)
Ulnar loop	226 (45.2)	187 (37.4)
Radial loop	16 (3.2)	14 (2.8)
Whorl	254 (50.8)	249 (49.8)
Arch	4 (0.8)	50 (10)
Total	500	500

Table 2: Comparison of finger patterns against dentulous and edentulous participants

Type of digit	Ulnar loop					P*
	Right		P*	Left		
	Dentulous (n)	Edentulous (n)		Dentulous (n)	Edentulous (n)	
First digit	19	15	0.600	14	10	0.601
Second digit	23	19		23	14	
Third digit	29	17		28	18	
Fourth digit	21	22		22	21	
Fifth digit	23	25		24	26	
Type of digit	Radial loop					P*
	Right		P*	Left		
	Dentulous (n)	Edentulous (n)		Dentulous (n)	Edentulous (n)	
First digit	1	0		4	1	
Second digit	5	3		2	7	
Third digit	1	2		1	0	
Fourth digit	1	1		1	0	
Fifth digit	0	0		0	0	
Type of digit	Whorl					P*
	Right		P*	Left		
	Dentulous (n)	Edentulous (n)		Dentulous (n)	Edentulous (n)	
First digit	30	33	0.696	31	36	0.977
Second digit	21	25		24	24	
Third digit	20	13		19	19	
Fourth digit	28	24		27	26	
Fifth digit	27	25		26	24	
Type of digit	Arches					P*
	Right		P*	Left		
	Dentulous (n)	Edentulous (n)		Dentulous (n)	Edentulous (n)	
First digit	0	2		1	3	
Second digit	0	3		1	5	
Third digit	1	18		2	13	
Fourth digit	0	3		0	3	
Fifth digit	0	0		0	0	

*Chi-square test

which are formed by the 6th week of gestation, reach maximum size between 12th and 13th weeks, and are completely formed after 10–20 weeks of gestation.^[11,15,16]

In dentistry, dermatoglyphics has been studied in cleft lip and palate, hereditary gingival fibromatosis, periodontal diseases, dental caries, dental malocclusions and potentially malignant disorders (oral submucous fibrosis, leukoplakia, and oral cancer), malignant disorders and aphthous ulcer of the oral cavity.^[11,15,17-19] Genetic or chromosomal abnormalities might be reflected as alterations in dermal ridges; they can be readily used as an accessible tool in the study of genetically influenced diseases.^[20]

If dermatoglyphic patterns determine the genetic predisposition of individual tooth loss, what is the prediction value (ie, the odds ratio). The type of fingerprints is unique and unalterable and is based on the genetic constitution of each individual. These dermal patterns once formed remain constant throughout life and also the impression recording or fingerprint can be accomplished rapidly, inexpensively, and without causing any trauma to the patient.^[21] The modern study of the hand

is far removed from the popular image of the traditional palmist uttering mysterious incantations in an arcane language. Rather, through decades of scientific research, the hand has come to be recognized as a powerful tool in the diagnosis of psychological, medical, and genetic conditions.^[22,23]

In the present study, it was found that the most common fingerprint among dentulous and edentulous patients was whorl pattern. The least common fingerprint was arch pattern among dentulous patients and radial loop pattern among edentulous patients. The study showed that arch pattern was ten times more prevalent in edentulous patients when compared to dentulous patients in the third digit of both hands. The dearth of published literature on dermatoglyphics and tooth loss is a limitation for the present study. To date, this is the first study conducted to determine the relationship between dermatoglyphics and tooth loss across the globe.

CONCLUSION

Finger patterns are genotypically determined and remain unchanged from birth till death. Dermatoglyphics has shown to be a cheap and noninvasive tool for early detection of

various dental diseases. The present study showed that the whorl pattern was the most prevalent pattern among both dentulous and edentulous patients followed by ulnar loop pattern. The difference observed was not statistically significant which could be attributed to the small sample size. The study showed that the ulnar loop pattern was most prevalent in the fifth digit of both right and left hands of edentulous patients whereas the ulnar loop was prevalent in the third digit of both right and left hands of dentulous patients. The difference observed was not statistically significant. Future studies on diverse and larger population would perhaps provide a conclusive relationship between dermatoglyphics and tooth loss.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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