Study of Palmar Dermatoglyphics in Hypertension

Dr. Mohtashim Ahmad1, Dr. D. S. Pimpalkar2

Department of Anatomy AIIMS Bhopal Saket Nagar Bhopal 462020

Abstract: The present study was conducted in the department of Anatomy Government Medical College and hospital Nagpur on hypertensive patients to determine the predominant dermatoglyphic marker for hypertension. One hundred patients and one hundred normal individuals were included in this study and rolled prints were taken from all the digits and palm prints was taken and stored on a proforma. In the present study the cases of hypertension show increased percentage of whorl pattern on first digit, second, third and fourth digits in both sex. In case of fifth finger the whorl patterns are same in percentage in both sexes of hypertensive patient and control group. The decrease in the percentage of loops there is an increased percentage of arches there are significant differences in the mean values of AFRC and TFRC in hypertensive patient as compared to controls groups. There is an increase in the mean value of Main Line Index. Overall ‘atd’ angle shows decrease in mean value in hypertensive patient than control but statistically these are not significant.

Keywords: Dermatoglyphics, hypertension

1. Introduction

Dermatoglyphics is a scientific study of epidermal ridges and their configuration on volar aspects of hands, fingers, feet and toes. The epidermal ridges are differentiated in their definitive form during 3rd and 4th month of intrauterine life. Hence they are significant indicators of conditions existing several months prior to the birth of an individual. During 5th to 6th month of intrauterine life primordium of sweat glands appears, proliferate and reach the surface of epidermis. The dermal ridge configurations and their component ridges enlarge with growth but their essential characteristics remain the same throughout the life. (Penrose, 1969)

It is reported that one of the etiology of hypertension is heredity. But surprisingly very few works has been carried out on dermatoglyphic pattern in hypertension. So the sincere and humble attempt has been made to study the palmar dermatoglyphics pattern in hypertension to see any specific relation between them.

2. Aims and Objectives

1) To study the finger and palmar dermatoglyphics pattern in hypertension
2) To compare dermatoglyphic configurations of hypertension with control
3) To compare our findings with other workers.
4) To find out whether a specific dermatoglyphic trait exists in hypertensive patients and whether it is significant

3. Method of Dermatoglyphic Printing

Dermatoglyphic prints were taken by the 'INK METHOD' as described by CUMMINS (1936) and CUMMINS & MIDLO

4. Material Required

1) Camel quick drying duplicating ink.
2) Rubber roller.
3) Inking Slab - Thick glass sheet fixed over wooden support.
4) Century board.
5) White 'Map Litho' paper with a glazed surface on one side.
6) Pressure pad made up of rubber foam.
7) Cotton puffs.
8) Scale.
9) Pencil pen.
10) Protractor - To measure 'atd' angle.
11) Needle with a sharp point, for ridge counting.

Dermatoglyphic Data

Qualitative analysis of finger prints.

a) Whorls
b) Loops
c) Arches

Quantitative analysis of finger prints.

a) Total finger ridge count
b) Absolute finger ridge count

Main line Index (A+D).

Axial triradii (t0, t1, t2).
atd angle.

Pattern Configurations

I) Fingers:-
1. Fingertip Pattern configurations.
2. Dermatoglyphic landmarks.

II) Palms: Palmar pattern configuration
Figure showing palmar pattern configuration

Figure showing ridge counting in various finger tip pattern types
5. Statistical Analysis

Furuhata’s Index: It is defined as the ratio of the whorls to the loops multiplied by hundred.

\[ \text{Furuhata's Index} = \frac{\text{Whorls}}{\text{Loops}} \times 100 \]

Dankmeijer’s Index: It is defined as the ratio of the arches to the whorls multiplied by hundred.

\[ \text{Dankmeijer's Index} = \frac{\text{Arches}}{\text{Whorls}} \times 100 \]

Observations and Results

In our study out of 100 cases studied, numbers of males were 62 and females were 38.

Fingertip Patterns

Whorls:
In the present study the cases of hypertension show increased percentage of whorl pattern on first digit in both sexes.

On the second fingertip, whorl patterns are increased in cases of female hypertensive patient.

There is an increase in the percentage of whorl patterns on third digit in both sexes of hypertensive patients.

There is more frequency of whorls in right and left hand of male hypertensive patients as compared to right and left hand of female hypertensive.

Loops
The table shows decrease in the percentage of loops in male patients.

Arches
There is an increased percentage of arches.

Quantitative characteristics of Finger Dermatographics
It is observed that there are significant differences in the mean values of AFRC and TFRC in hypertensive patient as compared to controls groups.

Main Line Index
There is an increase in the mean value of Main Line Index in hypertensive patient on the right hand. It is observed that there is significant difference between hypertensive patients and control group on right hand which is statistically significant (t value = 2.444 and p value = 0.015)

“atd” Angle

Overall „atd” angle shows decrease in mean value in hypertensive patient than control but statistically these are not significant.

Table 1: Frequency Distribution of Finger Tip Patterns among Patients and Controls (Henry’s classification)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Sex</th>
<th>Side</th>
<th>Total Whorls</th>
<th>Total Loops</th>
<th>Total Arches</th>
<th>Furuhata’s Index</th>
<th>Dankmeijer’s Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>M</td>
<td>R</td>
<td>126</td>
<td>161</td>
<td>23</td>
<td>78.261</td>
<td>18.254</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>116</td>
<td>176</td>
<td>18</td>
<td>65.909</td>
<td>15.517</td>
</tr>
<tr>
<td></td>
<td>R + L</td>
<td>242</td>
<td>337</td>
<td>41</td>
<td>71.810</td>
<td>16.942</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>R</td>
<td>60</td>
<td>114</td>
<td>16</td>
<td>52.632</td>
<td>26.667</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>60</td>
<td>107</td>
<td>23</td>
<td>56.075</td>
<td>38.333</td>
</tr>
<tr>
<td></td>
<td>R + L</td>
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<td>221</td>
<td>39</td>
<td>54.299</td>
<td>32.500</td>
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<tr>
<td>Control</td>
<td>M</td>
<td>R</td>
<td>186</td>
<td>275</td>
<td>39</td>
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<td></td>
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<td>283</td>
<td>41</td>
<td>62.191</td>
<td>23.295</td>
</tr>
<tr>
<td></td>
<td>R + L</td>
<td>362</td>
<td>558</td>
<td>80</td>
<td>64.875</td>
<td>22.099</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>R</td>
<td>106</td>
<td>148</td>
<td>16</td>
<td>71.622</td>
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<td>170</td>
<td>15</td>
<td>50.000</td>
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<td></td>
<td>R + L</td>
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<td>318</td>
<td>31</td>
<td>60.063</td>
<td>16.230</td>
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<tr>
<td></td>
<td>M + F</td>
<td>F</td>
<td>54</td>
<td>153</td>
<td>22</td>
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<td>R</td>
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<td>39.189</td>
<td>41.379</td>
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<tr>
<td></td>
<td></td>
<td>R + L</td>
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<tr>
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<td>L</td>
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<td>318</td>
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<td>R + L</td>
<td>303</td>
<td>619</td>
<td>77</td>
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<td>25.413</td>
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Table 2: Percentage wise Distribution of Finger Tip Patterns among Patients and Controls (Henry’s classification)

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<tr>
<th>Subject</th>
<th>Sex</th>
<th>Side</th>
<th>% of Whorls</th>
<th>% of Loops</th>
<th>% of Arches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>M</td>
<td>R</td>
<td>63</td>
<td>80.5</td>
<td>11.5</td>
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<tr>
<td></td>
<td></td>
<td>L</td>
<td>58</td>
<td>88</td>
<td>9</td>
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<td></td>
<td>R + L</td>
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<td>168.5</td>
<td>20.5</td>
<td></td>
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<tr>
<td></td>
<td>F</td>
<td>R</td>
<td>30</td>
<td>57</td>
<td>8</td>
</tr>
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<td></td>
<td></td>
<td>L</td>
<td>30</td>
<td>53.5</td>
<td>11.5</td>
</tr>
<tr>
<td></td>
<td>R + L</td>
<td>60</td>
<td>110.5</td>
<td>19.5</td>
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<tr>
<td></td>
<td>M + F</td>
<td>R</td>
<td>93</td>
<td>137.5</td>
<td>19.5</td>
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<td></td>
<td>L</td>
<td>88</td>
<td>141.5</td>
<td>20.5</td>
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<td></td>
<td>R + L</td>
<td>181</td>
<td>279</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>M</td>
<td>R</td>
<td>53</td>
<td>74</td>
<td>8</td>
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<tr>
<td></td>
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<td>L</td>
<td>42.5</td>
<td>85</td>
<td>7.5</td>
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<tr>
<td></td>
<td>R + L</td>
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<td>159</td>
<td>15.5</td>
<td></td>
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<tr>
<td></td>
<td>F</td>
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<td>R + L</td>
<td>56</td>
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<tr>
<td></td>
<td>M + F</td>
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<td></td>
<td>L</td>
<td>71.5</td>
<td>159</td>
<td>19.5</td>
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<td></td>
<td>R + L</td>
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<td>309.5</td>
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Table 3

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<thead>
<tr>
<th>Factor</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>T Value</th>
<th>P Value</th>
<th>Result</th>
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<tr>
<td>MLI (Left)</td>
<td>Patients</td>
<td>100</td>
<td>8.4800</td>
<td>1.3594</td>
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<td></td>
<td>Control</td>
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<td>8.2000</td>
<td>1.4071</td>
<td>.1407</td>
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Table 4

<table>
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<th>Factor</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>T Value</th>
<th>P Value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLI</td>
<td>Patients</td>
<td>100</td>
<td>9.2300</td>
<td>1.3622</td>
<td>.1362</td>
<td>2.444</td>
<td>0.015</td>
<td>S</td>
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<tr>
<td></td>
<td>Control</td>
<td>100</td>
<td>8.7100</td>
<td>1.6348</td>
<td>.1635</td>
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</table>

Table 5

<table>
<thead>
<tr>
<th>Factor</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>T Value</th>
<th>P Value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATD</td>
<td>Patients</td>
<td>100</td>
<td>41.1500</td>
<td>5.9380</td>
<td>.5938</td>
<td>-1.727</td>
<td>0.086</td>
<td>NS</td>
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<tr>
<td></td>
<td>Control</td>
<td>100</td>
<td>42.4700</td>
<td>4.8126</td>
<td>.4813</td>
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</table>

Table 6

<table>
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<th>Factor</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>T Value</th>
<th>P Value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATD</td>
<td>Patients</td>
<td>100</td>
<td>41.46</td>
<td>6.1864</td>
<td>0.6186</td>
<td>-0.934</td>
<td>0.351</td>
<td>NS</td>
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<td></td>
<td>Control</td>
<td>100</td>
<td>42.18</td>
<td>4.5999</td>
<td>0.46</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Discussion

1) Qualitative analysis of finger tip patterns

Whorls: In the present study hypertensive patients show increased percentage of whorl pattern on first digit in both sexes.

Polyzova D, Kuklik M, Berankova M, Shauwmann in 1991 carried out their study on hypertensive patient and they have also observed that in hypertensive patient there was increased frequency of whorls.

Godfrey KM, Barker DJ, Peace J, Cloke J, Osmond C in 1993 observed increased frequency of whorls in patients with hypertension.

VarshaMokashi, S. Kantha in 2002 observed highest frequency of whorls in hypertensive patients. Thus, the findings of present study are correlated with findings of above workers.

Loops: In the present study decreased percentage of loops was observed in hypertensive patient in first digit.

Polyzova D, Kuklik M, Berankova M, Shauwmann in 1991 observed lower frequency of fingertip ulnar loops in hypertensive patients.

VarshaMokashi, S. Kantha in 2002 observed decreased frequency of radial loops

2) Qualitative analysis of finger tip patterns

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VarshaMokashi, S. Kantha in 2002 observed decreased frequency of radial loops

There is decrease frequency of loops observed as a whole, which can be partially correlated with the above workers.

Arches: In the present study the increased percentage of the arches observed in female hypertensive patients only as compared to the control group.

On the contrary in case of male hypertensive patient there is marginal decrease in the percentage of arches observed.

VarshaMokashi, S. Kantha in 2002 only mentioned decreased percentage of arches in hypertensive patients but they have not specifically mentioned the gender in which the decreased percentage of arches occurred.

In our study only there is partial decrease in percentage of arches observed in male but there is an increased percentage of arches observed in female only. Hence our findings could not match with the findings of VarshaMokashi and S. Kantha.
3) Quantitative analysis of finger prints.
   a) Total finger ridge count: (TFRC): In the present study there is significant increase in the mean values of TFRC in hypertensive patients as compared to controls.

   Pursnani ML, Elhence GP, Tibrewala L in 1989 observed increased TFRC in hypertensive patients as compared to controls.

   Polyzova D, Kuklik M, Berankova M, Shaumann B in 1991 observed increased total finger ridge count (TFRC) in hypertensive patients.

   Reed T in 1995 observed decrease in total finger ridge count (TFRC) in hypertensive patients as compared to controls.

   VarshaMokashi, S Kantha in 2002 observed increased TFRC in hypertensive patients as compared to controls.

   PriyaRanganath, RoopaRavindranathShubha R in 2003 observed increased ridge count in hypertensive patients than in controls.

   Kulkarni DV, Herekar NG in 2005 observed increased total finger ridge count (TFRC) in hypertensive patients as compared to controls.

   Our findings of increased total finger ridge count (TFRC) in hypertensive patients is similar to almost all of the above workers except Reed T, who has observed decreased percentage of TFRC in hypertensive patients as compared to controls.

   Absolute finger ridge count: (ARFC)
   In the present study mean of absolute finger ridge count was highest in hypertensive patients as compared to controls.

   VarshaMokashi, S Kantha in 2002 observed increased ARFC in hypertensive patients as compared to controls.

   So our finding of having increase mean value of ARFC in hypertensive patients coincides with the above workers.

   Main Line Index (MLI)
   In the present study the mean value of main line index (MLI), in the right hand of hypertensive patients was found to be 9.2300 as compared to controls it was 8.7100.

   The previous workers has not done this study hence our findings could not be compared.

   “atd” Angle
   In the present study the mean value for “atd” angle is decreased in hypertensive patients as compared to controls.


   Whereas only Polyzova D, Kuklik M, Berankova M, Shaumann B in 1991 has shown increase in “atd” angle.

   Hence, our finding of decrease in “atd” angle in hypertensive patients coincides with the above workers except the findings of Polyzovaet Summary

   Qualitative
   • The whorl pattern was highest in percentage on first, second, third and fourth digits in both sexes in hypertensive patients.
   • The frequency of whorl was highest in right and left hand of male hypertensive patients.
   • The percentage of loops was decreased in male and female hypertensive patients on first, second, third and fourth digits.
   • There were an increase percentage of arches on first, third and fifth digit in hypertensive females and male.
   • The percentage of Arches was decreased in case of male hypertensive patients on first, fourth and fifth digit as compared with control group.

   Quantitative
   • There was an increase in the mean values of TFRC in hypertensive patient.
   • The present study showed an increase in mean values of AFRC in hypertensive patients.
   • The mean value of „atd” angle was decreased in hypertensive.

7. Conclusions

   From the present study, it was concluded that:
   1) Whorls were highest in hypertensive patients.
   2) Loops were decreased in hypertensive patients.
   3) Arches were highest in hypertensive patients.
   4) Mean value of TFRC was highest in hypertensive patients.
   5) AFRC was also highest in hypertensive patients.
   6) MLI was increased in hypertensive patients in right hand.
   7) „atd” angle was decreased in hypertensive patients.

References