

## Analysis of Dermatoglyphics in Pulmonary Tuberculosis Cases

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### Abstract

**Introduction:** Dermatoglyphics is scientific study of epidermal ridges and their configuration on palmar and plantar region. The factor which is responsible for genetic correlation of pulmonary tuberculosis is functional mutants of mannose binding protein. It plays important role in inheritance. Epidermal ridge pattern is also determined by genetics.

**Aims & Objectives:** To find out various Dermatoglyphic features in patients of pulmonary tuberculosis. To study the statistical significance of the difference found in patients and normal individuals.

**Observations:** This study was attempted in two groups i.e. one with 100 patients (72-males, 28-females) having pulmonary tuberculosis and the other with 100 healthy adult (72-males, 28-females) of same age groups 20-45 years.

**Results & Conclusions:** There is decrease in number of hands in which 'c' line termination is towards '9' in left hands of female patients than controls. Significant decrease in number of female patients having I<sub>3</sub> pattern in their right hands as compared to female controls. We found Dermatoglyphic analysis proven to have advantages as a diagnostic tool in certain diseases including pulmonary tuberculosis. It can use as for the prevention & control of disease.

**Key words:** Dermatoglyphics; Epidermal ridges; Tuberculosis; Prevention.

### Introduction

The study of epidermal ridge patterns of the skin of the fingers, palms, toes, and soles is known as 'Dermatoglyphics'. Man has always wondered about skin over the palms and soles which is peculiar in having epidermal ridges, lacks hair and sebaceous glands, sweat glands are numerous. These epidermal ridges are known as friction ridges and are seen in all primates, because they help to counteract

slipping.[1] The Harold Cummins coined the term Dermatoglyphics in 1926.[2] Dermatoglyphics literally means skin carvings. The tuberculosis is partly genetic and partly environmental. The study of Dermatoglyphics was pioneered long back by Galton (1892)<sup>3</sup>. Patterns once established never change throughout life.[4] Functional mutants of mannose binding protein are associated with pulmonary tuberculosis, which plays important role in inheritance and epidermal ridge pattern is also determined by genetics.[5] During 3rd & 4<sup>th</sup> month of foetal life ridges are differentiated in their definitive forms & remain permanent throughout the life. The original feature does not change if there is no injury. Very little study has been conducted so far, as far as Dermatoglyphics in pulmonary tuberculosis is concerned. Considering all above facts, the present study is under taken to find out various Dermatoglyphic features in pulmonary tuberculosis patients and compare them with normal individuals and

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to see differences found are statistically significant or not.

### Aims and Objectives

To find out various Dermatoglyphic features in patients of pulmonary tuberculosis.

To study the statistical significance of the difference found in patients and normal individuals.

### Material and Methods

The present study has been carried out on 200 individuals: Negative controlled study with two arms from the age group between 20-45 yrs, one with 100 patients (72-males; 28-females) having pulmonary tuberculosis and other with 100 healthy adult (72-males; 28-females).

*Materials used for fingerprint are as follows:* 'Kores' duplicating ink, Porcelain tile, Wooden table of suitable height, Cotton gauge ball, Printing paper, Towel, Pressure pad, Spirit, Soap, Water. Disposable Mask

*Instruments used for qualitative and quantitative analysis for the study are:* Scale, Protractor, Pencil, Needle, Compound magnifying lens.

#### Collection of data

From West Maharashtra region the patients selected and were diagnosed clinically as having pulmonary tuberculosis (sputum positive test). Controls are selected from the same age groups without any respiratory problem or any symptoms related to pulmonary tuberculosis. Family history was taken to exclude other diseases.

#### Method

Standard ink method is used in present

study.[6] To keep the hand clean and dry spirit was used because it removes remaining oil and other dirt.

#### Palm printing

Palm prints of both hands were obtained after inking with the help of cotton gauge ball. A uniform film of ink was obtained on the tile with cotton gauge ball. Then with the help of same cotton gauge ball ink was spread uniformly on both hands. Complete palm impression including the hollow of palm was obtained over the paper. The same procedure was followed for recording the palm prints of left hand. Thus palm prints of both hands were obtained and recorded.

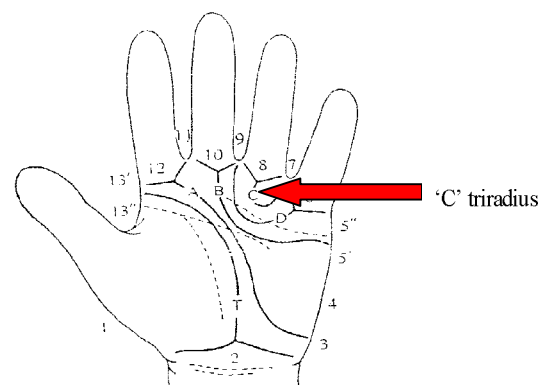
*Following Palmar patterns were studied and analyzed in the present study (Galton, 1892)[3] - (Photograph no. 1 & 2).*

#### 'C' Line termination

This line represents proximal radiant of 'C' triradius. It is most commonly altered in various disorders. 'C' line may be directed to ulnar, radial, proximal direction or it may be abortive or absent. Accordingly it is designated as c-u, c-r, c-p, c- abortive or absent.

The palmar area may be divided into different sectors and given numbers starting from thumb side (1 to 13) as shown in the figure above. The 'c' line is traced and its termination

**Figure 1: Showing 'C' triradius & numerical values used to designate termini of palmar main-line formula**



is recorded in numerical value. (Henry ER. 1927).[7]

*Thenar and First interdigital area (Th/I<sub>1</sub>)*

Anatomically these two areas are closely related. In dermatoglyphic analysis these two areas are considered as one area and it is labeled 'Thenar/first Interdigital' area (Th/I<sub>1</sub>). Usually, pattern is absent in this area. But sometimes 'a vestige' or 'a true' pattern can be present in either thenar or the I<sub>1</sub> area or in each of the areas at the same time (Alter M. 1967).[8] A vestige is a pattern configuration, which occurs when an area of abruptly disarranged ridges disturbs the simple flow of ridges. Commonly patterns showing loops are present in 'Thenar / first Interdigital' area, but sometimes whorls also occur in this area.

*Second, Third and Fourth Interdigital areas (I<sub>2</sub>, I<sub>3</sub> and I<sub>4</sub>)*

These areas are located in the distal palm in the region of the heads of the metacarpal bones. Each Interdigital area is bordered laterally by digital triradii. The digital triradii are almost always located proximal to the base of digits II, III, IV, V. Digital triradii are labeled as 'a', 'b', 'c' & 'd' starting from the triradius located at the base of digit II (Index finger) moving towards the triradius associated with digit V (little finger). Thus, the second Interdigital (I<sub>2</sub>) lies between triradii 'a' and 'b' the third Interdigital area (I<sub>3</sub>) lies between triradii 'b' and 'c' and the four the Interdigital area (I<sub>4</sub>) lies between triradii 'c' and 'd'.

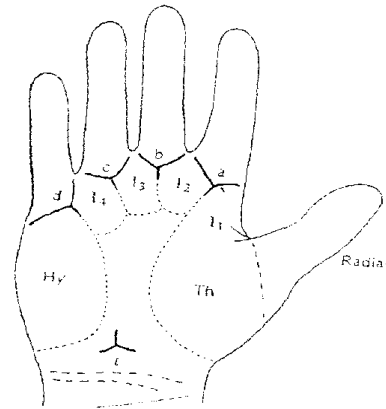
In the event of digital triradius being absent, the midpoint of the base of the corresponding digit can be used to separate the Interdigital areas. In these Interdigital areas the commonly found pattern configurations are loops, whorls, vestiges and open fields. Loops are most commonly found patterns in the distal palm. Whorls are very rare in the Interdigital areas; while vestiges are relatively common, open fields are the most common ridge configuration found in the distal palm. Truly speaking, open fields are pattern less area formed by almost parallel ridges.

*Hypothenar area (I<sub>5</sub>)*

True patterns are commonly present in the hypothenar area. The patterns usually found in this area are whorls, loops and tented arches. Sometimes simple arches, open fields, vestiges and ridge multiplication also occur. Whorls in the hypothenar area have three triradii.

Comparison of each study variable in patients and controls was done. Qualitative data was analyzed by using Chi-square test. The difference is said to be significant if

**Figure 2: Diagram of palm showing the dermatoglyphic pattern areas. Th- thenar; I<sub>1</sub>- I<sub>4</sub>-first to fourth interdigital areas and Hy- hypothenar**



**Figure 3: Showing the actual palm print taken**



significance i.e. 'P' value is less than 0.05.

**Table 1: Shows comparison of 'c' line termination in Right hands of Male Patients and Controls**

| 'C' line termination towards | Total Value | MP %  | Total Value | MC %  |
|------------------------------|-------------|-------|-------------|-------|
| 5                            | 3           | 4.16  | 0           | 0     |
| 7                            | 13          | 18.06 | 19          | 26.39 |
| 8                            | 0           | 0     | 0           | 0     |
| 9                            | 56          | 77.78 | 53          | 73.61 |

**Table 2: Shows comparison of 'c' line termination in Left hands of Male Patients and Controls**

| 'C' line termination towards | Total Value | MP %  | Total Value | MC %  |
|------------------------------|-------------|-------|-------------|-------|
| 5                            | 13          | 18.05 | 0           | 0     |
| 7                            | 19          | 26.39 | 22          | 30.55 |
| 8                            | 0           | 0     | 0           | 0     |
| 9                            | 40          | 55.56 | 50          | 69.45 |

**Table 3: Shows comparison of 'c' line termination in Right hands of Female Patients and Controls**

| 'C' line termination towards | Total Value | FP %  | Total Value | FC %  |
|------------------------------|-------------|-------|-------------|-------|
| 5                            | 2           | 7.14  | 0           | 0     |
| 7                            | 12          | 42.86 | 9           | 32.15 |
| 8                            | 0           | 0     | --          | 0     |
| 9                            | 14          | 50    | 19          | 67.85 |

**Table 4: Shows comparison of 'c' line termination in Left hands of Female Patients and Controls**

| 'C' line termination towards | Total Value | FP (%) | Total Value | FC (%) |
|------------------------------|-------------|--------|-------------|--------|
| 5                            | 5           | 17.85  | 0           | 0      |
| 7                            | 7           | 25     | 4           | 14.28  |
| 8                            | 0           | 0      | 0           | 0      |
| 9                            | 16          | 57.15  | 24          | 85.72  |

**Table 5: Shows comparison of I<sub>1</sub> to I<sub>5</sub> patterns in right hands of Male Patients and Controls**

| Patterns       | MP | MC | 'chi-square' Value | Statistical Significance |
|----------------|----|----|--------------------|--------------------------|
| I <sub>1</sub> | 2  | 2  | —                  | Not Significant          |
| I <sub>2</sub> | 7  | 5  | 0.364              | Not Significant          |
| I <sub>3</sub> | 39 | 41 | 0.112              | Not Significant          |
| I <sub>4</sub> | 35 | 31 | 0.448              | Not Significant          |
| I <sub>5</sub> | 22 | 14 | 2.370              | Not Significant          |

$\chi^2=0.364$ , p (0.50) =0.46  
 $\chi^2=0.448$  p (0.50) =0/46

$\chi^2=0.112$  p (0.50) =0.46  
 $\chi^2=2.370$  p (0.10) =2.37

**Table 6: Shows comparison of I<sub>1</sub> to I<sub>5</sub> patterns in left hands of Male Patients and Controls**

| Patterns       | MP | MC | 'chi-square' Value | Statistical Significance |
|----------------|----|----|--------------------|--------------------------|
| I <sub>1</sub> | 9  | 6  | 0.670              | Not Significant          |
| I <sub>2</sub> | 6  | 4  | 0.430              | Not Significant          |
| I <sub>3</sub> | 19 | 27 | 2.044              | Not Significant          |
| I <sub>4</sub> | 42 | 39 | 0.254              | Not Significant          |
| I <sub>5</sub> | 16 | 20 | 0.671              | Not Significant          |

$\chi^2=0.670$ ,p(0.50)=0.46

$\chi^2= 0.430$ ,p(0.50)=0.46

$\chi^2= 2.044$ ,p(0.50)=0.46

$\chi^2= 0.254$ ,p(0.50)=0.46

$\chi^2= 0.671$ ,p(0.50)=0.46

## Results and Discussion

### Palmar pattern

#### 'C' line termination

There is increase in number of hands in which 'c' line termination is towards '5' '8' '9' in right hands of male patients than controls. There is decrease in number of hands in which 'c' line termination is towards '7' in right hands of male patients than controls. There is increase in number of hands in which 'c' line termination is towards '5' in left hands of male patients than controls. There is decrease in number of hands in which 'c' line termination is towards '7' '8' '9' in left hands of male patients than controls. There is increase in number of hands in which 'c' line termination is towards '5' '7' '8' in right hands of female patients than controls. There is decrease in number of hands in which 'c' line termination is towards '9' in right hands of female patients than controls. There is increase in number of hands in which 'c' line termination is towards '5' '7' in left hands of female patients than controls. There is decrease in number of hands in which 'c' line termination is towards '9' in left hands of female patients than controls.

#### 2. I<sub>1</sub> - I<sub>5</sub> pattern

Significant decrease in number of female patients having I<sub>3</sub> pattern in their right hands as compared to female controls.

Pulmonary tuberculosis is most important cause of mortality & morbidity in India. Dermatoglyphics variations are expected as it has some genetic background. There is very

little study done in Dermatoglyphics in diseases like pulmonary tuberculosis. Sidhu LS[9] in 1977 and Nechaeva OB et al[10], 1996 found statistical significant differences in distribution of various subtypes in index fingers of both hands and little finger of right hand. Sangita S Babu et al[11] in 2005 studied the whorl pattern significantly predominant with decrease in loop pattern. Dermatoglyphics has genetic basis in certain diseases like Bronchial asthma, Cervical cancer, Breast cancer. In the present study Dermatoglyphic parameters were studied and found to be statistically significant.

### Conclusion

By above study it has been clear that any epidermal changes alternations in person have distinct dermatoglyphics feature. Genetic contribution is one of the causes of pulmonary tuberculosis. Some studies indicate that inherited susceptibility is important risk factor. Many Dermatoglyphic patterns seen in pulmonary tuberculosis patients are found to be statistically significant in comparison with controls. The result of this study establishes the fact that there is a random relation between palmar pattern and incidence of pulmonary tuberculosis. Advantage of this is simple, economical, ink method & material used is easily available & portable. We recommend for further quantitative study on large scale to use such screening tool as a diagnostic tool.

### References

1. Ashley Montague MF. Finger, palm, toe and soles prints. An introduction of physical anthropology 3<sup>rd</sup> ed. Springfield: Charles C Thomas Publisher; 1960, 581-582.
2. Cummins H, Midlow C. Palmar and plantar epidermal configuration in European Americans. *Am J Phy Anthropology*. 1926; (9): 471.
3. Galton F. Fingerprints McMillan and Company, London; 1892: Cited by Cummins and Midlow 1961:197.
4. Penrose LS. Medical significance of Fingerprints and related Phenomenon. *Bri Med J*. 1968; (2): 321-325.
5. Selvaraj P, Narayanan PR, Reetha AM. Association of mannose binding protein gene with susceptibility to pulmonary tuberculosis. *Tuber Lung Dis*. 1999; 79(4): 221-7.
6. Blanka S, Alter M. Dermatoglyphics in Medical disorders Library of congress: Springer, Verlag New York: Heidelberg, Berlin 1976.
7. Henry ER. Classification and use of Fingerprints 8th edition. London: HM Stationary office; 1927, Cited by Schumann and Alter 1936.
8. Alter M. Dermatoglyphics analysis as diagnostic tool. *Medicine*. 1967; (46): 35-36.
9. Sidhu LS, Bhatnagar DP, Malhotra R, Sodhi HS. Association of finger ball Dermatoglyphics with pulmonary tuberculosis. *Anthropology Anz Aug*. 1977; 36(1): 36-42.
10. Nechaeva OB, Polzik EV, Iakusheva Mlu, Kazantsev VS. The Dermatoglyphics of patients with different forms of tuberculosis of respiratory organs. 1996; 30(6): 65-9.
11. Sangita S Babu, Powar BP, Khare ON. Palmar Dermatoglyphics in pulmonary tuberculosis. *J Anat Soc India*. 2005; 54(2): 64-66.