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Original Research Article

Comparison of scanner method and stamp pad method for dermatoglyphic patterns

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ABSTRACT

Aim: Dermatoglyphics are useful in anthropological, medico legal and genetic studies. Hereditary and prenatal environmental factors leading to malocclusion may also influence fingerprint patterns which are classified into arches, loops and whorls. Dermatoglyphic pattern can be recorded by stamp ink pad method or scanner method. This study was conducted with an aim to compare stamp pad method and scanner method in terms of visibility and ease of identification by panel of postgraduate students of orthodontic speciality.

Materials and Methods: Finger print pattern of 140 digit of 14 participants with aged range of 20-40 years, were recorded by both stamp pad method and scanning method using Futronic scanner. Print out of scanned images was taken. Post graduate students were briefed about identification of different types of dermatoglyphic pattern and asked to identify finger prints of each subject which were arranged randomly in a file. The fingerprint pattern was cross-checked and identified by the operator. A questionnaire in the Google form was also given to each participant to know the ease of identification and visibility of finger pattern in both patterns.

Result: 92.8% of fingerprint pattern were correctly judged by participants for scanner method whereas 90% of fingerprint pattern were correctly judged by same participants for stamp pad method in comparison to judgement made by operator. According to participants scanner method was easier to identify due to better visibility. 77.8% participants found smudges in ink pad, 83.3% participants found better color contrast in scanning method. 72.2% participants found stamp pad method to be more time consuming.

Conclusion: It can be concluded that the scanner method may be better in terms of identification, visibility as seen by the response of participants. Therefore, there was less error in identification of fingerprint pattern with scanner method but with experience, accurate results could be derived from both the techniques.

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1. Introduction

Dermal ridge originates from the fetal volar pads from the ectodermal layer in the 6–7th week of embryonic life and patterns remain constant throughout life and are not altered by disease or age.^{1,2} Craniofacial characteristics and dermal ridge patterns are mainly, but not exclusively, genetically-

governed structures, it has been assumed that genetic and environmental factors that cause changes in alveolar bone, palate and dental occlusion may also cause peculiarities in the appearance of fingerprints and palm prints.³ This association may be due to the fact that the development of dentition and the palate occurs during the same period as the development of dermal patterns.

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Hereditary and prenatal environmental factors leading to malocclusion may also influence fingerprint patterns which are classified into four types viz. arches, loops, whorls and composite. In the field of dentistry, the association of dermatoglyphics has been studied in precancerous and cancerous lesions in the oral cavity, dental caries, and dental anomalies such as cleft lip and palate and malocclusion. Dermatoglyphics in orthodontic studies establish a relationship between finger patterns and the disease process.

Dermatoglyphic pattern can be recorded by various method like stamp ink pad method, scanner method, photographic method, transparent tape adhesive method etc.¹ This study was conducted with an aim to compare stamp ink pad and scanner methods for recording finger patterns in terms of visibility and ease of identification by panel of postgraduate students of orthodontic speciality.

2. Materials and Methods

2.1. Sample

Sample for this study included finger print pattern of 140 digit of 14 participants, which were recorded by both stamp ink pad method and scanning method. The age range was 20-40 years with mean age of 20+1.06 years. Subjects who were willing to participate in the study were taken and subjects with congenital or acquired deformities of the fingers, amputated fingers and skin disease with wound or scars on the fingers were excluded from the study.

2.2. Method

All subjects were asked to clean their hands with soap and water, and hands were wiped with hand antiseptic to remove the sweat, oil and dirt from the skin surface. In stamp ink pad method, blue duplicating ink was applied on the pulp of all the ten fingers before recording finger prints then impression of all the fingers was taken on blank white sheet (Figure 1). In scanning method, Futronic scanner was used to record fingerprints of all ten fingers (Figure 2).

Before identification of finger print patterns, all panel of post graduate students were briefed about identification of different dermatoglyphic pattern i.e. whorls, arches and loop. Finger print pattern were arranged randomly in a file and given each post graduate students to identify finger prints pattern obtained by both methods along with line diagram of whorl, arches and loop dermatoglyphic pattern (Figure 3).

In stamp ink pad method, magnifying lens was used for clear visualization and identification of finger prints pattern and repeated if the finger print impression was not satisfactory. In Scanner method, print out of scanned images of all fingers patterns was taken. Format for recording different finger print pattern was given to each participant (Table 1). A questionnaire as Google form pertaining to ease

of identification and visibility was also given to them after completing the process (Figure 4). The finger print patterns were further cross checked by the operator.

3. Results

Finger print pattern observed by operator and participants by stamp ink pad method and scanning method are shown in Tables 2 and 3 showed the accuracy of identification of dermatoglyphic pattern by participants in stamp pad method and Table 4 showed the accuracy of identification of dermatoglyphic pattern in scanning method. Questionnaires findings for ease of identification and visibility are shown in Table 5.



Fig. 1: Dermatoglyphic pattern recorded by stamp ink pad method.



Fig. 2: Dermatoglyphic pattern recorded by scanner method.

4. Discussion

Dermatoglyphics are naturally occurring unique patterns on the epidermal ridges of hands and feet.³ These are

Table 1: Format for recording finger print pattern

Number of participants S. No.	Pattern as seen on stamp pad method			Pattern as seen on scanning method		
	Whorl (W)	Loop (L)	Arch (A)	Whorl (W)	Loop (L)	Arch (A)
1.						
2.						
3.						
4.						

Table 2: Finger print Pattern observed by operator and participants

Finger print pattern	Observed by operator		Observed by participant	
	Stamp pad method	Scanner method	Stamp pad method	Scanner method
Whorls	53	53	48	50
Loops	85	85	78	81
Arches	7	7	4	6

Table 3: Accuracy of identification of dermatoglyphic pattern by participants in stamp pad method

Observation	Whorls	Loops	Arches
As observed by operator	53	85	7
Correct identification by participants	48	78	4
Incorrect identification by participants	5	7	3

Table 4: Accuracy of identification of dermatoglyphic pattern by participants in scanning method

Observation	Whorls	Loops	Arches
As observed by operator	53	85	7
Correct identification by participants	50	81	6
Incorrect identification by participants	3	4	1

Table 5: Results of questionnaires

	Stamp pad method	Scanner method
Ease of identification	0%	100%
Smudging of fingerprint	77.8%	22.2%
Fine details	0%	100%
Color contrast	16.7%	83.3%
Time consuming	72.2%	27.6%

**Fig. 3:** Different type of finger print pattern: **a:** Loop; **b:** Arch and **c:** Whorl.

constant throughout life and are considered as sensitive indicator of intrauterine anomalies occurring at the same

time of development.⁴ In humans, 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. The study of dermatoglyphics has come to be recognized as a powerful tool in the diagnosis of psychological, medical, and genetic conditions and in forensic medicine for personal identification. Fingerprints can be recorded by various methods like ink method, faurot inkless method, photographic method, transparent adhesive tape method, numerical methods, lipstick methods and fingerprint scanner along with ridge count software. Advantages of ink method are cheap, comfortable whereas disadvantages are that it is time taking, and there can be errors and overlapping of the imprints. In Faurot inkless method, advantage is that it is easy and convenient whereas disadvantage is that it is time taking. In transparent adhesive tape method, a dry coloring pigment is applied to the skin and is lifted off with the transparent adhesive tape.

Untitled form
Form description

Which method has ease of identification ?

stamp pad
 scanning

Smudging of fingerprint was seen in ?

stamp pad

Fine details are visible in which of the method ?

stamp pad
 scanning

Color contrast is better in which of the following method ?

stamp pad
 scanning

Which method was time consuming ?

stamp pad
 scanning

Fig. 4: Google form (questionnaires) to obtain participants feedback

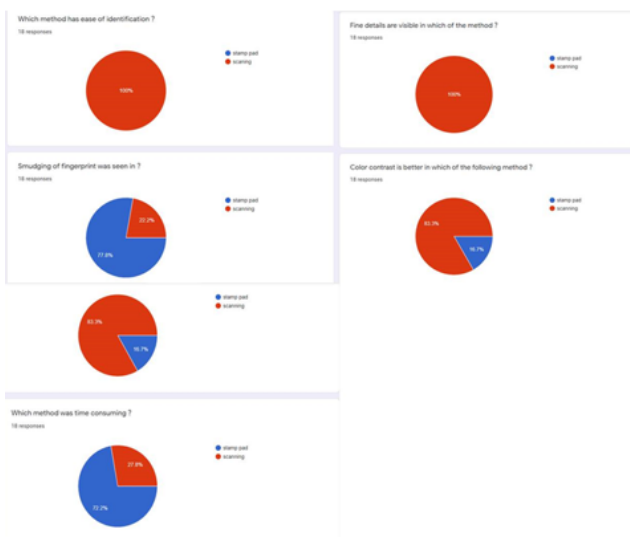


Fig. 5: Results of the questionnaire.

Advantages of this method is that it is faster and take short duration of time but disadvantages is missing ridges due to less adhesive of the tape and it may also affect the skin in cases of sensitivity. In Numerical method, an algorithm of images of fingerprints is used. Advantage is less time taking and disadvantages are distortion of images hence, unclear images. In lipstick method, lipstick is applied on the entire palm of the subject including the wrist creases, and digits. Then it is placed on the sheet of paper on top of the foam rubber pad on a flat, stable surface. The palm is placed on this and gently pressed. Advantages are the convenient method for taking the imprints and disadvantages are the overlapping of the imprints. Advantages of the scanning method are that it is easier to record with good color contrast and is less time consuming. Disadvantages of this method are that the data may be get deleted if any technical error occurs. The methods used here in this study were stamp pad method and scanning method.

From the present study 94.4% of fingerprint pattern were correctly judged by participants for scanner method whereas 89.6% of fingerprint pattern were correctly judged by same participants for stamp pad method in comparison to judgement made by operator. According to participants scanner method was easier to identify due to better visibility. 77.8% found smudges in ink pad, 83.3% found better color contrast in scanning method. 72.2% found stamp pad method to be more time consuming (Table 5). With the help of the stamp pad method and scanning method for recording dermatoglyphic pattern it seems easier to identify the different patterns.

According to Roopam K et al⁵ on comparing lip stick method to the stamp pad ink method it was found that lip stick was more easy to perform, better in clarity, easier to analyse, and very much subject friendly.⁵ The general feedback of participants in present study while recording finger print pattern using stamp pad method was that participant felt uncomfortable on seeing the ink on its hand and becomes uncooperative at times. In scanning method the participants were much comfortable in terms of the giving there fingerprints. The overlapping and smudging of imprints were unlikely in scanner method in comparison to stamp pad method.

It can be suggested from this study that use of scanning method was more accurate, reliable and it was easier to identify type of dermatoglyphic pattern. This could be the reason that scanning method, though being expensive than stamp pad method, had been widely used in studies done to assess dermatoglyphic.

Within the limitation of this study, done on smaller sample size, it can be concluded that the scanner method may be better in terms of identification, visibility (with no smudging) as seen by the response of participants. Therefore, there was less error in identification of fingerprint pattern with scanner method but with experience, accurate

results could be derived from both the techniques.pattern.^{6,7}

5. Conclusion

It can be concluded that the scanner method was more accurate and reliable in identification of dermatoglyphic pattern as there was less error in identification of type of pattern by participants. It may be better in terms of identification, visibility (with no smudging) as seen by the response of participants.

6. Source of Funding

None.

7. Conflict of Interest


None.

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