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Original Research Article

Comparison of various dermatoglyphic methods of collecting and preserving fingerprints for study purpose

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ABSTRACT

Background: This study is an attempt to compare the various methods of recording fingerprints and to find the most accurate, feasible, non-toxic, inexpensive and permanent method of recording and preserving dermatoglyphic prints for study and research purpose.
Methods: 100 adult volunteers from KLE Society's Institute of Dental Sciences participated in this study. They were asked to clean and dry their hands. Then they were randomly allotted to one of the 5 groups. The right thumb was used as a reference and prints were obtained by the method specified to the group. The prints obtained from different methods were compared for clarity, precision, ease of preservation.
Results: Prints obtained by the ink method were clear and accurate. Adhesive tape methods were difficult to obtain but yielded good prints. Machine oil method was relatively easy but did not yield good prints. Photographic prints were clear. Digital finger printing method gave the most accurate and reliable prints. All these prints were compared and they were rated based on clarity, accuracy and ease of recording and preserving.
Conclusions: Every method employed has its own advantages and disadvantages. Based on the type of study and the parameters to be assessed, different methods of collecting fingerprints can be employed.

Keywords: Dermatoglyphics, Fingerprints, Dermatoglyphic methods

INTRODUCTION

The history of using fingerprints as evidence in criminal courts and for legal purposes has been in practice for more than a century. And the use of fingerprints to predict events in a person's life is a very ancient age old practice adapted by Indian astrologers. But the use of fingerprints and palm prints for identifying and predicting medical disorders is more of a recent origin and has gained momentum in the last few decades. Dermatoglyphics offers two major advantages as an aid to the diagnosis of medical disorders: epidermal ridge patterns on the hands and soles are fully developed at birth and remain unchanged for life and scanning of the ridge patterns or recording their permanent impressions can be accomplished rapidly, inexpensively and without any trauma to the patient.[1] Although earlier records of dermatoglyphics are available, their significance in medical disorders came to limelight after Cummins published his detailed work on dermatoglyphics in 1943.[2] Several authors have researched this topic further and have contributed significantly to this field. The work by Cummins has served as guide for most of these studies. Although innumerable articles have been published on the relationship between medical disorders and dermatoglyphics, very little literature is available on the various methods available for recording and preserving dermatoglyphic prints. Medical researchers working on

the relationship between dermatoglyphics and finger/palm/toe/sole prints have attempted to use various techniques to obtain dermatoglyphic prints for study purpose. Although more than 20 different methods have been reported in earlier studies, 5 feasible and accurate methods were used for comparison in this study. The methods chosen for comparison are ink method, transparent adhesive tape method, machine oil method, photographic method and digital method.[1-7] These techniques were chosen after through literature review and were found to be easy, accurate, less messy and feasible for use by medical professional for medical research and study.

METHODS

This is a descriptive study carried out at the KLE Society's Institute of Dental Sciences, during the year 2018-2019. The topic was presented to the Internal Ethical Committee at the institute and was approved. Healthy adult male and female volunteers between the age group of 20-60 years were used for this study. Volunteers with physical deformities of fingers or hands and burn injuries on fingers were excluded from the study. The procedure was explained to them and informed consent was obtained from them. This is qualitative study and no statistical analysis is required.

Procedure

Ink method

Materials- Printing ink, paper, roller, glass slab, sponging pad.

Method- Subjects are asked to wash and dry their hands to keep them free of oil and dust before taking the prints. A thin layer of printers ink is smeared on the right thumb using a sponge or roller. Then the finger is placed on bond paper and the prints are taken by applying even pressure on the back of the finger. Rolled prints are obtained by rolling the finger from side to side.

Transparent adhesive tape method

Materials- Cellophane tape, white chalk, bond paper.

Method- The finger is cleaned and dried before the procedure. It is dusted with chalk powder. A wide clean cellophane tape is applied on the finger. Even pressure is applied on the whole surface and the finger print is lifted by stripping of the tape. These are then pasted on bond paper.

Machine oil method

Materials- Hand lotion, black powder, paper.

Method- The cleaned and dried finger is smeared with oily hand lotion. It is then placed on a clean bond paper and the impression is taken. Black powder is dusted over the impression and the excess is shaken off.

Photographic method

Materials- Camera.

Method- The finger is cleaned and dried thoroughly. The finger is placed against a plain background. The image is captured using a good camera.

Digital method

Materials- Finger print scanner, computer, software.

Method- A clean dry finger is placed on the finger print scanner and the image is captured by applying adequate pressure. It is connected to a computer with suitable software and the print is recorded and reproduced.

RESULTS

The prints obtained by different methods are compared and various parameters like clarity, minutiae, ease of storage, ridge counting and angle measurement are used as reference. The results are summarised in the table 1.

Table 1: Comparison of various parameters of different dermatoglyphic methods.

Method	Clarity	Minutiae	Ease of storage	Ridge counting	Angle measurement
Ink method	√√	√	√√	√√	√√
Transparent adhesive tape method	√√	√	√√	√√	√√
Machine oil method	√√	√	√√	√√	√√
Photographic method	√√√	√√	√√√	√√√	√
Digital method	√√√	√√√	√√√	√√√	√√√

Ink method

The image obtained is clear and the lines are well defined. Ridges on part of the finger in contact with the paper are only printed. Rolled prints provide a wider field for reference and analysis. Minutiae are not well defined. Ridges and angles can be easily measured. These prints can be easily filed and stored. (Figure 1)

Transparent adhesive tape method

The images obtained are good and clear when taken but on pasting it on paper, the clarity is reduced. The minutiae are not well defined. But ridges and angles can be measured to a certain degree of accuracy. Storing these prints for further study is difficult as the powder tends to fade. (Figure 2)

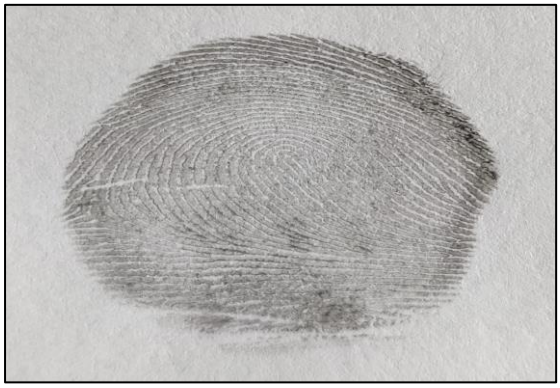

Figure 1: Dermatoglyphic print obtained by ink method.

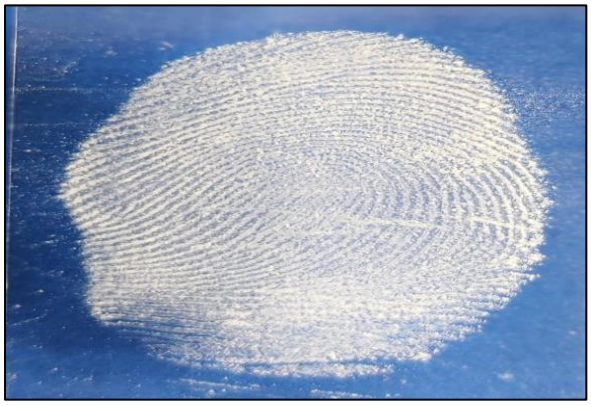

Figure 2: Dermatoglyphic print obtained by transparent adhesive tape method.

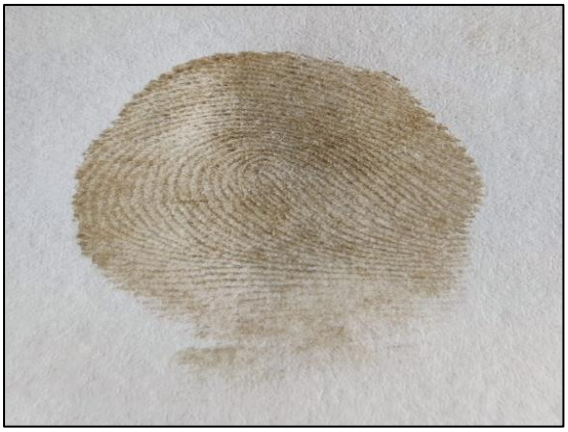

Figure 3: Dermatoglyphic print obtained by machine oil method.

Machine oil method

The images recorded by this method are good. The ridges and angles are clear but the edges started smudging later due to the oil content in the lotion used to imprint the image. (Figure 3)

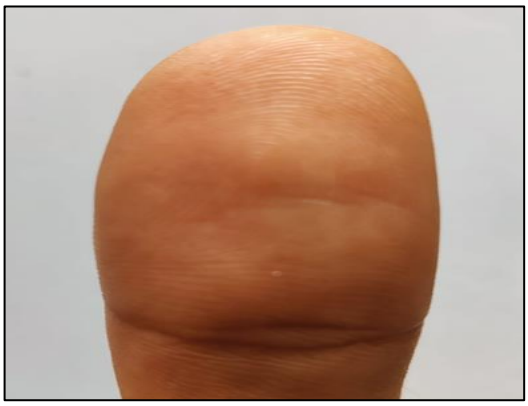

Figure 4: Dermatoglyphic print obtained by photographic method.

Figure 5: Dermatoglyphic print obtained by digital method.

Photographic method

The image obtained by this method is good. The clarity is good and the ridge patterns and other finer details can be better appreciated in this print. Storing these prints requires very less space and no paper is used to print these images. (Figure 4)

Digital method: The images are exact and all the details are clear and well defined. Digital images exhibit a great degree of clarity and accuracy. All minutiae are well defined. The digital prints require very less storage space and need not be printed on paper for analysis. (Figure 5)

DISCUSSION

Use of dermatoglyphics for forensic and legal purposes is in practice since a long time. But the use of

dermatoglyphics in medical research has gained momentum in the past few decades. A number of methods for recording dermatoglyphics exists.[1] The methods vary in their requirements for equipment, time, experience and in quality of prints produced.[1] There are more than 20 different methods recorded in literature and five among them are used in this study for comparison. These methods are broadly classified into two groups; ink and inkless methods.[2] The methods used for this study are relatively easy to use, rapid and inexpensive. Ink method, transparent adhesive tape method, machine oil method, photographic method and digital method are used in this study for comparison. Although each of these methods have their pros and cons, all methods cannot be used for collecting and preserving huge data.

Ink method is one of the best known most widely used dermatoglyphic printing methods.[1] This method uses printers ink and good quality paper. A modified ink method uses a resilient surface is used for obtaining good prints. A firm roller with a sponge sleeve can be used for taking rolled prints. Prints obtained by the standard ink method as described by Cummins are clear and give good impressions when taken by trained personnel. This is also the most common and prevalent method used by most researchers after the work by Cummins was published. The whole field can be printed by using the rolled fingerprint method. The prints obtained can be saved and used for further analysis. The ink used is nontoxic and can be easily washed off using regular soap and water. This method is ideal for collecting large scale data. This is ideal to be used in adults and cooperative children.[2] Lipstick was used instead of printers ink and the prints were obtained.[4] In the current study, prints obtained by ink method were clear and accurate.

Transparent adhesive tape method is generally used to lift partial prints from crime scenes on smooth dusted surfaces.[1-3] This method is most suitable for taking prints from areas hard to print by standard methods and to take prints from infants or small children. This procedure can be compared with the indirect process long employed by criminologists for "lifting" patterns off dusted smooth surfaces containing accidental finger print impressions.[5] Cotterman modified this method and used ink instead of chalk powder for obtaining the prints. Glass is generally used as an ideal mounting media in this method. This method is good and effective for obtaining good quality prints but storing these prints for further analysis is difficult. The prints obtained by this method are good but it is more time consuming than the ink method and not suitable for studies involving large number of subjects.

Machine oil and black powder is sometimes used to take finger prints.[1] This method uses machine oil to take prints that are later dusted with black powder. This powder is generally used in crime scenes to lift latent prints. Later researchers have used lotion in the place of machine oil and were able to obtain similar images. The prints obtained by this method stand out clearly as soon as they are taken. But the oil in the lotion spreads over time and the images become smudged and fade out with time. These can be fixed by treating the prints with a solution of resin in alcohol. This method yields good results and is less cumbersome but the prints obtained have to be analysed immediately and can't be stored for future.

Photographic method used by Stelin is less cumbersome and it is a stain less, strain less, user and subject friendly method. Recent advances in photography and photographic equipment aid in obtaining images with great clarity. And the procedure is less messy when compared to ink methods. The photographs taken require less space for storage and can be analysed manually or using digital soft wares. But the field obtained is not flat and measuring angles on the image obtained might not be accurate. Thus the photographic method is strain less, stain less, very cheap, subject and user friendly when compared to any other method used so far in dermatoglyphic analysis.[6]

Digital scanner was used for obtaining and analysing dermatoglyphic patterns in malocclusion.[7] It helps in obtaining very clear images that are easy to analyse. All minutiae are well defined and they are very clear. Analysing images obtained by this method is very easy and several soft wares are available for this purpose. Although the method has several advantages over other methods, it is not secure as these can be easily recreated and misused. Hence these methods are not good from the security point of view.

Among all the methods suggested by various authors and those mentioned in literature, only a select few could be used for this study owing to the fact that all studies are not feasible for use in medical studies. Some of these methods are more cumbersome and cannot be used while collecting large data. Some methods provide a great degree of clarity and accuracy but cannot be used as they can be recreated or falsified hence not accepted or approved for study purposes.

CONCLUSION

Ink method was first described in detail by Cummins and used by several researchers after him for various studies. It is still the most widely used and accepted method for different comparative studies. Adhesive tape or scotch tape method is widely used in forensic studies for lifting partial and latent prints from crime scenes. Machine oil method is no longer used because of several disadvantages it exhibits. Photographic and digital methods are the most recent techniques used for obtaining finger prints but are not still accepted widely due to ethical issues related to their use and storage.

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REFERENCES

1. Schaumann B, Alter M. Dermatoglyphics in Medical Disorders. `Springer Verlag. 1976;13-26.
2. Cummins H, Midlo C. Fingerprints, Palms and Soles. An Introduction to Dermatoglyphics. Dover publications. 1961;45-55.
3. Jain G. Dermatoglyphics - The science of lines and patterns and its implications in dentistry. International Journal of Contemporary Medical Research. 2016;3(10):2973-7.
4. Gupta RK, Gupta AK. New, Easy and Effective Method to Take Dermatoglyphic Prints. National Journal of Medical Research. 2013;3(1):45-7.
5. Cotterman CW. A Scotch-tape India-ink method for recording dermatoglyphics. American Journal of Human Genetics. 1951;3(4):376-9.
6. Wersely SAM, Manjunath KY, Kumar KV, Vrijakumari CR. Photographic Method in Dermatoglyphics Analysis. IOSR Journal of Dental and Medical Sciences. 2016;15(12):01-3.
7. Charles A, Ramani P, Sherlin HJ, Dilip S, Srinivas S, Jayaraj G. Evaluation of dermatoglyphic patterns using digital scanner technique in skeletal malocclusion: A descriptive study. Indian Journal of Dental Research. 2018;29(6):711-5.

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