

# Role of Nail Striation in Forensic Identification

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**Abstract:** *In the present study nail samples were collected randomly from 30 individuals. Comparing the intra and inter striations and when the inter finger nails were compared with a striation no match was seen and the same result appeared when intra finger and toe nail striations were compared. Showing both uniqueness and persistence properties. Concluding that the nail striations are as unique as that of finger prints. Thus, if ever encounter as an evidence, nail clipping can be used as a potential evidence to convict the suspects.*

**Keywords:** *Nail striation, forensic, evidence, sample, criminal.*

## 1. PREFACE:

Nail is one of the physical evidences that can be encountered in criminal cases related to homicide and sexual offences etc. Though it is not widely found on the crime scene but if at all encounters it should not be avoided or destroyed as it can help us to narrow down our area of search.

Unlike other type of biological evidence, nail is remarkably stable evidence to most of the environmental conditions and does not break down easily. In addition it is relatively unnoticeable to the untrained eye; therefore a criminal is not likely to make special efforts to destroy the nail evidence, as it is not known to many people that this small nail clipping can also play important role in linking the criminal to either to crime scene or a victim.

Evaluation of human nail clippings provides useful information which helps us in achieving the individuality of an individual. In the present study attempt has been made to study the microscopic features of nail striations present on the nails with the help of comparison microscope. In this study the parameters that were included were, matching of inter finger and toe nail striations and intra finger and toe nail striation also the nail striations of different individuals were matched.

## 2. INTRODUCTION:

Nail is occasionally found as physical evidence at various crime scenes like homicide and the cases related to sexual assaults etc. If collected and analyzed properly can help in linking the criminal with victim and the crime scene. The most important advantage of this evidence is that it is not affected by most of the external conditions so it can remain at the crime scene for longer time hence plays an important role in linking. During their collection it has to be kept in mind that they have to be collected carefully and clippings have to be of medium size. In the present study the nail clippings were analyzed with the help of comparison microscope.

Studies have shown that the use of the fingernail striation pattern appears on each nail of the person irrespective of either toe or finger (1985). Earlier studies are performed by McDonald & Co-workers (1978). They had reported comparison of the fingernail pattern of Monozygotic (identical) twins.

Nails are also considered as one of the important tissues which can be used for personal identification. In contrast to tissues, nails survive relatively well in decomposition environment. Thus taking this point as major advantages of utilizing nails for personal identification in comparison with other tissues is that the sample size does not matter and sample process is relatively non-destructive and non-invasive and yet each nail retains a discrete record of detailed information on genetic inheritance and individualization. Further most in contrast to other tissues like bones, nails are easy to decontaminate from external environment and is remarkably stable to most of the environmental conditions and does not break down easily. In addition it is relatively unnoticeable to the untrained eye; therefore a criminal is not likely to make special efforts to destroy the nail evidence as it may also not seemed that this nail clipping can also help to link to the criminal. Study of human nail clippings provides useful information which helps us to gain the individuality of an individual. Nail examination is being used as a tool of personal identification. Such studies have shown that the use of the fingernail striation pattern appears on each nail of the person irrespective of either toe or finger. Thus, nail as evidence may be used to:

1. To study the Uniqueness in nail striations
2. To study Permanency and persistence in nail striations

### 2.1 Uniqueness:

To determine uniqueness of nail striation of an individual, the following two parameters were included

- a) Inter personal nail comparison.
- b) Intra personal nail comparison.

In interstriation matching of nail clippings of two individuals were compared of both the hands which showed no match.

In intra striation matching the nail clipping of individual was taken and each finger was compared of the individual and showed no match.

## 2.2 Persistence:

To determine the persistence same individuals clipping was taken after 5 day interval , 10 day interval, 15 day interval, 20 day interval , 25 day interval. And all this showed a positive match.

Moreover very little literature related to identification from nail/nail clipping is available. Keeping all these things in mind, it was thought desirable to undertake this project. So in the present study an attempt has been made to collect nail clippings from male and females with the gap of few 5 days.

It is expected after studying the striations present in the nail clippings with the help of comparison microscope at different magnifications can help not only in linking the suspect and victim with each other and also with crime scene but also narrow down the area of search.

## 3. METHODOLOGY:

### SAMPLE COLLECTION:

In the present study nail clippings were collected by using cosmetic fingernail clipping from 30 individuals that included both male and female of varying age randomly to study the striations present. The nail clipping of each finger and toes were taken from fingers of respective person. During the collection of the sample each and every person was told about the study that was being to be conducted and there oral consent was taken for sample collection.

### 3.1 Objectives:

The present study has been conducted to achieve the following purposes:

1. To study the Uniqueness in nail striations
2. To study Permanency and persistence in nail striations

#### 1. Uniqueness:

To establish the uniqueness of nail striation of an individual, the following two parameters were studied

- Inter personal and
- Intra personal nail comparison.

In inter striation matching nail clippings of two individuals were compared of both the hands which showed no match.

In intra striation matching the nail clipping of each finger was compared with each other of the same hand and it showed no match.

#### 2. Persistence:

To establish further the persistence of nail striations, the nail clippings from the same individuals was collected after the interval of 5 day, 10 day, 15 day, 20 day and 25 day.

### 3.2 Method for comparison:

The method that was employed for the comparison include following steps:

1. The nail clipping of each of the finger was taken using cosmetic fingernail clipper.
2. Clipped nail clippings were cleaned with ethanol.
3. The cleaned nail clippings were examined under comparison microscope.
4. The compared clippings photograph was clicked and were checked further for comparison.



**Fig1: diagram showing well labeled comparison microscope.**

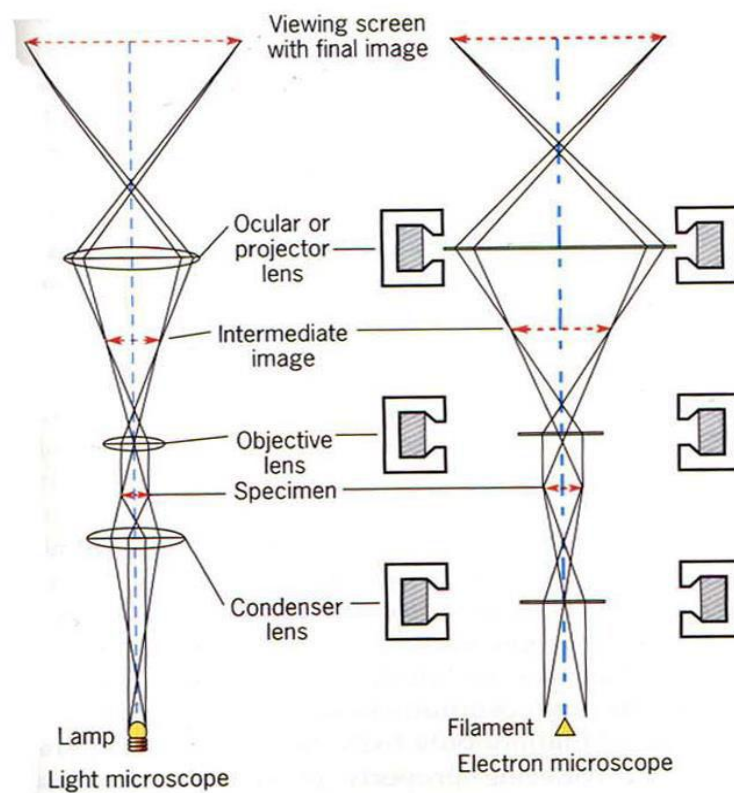
- A. Eyepiece
- B. Bridge
- C. Objective lens
- D. Mechanical stage
- E. Iris diaphragm
- F. Illuminator
- G. Base
- H. Body tube
- I. ARM

#### 4. INSTRUMENT USED:

##### 1. COMPARISON MICROSCOPE:

Comparison microscopes have two compound light microscopes that sit side by side and allow the user to view both specimens through a center eyepiece that displays both images. Compound microscopes are microscopes that use multiple lenses to magnify an image for study. The images from the comparison instrument can also be transferred to a computer monitor, television screen or sent via the Internet to a remote computer. The ability to view two samples simultaneously allows them to be meticulously compared to see if they are identical or different.

Advantages: The primary use of these types of dual microscopes is in **forensics**, a discipline that uses science and technology to help solve crimes by providing factual evidence and linking crime scene evidence to a suspect or location. Tools create specific marks, bullets have signature marks, hair can be human or animal and using two compound microscopes to study a known sample against a collected piece of evidence can confirm an objects origin. Having multiple eyepieces, image magnifications ranging from 6x to 400x depending on the microscope model and image viewing options including left or right views only, side by side views of both samples and superimposed viewing places one image on top of the other for comparison.



**Fig2: diagram showing working of comparison microscope.**

#### 4.1 CAMERA:

The Sony DSC-W650 cyber shot camera was used for taking photographs to compare inter and intra finger nail striations

#### 5. RESULT AND DISCUSSION:

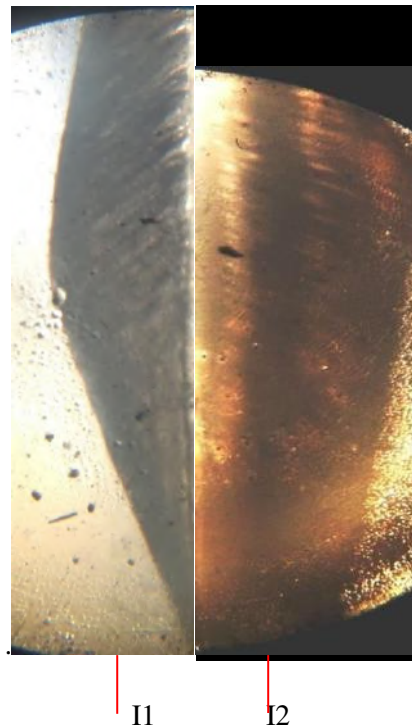
In the present study nails of individuals were taken in order to determine persistence and uniqueness of nail striation.

## 6. UNIQUENESS:

In order to determine the Uniqueness of the nail striation different individuals were asked for nail clippings and compared interpersonally and intrapersonal.

### 6.1 Interpersonal:

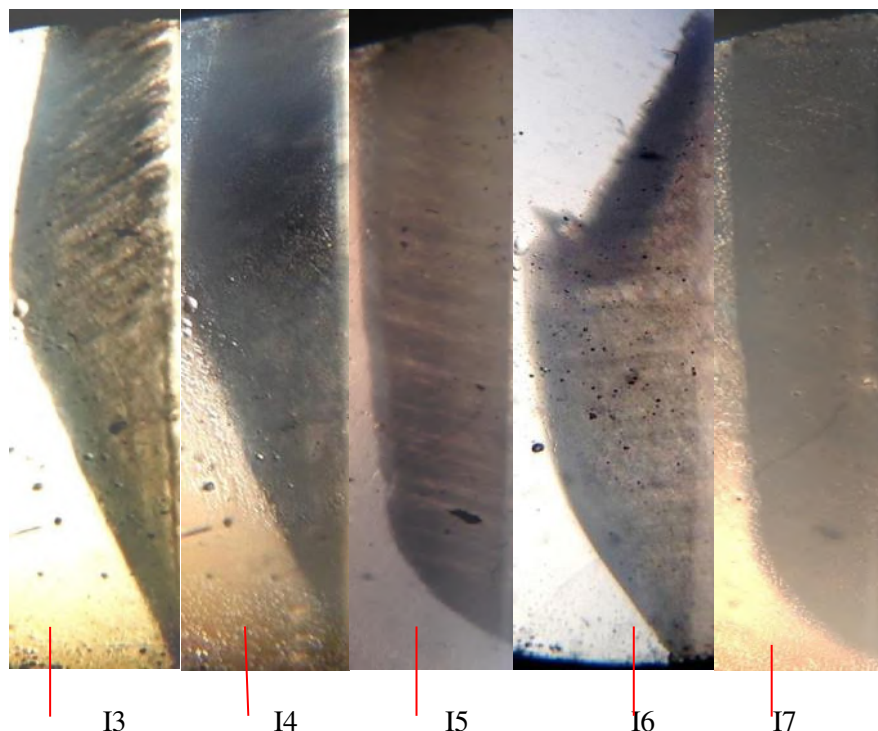
In the present study nail striations of different individuals were taken and compared as shown in figure (1). The nail clippings of subject 1(I1) were compared with nail clipping of subject 2 (I2) both of same hand and no match was found. Following study was repeated for 10 individuals and similar results were found.



**Fig 3: Diagram showing nail clipping of subject 1 and subject 2.**

### 6.2 Intrapersonal:

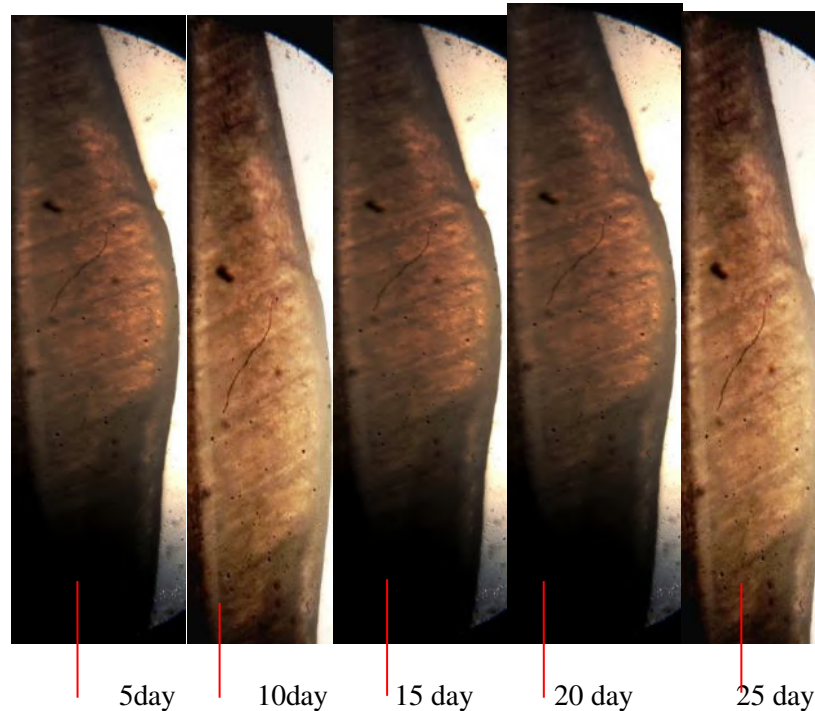
In the present study nail striation of different fingers of same hand were compared as shown in figure (2). The nail clipping of middle finger (I3), index finger (I4), ring finger (I5), little finger (I6), thumb finger (I7) were compared and no match was found. Following study was repeated for 10 individuals and same results were observed as follows



**Fig: 4 Diagram showing nail clippings of different fingers of same hand of individual.**

## 7. PERSISTANCE:

In order to determine the persistence of nail striations the individuals were requested to give clippings of the same finger of same hand after the interval of 5 day, 10 day, 15 day, 20 day and 25 day. As shown in the figure. When they were compared it showed a positive match.



**Fig5: showing nail clippings taken after 5 day interval for striation comparison.**

## 8. SUMMARY AND CONCLUSIONS:

In the present study nail samples were collected randomly from 30 individuals. The conclusions emerged out as follows:

When the inter finger nails were compared with each other the striation showed no match and the same result appeared when intra finger and toe nail striations were compared. Thus, it concludes that nail striations are as unique as that of finger prints.

Thus, if ever encounter nail as evidence, nail clipping can be used as a potential evidence to convict the suspects.

## REFERENCES:

1. Boehm et al.: Comparison of finger nail ridge pattern. *Journal of Forensic Sciences*, 35(1): 97-102. (1990).  
Apolinar et al. : Comparison of finger nail ridge pattern, *Journal of Forensic Sciences*, 25(1):154-161. (1980).  
Tag Anbar et al.: Clinical study of nail changes in vitiglo, *Journal of cosmetic Dermatology*.12 (1): 67-72. (2013).
2. Kempton et al. : Comparison of finger nail pattern in identical twins, *Journal of forensic science*. 37(6):1534-40. (1992).
3. Parmar et al: Forensic oncology : an essential entity against crime, *Journal of Acad Forensic medicine*, 34(4) . (2012).

## WE REFERENCES:

- <http://www.dermweb.com/hairnails mucous membranes/nails.htm>  
[http://shodhganga.inflibnet.ac.in:8080/jspui/bitstream/10603/2434/9/09\\_chapter%201.pdf](http://shodhganga.inflibnet.ac.in:8080/jspui/bitstream/10603/2434/9/09_chapter%201.pdf)  
<http://www.rci.rutgers.edu/~uzwiak/AnatPhys/APFallLect7.html>  
<http://www.jsmedcentral.com/Dermatology/dermatology-2-1008.php>  
<http://www.healthhype.com/parts-of-the-nail-and-pictures-human-finger-and-toe.html>  
<http://www.microscopemaster.com/comparison-microscope.html>